83-31-12 ✓

July 1987
Env. Eng. Rept. No. 95-87-3 ~~xx-xx-xx~~

TECHNICAL REPORT

CASPER:

A COMPUTER-ASSISTED PERFORMANCE EVALUATION AND REPORTING SYSTEM FOR MONITORING PUBLICLY-OWNED TREATMENT WORKS

by

Kevin T. Lautz
Graduate Research Assistant

and

Richard R. Noss
Assistant Professor

Department of Civil Engineering
Environmental Engineering Program
University of Massachusetts
Amherst, MA 01003

Submitted to the

Massachusetts Department of Environmental Quality Engineering
Division of Water Pollution Control
S. Russell Silva, Commissioner
Thomas C. McMahon, Director

July 1987

R & D PROJECT
83-31-12

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF TABLES

FOREWORD

The Computer assisted performance evaluation and reporting system for monitoring Massachusetts publicly-owned treatment works described here was developed by Mr. Kevin T. Lautz (under the direction of Dr. Richard R. Noss) in partial fulfillment of the requirements for his Masters Degree in Environmental Engineering from the University of Massachusetts. Work on computer assisted monthly reporting for wastewater treatment plants at the University of Massachusetts dates to the early 1970's. The CASPER system described in this report has its roots in this earlier work, but is essentially an entirely new system. The incorporation of an existing scientific database management system, SIR (Scientific Information Retrieval), as an integral part of the system gives CASPER significantly more power and flexibility than the earlier versions (earlier versions were known as DTECTR).

The current version of CASPER is essentially a data-scanning and report writing utility. The basic framework is there, however, to easily accept and support add-on application and evaluation sub-programs. The menu-driven nature of CASPER makes it accessible to novice users, facilitates the addition of sub-programs in the future, and maximizes efficiency by allowing the user to access and print only the data desired.

The work covered by this report was supported in part by a grant from the Massachusetts Division of Water Pollution Control (Research and Development Grant No. 83-31). We are grateful for the assistance and support (and patience) of members of the Massachusetts Division of Water Pollution Control Research and Demonstration Section staff, especially Art Screpetis, Mary Wheeler, Russ Isaacs, Carl Verro, John Jonasch, and Kathy O'Riordan.

ABSTRACT

CHAPTER 1

INTRODUCTION

Under the provisions of the 1972 Amendments to the Federal Water Pollution Control Act (PL 92-500), each publicly-owned treatment works (POTW) in Massachusetts is required to adhere to the conditions specified by its National Pollution Discharge Elimination System (NPDES) permit. In order to monitor compliance, monthly reports are required from each facility for both the federal Environmental Protection Agency (EPA) and the Massachusetts Division of Water Pollution Control (MDWPC). These reports summarize average and maximum and/or minimum values of permit parameters on a daily, weekly, and monthly basis. The state report form also includes unit process parameters for use in diagnostic evaluation of facilities not in compliance with their permits.

Review of the state monthly report forms is done by one or more MDWPC engineers in each of the four administrative regions. This review process consists of manually checking values for permit parameters given in the report against the limits specified in the permit itself. A more detailed review of the additional data may be conducted if time permits. The initial review procedure (compliance checking) generally requires one hour for each of the 112 POTWs in the state. In addition, there are about 100 major and over 400 minor industrial dischargers that are also subject to varying degrees of review.

Given the present staffing limitations within the Division, as well as the ever-increasing number of NPDES permittees (i.e. fewer engineers reviewing more and more monthly reports), it is not surprising that the majority of these reports often do not receive a full review. Most of the POTWs and major industrial dischargers are simply checked for permit compliance. Violations and obvious problems are noted, but little in-depth analysis of the data is possible. Some of the smaller POTWs and most of the minor industrial dischargers only receive a quick scan, and only significant violations are noted. As a result,

potential operational problems are not diagnosed until they cause permit violations. In the case of plants with chronic violations, diagnosis is often hindered by the inconvenience involved in obtaining several months or years worth of data, as well as the lack of appropriate means to correlate or otherwise analyze the data once it is obtained.

Clearly, a faster, more efficient system for monitoring and evaluating municipal and industrial discharger data would result in a more rapid and effective redress of permit violations. By delegating most of the redundant checking and number-crunching tasks to a digital computer, the engineer is free to concentrate on a more refined analysis of data from problem facilities, and follow up this analysis with technical assistance in the field. Through a database management system (DBMS), the computer may also facilitate more efficient storage and retrieval of the large quantity of data that is necessarily generated.

Computers in Water Pollution Control

As in just about every other technical area, the application of computer technology to the water pollution control field has burgeoned over the past five to ten years. The recent development of powerful, inexpensive, and easy-to-use hardware and software will allow even small facilities to harness the potential of this technology.

Computer-based data management offers great potential for improving performance and monitoring of POTWs. This application utilizes the computer's capability for storing and retrieving large amounts of data quickly and easily. Data management systems are currently being implemented in both POTWs and the government agencies overseeing them.

At the plant level, microcomputer-based spreadsheets and database managers (e.g. Multiplan, Lotus 1-2-3, dBaseII) are being used to record process data, keep track of maintenance and inventory, and generate monthly state and EPA reports. A time savings of 50%-75% over manual data management methods is indicated, based on interviews with several plant operators currently using microcomputers on-site. This savings, coupled with an initial required investment of less than $3000 for hardware and software, would suggest that computer data management in municipal

POTWs may soon be widespread.

At the agency level, data management systems have been implemented in some states and at the federal level to keep track of NPDES permittees via monthly Discharge Monitoring Reports (DMRs). Additional effluent data, process data, and general plant information are commonly recorded as well. These systems are necessarily more complex, and require more powerful mini- or mainframe computers, than the plant-level systems.

Previous Development Work for the MDWPC -- DTECTR

The utility of computer-assisted review and analysis of POTW performance was recognized by the DWPC as early as 1974, with the development of the original DTECTR (**D**iagnostic **T**esting of **E**fficiency by **C**omputerization of **T**reatment **R**eports) program (DiGiano, et al., 1977). Written in FORTRAN IV, this program read in operating data obtained from optical scanning forms and generated tabular output summarizing the day-to-day and monthly averages of these data, as well as the calculated values of specific performance parameters (e.g. percent removals, solids loading, food-to-microorganism ratio). In addition, values for design and NPDES permit parameters were checked for compliance, and overall performance was compared to that of the previous month and the year-to-date.

The original DTECTR program was tested in a pilot scale implementation study conducted in 1974, using data obtained from three facilities. Although more readable than the monthly report form then used, the DTECTR output was considered "not concise enough for general application" (Ruh, 1983). The project was discontinued at that point, and by 1981, both the program and the optical scanning form had been rendered obsolete.

In 1982, the DTECTR project was revived. The code was rewritten in FORTRAN V using structured programming techniques and sufficient documentation to make the program itself more readable. In addition, the format of the output was improved; more parameters were included; the performance and compliance checking sections were consolidated into one section and made more concise; and a trend analysis section using low-resolution graphics was added. The old optical scanning form, which held four days worth of data per form, was replaced by two new forms; the

first form held one day's daily operating data, while the second form held one day's BOD, Suspended Solids, and sludge processing data.

A pilot implementation of the revised DTECTR program and forms was conducted in the summer of 1983. The purpose of this implementation was two-fold: first, to evaluate the performance of the program using actual plant data and second, to obtain feedback from operators and the MDWPC regarding the feasibility of the system and possible improvements. Ten POTWs participated in the study, agreeing to complete facsimilies of the draft optical scanning forms over a period of two months. These facsimiles were not actually read by an optical scanner; their purpose was to expose the operators to this particular means of data entry in order to receive constructive commentary. The data itself was entered manually onto a VAX 11/780 minicomputer, where the revised version of DTECTR resided. DTECTR was subsequently run using the data, and, after some minor debugging, reports were generated.

An evaluation of the system based upon its performance in the second pilot study indicated that further modification was necessary in order to demonstrate a substantial improvement over the manual review system. The biggest "bottleneck" in the system proved to be the optical scanning method of data entry. In comparing the optical scanning form to the current monthly report form, the operator response varied. All indicated that it took at least as much time to fill out one as the other, and most indicated that the op-scan form took longer. In addition, a projection of the pilot study to all 112 POTWs (generating an average of 40 forms per month) resulted in an estimated handling of 53,760 forms per year: quite literally, a ton of paperwork.

Another aspect of the system where refinement was deemed necessary was in the presentation of the output. All through the development of DTECTR, the output was solely in the form of a multi-page printout, replete with tables, graphs, and an NPDES summary. Again, it was felt that this generated an unjustifiably excessive amount of paperwork, which would only serve to bog down the review process that the system was designed to streamline.

Despite the aforementioned drawbacks, an estimated 35% cost savings over manual review was demonstrated (Noss and Lautz, 1985). More importantly, however, was a time savings

of up to 75% for the MDWPC engineer doing the review (Ruh, 1983) - time that would then become available for technical assistance to POTW operators.

Statement of Purpose

The objectives of this report are as follows:

1) to describe a prototype computer-based performance evaluation and reporting system which would assist the Massachusetts Division of Water Pollution Control in monitoring POTWs within its jurisdiction;

2) to provide documentation on the rationale and operation of the system in the form of a user's manual/report;

3) to offer recommendations for the implementation and administration of the system.

The data management and analysis system herein described was conceived as a spinoff of the DTECTR program. The goal was to more fully utilize available computer resources (especially database management), while incorporating desireable features found in many of today's computer software products. These features include an interactive, user-friendly environment, modular programming (to facilitate program modification), and program portability. The original concept also included provisions for microcomputer-based input of data to replace optical scanning; however, owing to the wide variety of products and methods available for data input, it was decided to leave this consideration outside the scope of the project.

CHAPTER 2

CASPER: SYSTEM OVERVIEW

The remaining chapters of this report will describe CASPER (**C**omputer-**AS**sisted **P**erformance **E**valuation and **R**eview), a prototype data management and analysis system for monitoring publicly-owned treatment works in the Commonwealth of Massachusetts.

System Organization

The CASPER system consists of three major components: the applications program, the database, and the CASPER command procedure file. A schematic diagram of the system is shown in Figure 2-1.

This first version of CASPER has been designed to run on a CDC Cyber 175 or 730 mainframe computer running under Network Operating System (NOS) version 2. Development of the applications program was under CDC's implementation of FORTRAN V; it is believed that this is close enough to standard ANSI FORTRAN to ensure portability to other systems with little or no modification (University of Massachusetts Computing Center, personal communication).

The applications program (CASAPPL) is structured as a main program unit and eight subroutines. A generalized flow chart of CASAPPL is given in Figure 2-2, and a summary of the task(s) performed by the main program unit and each of the subroutines is given in Table 2-1. The full program listing is given in Appendix B.

CASAPPL was designed to be as modular and flexible as possible, to facilitate modification or addition to the code. It is also fully documented within the code itself, to assist in understanding the "flow" of the program.

The database is the actual body of data to be accessed by the applications program. This database contains two

Figure 2-1. CASPER system schematic.

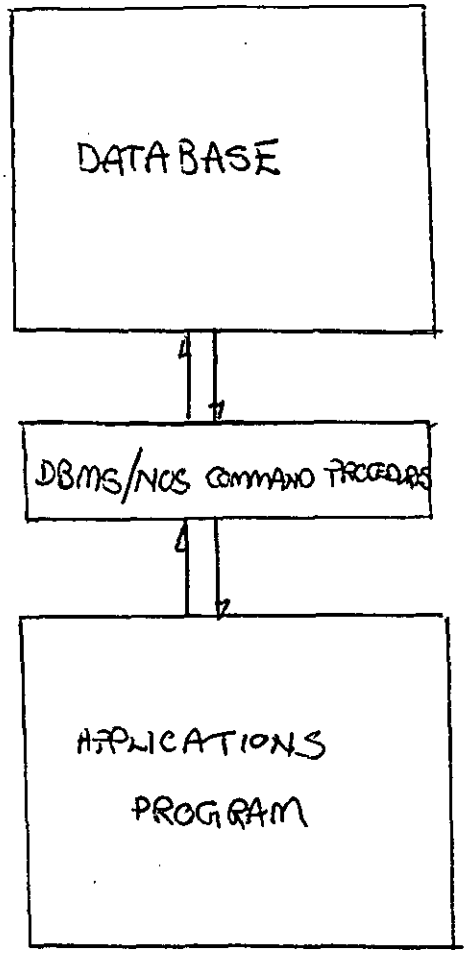


Figure 2-2. CASAPPL flow chart.

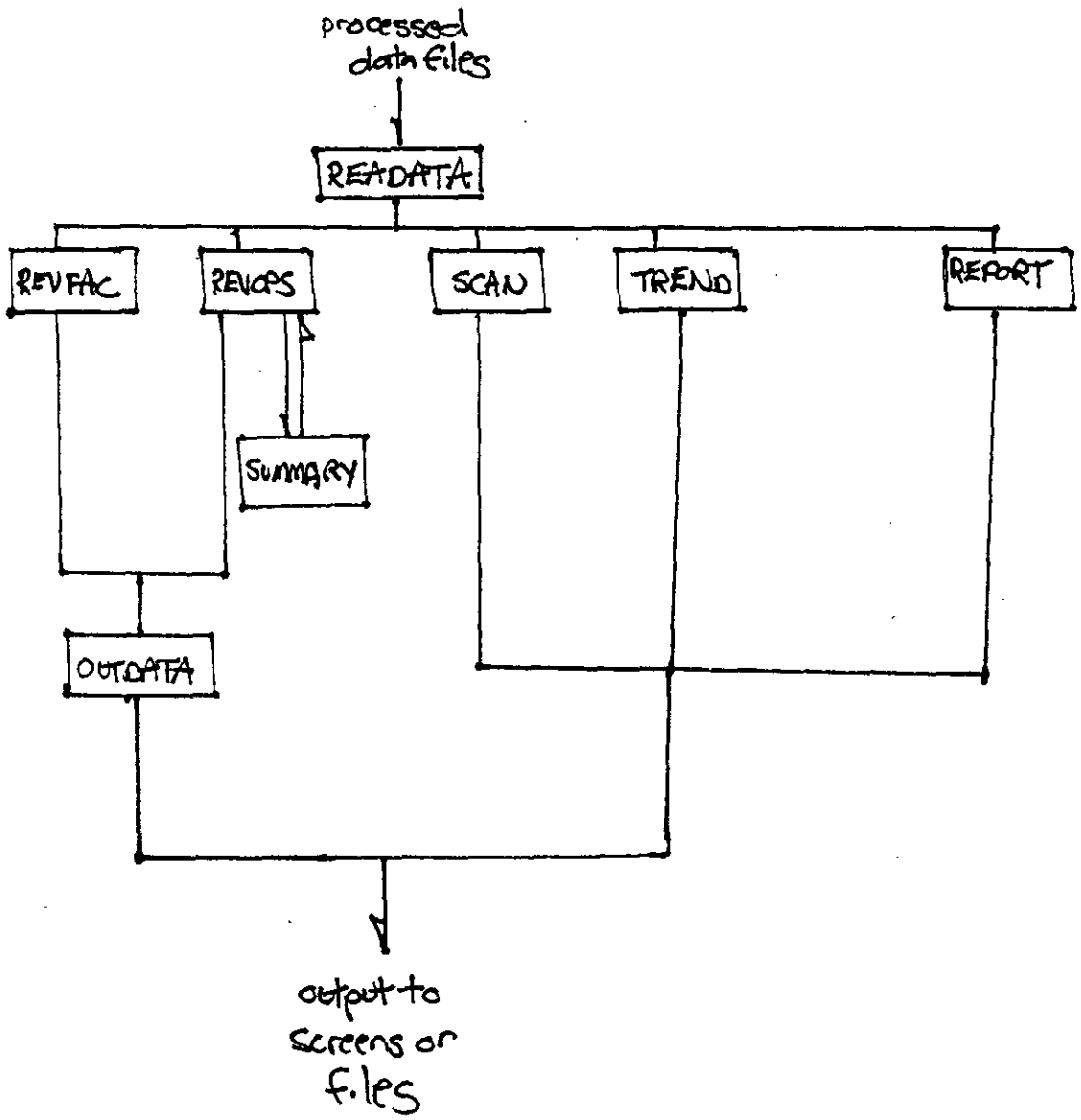


Table 2-1. CASAPPL program unit summary.

Program unit	Task(s) performed by program unit
main program	opens and reads in configuration file and facility and parameter indexes; prompts user for current month and year; generates CASPER applications menu.
READATA	reads data files.
OUTDATA	produces output to screens and to output files.
SCAN*	performs NPDES compliance checking, including prompts, menu, and output.
REVFAC	generates 'REVIEW FACILITY DATA' menu and associated prompts.
REVOPS	generates 'REVIEW OPERATIONS DATA' menu and associated prompts; converts numeric data to character formats (to be displayed using OUTDATA).
SUMMARY	calculates summary statistics.
TREND*	generates trend analysis plots.
REPORT*	generates a standardized report for each plant.

* Not fully implemented - to be included in a later release.

major classifications of data:

* facility data - information on POTWs which is more or less permanent (i.e. does not change from month to month);

* operations data - monthly report data for the current month.

Because of the voluminous amount of data which is expected to be handled by the CASPER system, a professionally-developed database management system (DBMS) is necessary to coordinate the flow of data between the database and the applications program. For the initial implementation of CASPER, a DBMS product known as Scientific Information Retrieval (SIR version 2, SIR Inc., Evanston IL) is used.

Activities within the CASPER system (e.g. loading data into the database, executing the applications program) are controlled via the CASPER command procedure file. This file is a collection of command procedures which automatically generate the NOS and SIR commands necessary to perform these activities. The command procedure file also generates the main menu, from which the user selects the desired activity. A summary of the procedure files contained in the command procedure file is given in Table 2-2, and a full listing is given in Appendix D.

System Operation

A diagram illustrating the flow of data through the CASPER system is given in Figure 2-3. This flow can be considered as consisting of six individual steps:

1) data input to unprocessed data files;

2) transfer of unprocessed data files to mainframe (Cyber) computer;

3) load data from unprocessed files into database;

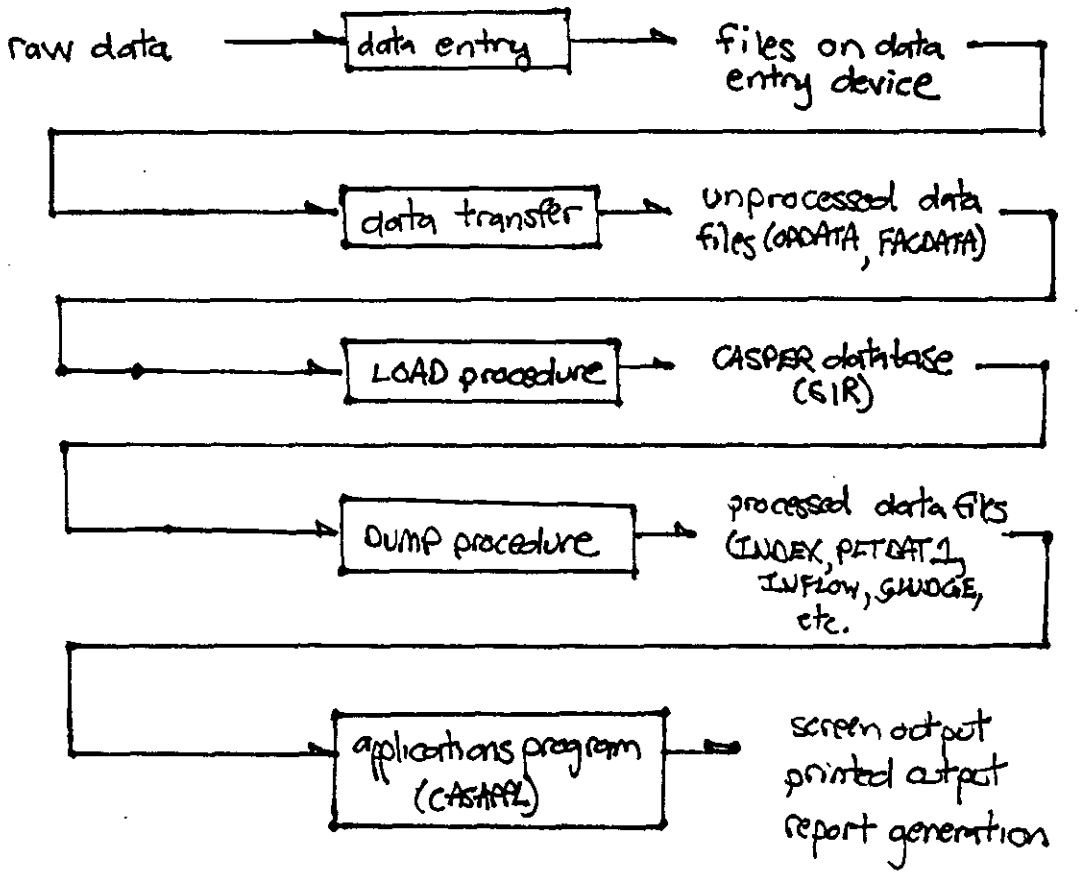
4) perform data processing within the database;

5) retrieve processed data and dump into data files;

Table 2-2. Summary of CASPER procedure files.

Procedure	Task(s) performed by procedure
CASPER	main NOS command procedure: prints title screen and main menu; calls MENU procedure.
MENU	NOS command procedure: prints main menu; calls other NOS command procedures.
LOAD	NOS command procedure: loads data into database.
DUMP	NOS command procedure: retrieves data from database.
APPL	NOS command procedure: executes CASPER applications program, calls necessary files, replaces output files produced by applications program.
LOADINT LOADOPS	SIR command procedures: called by LOADFAC LOAD.
DUMPOUT DUMP1 DUMP2 . . . DUMP16	SIR command procedures: called by DUMP.

Figure 2-3. CASPER system operation flow chart.



6) perform data analysis and review of processed data using the applications program (CASAPPL).

The term "processed", in this context, refers to any operation performed on the data by the DBMS. In the initial version of CASPER, processing is restricted to sorting and selecting data (for example, obtaining all data for facilities in a specific administrative region), as well as screening "bad" data records. "Unprocessed" data files are simply raw data files; no sorting is assumed, though they must adhere to a specified format.

Step 1: Data Input

This step involves the initial logging of data onto some sort of electronic storage medium (e.g. tape, disk, diskette). Several alternatives are available for this task, and include:

* manual input of data using a preprocessor, which is simply a program which prompts the user for data, and then stores it in the proper format onto tape or disk, depending upon the input device used;

* manual input of data using a commercially available spreadsheet, which will then store the data in the proper format onto tape or disk, again depending upon the input device used;

* direct transcription of data onto tape using optical scanning/optical reading forms.

The "input device" refers to the hardware used to log in the data. For the first alternative (preprocessor) the input device may reside either on the Cyber, or on a remote computer (e.g. a microcomputer located in a POTW or DWPC office). As the Cyber at this time does not possess a spreadsheet program, implementation of the second alternative would be restricted to a remote computer. The third alternative (optical scanning/optical reading), would require the use of a specialized equipment and forms, which would transcribe the data directly onto a tape to be read by the Cyber.

Step 2: Data Transfer

If the data is logged onto a remote device (a device other than the Cyber), then it must be transferred intact to the Cyber. With the optical reader/scanner, the data is transcribed onto magnetic tape, which may be "mounted" directly onto a Cyber tape reader. If data is entered using a remote computer (e.g. a microcomputer located at a WPCF), then transfer of data requires a modulator/demodulator (modem) and a communication protocol to move the data electronically between computers. A communication protocol is a program which connects two computers via their TTY (telephone) ports, and then synchronizes the flow of data between them. In addition, the protocol checks for corruption of the data during transfer, due primarily to line noise commonly present in telephone lines.

Step 3: Load data into database

Once unprocessed files have been transferred to permanent storage on the Cyber, they would be promptly loaded into the CASPER database. This is accomplished using the LOAD procedure. This procedure retrieves all the unprocessed data files for a facility and then executes a SIR Batch Data Input command file, which issues the proper SIR commands to enter the data records into the database. In addition, any "bad" records (i.e. improperly formatted, garbled during transfer, etc.) are identified and sent to a separate file. Finally, as the unprocessed data files are no longer required, they are deleted automatically.

The LOAD procedure discriminates between files containing operations data, in which new data is loaded at least once per month, and facility data, which is loaded only if the information on the facility needs to be updated. The CASPER user will be prompted to indicate which type of data is to be loaded, and, based upon the response given, LOAD will execute the proper set of SIR Batch Data Input commands.

It is not possible to corrupt the database by using the LOAD procedure. Once data is loaded into the database, it may only be removed by explicitly deleting or altering the database files.

Step 4: Perform processing functions within the database

The CASPER database functions as a central repository for all facility and operations data in the state. Once data is loaded into the database, it may be manipulated by the SIR DBMS in many different ways, limited only by the capabilities of the DBMS itself.

In this initial version of CASPER, processing by SIR is limited to the two major functions of a DBMS: data storage and data retrieval. The inclusion of SIR in the system was deemed appropriate, however, because it was recognized that a DBMS would be useful in maintaining the large and varied amount of data to be handled, and that it would be easier for later versions of CASPER to more fully realize SIR's potential.

For example, some possibilities for data processing within SIR include:

* sorting data by administrative region, to allow for separate processing by regional offices;

* creation of files with specific data items for use outside the scope of CASPER;

* creation of "subset" databases which may be used for data analysis within SIR, or with other data analysis packages such as SPSS or BMDP;

* custom report generation using SIR's report generator utility;

Implementation of the above tasks would involve development and execution of customized SIR retrieval command files and procedures by someone familiar with the SIR DBMS. The point is that once the data is properly located within the database, many other options become possible.

Step 5: Retrieve processed data and dump into files

After data has been processed within SIR, it must be transferred to files which can be accessed by the applications program. This is accomplished using the DUMP procedure. DUMP executes a SIR retrieval procedure to retrieve all data from the CASPER database, and write the data to files according to each data record's record type

(see " Appendix C1 - The Database Model" for a discussion of record types and other database concepts). The data may be sorted by administrative region, and processedand analyzed separately by each regional office. In addition, any missing numerical data is converted to a value of -1.0, which will be recognized by CASAPPL as missing rather than 0.0 (FORTRAN interprets blank numeric fields as 0.0, which is problematic when performing some computations).

Step 6: Perform data analysis and review using CASAPPL

The applications program, CASAPPL, written in FORTRAN V, consists of several subroutines which perform the actual analysis of the data, including:

* NPDES compliance checking;

* tabular displays of data, including summary statistics (average, median, maximum, minimum) for each parameter for each month;

* trend analysis using low resolution graph displays;

* generation of a standardized, hardcopy report for legal and administrative purposes;

Execution of CASAPPL is accomplished through the CASPER command procedure file, which calls the necessary processed data files from permanent storage, executes the compiled version of CASAPPL (CASBIN), and upon completion of execution, places any output files created into permanent storage.

CHAPTER 3

USING CASPER

This chapter will present and describe the features of the CASPER system, including step-by-step instructions for use. The focus of this presentation will be on the user's perspective; for a more in-depth discussion of programming and database considerations, refer to Chapter 2 (System Overview) and the Appendix.

The CASPER system is designed so that users need not be "computer-literate" to be able to utilize it. The applications program itself is menu-driven, while routine transfers of data between the database and data files is accomplished using simple commands.

It is assumed that the user is familiar with logon/logoff procedures and basic operating system commands for the UMass CDC Cyber computer. Those new to the system should refer to the "Introduction to Time Sharing" manual (1982) for a description of these procedures. Relevant excerpts of this publication have been included in Appendix E.

To execute the CASPER system, three files must exist in the user's file catalog: CASPER, CASBIN, and SETUP. In addition, the database requires four files: CASPER1, CASPER2, CASPER3, and CASPER4. If any of these files are missing, contact your system administrator. To list the files in your catalog, use the CATLIST command:

CATLIST {cr} (Note: User entry is in **bold** type; {cr} means press the "return" or "enter" key. Unless otherwise noted, all user responses will require a {cr}.)

The terminal responds:

CATALOG OF 5103128 FM/UMASS 87/05/08 08.40.26.

(files are listed here)

The remaining instructions will follow the six-step procedure described in Chapter 2 (System Overview).

Data Input

Entering unprocessed data occurs outside of the CASPER system, either using one of the editors resident on Cyber (XEDIT or FSE), a pre-processor program, or an electronic spreadsheet. The required input formats are described in Appendix C3 (Data Element Summary), and must be followed precisely for correct transcription of the data. Obtaining proper formatting may be facilitated best by setting up a preprocessor or spreadsheet with the prescribed formats for each of the 16 record types (groups of data).

Data Transfer

If raw data is entered from outside the Cyber environment (e.g. a personal computer), then it must be transferred via modem to the Cyber. Data should be transferred in ASCII format, using a compatible communications protocol (e.g., UNCLE, PC-TERM). If possible, data should be merged into one of two files (one containing facility data, the other containing operations data) prior to transmission. Contact your system administrator for assistance.

CASPER: Executing the Command Procedure File

Steps 3, 5, and 6, as described in Chapter 2, are performed from within the CASPER system. Execution of the individual tasks is controlled by the CASPER command procedure file, which presents menus and interactive prompts to the user, and then automatically generates the

necessary commands.

The unprocessed data must be contained in one of two Cyber text files, FACDATA (for facility data) and OPDATA (for operations data), prior to execution of the CASPER system. These files are created by the user in the data input step if unprocessed data is entered directly on Cyber; otherwise, they should be transferred to the Cyber by the communications protocol.

Once these files are created or transferred, the user issues the following command to execute the command procedure file:

GET,CASPER {cr}

READY.

X,CASPER {cr}

The title screen and main menu will then appear (see Figure 3-1). Four options are available at this stage:

* (L)oad unprocessed data in the database;
* (D)ump processed data into files;
* E(X)ecute the applications program;
* (Q)uit from CASPER.

The user should enter the letter in parentheses corresponding to the desired operation. Entering a **'?'** at the prompt will print a message briefly describing each of the options.

Assuming that no processed data files are available, the first three operations should be performed from top to bottom (i.e. (**L**)oad, (**D**)ump, and then E(**X**)ecute). Once the processed data files have been created, then the user needs only to E(X)ecute the applications program.

Figure 3-1. CASPER Title screen and Main Menu.

```
**********************************************************************
*                                CASPER                              *
*      COMPUTER-ASSISTED PERFORMANCE EVALUATION AND REVIEW           *
*                           VERSION 1.0                              *
*                                                                    *
*                                BY                                  *
*                                                                    *
*           KEVIN T. LAUTZ, GRADUATE RESEARCH ASSISTANT              *
*           RICHARD R. NOSS, ASST. PROF. OF CIVIL ENGR.              *
*                                                                    *
*      UNDER A GRANT FROM THE MASSACHUSETTS DIVISION OF              *
*                        WATER POLLUTION CONTROL                     *
*                                                                    *
*                           SEPTEMBER, 1987                          *
*                                                                    *
**********************************************************************

CASPER MAIN MENU

Enter OPTION (L)OAD (D)UMP E(X)ECUTE (Q)UIT (?=HELP)?
```

CASPER: Loading Data into the Database

Selecting the (**L**)oad option from the main menu invokes the LOAD procedure file, which will load the unprocessed data files (FACDATA and OPDATA) into the database. The system will respond with the following prompt:

```
Enter TYPE (I)NIT (F)AC (O)PER (? = HELP)?
```

At this point, the user may specify database initialization, load facility data, or load operations data, by typing in the appropriate single-character response ('**I**', '**F**', or '**O**'). The initialization option is used the first time that data is entered into the CASPER database; all subsequent load operations will use either the '**F**' or '**O**' option. Data need only be entered once (unless there are bad records or updated information); therefore, once facility data is loaded, it need not be reloaded unless there is new or updated information to be entered. Operations data will generally be loaded once per month, or more frequently if the data entry is broken up into smaller runs, or if bad records are encountered.

Occasionally, a record or group of records will be rejected by the DBMS, and not entered into the database. This may occur because of erroneous or improperly entered data, or data garbled during transfer. After a LOAD is performed, a batch data input summary is issued by the DBMS. This summary is written to the file LOADOUT, which is printed to the screen. The user may verify the success of the loading operation by examining the summary. LOADOUT gives information on the number of records accepted or rejected for each record type, as well as listing rejected records, and an error message indicating the reason for rejection (see Figure 3-2). In addition, a file called BADRECS is created which contains the rejected records. This file may be edited directly, and the records reentered by renaming the file FACDATA (for facility data) or OPDATA (for operations data) and subsequently invoking the LOAD procedure file.

Figure 3-2. Listing of LOADOUT file.

```
BATCH DATA INPUT SUMMARY REPORT
-------------------------------

DATABASE NAME:                          CASPER

UPDATE LEVEL:                           2
DATE/TIME OF UPDATE:                    07/22/87  00:27:58

INPUT FILENAME:                         OPDATA
NUMBER OF LINES READ:                   319

ACCEPT OPTION:                          OFF
ALL OPTION:                             OFF
ERROR FILE OPTION:                      ON
ERROR FILENAME:                         BADRECS
RECORDS WRITTEN TO FILE:                0

JOURNAL FILE OPTION:                    OFF

LOG FILE OPTION:                        OFF

EVICT RECORD OPTION:                    OFF
EVICT CIR OPTION:                       OFF

CASES INITIALLY:                        24
CASES ADDED:                            0
CASES UPDATED:                          3
CASES EVICTED:                          0
CASES AT END:                           24

RECORDS INITIALLY:                      147
RECORDS ADDED WITHOUT ERRORS:           226
RECORDS ADDED WITH ERRORS:              0
RECORDS UPDATED WITHOUT ERRORS:         0
RECORDS UPDATED WITH ERRORS:            0
RECORDS REJECTED:                       0
RECORDS EVICTED:                        0
RECORDS REJECTED (UNKNOWN TYPE):        0
RECORDS AT END:                         373

RECORD  PREVIOUS      NEW     NEW/  UPDATED UPDATED/ REJECTED  EVICTED  CURRENT
          TOTAL             ERRORS          ERRORS                      TOTAL
-------------------------------------------------------------------------------
     1       20        0        0        0        0        0        0       20
     2       20        0        0        0        0        0        0       20
     3        4        0        0        0        0        0        0        4
     4       13        0        0        0        0        0        0       13
     5       10        0        0        0        0        0        0       10
     6       10        0        0        0        0        0        0       10
     7       64        0        0        0        0        0        0       64
     8        6        0        0        0        0        0        0        6
     9        0       31        0        0        0        0        0       31
    10        0       31        0        0        0        0        0       31
    11        0       31        0        0        0        0        0       31
1CASPER DATA LOADER - INITIALIZATION                          (SIR/DBMS 2.1.3)
        07/22/87  00:27:47  PAGE    5

RECORD  PREVIOUS      NEW     NEW/  UPDATED UPDATED/ REJECTED  EVICTED  CURRENT
          TOTAL             ERRORS          ERRORS                      TOTAL
-------------------------------------------------------------------------------
    12        0       31        0        0        0        0        0       31
    13        0       31        0        0        0        0        0       31
    14        0       31        0        0        0        0        0       31
    15        0       31        0        0        0        0        0       31
    16        0        9        0        0        0        0        0        9
-------------------------------------------------------------------------------
TOTALS:     147      226        0        0        0        0        0      373
```

Retrieving Processed Data

Once loaded into the database, the data must be retrieved and "dumped" into files to be accessed by the applications program. This is accomplished by selecting the (**D**)UMP option from the main menu. This will invoke the DUMP procedure, which will respond with the following message:

```
TRANSFERRING DATA FROM DATABASE TO FILES.......
```

The DUMP procedure file will create 16 data files (see Figure 3-3), which are necessary for the execution of the CASPER applications program and should not be deleted.

Performing Data Analysis and Review

Once the DUMP procedure has been completed, the applications program may be used to display and analyze the data. To execute the applications program, the user selects the E(**X**)ecute option from the main menu. This invokes the APPL procedure file, which calls all the necessary files into the user's workspace and executes the binary version of the applications program (CASBIN). The applications program itself is "user-friendly", requiring only that the user respond to menus or simple user prompts.

Upon selection of the E(**X**)ecute option the user is prompted to verify the current month:

```
MONTH Ø5  YEAR 1987

IS THIS CORRECT? (Y/N)
?
```

The user will respond appropriately at the '?'. If '**N**' is selected, the program will transfer the user into the configuration routine (see description of option **6** below), where the user will be allowed to specify a new date.

If '**Y**' is selected, the main applications menu is called:

Figure 3-3. Data files created by the DUMP procedure.

INDEX	PLTDAT1	PLTDAT2	PLTDAT3
NPDES1	NPDES2	PARAM	DESIGN
INFLOW	PRIMARY	SECNDRY	TRTIARY
GENERAL	BIOPRO	SLUDGE	COMMENT

```
                CASPER APPLICATIONS MENU
               -------------------------

                1 - NPDES SCAN
                2 - REVIEW FACILITY DATA
                3 - REVIEW OPERATIONS DATA
                4 - TREND ANALYSIS
                5 - REPORT GENERATION
                6 - CONFIGURATION FILE
                Ø - EXIT CASPER

SELECT OPTION
?
```

At this point the user will specify an option by entering the appropriate number.

Option Ø - EXIT CASPER. This option terminates execution of the applications program. The user is returned to the CASPER main menu.

Option 1 - NPDES SCAN. This option performs a scan of all NPDES parameters for a selected facility, or for all facilities, and lists (to the screen and to output file 'SCANOUT') any NPDES violations found.

[Note: This feature is not yet fully implemented. A technical memorandum will be issued when this status changes.]

Upon selection of this option, the system responds with the following menu:

```
CASPER - NPDES SCAN
-----------------------------------

XXX - SCAN FACILITY XXX

  A - SCAN ALL FACILITIES

  L - LIST FACILITY CODES

  X - EXIT TO APPLICATIONS MENU

?
```

At this point, the user will select the facility code corresponding to the desired facility, or select the 'A' option to perform the scan for all facilities. If the facility code is unknown, then the user may specify the 'L' option to list the facility index.

Once the user has selected one (or all) of the facilities, the system searches the appropriate data files for the necessary information. If the information is not found, the system will respond:

```
RECTYPE nn   aaaaaaa

NO DATA AVAILABLE FOR FACILITY xxx
```

where 'nn' is the rectype number, 'aaaaaaa' is the rectype name, and 'xxx' is the facility number.

If all the necessary information is present, the scan is performed. If a violation is encountered during the scan, it is recorded both on the screen, and on a data file called SCANOUT. The violation report (see Fig. 3-4) includes the MDWPC facility code, facility name, NPDES ID number, and current date (month and year) at the top; each violation record includes the day the violation occurred, the code, name and units of the parameter violated, the value recorded, and the permit value. If no violations were noted for a facility, the following message is printed in the report:

```
NO NPDES VIOLATIONS FOUND
```

If the scan report requested occupies more space than a terminal screen provides, it is broken up into 16-line "subscreens". After each subscreen is displayed, the system prompts the user:

```
CONTINUE? [Y/N]
```

Entering '**Y** {cr}' at the prompt will print the next subscreen. Entering '**N** {cr}' will return the user to the SCAN menu. After the last subscreen has been printed, the system responds:

Figure 3-4. NPDES Scan Violation Report.

(not implemented currently)

END OF LISTING, LIST AGAIN? [Y/N]

Entering **'Y** {cr}' at the prompt will cause the data to be listed again, starting from the first subscreen. Entering **'N** {cr}' will return the user to the SCAN menu.

Data sent to the SCANOUT file is broken up into 60 line pages. No prompts are issued to the user during file creation. Page breaks are inserted automatically between pages.

Option **2** - REVIEW FACILITY DATA. This option allows the user to view facility data for any facility in the facility index. These record types are listed in the REVIEW FACILITY DATA menu:

CASPER REVIEW FACILITY DATA

---

1 - INDEX (INDEX TO FACILITIES)
2 - PLTDAT1 (GENERAL FACILITY INFORMATION)
3 - PLTDAT2 (TREATMENT INFORMATION)
4 - PLTDAT3 (PERSONNEL INFORMATION)
5 - NPDES1 (NPDES PERMIT INFORMATION)
6 - NPDES2 (NPDES LIMITS INFORMATION)
7 - PARAM (PARAMETER INDEX)
8 - DESIGN (FACILITY DESIGN INFORMATION)

SELECT NUMBER CORRESPONDING TO DESIRED INFORMATION
?

Upon selection of a record type (**1 - 8**), the system responds with the following prompt:

```
CASPER: REVIEW FACILITY DATA
----------------------------------------

XXX - LIST DATA FOR FACILITY XXX

A - LIST DATA FOR ALL FACILITIES

L - LIST FACILITY [PARAMETER] CODES

X - EXIT TO APPLICATIONS MENU

?
```

---

* Note: If record type '7' (parameter index) is selected, the second line appears as

* XXXXX - LIST DATA FOR PARAMETER XXXXX

At this point, the user will select the facility code corresponding to the desired facility, or select the 'A' option to print out information for all facilities. If the facility code is unknown, then the user may specify the 'L' option to list the facility index.

Once the user has selected one (or all) of the facilities, the system searches the appropriate data file for the desired information. If the information is not found, the system will respond:

```
RECTYPE nn   aaaaaaa

NO DATA AVAILABLE FOR FACILITY xxx
```

where 'nn' is the rectype number, 'aaaaaaa' is the rectype name, and 'xxx' is the facility number.

For record types 1 - 4 and 7, data is presented on a single screen format. For record types 5, 6, and 8, data is distributed between two alternate screen formats. In this latter case, the user is given a menu of the data available on each alternate screen, and prompted to select

one:

NPDES LIMITS INFORMATION

A - LIMITS DATES AND VALUES

B - OTHER LIMIT INFORMATION

X - RETURN TO PREVIOUS MENU

?

The user may specify where the output is to be sent at the next prompt:

(S)CREEN OR (F)ILE?
?

If the user wishes to have the information printed to the screen, then '**S** {cr}' is entered at the prompt. If the user wishes to save the information in a file, then '**F** {cr}' is entered. If the file option is specified, then the user is prompted for a name for the output file (seven letters or numbers maximum, file name must start with a letter). It is suggested that the name 'OUTPUT' **not** be used for the output file, as that is the default name used for output to the screen. If an output file is created, and the user wishes to keep the file in permanent storage, then the NOS command **REPLACE** should be issued immediately after the exiting the CASPER system.

Data is presented in formatted "screens" (for terminal output) or "pages" (for file output). The formats for these screens and pages vary according to the record type; several examples of these screens are given in Figures 3-x to 3-x.

A typical screen (or page) consists of the header, a subheader, and then the data. The header is the first two lines of a screen or page, and consists of the MDWPC facility code, the facility name, the administrative region, and the NPDES identification number on the first line, and the current month, year, and record type number

Figure 3-5. REVFAC: Facility Index screen.

```
NUM  NAME                                                    AR NPDESID
-------------------------------------------------------------------------
001  ATHOL WWTP                                              CN 111111111
002  AYER WWTP                                               NE 222222222
009  AMHERST WWTF                                            WS 333333333
010  ADAMS WWTP                                              WS 444444444
017  GREATER LAWRENCE SANITARY DISTRICT                      NE 555555555
020  MARLBORO EAST                                           NE 666666666
026  ATTLEBORO WWTP                                          SE 777777777
030  LOWELL WWTF                                             NE 098765432
053  CHARLTON CITY WWTP                                      CN 234543426
063  NEWBURYPORT WPCF                                        NE 348764543
070  DARTMOUTH WPCF                                          SE 555987634
072  HAVERHILL WWTF                                          NE 090909090
075  PITTSFIELD WWTF                                         WS 664637849
076  MANSFIELD WWTF                                          SE 737187373
077  BILLERICA WWTP                                          NE 840553844
079  AMESBURY WPCF                                           NE 894883744
CONTINUE LISTING? (Y/N)
?
```

Figure 3-6. REVFAC: Facility Personnel screen.

```
089 UPPER BLACKSTONE WPCF                                    CN 123456789
--------------------------------FILE  4 - PLTDAT3-------------------------------

NAME                              TITLE                                CLASS
-------------------------------------------------------------------------------
BACHARD             CLARENCE      SUPERINTENDENT                         N
HANLEY              JAMES         CHIEF OPERATOR                         7
HOLLAND             EMIL          ENGINEER                               N
KEANE               GERALD        OPERATOR                               4
KENNEDY             PAUL          SHIFT OPERATOR                         7
NICHOLSON           PAUL          ASST. CHIEF OPERATOR                   7
SEED                EDWARD                                               6
ST.JOHN             HENRY                                                6

END OF LISTING, LIST AGAIN? (Y/N)
?
```

Figure 3-7. REVFAC: NPDES Permit Information screen.

```
089 UPPER BLACKSTONE WPCF                                    CN 123456789
------------------------------FILE  5 - NPDES1 ------------------------------

MAJOR DISCHARGE: M       EPA/STATE PERMIT: E      TYPE OF OWNERSHIP: PUB

PERMIT DATE ISSUED: 85/09/30            PERMIT DATE EXPIRED: 90/09/30

FINAL LIMITS INDICATOR: F

FACILITY INACTIVE CODE: A               FACILITY INACTIVE DATE:   /  /

END OF LISTING, LIST AGAIN? (Y/N)
?
```

Figure 3-8. REVFAC: Parameter Index screen.

```
PARAM          PARAMETER
CODE             NAME            UNITS
-------------------------------------------------------------------------------
00011    WASTEWATER     TEMP      [DEG. F]
00056      FLOW:      AVERAGE     [MGD]
00171     SEPTAGE       FLOW      [GAL]
00172     DIGESTER   TOT. SOL.      %
00174     DIGESTER   GAS PROD.   [1000 CF]
00300                    DO        [MG/L]
00310                   BOD        [MG/L]
00400                    PH
00530                    SS        [MG/L]
00535                   VSS        [MG/L]
00545      SETTL.      SOLIDS      [ML/L]
00600      TOTAL        NIT.       [MG/L]
00665      TOTAL       PHOS.       [MG/L]
46529                 RAINFALL     [IN]
50047      FLOW:      MAXIMUM      [MGD]
50058     PRECHLOR     DOSAGE     [LB/DAY]
CONTINUE LISTING? (Y/N)
?
```

and name on the second line. The subheader serves as the column headings for data presented in tabular form (as in record types 1, 4, 6, 7, and 8). The remainder of the screen or page contains the data itself, either in tabular form, or appropriately labeled and formatted.

If the data requested occupies more space than a terminal screen provides, it is broken up into 16-line "subscreens". After each subscreen is displayed, the system prompts the user:

CONTINUE? [Y/N]

Entering '**Y** {cr}' at the prompt will print the next subscreen. Entering '**N** {cr}' will return the user to the previous menu. After the last subscreen has been printed, the system responds:

END OF LISTING, LIST AGAIN? [Y/N]

Entering '**Y** {cr}' at the prompt will cause the data to be listed again, starting from the first subscreen. Entering '**N** {cr}' will return the user to the previous menu.

Data sent to an output file is broken up into 60 line pages. No prompts are issued to the user during file creation. Page breaks are inserted automatically between pages.

Option 3 - REVIEW OPERATIONS DATA. This option allows the user to view monthly report data for any facility in the facility index. These record types are listed in the REVIEW OPERATIONS DATA menu:

output) or "pages" (for file output). The formats for these screens and pages vary according to the record type; several examples of these screens are given in Figures 3-x to 3-x.

A typical screen (or page) consists of the header, a subheader, and then the data. The header is the first two lines of a screen or page, and consists of the MDWPC facility code, the facility name, the administrative region, and the NPDES identification number on the first line, and the current month, year, and record type number and name on the second line. The subheader serves as the column headings for data presented in tabular form (as in record types 9 - 15), and consists of the parameter names and units for each screen. The remainder of the screen or page contains the data itself, in tabular form. An exception here is record type 16 (COMMENT), where the comments are simply listed line by line.

If the data requested occupies more space than a terminal screen provides, it is broken up into 16-line "subscreens". Typically, two screens are required to print out a month's worth of data, if data were recorded every day. After each subscreen is displayed, the system prompts the user:

CONTINUE? [Y/N]

Entering '**Y** {cr}' at the prompt will print the next subscreen. Entering '**N** {cr}' will return the user to the previous menu. After the last subscreen has been printed, the system responds:

END OF LISTING, LIST AGAIN? [Y/N]

Entering '**Y** {cr}' at the prompt will cause the data to be listed again, starting from the first subscreen. Entering '**N** {cr}' will return the user to the previous menu.

After data is listed, the system responds:

PRINT SUMMARY STATISTICS? [Y/N]

Figure 3-9. REVOPS: Inflow Data screen.

089 UPPER BLACKSTONE WPCF CN 123456789

FILE 9 - INFLOW

DAY	BOD [MG/L]	SS [MG/L]	VSS [MG/L]	SETTL. SOLIDS [ML/L]	DO [MG/L]	PH
1	98.000	127.000	84.000	2.000	3.700	7.000
2	104.000	129.000	62.500	3.000	4.500	6.900
3	60.000	76.000	61.800	1.000	8.200	6.600
4	80.000	81.000	63.700	.100	7.400	6.600
5	72.000	72.000	55.900	.200	6.900	6.800
6	--------	--------	--------	--------	--------	7.000
7	83.000	76.000	53.800	--------	--------	--------
8	93.000	74.000	49.500	2.000	5.200	6.700
9	258.000	177.000	133.800	1.000	5.800	6.700
10	99.000	86.000	--------	2.000	5.500	7.000
11	147.000	116.000	--------	2.000	4.900	6.800
12	102.000	93.000	--------	4.000	4.400	7.300
13	--------	--------	55.700	--------	--------	7.100
14	99.000	71.000	--------	--------	--------	--------
15	96.000	105.000	--------	5.000	4.400	7.000
16	120.000	124.000	--------	2.000	4.400	6.800

CONTINUE LISTING? (Y/N)
?

Figure 3-10. REVOPS: Biological Process Data: Screen 'A'.

089 UPPER BLACKSTONE WPCF CN 123456789

FILE 13 - BIOPRO

DAY	MLSS [MG/L]	MLVSS [MG/L]	MLDO [MG/L]	MLPH	MLSETS [ML/L]	AIR SUPPLIED [C.F./MIN]
1	3260.000	2310.000	2.200	6.800	430.000	--------
2	3260.000	2330.000	1.800	6.900	590.000	--------
3	2190.000	1630.000	2.300	6.800	250.000	--------
4	2910.000	2150.000	1.800	6.500	330.000	--------
5	2770.000	1790.000	.700	7.000	245.000	--------
6	3340.000	2310.000	.700	--------	290.000	--------
7	--------	--------	.700	--------	--------	--------
8	3360.000	2330.000	.700	7.100	305.000	--------
9	3370.000	2310.000	.700	7.000	310.000	--------
10	3170.000	2160.000	.700	6.800	280.000	--------
11	3460.000	2390.000	.700	6.000	315.000	--------
12	--------	--------	.600	--------	--------	--------
13	3830.000	2550.000	.900	--------	345.000	--------
14	--------	--------	.800	--------	--------	--------
15	3510.000	2520.000	1.100	6.300	372.000	--------
16	4130.000	2830.000	.500	6.800	345.000	--------

CONTINUE LISTING? (Y/N)
?

Entering '**Y** {cr}' at the prompt will cause the summary statistics (total, arithmetic mean, geometric mean, median, maximum value, mimimum value) for each parameter to be printed to the screen (see Figure 3-x). Entering '**N**' will return the user to the previous menu.

Data sent to an output file is broken up into 60 line pages. No prompts are issued to the user during file creation. Page breaks are inserted automatically between pages, and the summary statistics are listed immediately beneath the data.

Option **4** - TREND ANALYSIS. This option displays selected operations parameters in graphical form for the current month, to allow the user to spot day-to-day trends in a facility's performance.

[Note: This feature is not yet fully implementable. A technical memorandum will be issued when this status changes.]

Option **5** - REPORT GENERATION. This option generates a standardized listing of operations and process evaluation parameter values for each facility for the current month. This listing is stored in a file named 'REPORT', which may be stored and subsequently printed out.

[Note: This feature is not yet fully implementable. A technical memorandum will be issued when this status changes.]

Data Processing Using SIR

The SIR DBMS offers a wide range of processing and analysis features for the data once it is loaded into the database. These features are outside the scope of the CASPER system, however, and require that the user familiarize him/herself with SIR commands and procedures. Commonly used SIR procedures, once developed, may be stored in a command procedure file similar to the one used by CASPER, so that they may be accessed quickly and easily.

For more information regarding the SIR DBMS system, refer to the SIR Version 2.0 user's manual (SIR, Inc., 1980). Information regarding development of NOS procedure files may be found in the NOS Version 2 Reference Manual,

Figure 3-11. REVFAC: Summary Statistics screen.

```
089 UPPER BLACKSTONE WPCF                                          CN 123456789
------------------------------FILE  9 - INFLOW -------------------------------

                                                 SETTL.
            BOD          SS          VSS        SOLIDS         DO          PH
DAY        [MG/L]      [MG/L]      [MG/L]      [ML/L]      [MG/L]
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
 AMEAN      92.680      89.200      68.967       1.548       5.938       6.850
 MEDIAN     83.000      80.000      61.800       1.500       5.800       6.800
 GMEAN        .000        .000        .000        .000        .000        .000
 MAX        258.000     177.000     133.800       5.000       9.700       7.300
 MIN         53.000      43.000      49.500        .000       3.700       6.400
 TOTAL     2317.000    2230.000    620.700      32.500     124.700     178.100

 END OF LISTING, LIST AGAIN? (Y/N)
?
```

Volume 3 (Control Data Corporation, 1985).

CHAPTER 4

CASPER: IMPLEMENTATION AND ADMINISTRATION

The final chapter of this report discusses issues and logistics related to the initial implementation and administration of the CASPER system, including equipment and personnel requirements, system startup, system maintenance, and future modification and expansion. While not making specific recommendations in all cases, available options will be proffered. This chapter is directed primarily toward those responsible for implementing and maintaining the system, rather than those who simply use the system.

Equipment Requirements

Data Entry

Necessary equipment for entry of data is dependent upon what option is selected. The three options discussed in Chapter IV were preprocessing, spreadsheets, and optical scanning. The preprocessing option would require the least amount of additional equipment, as it could be developed directly on the Cyber. This option would require the development of the preprocessor program, which could be written in any of the languages available on the Cyber (BASIC, FORTRAN, Pascal, COBOL, etc.). Alternatively, the preprocessor could be developed on a microcomputer, using whatever language was available.

The spreadsheet option would require access to another computer (Cyber does not have one), though a microcomputer with the same available memory as required for operating CASAPPL would suffice. Some very good and very versatile spreadsheets are available (e.g. dBase III, Lotus, PCCalc). Whichever spreadsheet is selected should be capable of converting data files to ASCII (American Standard Code for Information Interchange) format. This is necessary for proper data transfer between computers.

The final option is use of optical scanners/readers to read special forms containing the data. Optical scanners

are designed to read marks made on the form (generally filled in circles made by a soft lead pencil); the location of these marks determines the value transcribed to tape. Optical readers, on the other hand, attempt to read numerical characters written directly on the form. Because of the nature of the operations data, the latter option would be preferred, as it would require less space (and fewer forms) to log the same amount of data.

Database and Applications Programming

The CASPER system has been designed to run entirely on a CDC Cyber mainframe computer running under version 2 of the CDC Network Operating System (NOS). The software products used include the SIR DBMS (version 2), and CDC's implementation of FORTRAN 77 (FORTRAN V). Current memory requirements during the pre-implementation testing phase necessitated a minimum of 303,700 octal words of central memory. This requirement may have to be increased as implementation and expansion proceeds. In addition, use of tape backup and mounting utilities may be required for storage of data beyond the current month. The Cyber system manager should be contacted for more details concerning computer resource requirements.

Access to the University of Massachusetts CDC Cyber system is currently available through a TTY (telephone) connection to the Westboro office. All regional offices, as well as any other sites the Division deems necessary, can and should also have access to the mainframe. Equipment requirements for this access will include a CRT terminal, a modem, and a telephone. Alternatively, a microcomputer, with terminal emulation and communications software, can function in the place of a terminal. An emulation package known as Uncle is recommended for using CASPER on the UMass Cyber installation, due to its speed and compatibility. This package is available directly from the University Computing Center. More information on accessing the Cyber (including logon/logoff and basic system commands) are available from the Introduction to Time Sharing manual (UCC, 1982).

It is potentially feasible that the CASPER applications program would be run from a microcomputer rather than off the mainframe (e.g. in a regional office). With this option, data would still be loaded into and dumped from the database on the Cyber, but the processed

data files would be electronically transferred to remote computers for compliance checking and analysis. In this case, a microcomputer with at least 512 Kb of random access memory is recommended. The applications could be run off of floppy disks alone, but the increased speed and convenience of a hard disk would justify the additional expense. In this case, the applications program and current month's data for any one administrative region could easily be contained in 10 Mb of storage, a commonly available and relatively inexpensive size for hard disks. The software required would include an operating system (generally provided with the computer) and a FORTRAN compiler. It should be noted that some modification of the CASAPPL code may be necessary to allow for differences in FORTRAN between installations, as well as constraints on available memory.

Personnel Requirements

The CASPER system has been designed to be as user-friendly as possible, so that very little specialized training is required for the ordinary user. Potential users should be encouraged to read Chapters 2 and 3 of this manual as a minimum; however, most of the "training" will come as a result of "hands-on" use of the system.

As the CASPER system will likely receive most of its use in the regional offices, it is recommended that a minimum of one person from each office be designated as the CASPER "house expert", to receive any updated information or specialized training that may be required in future versions.

Actual implementation and administration of the system (including system modification and expansion) should be performed by someone familiar with the computer resources used, including:

* database management concepts in general, and the SIR DBMS in particular;

* the FORTRAN programming language;

* the Cyber Network Operating System, including Cyber Command Language procedure files.

System Installation and Startup

Cyber User Accounts

It is recommended that the MDWPC set aside two computer accounts solely for operation and maintenance of the CASPER system. One account (the 'master' account) will be used for actually running the system; access will be made available to all who need it. The other account (the 'administration' account), will be used for system upgrading, installation, and as a backup to the master account; access to this account should be restricted to whomever is responsible for maintaining the system (referred to in this report as the 'system administrator'). It is also recommended that each of the regional offices be given its own account, from which the CASPER system may be run.

Installation Procedure

The CASPER system has been designed to be as modular as possible, to provide portability and facilitate maintenance and upgrading. The entire system consists of three distince parts: the database, the applications program, and the command procedure file.

[NOTE: The installation procedure is to be performed from the administration account.]

Installation of the database requires the file containing the database schema ('SCHEMA'). To install, enter the following commands from the NOS subsystem:

GET,SCHEMA (Note: user entry is in **bold** type)

READY.

FINDLIB,SIR=SIR2

READY.

X,SIR(IN=SCHEMA,OUT=SCHOUT)

Normal execution of these commands results in the creation of four direct access files: CASPER1, CASPER2, CASPER3, and CASPER4. These files form the CASPER database, and should not be deleted once created.

Installation of the applications program requires the source program (CASAPPL), and the applications configuration file (SETUP). This source program should be compiled, and the object code stored in the file CASBIN, which is then put into permanent storage:

GET,CASAPPL

READY.

FORTRAN

READY.

RUN,I=CASAPPL,B=CASBIN

(several 'trivial' error messages will be printed here, and should be disregarded, as they do not affect system performance)

READY.

REPLACE,CASBIN

The command procedure file (CASPER) is self-contained and ready to use, so no special installation procedures are required.

After completing the installation procedure, the following files should appear in the administation account's file

catalog:

CATLIST {CR}

CATALOG OF 5103128 FM/UMASS 87/05/08 09.20.15

INDIRECT ACCESS FILES

CASAPPL CASBIN CASPER SCHEMA SETUP

DIRECT ACCESS FILES

CASPER1 CASPER2 CASPER3 CASPER4

At this point, all files are "private" access, i.e. they may not be read, copied, etc. unless the administrator explicitly permits them access. The PERMIT command allows access to files by another account:

PERMIT,filename,usernum

where 'filename', is the name of the file to be permitted, and 'usernum' is the account number to which the file is permitted. The administrator should permit the files CASPER, CASBIN, SETUP, and the database files to the master account. Once permitted, a user on the master account may obtain the files by entering the following commands:

GET,filename<1>,filename<2>,...,filename<n>/UN=usernum

where 'filename<1>,...,filename<n>, are the names of the files to be obtained, and 'usernum' is the administration account user number.

System Maintenance

This section details the monthly operation of the system by the administrator.

Data Entry and Transfer

As data entry and transfer are outside the scope and control of the CASPER system, maintenence of these processes are the responsibility of the user. To ensure that they are performed reliably, the administrator should determine that:

* the input formats specified in the appendix are used;
* prior to transfer, all data must be merged onto one of two files: FACDATA (for facility data), and OPDATA (for operations data);
* files should be transferred using a dependable communications protocol (UNCLE is recommended);
* after transferring the data, the user should immediately execute the CASPER system and load the data into the database.

Maintenance of the database

Maintenance of the database involves monthly backup of the previous month's data, and initialization for the current month.

[Note: This feature is not yet fully implemented. A technical memorandum will be issued when this status changes.

APPENDIX A

VARIABLES USED IN CASPER

The CASPER Data Element Summary included as Appendix II describes the variables contained in the record types of the database in detail. Those variables are covered by the following COMMON statements:

CDATA1	CDATA7
CDATA2	CDATA8
CDATA3	CDATA99
CDATA4	DATA3
CDATA5	DATA6
CDATA6	DATA8

Note: 'DATA' common blocks contain integer data; 'CDATA' common blocks contain character data.

Variables not included in the CASPER Data Element Summary are described below. Names in parentheses ( ) are the subroutines in which the variable is found. Names in slashes / / are the COMMON blocks in which the variables are found.

Name	Location	Description
BOTTOM	(OUTDATA)	counter to determine the end of page or end of screen
CLEAR	/SUB6/	VT100 character code to clear the screen
CODE	(CASPER, READATA OUTDATA, REVFAC)	Dummy Arg. for plant number or parameter number
COUNT	(READATA, OUTDATA REVFAC)	Dummy Arg. - counts number of records in the file
DAY	/DATA99/	day of the month
FILENAM	/CDATA0/	name of the record type (Character Var.)
FILENUM	(READATA, CONFIG REVFAC)	Dummy Arg. - record type number (1-14) (See Appendix II)
FORM	/CDATA0/	array containing formats used when reading data
FOUND	(CASPER, READATA OUTDATA, REVFAC)	logical variable - used to determine if files are empty
FULL	(OUTDATA)	number of lines per page (60) or screen (16)
INDXCNT	/DATA0/	number of plants in the facility index (Record Type 1)
LENG	/DATA0/	length of data record
LINE	/DATA16/	line number of comment file
LISTNUM	(REVFAC)	same as FILENUM
LOOPCNT	(REVFAC)	counter for a loop
MONTH	/CDATA0/	month (1-12) defined in SETUP file and changed interactively in subroutine CONFIG
NUMFILS	/DATA0/	number of files in the database (= 16 now) (defined in the SETUP file)
NUMP(I)	/DATA0/	number of parameters in record type (I) (I = 9 to 15)

ODARRAY(I,J,K)		
	/OPDATA/	operating data array - the database
PARLIST	/DATA0/	list of parameters found in a specific operations data file
POINTER	(OUTDATA)	Dummy Arg. - keeps track of the specific plant or parameter for which data is wanted
PRAMCNT	/DATA0/	number of parameters in the parameter listing (Record Type 7)
REMAIN	(OUTDATA)	keeps track of the lines of data remaining to be printed
REPLY	(CASPER, OUTDATA REVFAC)	local variable receiving input in response to questions from CASPER
REPLY1	(CONFIG)	same as REPLY
REPLY2	(CONFIG)	same as REPLY
TOP	(OUTDATA)	counter to determine top of page or top of screen
YEAR	/CDATA0/	year (4 digits) defined in file SETUP, changed interactively in subroutine CONFIG

REVIEW OPERATIONS DATA

```
 9 - INFLUENT DATA
1Ø - PRIMARY TREATMENT DATA
11 - SECONDARY TREATMENT DATA
12 - TERTIARY TREATMENT DATA
13 - BIOLOGICAL PROCESS DATA
14 - GENERAL OPERATIONS DATA
15 - SLUDGE TREATMENT DATA
16 - COMMENTS
 Ø - RETURN TO PREVIOUS MENU

?
```

Upon selection of a record type (**9 - 16**), the system responds with the following menu:

```
CASPER: REVIEW OPERATIONS DATA
------------------------------------

XXX - LIST DATA FOR FACILITY XXX

  L - LIST FACILITY CODES

  X - EXIT TO CASPER APPLICATIONS MENU

?
```

At this point, the user will select the facility code corresponding to the desired facility, or select the 'A' option to print out information for all facilities. If the facility code is unknown, then the user may specify the 'L' option to list the facility index.

Once the user has selected one (or all) of the facilities, the system searches the appropriate data file for the desired information. If the information is not found, the system will respond:

```
RECTYPE nn   aaaaaaa

NO DATA AVAILABLE FOR FACILITY xxx
```

where 'nn' is the rectype number, 'aaaaaaa' is the rectype name, ans 'xxx' is the facility number.

For each record type, data is distributed between two or more alternate screen formats. The user is given a menu of the data available on each alternate screen, and prompted to select one:

```
SECONDARY TREATMENT DATA
------------------------------------------------------------

A - BOD                                  B - PHOSPHORUS
    SUSP. SOLIDS                             TOTAL NITROGEN
    SETTLEABLE SOLIDS                        AMMONIA NITROGEN
    DISSOLVED OXYGEN                         NITRATE NITROGEN
    PH                                       NIT. BOD
    DEPTH OF BLANKET

SELECT DESIRED GROUP OF DATA BY LETTER ('X' TO RETURN TO
PREVIOUS MENU
?
```

The user may specify where the output is to be sent at the next prompt:

```
(S)CREEN OR (F)ILE?
?
```

If the user wishes to have the information printed to the screen, then '**S** {cr}' is entered at the prompt. If the user wishes to obtain a permanent copy of the desired information, then '**F** {cr}' is entered. If the file option is specified, then the user is prompted for a name for the output file (seven letters or numbers maximum, file name must start with a letter). It is suggested that the name 'OUTPUT' **not** be used for the output file, as that is the default name used for output to the screen. If an output file is created, and the user wishes to keep the file in permanent storage, then the NOS command **REPLACE** should be issued immediately after the terminal session.

Data is presented in formatted "screens" (for terminal

```
      PROGRAM CASPER (INPUT,OUTPUT)

      COMMON/SUB6/CLEAR
      COMMON/DATA0/NUMFILS, LENG, NUMP, INDXCNT, PRAMCNT
      COMMON/CDATA0/MONTH, YEAR, FILENAM, FORM, PARLIST

      INTEGER LENG(25), NUMFILS, NUMP(25), INDXCNT, PRAMCNT
      CHARACTER CLEAR*15, FORM(25)*120, REPLY*1, MONTH*2, YEAR*4,
     +     FILENAM(25)*7, CODE*3, PARLIST(25,40)*5
      LOGICAL FOUND

*     ASSIGN 'CLEAR SCREEN' CHARACTER CODE (VT100) TO VARIABLE 'CLEAR'.

      CLEAR = ':I^>[H^>[J'

*     OPEN CONFIGURATION FILE  'SETUP' AND READ IN CONTENTS.

      OPEN (0,FILE = 'SETUP',RECL = 202)
      REWIND 0

    5 FORMAT(A2,A4)
    6 FORMAT(I2)
    7 FORMAT(A7,I3,A120)
    8 FORMAT(I2,40A5)

      READ(0,5) MONTH, YEAR
      READ(0,6) NUMFILS

      DO 20 I = 1,NUMFILS
         READ(0,7) FILENAM(I), LENG(I), FORM(I)
   20 CONTINUE

      DO 22 I = 9,NUMFILS
         READ(0,8) NUMP(I), (PARLIST(I,J), J = 1,NUMP(I))
   22 CONTINUE


*     CHECK 'MONTH' AND 'YEAR' TO SEE IF THEY CONTAIN PROPER VALUES.
*     PROGRAM WILL PROMPT USER FOR PROPER VALUES IF CURRENT ONES ARE
*     INCORRECT.

      WRITE(*,'(A)') CLEAR
   25 PRINT*, 'MONTH ', MONTH, '  YEAR ', YEAR
      PRINT*
      PRINT*, 'IS THIS CORRECT? (Y/N)'
      READ '(A)', REPLY

      IF (REPLY .NE. 'Y') THEN
         CALL CONFIG
      ENDIF

*     READ IN CONTENTS OF 'INDEX' AND 'PARAM' FILES

      CALL READATA(1, CODE, INDXCNT, FOUND)

      IF (.NOT. FOUND) GOTO 28

      CALL READATA(7, CODE, PRAMCNT, FOUND)

   28 IF (.NOT. FOUND) THEN
         PRINT*
```

```
            PRINT*, 'THE ABOVE FILE IS NECESSARY FOR PROPER '.
     +           'EXECUTION OF CASPER.  PLEASE REFER'
            PRINT*, ' TO THE CASPER USER''S GUIDE FOR MORE ',
     +           'INFORMATION.'
            GOTO 99
         ENDIF

*        CLEAR SCREEN AND PRINT MAIN MENU.

      30 WRITE(*,'(A)') CLEAR

      35 PRINT*
         PRINT*
         PRINT*, '                        CASPER APPLICATIONS MENU'
         PRINT*, '                        ------------------------'
         PRINT*
         PRINT*, '                         1 - NPDES SCAN'
         PRINT*, '                         2 - REVIEW FACILITY DATA'
         PRINT*, '                         3 - REVIEW OPERATIONS DATA'
         PRINT*, '                         4 - TREND ANALYSIS'
         PRINT*, '                         5 - REPORT GENERATION'
         PRINT*, '                         6 - CHANGE CONFIGURE FILES'
         PRINT*, '                         0 - EXIT CASPER'
         PRINT*
         PRINT*
         PRINT*, 'SELECT OPTION'
         READ '(A)', REPLY


*        BASED ON MENU SELECTION, BRANCH TO PROPER SUBROUTINE, OR END CASPER
*        RUN. PROGRAM INFORMS USER IF INVALID OPTION HAS BEEN SELECTED.

         WRITE(*,'(A)') CLEAR

         IF (REPLY .EQ. '0') THEN
              GOTO 99
*        ELSEIF (REPLY .EQ. '1') THEN
*             CALL SCAN
         ELSEIF (REPLY .EQ. '2') THEN
              CALL REVFAC
         ELSEIF (REPLY .EQ. '3') THEN
              CALL REVOPS
         ELSEIF (REPLY .EQ. '4') THEN
              CALL TREND
         ELSEIF (REPLY .EQ. '5') THEN
              CALL REPORT
         ELSEIF (REPLY .EQ. '6') THEN
              CALL CONFIG
         ELSE
              WRITE(*,'(A)') CLEAR
              PRINT*, 'INVALID SELECTION, PLEASE TRY AGAIN'
              GOTO 35
         ENDIF

         GOTO 30

      99 END
```

****

```
      SUBROUTINE READATA(FILENUM, CODE, COUNT, FOUND)

*     COMMON BLOCK


      COMMON/DATA99/DAY

      COMMON/CDATA99/PLTNUM

      COMMON/DATA0/NUMFILS, LENG, NUMP, INDXCNT, PRAMCNT

      COMMON/CDATA0/MONTH, YEAR, FILENAM, FORM, PARLIST

      COMMON/CDATA1/INDXNUM, PLTNAM, REGION, NPDES

      COMMON/CDATA2/MADD1, MADD2, MCITY, MZIP, TELNUM,
     +     BASIN, RECWAT, COMM21, COMM22

      COMMON/DATA3/WCOD, SCOD

      COMMON/CDATA3/DESC3, COMM31, COMM32

      COMMON/CDATA4/LNAME, FNAME, TITLE, CLASS

      COMMON/CDATA5/MADI, EPST, TYPD, PERD, PERE, FLIM,
     +     IACC, IADI, DNAM, DADD1, DADD2, DCITY, DZIP, COMM51,
     +     COMM52

      COMMON/DATA6/DMAX, DMIN, WMAX, WMIN, MMAX, MMIN, QMAX, QMIN

      COMMON/CDATA6/LIMTYP, PARCOD, MONLOC, FREQAN, SAMTYP, START,
     +     END, DBOUND, DSTAT, WBOUND, WSTAT, MBOUND, MSTAT,
     +     QBOUND, QSTAT, DESC6, COMM60

      COMMON/CDATA7/PCODE, PNAME1, PNAME2, UNITS, COMM70

      COMMON/DATA8/LENGTH, WIDTH, DIAM, DEPTH, HLOAD, SLOAD, DESD,
     +     VLOAD, DESFM, DESREC

      COMMON/CDATA8/UNITYP, UNITNUM, CONFIG, COMM80

      COMMON/OPDATA/ODARRAY,PUNIT,SUNIT,TUNIT,BUNIT

      COMMON/DATA16/LINE

      COMMON/CDATA16/COMMENT


*     VARIABLE DECLARATIONS


      INTEGER   DAY(0:32)

      CHARACTER PLTNUM*3

      INTEGER NUMFILS, LENG(25), NUMP(25), INDXCNT, PRAMCNT

      CHARACTER MONTH*2, YEAR*4, FILENAM(25)*7, FORM(25)*120,
     +     PARLIST(25,40)*5
```

```
      CHARACTER INDXNUM(200)*3, PLTNAM(200)*60, REGION(200)*30,
     +          MPDES(200)*9

      CHARACTER MADD1*30, MADD2*30, MCITY*30, MZIP*9, TELNUM*14,
     +          BASIN*30, RECWAT*30, COMM21*72, COMM22*72

      INTEGER   WCOD(15), SCOD(15)
      CHARACTER DESC3(6)*20, COMM31*72, COMM32*72

      CHARACTER LNAME(15)*18, FNAME(15)*10, TITLE(15)*30,
     +          CLASS(15)*2

      CHARACTER MADI*1, EPST*1, TYPO*3, PERD*6, PERE*6, FLIM*1,
     +          IACC*1, IADI*6, DNAM*30, DADD1*30, DADD2*30,
     +          DCITY*30, DZIP*9, COMM51*72, COMM52*72

      CHARACTER LIMTYP(40)*1, PARCOD(40)*5, MONLOC(40)*1,
     +          FREQAN(40)*5, SAMTYP(40)*2, START(40)*4, END(40)*4,
     +          DBOUND(40)*1, DSTAT(40)*1, WBOUND(40)*1,
     +          WSTAT(40)*1, MBOUND(40)*1, MSTAT(40)*1,
     +          OBOUND(40)*1, OSTAT(40)*1, DESC6(40)*20,
     +          COMM60(40)*43
      REAL      DMAX(40), DMIN(40), WMAX(40), WMIN(40), MMAX(40),
     +          MMIN(40), OMAX(40), OMIN(40)

      CHARACTER PCODE(100)*5, PNAME1(100)*10, PNAME2(100)*10,
     +          UNITS(100)*10, COMM70(100)*72

      CHARACTER UNITYP(25)*1, CONFIG(25)*1, UNTNUM(25)*2,
     +          COMM80(25)*72
      REAL      LENGTH(25), WIDTH(25), DIAM(25), DEPTH(25),
     +          HLOAD(25), SLOAD(25), DESQ(25), DESFM(25),
     +          VLOAD(25), DESREC(25)

      INTEGER    PUNIT(0:32), SUNIT(0:32), TUNIT(0:32), QUNIT(0:32)
      REAL       QDARRAY(7,31,40)

      INTEGER   LINE(20)
      CHARACTER COMMENT(20)*70


      INTEGER   I, COUNT, FILENUM, PAGE
      LOGICAL   FOUND
      CHARACTER CODE*3


*     BEGIN EXECUTABLE CODE

*     RETRIEVE SELECTED DATA FILE FROM PERMANENT STORAGE, OPEN IT, AND
*     REWIND IT.

      OPEN(FILENUM, FILE = FILENAM(FILENUM), RECL = LENG(FILENUM))
      REWIND FILENUM

*     INITIALIZE INPUT CONTROL VARIABLES

      I = 1
      FOUND = .FALSE.
```

```
   10 IF (FILENUM .LE. 8) THEN

         IF (FILENUM .EQ. 1) THEN
            READ(1, FMT = FORM(1), END = 99) INDXNUM(I), PLTNAM(I),
     +           REGION(I), MPDES(I)
            PLTNUM = CODE
         ELSEIF (FILENUM .EQ. 2) THEN
            READ(2, FMT = FORM(2), END = 99) PLTNUM, MADD1, MADD2,
     +           MCITY, MZIP, TELNUM, BASIN, RECWAT, COMM21, COMM22
         ELSEIF (FILENUM .EQ. 3) THEN
            READ(3, FMT = FORM(3), END = 99) PLTNUM, (WCOD(J), J =
     +           1,15),(SCOD(J), J = 1,15), (DESC3(J), J = 1,6),
     +           COMM31, COMM32
         ELSEIF (FILENUM .EQ.4) THEN
            READ(4, FMT = FORM(4), END = 99) PLTNUM, LNAME(I),
     +           FNAME(I), TITLE(I), CLASS(I)
         ELSEIF (FILENUM .EQ. 5) THEN
            READ(5, FMT = FORM(5), END = 99) PLTNUM, MADI, EPST,
     +           TYPO, PERD, PERE, FLIM, IACC, IADT, DNAM, DADD1,
     +           DADD2, DCITY, DZIP, COMM51, COMM52
         ELSEIF (FILENUM .EQ. 6) THEN
            READ(6, FMT = FORM(6), END = 99) PLTNUM, PARCOD(I),
     +           START(I), END(I), LIMTYP(I), MONLOC(I), FREQAN(I),
     +           SAMTYP(I), DBOUND(I), DSTAT(I), DMAX(I), DMIN(I),
     +           WBOUND(I), WSTAT(I), WMAX(I), WMIN(I), MBOUND(I),
     +           MSTAT(I), MMAX(I), MMIN(I), OBOUND(I), OSTAT(I),
     +           OMAX(I), OMIN(I), DESC6(I), COMM60(I)
         ELSEIF (FILENUM .EQ. 7) THEN
            READ(7, FMT = FORM(7), END = 99) PLTNUM, PCODE(I),
     +           PNAME1(I), PNAME2(I), UNITS(I), COMM70(I)
           PLTNUM = CODE
         ELSEIF (FILENUM .EQ. 8) THEN
            READ(8, FMT = FORM(8), END = 99) PLTNUM, UNTYP(I),
     +           UNTNUM(I), CONFIG(1), LENGTH(I), WIDTH(I), DIAM(I),
     +           DEPTH(I), HLOAD(I), SLOAD(I), DESQ(I), DESFM(I),
     +           DESREC(I), COMM80(1)
         ENDIF

      ELSE


         IF (FILENUM .EQ. 9) THEN
            READ(9, FMT = FORM(9), END = 99) PLTNUM, DAY(I),
     +           (ODARRAY(1,I,J), J = 1, NUMP(9))
         ELSEIF (FILENUM .EQ. 10) THEN
            READ(10, FMT = FORM(10), END = 99) PLTNUM, DAY(I),
     +           PUNIT(I), (ODARRAY(2,I,J), J = 1, NUMP(10))
         ELSEIF (FILENUM .EQ. 11) THEN
            READ(11, FMT = FORM(11), END = 99) PLTNUM, DAY(I),
     +           SUNIT(I), (ODARRAY(3,I,J), J = 1, NUMP(11))
         ELSEIF (FILENUM .EQ. 12) THEN
            READ(12, FMT = FORM(12), END = 99) PLTNUM, DAY(I),
     +           TUNIT(1), (ODARRAY(4,1,J), J = 1, NUMP(12))
         ELSEIF (FILENUM .EQ. 13) THEN
            READ(13, FMT = FORM(13), END = 99) PLTNUM, DAY(I),
     +           BUNIT(I), (ODARRAY(5,I,J), J = 1, NUMP(13))
         ELSEIF (FILENUM .EQ. 14) THEN
            READ(14, FMT = FORM(14), END = 99) PLTNUM, DAY(I),
     +           (ODARRAY(6,1,J), J = 1, NUMP(14))
         ELSEIF (FILENUM .EQ. 15) THEN
```

```
            READ(15, FMT = FORM(15), END = 99) PLTNUM, DAY(I),
     +           (ODARRAY(7,I,J), J = 1, NUMP(15))
          ELSEIF (FILENUM .EQ. 16) THEN
            READ (16, FMT = FORM(16), END = 99) PLTNUM, LINE(I),
     +           COMMENT(1)
          ENDIF

        ENDIF

        IF  (PLTNUM .EQ. CODE) THEN
            FOUND = .TRUE.

            IF ((FILENUM .EQ. 2) .OR. (FILENUM .EQ. 3) .OR.
     +       (FILENUM .EQ. 5)) THEN
                COUNT = 1
                RETURN
            ELSE
                I = I + 1
                GOTO 10
            ENDIF
        ELSEIF (.NOT. FOUND) THEN
            GOTO 10
        ELSE
            COUNT = I - 1
            RETURN
        ENDIF

    99  IF (.NOT. FOUND) THEN
            PRINT*, 'RECORD TYPE ', FILENUM, '  ', FILENAM(FILENUM)
            PRINT*
            PRINT*, 'NO DATA FOUND FOR FACILITY ', CODE
            RETURN
        ELSE
            COUNT = I - 1
            RETURN
        ENDIF

        END

*************************************************************************

        SUBROUTINE OUTDATA (FILENUM,OUTFILE,COUNT,CODE, ALT)

*       COMMON BLOCK

        COMMON/SUB6/CLEAR

        COMMON/DATA99/DAY

        COMMON/CDATA99/PLTNUM

        COMMON/DATA0/NUMFILS, LENG, NUMP, INDXCNT, PRAMCNT

        COMMON/CDATA0/MONTH, YEAR, FILENAM, FORM, PARLIST

        COMMON/CDATA1/INDXNUM, PLTNAM, REGION, NPDES

        COMMON/CDATA2/MADD1, MADD2, MCITY, MZIP, TELNUM,
     +       BASIN, RECWAT, COMM21, COMM22
```

```
      COMMON/DATA3/WCOD, SCOD

      COMMON/CDATA3/DESC3, COMM31, COMM32

      COMMON/CDATA4/LNAME, FNAME, TITLE, CLASS

      COMMON/CDATA5/MADI, EPST, TYPO, PERD, PERE, FLIM,
     +      IACC, IADT, DNAM, DADD1, DADD2, DCITY, DZIP, COMM51,
     +      COMM52

      COMMON/DATA6/DMAX, DMIN, WMAX, WMIN, MMAX, MMIN, QMAX, QMIN

      COMMON/CDATA6/LIMTYP, PARCOD, MONLOC, FREQAN, SAMTYP, START,
     +      END, DBOUND, DSTAT, WBOUND, WSTAT, MBOUND, MSTAT,
     +      QBOUND, QSTAT, DESC6, COMM60

      COMMON/CDATA7/PCODE, PNAME1, PNAME2, UNITS, COMM70

      COMMON/DATA8/LENGTH, WIDTH, DIAM, DEPTH, HLOAD, SLOAD, DESQ,
     +      VLOAD, DFSPM, DESREC

      COMMON/CDATA8/UNTYP, UNTNUM, CONFIG, COMM80

      COMMON/OPDATA/ODARRAY,PUNIT,SUNIT,TUNIT,QUNIT

      COMMON/DATA16/LINE

      COMMON/CDATA16/COMMENT

      COMMON/OUTLINK/CHARRAY

      COMMON/SUMVALS/MAXVAL,MINVAL,MEDVAL,AVGVAL,GEOMVAL,SUMVAL


*     VARIABLE DECLARATIONS

      INTEGER   DAY(0:32)

      CHARACTER PLTNUM*3

      INTEGER NUMFILS, LENG(25), NUMP(25), INDXCNT, PRAMCNT

      CHARACTER MONTH*2, YEAR*4, FILENAM(25)*7, FORM(25)*120,
     +      PARLIST(25,40)*5

      CHARACTER INDXNUM(200)*3, PLTNAM(200)*60, REGION(200)*30,
     +          NPDES(200)*9

      CHARACTER MADD1*30, MADD2*30, MCITY*30, MZIP*9, TELNUM*14,
     +          BASIN*30, RECWAT*30, COMM21*72, COMM22*72

      INTEGER   WCOD(15), SCOD(15)
      CHARACTER DESC3(6)*20, COMM31*72, COMM32*72

      CHARACTER LNAME(15)*18, FNAME(15)*10, TITLE(15)*30,
     +          CLASS(15)*2

      CHARACTER MADI*1, EPST*1, TYPO*3, PERD*6, PERE*6, FLIM*1,
     +          IACC*1, IADT*6, DNAM*30, DADD1*30, DADD2*30,
     +          QCITY*30, DZIP*9, COMM51*72, COMM52*72
```

```
      CHARACTER LIMTYP(40)*1, PARCOD(40)*5, MONLOC(40)*1,
     +          FREQAN(40)*5, SAMTYP(40)*2, START(40)*4, END(40)*4,
     +          DBOUND(40)*1, DSTAT(40)*1, WBOUND(40)*1,
     +          WSTAT(40)*1, MBOUND(40)*1, MSTAT(40)*1,
     +          OBOUND(40)*1, OSTAT(40)*1, DESC6(40)*20,
     +          COMM60(40)*43
      REAL      DMAX(40), DMIN(40), WMAX(40), WMIN(40), MMAX(40),
     +          MMIN(40), OMAX(40), OMIN(40)

      CHARACTER PCODE(100)*5, PNAME1(100)*10, PNAME2(100)*10,
     +          UNITS(100)*10, COMM70(100)*72

      CHARACTER UNTYP(25)*1, CONFIG(25)*1, UNTNUM(25)*2,
     +          COMM80(25)*72
      REAL      LENGTH(25), WIDTH(25), DIAM(25), DEPTH(25),
     +          HLOAD(25), SLOAD(25), DESQ(25), DESFM(25),
     +          VLOAD(25), DESREC(25)

      INTEGER   PUNIT(0:32), SUNIT(0:32), TUNIT(0:32), BUNIT(0:32)
      REAL      ODARRAY(7,31,40)

      INTEGER   LINE(20)
      CHARACTER COMMENT(20)*70

      CHARACTER  CHARRAY(7,34,40)*10

      REAL MAXVAL(40), MINVAL(40), MEDVAL(40), AVGVAL(40),
     +     GEOMVAL(40), SUMVAL(40)

*     LOCAL VARIABLE DECLARATIONS

      INTEGER   COUNT, FULL, FILENUM, POINTER, REMAIN, N, TOP,
     +          BOTTOM, MARK(40), PAGE, LOW, HIGH
      LOGICAL   FOUND
      CHARACTER OUTFILE*7, CODE*3, REPLY*1, CLEAR*15, ALT*1

*     OPEN OUTPUT FILE

      OPEN(99, FILE = OUTFILE)

      PAGE = FILENUM - 8

*     PRINT*, 'DEBUG OUTPUT'
*     PRINT*
*
*     DO 2 II = 1,34
*          WRITE(*,'(6(A,1X))')(CHARRAY(PAGE,II,JJ),JJ=1,6)
*   2 CONTINUE
*
*     PRINT*
*     PRINT*, 'END DEBUG OUTPUT'
*     INITIALIZE VARIABLE 'FULL', WHICH DEFINES THE NUMBER OF LINES OF
*     DATA FOR A FULL SCREEN OR PAGE OF OUTPUT.

      IF (OUTFILE .EQ. 'OUTPUT') THEN
          FULL = 16
      ELSE
          FULL = 60
      ENDIF
```

```
*     INITIALIZE OUTPUT CONTROL VARIABLES.

   10 REMAIN = COUNT
      N = 1

*     RETRIEVE PROPER VALUES FROM FACILITY OR PARAMETER INDEX FOR USE IN
*     THE HEADER.  THIS IS SUPPRESSED WHEN LISTING ALL INDEX OR PARAMETER
*     DATA.

      IF (CODE .NE. 'L') THEN
           FOUND = .FALSE.

           IF (FILENUM .EQ. 1) THEN
                DO 20 I = 1, INDXCNT
                     IF (INDXNUM(1) .EQ. CODE) THEN
                          FOUND = .TRUE.
                          N = 1
                          GOTO 45
                     ENDIF
   20           CONTINUE
           ELSE IF (FILENUM .EQ. 7) THEN
                DO 30 I = 1, PRAMCNT
                     IF (PCODE(1) .EQ. CODE) THEN
                          FOUND = .TRUE.
                          POINTER = 1
                          GOTO 45
                     ENDIF
   30           CONTINUE
           ELSE
                DO 40 I = 1, INDXCNT
                     IF (INDXNUM(1) .EQ. CODE) THEN
                          FOUND = .TRUE.
                          POINTER = 1
                          GOTO 45
                     ENDIF
   40           CONTINUE
           ENDIF

           IF (.NOT. FOUND) THEN
                WRITE (99,*) 'NO INDEX DATA FOR CODE ', CODE
                RETURN
           ENDIF

      ENDIF

*     THIS BLOCK RETRIEVES PROPER VALUES FROM PARAMETER INDEX
*     FOR USE IN LISTING NPDES PERMIT DATA (FILE 6).

   45 IF (FILENUM .EQ. 6) THEN

           IF (ALT .EQ. 'B') THEN
                REMAIN = 1
                PRINT*, 'ENTER A 5 DIGIT PARAMETER CODE'
                READ '(A)', PARCOD(1)
                PRINT*
           ENDIF

           DO 60 II = 1,REMAIN
                DO 50 JJ = 1,PRAMCNT
```

APPENDIX B

CASAPPL PROGRAM LISTING

```
+              'MAX/MIN',T64,'MAX/MIN',T73,'MAX/MIN')
       ELSEIF (FILENUM .EQ. 7) THEN
            WRITE (99,150)
            WRITE (99,90)
  150       FORMAT (/T2,'PARAM',T17,'PARAMETER'/T2,'CODE',T20,
+                'NAME',T36,'UNITS')
       ELSEIF ((FILENUM .GE. 9) .AND. (FILENUM .LE. 15)) THEN
            WRITE(99,155) (CHARRAY(PAGE,32,I), I = LOW, HIGH)
            WRITE(99,155) (CHARRAY(PAGE,33,I), I = LOW, HIGH)
            WRITE(99,156) (CHARRAY(PAGE,34,I), I = LOW, HIGH)
            WRITE(99,90)
  155       FORMAT(T10,6(A10,1X))
  156       FORMAT(T2,'DAY',T10,6(A10,1X))
       ENDIF

       IF (REMAIN .LT. 0) GOTO 510

*      SET INDEX VALUES FOR DO LOOP BELOW

       IF (REMAIN .GT. FULL) THEN
            TOP = N
            BOTTOM = N + FULL - 1
       ELSE
            TOP = N
            BOTTOM = N + REMAIN -1
       ENDIF

*>>>>>>>>>ADJUST FOR MULTI-LINE RECORD?

*      PRINT A SCREEN OR PAGE OF DATA

       DO 500 I = TOP, BOTTOM
            IF (FILENUM .EQ. 1) THEN
                 WRITE(99,160) INDXNUM(I), PLTNAM(I),
+                     REGION(I), NPDES(I)
  160            FORMAT(T2,A3,2X,A60,1X,A2,1X,A9)
            ELSEIF (FILENUM .EQ. 2) THEN
                 WRITE(99,170) BASIN, MADD1, RECWAT, MADD2, MCITY,
+                     MZIP, TELNUM(1:3), TELNUM(4:6), TELNUM(7:10),
+                     TELNUM(11:14), COMM21, COMM22
  170            FORMAT(/T2,'MAILING ADDRESS:',T41,'BASIN:',T48,A/
+                     T2,A,T35,'REC. WATERS:',T48,A/T2,A/T2,A,
+                     /T2,'MA',2X,A,T40,'TEL. #: (',A,')',1X,A,
+                     '-',A,1X,'EX ',A/T2,A/T2,A)
            ELSEIF (FILENUM .EQ. 3) THEN
                 WRITE(99,185)

                 DO 175 K = 1,15,5
                      WRITE(99,190) (WCOD(J), J = K,K+4)
  175            CONTINUE

                 WRITE(99,195)

                 DO 180 K = 1,15,5
                      WRITE(99,190) (SCOD(J), J = K,K+4)
  180            CONTINUE

  185            FORMAT(T30,'WASTEWATER TREATMENT')
  190            FORMAT(T2,5(1X,I2,1X,'--->'))
  195            FORMAT(T32,'SLUDGE TREATMENT')
```

```
      ELSEIF (FILENUM .EQ. 4) THEN
           WRITE(99,200) LNAME(I), FNAME(I), TITLE(I),
     +          CLASS(I)
  200      FORMAT(12,A18,2X,A10,T35,A30,T70,A2)
      ELSEIF (FILENUM .EQ. 5) THEN
           IF (ALT .EQ. 'A') THEN
                WRITE(99,210) MADI, EPST, TYPO, PERD(1:2),
     +            PERD(3:4), PERD(5:6), PERE(1:2), PERE(3:4),
     +            PERE(5:6), FLIM, IACC, IADT(1:2), IADT(3:4),
     +            IADT(5:6)
           ELSE
                WRITE(99,220) DNAM, DADD1, DADD2, DCITY, DZIP,
     +            COMM51, COMM52
           ENDIF

  210      FORMAT(/T2,'MAJOR DISCHARGE: ',A1,T27,'EPA/STATE',
     +            ' PERMIT: ',A1,T52,'TYPE OF OWNERSHIP: ',
     +            A3//T2,'PERMIT DATE ISSUED: ',A2,'/',A2,
     +            '/',A2,T42,'PERMIT DATE EXPIRED: ',A2,'/',
     +            A2,'/',A2//T2,'FINAL LIMITS INDICATOR: ',
     +            A1//T2,'FACILITY INACTIVE CODE: ',A1, T42,
     +            'FACILITY INACTIVE DATE: ', A2,'/',A2,'/',
     +            A2)
  220      FORMAT(/T2,'DMR FACILITY NAME: ',T25,A30/T2,
     +            'DMR ADDRESS: ',T25,A30/T25,A30/T25,A30/
     +            T25,'MA',2X,A9/2(/T2,A72))
      ELSEIF (FILENUM .EQ. 6) THEN

           IF (ALT .EQ. 'A') THEN
                WRITE(99,230) PARCOD(I), PNAME1(MARK(I)),
     +            UNITS(MARK(I)), START(I)(1:2),
     +            START(I)(3:4), END(I)(1:2), END(I)(3:4),
     +            DMAX(I), WMAX(I), MMAX(I), QMAX(I),
     +            PNAME2(MARK(I)), DMIN(I), WMIN(I),
     +            MMIN(I), QMIN(I)
           ELSE
               WRITE(99,240) PARCOD(I), PNAME1(MARK(I)),
     +            LIMTYP(I), MONLOC(I), FREQAN(I), SAMTYP(I),
     +            DBOUND(I), DSTAT(I), WBOUND(I), WSTAT(I),
     +            MBOUND(I), MSTAT(I), QBOUND(I), QSTAT(I)
           ENDIF

  230      FORMAT(12,A5,18,A10,T19,A10,2(1X,A2,'/',A2),
     +          4(1X,F9.4)/T8,A10,T41,4(1X,F9.4))
  240      FORMAT(/T2,A5,T15,A10/T15,A10/T2,'LIMIT TYPE: ',
     +          A1,T41,'MON. LOCATION: ',A1/T2,'FREQ. OF ',
     +          'ANALYSIS: ',A5,T41,'SAMPLE TYPE: ',A2//
     +          T2,'DAILY LIMIT',T21,A1,T41,A1/T2,'WEEKLY ',
     +          'LIMIT',T21,A1,T41,A1/T2,'MONTHLY LIMIT',
     +          T21,A1,T41,A1//T2,'OTHER LIMIT',T21,A1,T41,A1)
      ELSEIF(FILENUM .EQ. 7) THEN
           WRITE(99,250) PCODE(I), PNAME1(I), PNAME2(I),
     +          UNITS(I)
  250      FORMAT(T2,A5,T11,A10,T22,A10,T33,A10)

      ELSEIF ((FILENUM .GE. 9) .AND. (FILENUM .LE. 15)) THEN
           WRITE(99,300) DAY(I), (CHARRAY(PAGE,I,J), J = LOW,
     +          HIGH)
```

```
                    IF (PARCOD(II) .EQ. PCODE(JJ)) THEN
                         MARK(II) = JJ
                         GOTO 60
                    ENDIF
   50               CONTINUE
   60          CONTINUE

       ENDIF

*      ASSIGNS APPROPRIATE VALUES FOR 'LOW' AND 'HIGH', FOR USE IS LISTING
*      OUT OPERATIONS DATA.

       IF (FILENUM  .EQ. 9) THEN
            IF (ALT .EQ. 'A') THEN
                 LOW = 1
                 HIGH = 6
            ELSE
                 LOW = 7
                 HIGH = 11
            ENDIF
       ELSEIF (FILENUM .EQ. 10) THEN
            LOW = 1
            HIGH = 6
       ELSEIF (FILENUM .EQ. 11) THEN
            IF  (ALT .EQ. 'A') THEN
                 LOW = 1
                 HIGH = 6
            ELSE
                 LOW = 7
                 HIGH = 11
            ENDIF
       ELSEIF (FILENUM .EQ. 12) THEN
            IF (ALT .EQ. 'A') THEN
                 LOW = 1
                 HIGH = 5
            ELSE
                 LOW = 6
                 HIGH = 10
            ENDIF
       ELSEIF (FILENUM .EQ. 13) THEN
            IF (ALT .EQ. 'A') THEN
                 LOW = 1
                 HIGH = 3
            ELSE
                 LOW = 4
                 HIGH = 9
            ENDIF
       ELSEIF (FILENUM .EQ. 14) THEN
            IF (ALT .EQ. 'A') THEN
                 LOW = 1
                 HIGH = 6
            ELSEIF (ALT .EQ. 'B') THEN
                 LOW = 7
                 HIGH = 9
            ELSE
                 LOW = 10
                 HIGH = 15
            ENDIF
       ELSEIF (FILENUM .EQ. 15) THEN
            IF (ALT .EQ. 'A') THEN
```

```
                LOW = 1
                HIGH = 6
           ELSEIF (ALT .EQ. 'B') THEN
                LOW = 7
                HIGH = 8
           ELSEIF (ALT .EQ. 'C') THEN
                LOW = 9
                HIGH = 13
           ELSEIF (ALT .EQ. 'D') THEN
                LOW = 14
                HIGH = 18
           ELSEIF (ALT .EQ. 'E') THEN
                LOW = 19
                HIGH = 23
           ELSEIF (ALT .EQ. 'F') THEN
                LOW = 24
                HIGH = 28
           ENDIF
      ENDIF

   70 IF (OUTFILE .EQ. 'OUTPUT') THEN
           WRITE (*, '(A)') CLEAR
      ELSE
           WRITE (99,80)
      ENDIF

*     THIS FORMAT LINE INSERTS A FORM-FEED (FF) FLAG TO THE OUTPUT FILE,
*     WHICH CAUSES THE PRINTER TO ADVANCE TO THE TOP OF A NEW PAGE.

   80 FORMAT (T1, '1')

*     PRINT OUT HEADER

      IF ((FILENUM .NE. 1) .AND. (FILENUM .NE. 7)) THEN
           WRITE (99,100) INDXNUM(POINTER), PLTNAM(POINTER),
+               REGION(POINTER), NPDES(POINTER)
           WRITE (99,110) FILENUM, FILENAM(FILENUM)
      ENDIF

   90 FORMAT (T2,79('-'))
  100 FORMAT (/T2,A3,1X,A60,T67,A2,T70,A9)
  110 FORMAT (T2,30('-'),'FILE ',I2,' - ',A7,30('-'))


*     PRINT SUBHEADERS (IF ANY)

      IF (FILENUM .EQ. 1) THEN
           WRITE (99,120)
           WRITE (99,90)
  120      FORMAT (/T2,'NUM',T7,'NAME',T68,'AR',T71,'NPDESID')
      ELSEIF (FILENUM .EQ. 4) THEN
           WRITE (99,130)
           WRITE (99,90)
  130      FORMAT (/T2,'NAME',T35,'TITLE',T70,'CLASS')
      ELSEIF ((FILENUM .EQ. 6) .AND. (ALT .EQ. 'A')) THEN
           WRITE (99,140)
           WRITE (99,90)
  140      FORMAT(/T2,'PARAM',T8,'PARAM',T45,'DAILY',T54,'WEEKLY',
+              T64,'MONTHLY',T74,'OTHER'/T2,'CODE',T8,'NAME',T22,
+              'UNITS',T30,'START',T37,'END',T44,'MAX/MIN',T54,
```

```
                OUTFILE = 'OUTPUT'
            ELSEIF (REPLY .EQ. 'F') THEN
                PRINT*, 'ENTER THE NAME OF THE OUTPUT FILE (UP TO',
     +              ' SEVEN CHARACTERS)'
                READ '(A7)', OUTFILE
            ELSE
                PRINT*, 'INVALID ENTRY, PLEASE TRY AGAIN'
                GOTO 65
            ENDIF

            CALL OUTDATA(FILENUM, OUTFILE, COUNT, CODE, ALT)
        ENDIF

        IF ((FILENUM .EQ. 5).OR.(FILENUM .EQ. 6)) THEN
            GOTO 25
        ELSE
            GOTO 18
        ENDIF

        END

*****************************************************************************

        SUBROUTINE REVOPS

*       COMMON BLOCKS

        COMMON/SUB6/CLEAR

        COMMON/DATA99/DAY

        COMMON/CDATA99/PLTNUM

        COMMON/DATA0/NUMFILS, LENG, NUMP, INDXCNT, PRAMCNT

        COMMON/CDATA0/MONTH, YEAR, FILENAM, FORM, PARLIST

        COMMON/CDATA1/INDXNUM, PLTNAM, REGION, NPDES

        COMMON/CDATA2/MAOD1, MAD02, MCITY, MZIP, TELNUM,
     +          BASIN, RECWAT, COMM21, COMM22

        COMMON/DATA3/WCOD, SCOD

        COMMON/CDATA3/DESC3, COMM31, COMM32

        COMMON/CDATA4/LNAME, FNAME, TITLE, CLASS

        COMMON/CDATA5/MADI, EPSI, TYPO, PERD, PERE, FLIM,
     +          IACC, IADT, DNAM, DADD1, DADD2, DCITY, DZIP, COMM51,
     +          COMM52

        COMMON/DATA6/DMAX, DMIN, WMAX, WMIN, MMAX, MMIN, OMAX, OMIN

        COMMON/CDATA6/LIMTYP, PARCOD, MONLOC, FREQAN, SAMTYP, START,
     +          END, OBOUND, DSTAT, WBOUND, WSTAT, MBOUND, MSTAT,
     +          OBOUND, OSTAT, DESC6, COMM60

        COMMON/CDATA7/PCODE, PNAME1, PNAME2, UNITS, COMM70
```

```
      COMMON/DATA8/LENGTH, WIDTH, DIAM, DEPTH, HLOAD, SLOAD, DESQ,
     +     VLOAD, DESFM, DESREC

      COMMON/CDATA8/UNTYP, UNTNUM, CONFIG, COMM80

      COMMON/OPDATA/ODARRAY,PUNIT,SUNIT,TUNIT,BUNIT

      COMMON/DATA16/LINE

      COMMON/CDATA16/COMMENT

      COMMON/OUTLINK/CHARRAY

      COMMON/SUMVALS/MAXVAL,MINVAL,MEDVAL,AVGVAL,GEOMVAL,SUMVAL

*     VARIABLE DECLARATIONS

      INTEGER   DAY(0:32)

      CHARACTER PLTNUM*3

      INTEGER NUMFILS, LENG(25), NUMP(25), INDXCNT, PRAMCNT

      CHARACTER MONTH*3, YEAR*4, FILENAM(25)*7, FORM(25)*120,
     +     PARLIST(25,40)*5

      CHARACTER INDXNUM(200)*3, PLTNAM(200)*60, REGION(200)*30,
     +          NPDES(200)*9

      CHARACTER MADD1*30, MADD2*30, MCITY*30, MZIP*9, TELNUM*14,
     +          BASIN*30, RECWAT*30, COMM21*72, COMM22*72

      INTEGER   WCOD(15), SCOD(15)
      CHARACTER DESC3(6)*20, COMM31*72, COMM32*72

      CHARACTER LNAME(15)*18, FNAME(15)*10, TITLE(15)*30,
     +          CLASS(15)*2

      CHARACTER MADI*1, EPST*1, TYPO*3, PERD*6, PERE*6, FLIM*1,
     +          IACC*1, IADT*6, ONAM*30, OADD1*30, OADD2*30,
     +          OCITY*30, OZIP*9, COMM51*72, COMM52*72

      CHARACTER LIMTYP(40)*1, PARCOD(40)*5, MONLOC(40)*1,
     +          FREQAN(40)*5, SAMTYP(40)*2, START(40)*4, END(40)*4,
     +          DBOUND(40)*1, DSTAT(40)*1, WBOUND(40)*1,
     +          WSTAT(40)*1, MBOUND(40)*1, MSTAT(40)*1,
     +          OBOUND(40)*1, OSTAT(40)*1, DESC6(40)*20,
     +          COMM60(40)*43
      REAL      DMAX(40), DMIN(40), WMAX(40), WMIN(40), MMAX(40),
     +          MMIN(40), OMAX(40), OMIN(40)

      CHARACTER PCODE(100)*5, PNAME1(100)*10, PNAME2(100)*10,
     +          UNITS(100)*10, COMM70(100)*72

      CHARACTER UNTYP(25)*1, CONFIG(25)*1, UNTNUM(25)*2,
     +          COMM80(25)*72
      REAL      LENGTH(25), WIDTH(25), DIAM(25), DEPTH(25),
     +          HLOAD(25), SLOAD(25), DESQ(25), DESFM(25),
     +          VLOAD(25), DESREC(25)
```

```
      INTEGER    PUNIT(0:32), SUNIT(0:32), TUNIT(0:32), BUNIT(0:32)
      REAL       ODARRAY(7,31,40)

      INTEGER   LINE(20)
      CHARACTER COMMENT(20)*70

      CHARACTER  CHARRAY(7,34,40)*10, TEMP*10

      REAL MAXVAL(40), MINVAL(40), MEDVAL(40), AVGVAL(40),
     +     GEOMVAL(40), SUMVAL(40), AVG, MEDIAN, MAX, MIN,
     +     SUM, GEOM, LIST(32)
      INTEGER LISTNUM, COUNT, FILENUM, LISTCNT
      CHARACTER CODE*3, OUTFILE*7, ALT*1, REPLY*1, CLEAR*15
      LOGICAL FOUND

*     PROMPT AND READ IN FACILITY CODE

   10 WRITE (*,'(A)') CLEAR

      PRINT*, 'ENTER FACILITY CODE (TYPE ''L'' TO LIST CODES,',
     +     ' ''X'' TO RETURN TO MENU)'
      READ '(A)', CODE

      IF (CODE .EQ. 'X') THEN
          RETURN
      ELSEIF (CODE .EQ. 'L') THEN
          OUTFILE = 'OUTPUT'
          LISTNUM = 1
          COUNT = INDXCNT

          CALL OUTDATA(LISTNUM, OUTFILE, COUNT, CODE, ALT)

          GOTO 10
      ENDIF

   15 WRITE (*,'(A)') CLEAR
   20 PRINT*
      PRINT*
      PRINT*,'                    REVIEW OPERATIONS DATA'
      PRINT*,'                    ----------------------'
      PRINT*
      PRINT*, '                     9 - INFLUENT DATA'
      PRINT*, '                    10 - PRIMARY TREATMENT DATA'
      PRINT*, '                    11 - SECONDARY TREATMENT DATA'
      PRINT*, '                    12 - TERTIARY TREATMENT DATA'
      PRINT*, '                    13 - BIOLOG. PROCESS DATA'
      PRINT*, '                    14 - GENERAL OPERATIONS DATA'
      PRINT*, '                    15 - SLUDGE TREATMENT DATA'
      PRINT*, '                    16 - COMMENTS'
      PRINT*, '                     0 - REVIEW ANOTHER FACILITY'
      PRINT*
      PRINT*, 'SELECT NUMBER CORRESPONDING TO DESIRED INFORMATION'
      READ*, FILENUM

      WRITE (*,'(A)') CLEAR

      IF (FILENUM .EQ. 0) GOTO 10

      IF ((FILENUM .LT. 9) .OR. (FILENUM .GT. 16)) THEN
```

```
            PRINT*, 'INVALID ENTRY, PLEASE TRY AGAIN'
            GOTO 20
         ENDIF

*        READ DATA INTO ODARRAY

         CALL READATA (FILENUM, CODE, COUNT, FOUND)

         IF (.NOT. FOUND) GOTO 20

         PAGE = FILENUM - 8

         DO 24 I = 1, COUNT
            DO 22 J = 1, NUMP(FILENUM)
               IF (ODARRAY(PAGE,I,J) .LT. 0) THEN
                  CHARRAY(PAGE,I,J) = ' -------- '
               ELSE
                  WRITE(TEMP, '(F10.3)') ODARRAY(PAGE,I,J)
                  READ(TEMP, '(A10)') CHARRAY(PAGE,I,J)
               ENDIF
   22       CONTINUE
   24    CONTINUE

         DO 30 I = 1, NUMP(FILENUM)
            DO 25 J = 1, PRAMCNT
               IF (PARLIST(FILENUM,I) .EQ. PCODE(J)) THEN
                  CHARRAY(PAGE,32,1) = PNAME1(J)
                  CHARRAY(PAGE,33,I) = PNAME2(J)
                  CHARRAY(PAGE,34,1) = UNITS(J)
                  GOTO 30
               ENDIF
     25    CONTINUE
   30    CONTINUE

         DO  40 J = 1, NUMP(FILENUM)
            LISTCNT = 0

            DO  35 I = 1, COUNT
               IF (ODARRAY(PAGE,I,J) .GE. 0) THEN
                  LISTCNT = LISTCNT + 1
                  LIST(LISTCNT) = ODARRAY(PAGE,I,J)
               ENDIF
   35       CONTINUE

            IF (LISTCNT .NE. 0) THEN
               CALL SUMMARY(LIST, LISTCNT, MAX, MIN, MEDIAN, AVG,
     +              GEOM, SUM)
            ENDIF

*        ASSIGN SUMMARY VALUES TO ARRAYS TO BE DISPLAYED WITH OPERATIONS DATA

            MAXVAL(J) = MAX
            MINVAL(J) = MIN
            MEDVAL(J) = MEDIAN
            AVGVAL(J) = AVG
            GEOMVAL(J) = GEOM
            SUMVAL(J) = SUM
   40    CONTINUE
```

```
300           FORMAT(T2,I2,T10,6(A10,1X))

      ENDIF

500 CONTINUE


*     THIS BLOCK CHECKS FOR REMAINING DATA TO BE PRINTED.  IF OUTPUT
*     IS SENT TO SCREEN, USER IS PROMPTED FOR CONTINUATION OF OUTPUT.
*     IF END-OF-DATA IS NOT ENCOUNTERED, OUTPUT CONTROL VARIABLES ARE
*     ADJUSTED, AND CONTROL IS RETURNED TO THE TOP OF THE SUBROUTINE,
*     TO PRINT OUT THE NEXT PAGED FOR RE-LISTING OF THE SAME DATA.CONTROL
*     IS RETURNED TO THE CALLING PROGRAM UNIT.  FOR SCREEN OUTPUT, USER
*     IS GIVEN THE OPTION OF RELISTING THE DATA, WHEREBY CONTROL IS
*     RETURNED TO THE TOP OF THE SUBROUTINE (OUTPUT CONTROL VARIABLE
*     INITIALIZATION)

      IF (REMAIN .GT. FULL) THEN
           IF (OUTFILE .EQ. 'OUTPUT') THEN
                PRINT*, 'CONTINUE LISTING? (Y/N)'
                READ '(A)', REPLY

                IF (REPLY .EQ. 'N') RETURN
           ENDIF

           REMAIN = REMAIN - FULL
           N = N + FULL
           GOTO 70
      ELSE
           IF (OUTFILE .EQ. 'OUTPUT') THEN
                IF ((FILENUM .GE. 9).AND.(FILENUM .LE. 15)) THEN
                     PRINT*, 'PRINT SUMMARY DATA?'
                     READ '(A)', REPLY
                     IF (REPLY .EQ. 'Y') THEN
                          REMAIN = -1
                          GO TO 70
                     ENDIF
                ENDIF
                GOTO 600
           ENDIF
      ENDIF

510 WRITE(99,90)
      WRITE(99,515) (AVGVAL(I),I = LOW, HIGH)

515 FORMAT(T3,'AMEAN',T9,6(F10.3,1X))

600 IF (OUTFILE .EQ. 'OUTPUT') THEN
           PRINT*
           PRINT*, 'END OF LISTING, LIST AGAIN? (Y/N)'
           READ '(A)', REPLY
           IF (REPLY .EQ. 'Y') THEN
                GOTO 10
           ELSE
                RETURN
           ENDIF
      ENDIF

      RETURN
```

```
      END
*****************************************************************************

      SUBROUTINE REVFAC

*     COMMON BLOCKS

      COMMON/SUB6/CLEAR

      COMMON/DATA99/DAY

      COMMON/CDATA99/PLTNUM

      COMMON/DATA0/NUMFILS, LENG, NUMP, INDXCNT, PRAMCNT

      COMMON/CDATA0/MONTH, YEAR, FILENAM, FORM, PARLIST

      COMMON/CDATA1/INDXNUM, PLTNAM, REGION, NPDES

      COMMON/CDATA2/MAD01, MADD2, MCITY, MZIP, TELNUM,
     +     BASIN, RECWAT, COMM21, COMM22

      COMMON/DATA3/WCOD, SCOD

      COMMON/CDATA3/DESC3, COMM31, COMM32

      COMMON/CDATA4/LNAME, FNAME, TITLE, CLASS

      COMMON/CDATA5/MAD1, EPSI, TYPO, PERD, PERE, FLIM,
     +     IACC, IADT, DNAM, DADD1, DADD2, DCITY, DZIP, COMM51,
     +     COMM52

      COMMON/DATA5/DMAX, DMIN, WMAX, WMIN, MMAX, MMIN, OMAX, OMIN

      COMMON/CDATA6/LIMTYP, PARCOD, MONLOC, FREQAN, SAMTYP, START,
     +     END, DBOUND, DSTAT, WBOUND, WSTAT, MBOUND, MSTAT,
     +     OBOUND, OSTAT, DESC6, COMM60

      COMMON/CDATA7/PCODE, PNAME1, PNAME2, UNITS, COMM70

      COMMON/DATA8/LENGTH, WIDTH, DIAM, DEPTH, HLOAD, SLOAD, DESR,
     +     VLOAD, DESFH, DESREC

      COMMON/CDATA8/UNITYP, UNTNUM, CONFIG, COMM80


*     VARIABLE DECLARATIONS


      INTEGER   DAY(0:32)

      CHARACTER PLTNUM*3

      INTEGER NUMFILS, LENG(25), NUMP(25), INDXCNT, PRAMCNT

      CHARACTER MONTH*2, YEAR*4, FILENAM(25)*7, FORM(25)*120,
     +     PARLIST(25,40)*5
```

```
      CHARACTER INDXNUM(200)*3, PLTNAM(200)*60, REGION(200)*30,
     +          NPDES(200)*9

      CHARACTER MADD1*30, MADD2*30, MCITY*30, MZIP*9, TELNUM*14,
     +          BASIN*30, RECWAT*30, COMM21*72, COMM22*72

      INTEGER   WCOD(15), SCOD(15)
      CHARACTER DESC3(6)*20, COMM31*72, COMM32*72

      CHARACTER LNAME(15)*18, FNAME(15)*10, TITLE(15)*30,
     +          CLASS(15)*2

      CHARACTER MADI*1, EPSI*1, TYPO*3, PERD*6, PERE*6, FLIM*1,
     +          IACC*1, IADT*6, DNAM*30, DADD1*30, DADD2*30,
     +          DCITY*30, DZIP*9, COMM51*72, COMM52*72

      CHARACTER LIMTYP(40)*1, PARCOD(40)*5, MONLOC(40)*1,
     +          FREQAN(40)*3, SAMTYP(40)*2, START(40)*4, END(40)*4,
     +          DBOUND(40)*1, DSTAT(40)*1, WBOUND(40)*1,
     +          WSTAT(40)*1, MBOUND(40)*1, MSTAT(40)*1,
     +          OBOUND(40)*1, OSTAT(40)*1, DESC6(40)*20,
     +          COMM60(40)*43
      REAL      DMAX(40), DMIN(40), WMAX(40), WMIN(40), MMAX(40),
     +          MMIN(40), OMAX(40), OMIN(40)

      CHARACTER PCODE(100)*5, PNAME1(100)*10, PNAME2(100)*10,
     +          UNITS(100)*10, COMM70(100)*72

      CHARACTER UNTYP(25)*1, CONFIG(25)*1, UNTNUM(25)*2,
     +          COMM80(25)*72
      REAL      LENGTH(25), WIDTH(25), DIAM(25), DEPTH(25),
     +          HLOAD(25), SLOAD(25), DESW(25), DESFM(25),
     +          VLOAD(25), DESREC(25)


*     LOCAL FILE DECLARATIONS

      INTEGER   COUNT, FILENUM, LISTNUM, LOOPCNT
      LOGICAL   FOUND
      CHARACTER CODE*5, CLEAR*15, REPLY*1, OUTFILE*7, ALT*1

   10 WRITE (*,'(A)') CLEAR
   15 PRINT*
      PRINT*
      PRINT*, '                REVIEW FACILITIES DATA'
      PRINT*, '                ----------------------'
      PRINT*
      PRINT*, '         1 - INDEX    (INDEX TO FACILITIES)'
      PRINT*, '         2 - PLTDAT1  (GENERAL FACILITY INFORMATION)'
      PRINT*, '         3 - PLTDAT2  (TREATMENT INFORMATION)'
      PRINT*, '         4 - PLTDAT3  (PERSONNEL INFORMATION)'
      PRINT*, '         5 - NPDES1   (NPDES PERMIT INFORMATION)'
      PRINT*, '         6 - NPDES2   (NPDES LIMITS INFORMATION)'
      PRINT*, '         7 - PARAM    (PARAMETER INFORMATION)'
      PRINT*, '         8 - DESIGN   (FACILITY DESIGN INFORMATION)'
      PRINT*, '         0 - RETURN TO MAIN MENU'
      PRINT*
      PRINT*, 'SELECT NUMBER CORRESPONDING TO DESIRED INFORMATION'
      READ *, FILENUM
```

```
   10 WRITE (*,'(A)') CLEAR

   20 IF (FILENUM .EQ. 0) RETURN

      IF ((FILENUM .LT. 1) .OR. (FILENUM .GT. 8)) THEN
           PRINT*, 'INVALID SELECTION, PLEASE TRY AGAIN'
           GOTO 15
      ENDIF

      PRINT*
      PRINT*
      PRINT*, '     ENTER:'
      PRINT*

      IF (FILENUM .EQ. 7) THEN
           PRINT*,'         ***** - FIVE DIGIT PARAMETER CODE'
      ELSE
           PRINT*,'         ***   - THREE DIGIT FACILITY CODE'
      ENDIF

      PRINT*
      PRINT*,'         A - LIST DATA FOR ALL FACILITIES'
      PRINT*
      PRINT*,'         L - LIST CODES'
      PRINT*
      PRINT*,'         X - GO TO ''REVIEW FACILITIES DATA'' MENU'
      PRINT*
      READ '(A)', CODE

   25 WRITE (*,'(A)') CLEAR

      IF (CODE .EQ. 'X') THEN
           GOTO 10
      ELSEIF (CODE .EQ. 'L') THEN
           OUTFILE = 'OUTPUT'

           IF (FILENUM .EQ. 7) THEN
                LISTNUM = 7
                COUNT = PRAMCNT
           ELSE
                COUNT = INDXCNT
                LISTNUM = 1
           ENDIF

           CALL OUTDATA(LISTNUM, OUTFILE, COUNT, CODE, ALT)

           GOTO 10
      ELSEIF (CODE .EQ. 'A') THEN

           PRINT*, 'THIS OPTION NOT OPERABLE YET'
           GOTO 20
*          IF ((FILENUM .EQ. 1) .OR. (FILENUM .EQ. 7)) THEN
*               CODE = 'L'
*               GOTO 25
*          ELSE
*               DO 30 LOOPCNT = 1, INDXCNT
*                    CODE = INDXNUM(LOOPCNT)
*                    CALL READDATA(FILENUM, CODE, COUNT, FOUND)
*
*                    IF (.NOT. FOUND) THEN
```

```
*                         PRINT *,'THIS IS A BUG'
*                     ENDIF
*
*                     CALL OUTDATA(FILENUM, OUTFILE, COUNT, CODE,
*+                        ALT)
*  30             CONTINUE
*            ENDIF
          ELSE
               IF ((FILENUM .EQ. 1) .OR. (FILENUM .EQ. 7)) THEN
                    COUNT = 1
               ELSE
                    CALL READDATA(FILENUM, CODE, COUNT, FOUND)

                    IF (.NOT. FOUND) GOTO 20
               ENDIF

               ALT = ' '

               IF (FILENUM .EQ. 5) THEN
                    PRINT*, '    NPDES PERMIT INFORMATION'
                    PRINT*, '    ------------------------'
                    PRINT*
                    PRINT*, '     A - MISC. INFORMATION'
                    PRINT*
                    PRINT*, '     B - DMR ADDRESS & COMMENTS'
                    PRINT*
                    PRINT*, '     X - RETURN TO PREVIOUS MENU'
                    PRINT*
                    GOTO 60
               ELSEIF (FILENUM .EQ. 6) THEN


                    PRINT*, '    NPDES LIMITS INFORMATION'
                    PRINT*, '    ------------------------'
                    PRINT*
                    PRINT*, '     A - LIMIT DATES AND VALUES'
                    PRINT*
                    PRINT*, '     B - OTHER LIMIT INFORMATION'
                    PRINT*
                    PRINT*, '     X - RETURN TO PREVIOUS MENU'
                    PRINT*
                    GOTO 60
               ENDIF

               GOTO 65

    60         PRINT*
               READ '(A)', ALT

               IF ((ALT .NE. 'A') .AND. (ALT .NE. 'B')) THEN
                    GOTO 10
               ENDIF

    65         WRITE(*,'(A)') CLEAR
               PRINT*
               PRINT*, '    S - OUTPUT TO SCREEN'
               PRINT*, '    F - OUTPUT TO FILE'
               READ '(A)', REPLY

               IF (REPLY .EQ. 'S') THEN
```

```
      PRINT*
*     PRINT*,'*****DEBUG - REVOPS**********************'
*     PRINT*
*
*     DO 42 I = 1,54
*        WRITE(*,'(6(A,1X))') (CHARRAY(PAGE,I,J),J=1,6)
*  42 CONTINUE


   45 IF (FILENUM .EQ. 9) THEN
         PRINT*, 'INFLUENT DATA'
         PRINT*, '-------------------------------------------------------',
     +           '-------------'
         PRINT*
         PRINT*, '       A - BOD                                         ',
     +           'B - PHOSPHORUS'
         PRINT*, '            SUSP. SOLIDS                               ',
     +           '   TOTAL NITROGEN'
         PRINT*, '            VOL SUSP. SOLIDS                           ',
     +           '   AMMONIA NITROGEN'
         PRINT*, '            SETTLEABLE SOLIDS                          ',
     +           '   NITRATE NITROGEN'
         PRINT*, '            DISSOLVED OXYGEN                           ',
     +           '   NIT. BOD'
         PRINT*, '            PH                                         '
         PRINT*
         PRINT*
      ELSEIF (FILENUM .EQ. 10) THEN
         PRINT*, 'PRIMARY TREATMENT DATA'
         PRINT*, '-------------------------------------------------------',
     +           '-------------'
         PRINT*
         PRINT*, '       A - BOD                                         '
         PRINT*, '            SUSP. SOLIDS                               '
         PRINT*, '            SETTLEABLE SOLIDS                          '
         PRINT*, '            DISSOLVED OXYGEN                           '
         PRINT*, '            PH                                         '
         PRINT*, '            DEPTH OF BLANKET                           '
         PRINT*
         PRINT*
         PRINT*
      ELSEIF (FILENUM .EQ. 11) THEN
         PRINT*, 'SECONDARY TREATMENT DATA'
         PRINT*, '-------------------------------------------------------',
     +           '-------------'
         PRINT*
         PRINT*, '       A - BOD                                         ',
     +           'B - PHOSPHORUS'
         PRINT*, '            SUSP. SOLIDS                               ',
     +           '   TOTAL NITROGEN'
         PRINT*, '            SETTLEABLE SOLIDS                          ',
     +           '   AMMONIA NITROGEN'
         PRINT*, '            DISSOLVED OXYGEN                           ',
     +           '   NITRATE NITROGEN'
         PRINT*, '            PH                                         ',
     +           '   NIT. BOD'
         PRINT*, '            DEPTH OF BLANKET                           '
         PRINT*
         PRINT*
      ELSEIF (FILENUM .EQ. 12) THEN
```

```
            PRINT*, 'TERTIARY TREATMENT DATA'
            PRINT*, '-------------------------------------------------',
     +           '-----------------------------------'
            PRINT*
            PRINT*, '       A - BOD                                   ',
     +           'B - PHOSPHORUS'
            PRINT*, '           SUSP. SOLIDS                          ',
     +           '   TOTAL NITROGEN'
            PRINT*, '           SETTLEABLE SOLIDS                     ',
     +           '   AMMONIA NITROGEN'
            PRINT*, '           DISSOLVED OXYGEN                      ',
     +           '   NITRATE NITROGEN'
            PRINT*, '           PH                                    ',
     +           '   NIT. BOD'
            PRINT*
            PRINT*
          ELSEIF (FILENUM .EQ. 13) THEN
            PRINT*, 'BIOLOGICAL PROCESS DATA'
            PRINT*, '-------------------------------------------------',
     +           '-----------------------------------'
            PRINT*
            PRINT*, '       A - RETURN (RECYCLE) FLOW                 ',
     +           'B - MIXED LIQUOR SUSP. SOLIDS'
            PRINT*, '           RETURN  SUSP. SOLIDS                  ',
     +           '   MIXED LIQUOR VOL. SUSP. SOLIDS'
            PRINT*, '           WASTE FLOW                            ',
     +           '   MIXED LIQUOR DISSOLVED OXYGEN'
            PRINT*, '                                                 ',
     +           '   MIXED LIQUOR PH'
            PRINT*, '                                                 ',
     +           '   MIXED LIQUOR SETTL. SOLIDS'
            PRINT*, '                                                 ',
     +           '   AIR REQUIRED '
            PRINT*
            PRINT*
          ELSEIF (FILENUM .EQ. 14) THEN
            PRINT*, 'GENERAL OPERATIONS DATA'
            PRINT*, '-------------------------------------------------',
     +           '-----------------------------------'
            PRINT*
            PRINT*, '       A - RAINFALL                              ',
     +           'B - GRIT/SCREENING'
            PRINT*, '           AIR TEMPERATURE                       ',
     +           '   SEPTAGE FLOW'
            PRINT*, '           WASTEWATER TEMPERATURE                ',
     +           '   SEPTAGE PH'
            PRINT*, '           MINIMUM FLOW                          '
            PRINT*, '           MAXIMUM FLOW                          '
            PRINT*, '           AVERAGE (TOTAL DAILY) FLOW            '
            PRINT*
            PRINT*
            PRINT*, '       C - PRECHLOR.: DOSAGE                     '
            PRINT*, '           PRECHLOR.: RESIDUAL                   '
            PRINT*, '           POSTCHLOR.: DOSAGE                    '
            PRINT*, '           POSTCHLOR.: RESIDUAL                  '
            PRINT*, '           TOTAL COLIFORMS                       '
            PRINT*, '           FECAL COLIFORMS                       '
            PRINT*
            PRINT*
            PRINT*
```

```
      ELSEIF (FILENUM .EQ. 15) THEN
           PRINT*, 'SLUDGE TREATMENT DATA'
           PRINT*, '-------------------------------------------------',
     +          '-------------------------------'
           PRINT*
           PRINT*, 'A - PRIMARY SLUDGE WASTED     ',
     +             'B - THICKENER: INF. % SOLIDS ',
     +             'C - DEWATERER: FLOW IN'
           PRINT*, '     PRIM. SLUDGE TOT. SOLIDS ',
     +             '     THICKENER: SUPER.. WAS.  ',
     +             '     DEWATERER: HRS OPERATED'
           PRINT*, '     PRIM. SLUDGE VOL. SOLIDS ',
           PRINT*, '                              ',
     +             '     DEWATERER: INF. % SOLIDS ',
           PRINT*, '     SEC. SLUDGE TOT. SOLIDS  ',
           PRINT*, '     SEC. SLUDGE VOL. SOLIDS  ',
           PRINT*
           PRINT*
           PRINT*, 'D - DIGESTER: FLOW            ',
     +             'E - DIGESTER: GAS PROD.       ',
     +             'F - FIL. CAKE PRODUCED'
           PRINT*, '     DIGESTER: TEMPERATURE    ',
     +             '     DIGESTER: ALKALINITY     ',
     +             '     FIL. CAKE TOT. SOLIDS'
           PRINT*, '     DIGESTER: PH             ',
     +             '     DIGESTER: VOL. ACIDS     ',
     +             '     SAND BED: VOL. DRAWN'
           PRINT*, '     DIGESTER: SUP. WASTED    ',
     +             '     DIGESTER: TOT. SOLIDS    ',
     +             '     SAND BED: VOL. REMOVED'
           PRINT*, '     DIGESTER: SUP. PH        ',
     +             '     DIGESTER: VOL. SOLIDS    ',
     +             '     CHEM. ADD.: FECL3        ',
           PRINT*, '                              ',
     +             '                              ',
     +             '     CHEM. ADD.: LIME'
           PRINT*, '                              ',
     +             '                              ',
     +             '     CHEM. ADD.: POLY'
           PRINT*
           PRINT*
      ENDIF

      PRINT*, 'SELECT DESIRED GROUP OF DATA BY LETTER (''X''',
     +        'TO RETURN TO PREVIOUS MENU)'
      READ '(A)', ALT

      IF (ALT .EQ. 'X') THEN
           WRITE(*,'(A)') CLEAR
           GOTO 20
      ENDIF

*     PRINT OUT DATA

      WRITE (*,'(A)') CLEAR

   50 PRINT*, '     S - OUTPUT TO SCREEN'
      PRINT*, '     F - OUTPUT TO FILE'
      READ '(A)', REPLY
```

```
      IF (REPLY .EQ. 'S') THEN
           OUTFILE = 'OUTPUT'
      ELSEIF (REPLY .EQ. 'F') THEN
           PRINT*, 'ENTER THE NAME OF THE OUTPUT FILE (UP TO',
     +          ' SEVEN CHARACTERS)'
           READ '(A)', OUTFILE
      ELSE
           PRINT*, 'INVALID ENTRY, PLEASE TRY AGAIN'
           GOTO 30
      ENDIF


      CALL OUTDATA(FILENUM, OUTFILE, COUNT, CODE, ALT)

      GOTO 45

      END

*****************************************************************************

      SUBROUTINE SUMMARY(LIST, LISTCNT, MAX, MIN, MEDIAN, AVG,
     +                   GEOM, SUM)

      INTEGER   LISTCNT, MID
      REAL      LIST(31), MAX, MIN, MEDIAN, AVG, SUM, GEOM, SUMG
      LOGICAL   SORTED

*     RETURN IF THERE IS NO DATA

      IF (LISTCNT .EQ. 0) RETURN

*     SORT LIST IN ASCENDING ORDER

   15 SORTED = .TRUE.

      DO 20 I = 2,LISTCNT

           IF (LIST(I) .LT. LIST(I-1)) THEN
                TEMP = LIST(I-1)
                LIST(I-1) = LIST(I)
                LIST(I) = TEMP
                SORTED = .FALSE.
           ENDIF

   20 CONTINUE

      IF (.NOT. SORTED) GOTO 15

*     FIND MAX AND MIN

      MIN = LIST(1)
      MAX = LIST(LISTCNT)

*     FIND MEDIAN

      IF (MOD(LISTCNT,2) .EQ. 1) THEN
           MID = (LISTCNT + 1)/ 2
           MEDIAN = LIST(MID)
      ELSE
           MID = LISTCNT/ 2
```

```
            MEDIAN = (LIST(MID) + LIST(MID+1))/ 2
         ENDIF

*        FIND AVERAGE

         SUM = 0

         DO 30 I = 1, LISTCNT
              SUM = SUM + LIST(I)
      30 CONTINUE

         AVG = SUM/LISTCNT

*        FIND GEOMETRIC MEAN

         SUMG = 0

         DO 40 I = 1,LISTCNT
              SUMG = SUMG * LIST(I)
      40 CONTINUE

         GEOM = SUMG ** (1.0/LISTCNT)

         RETURN
         END

*****************************************************************************

         SUBROUTINE CONFIG

         COMMON/SUB6/CLEAR
         COMMON/DATA0/NUMFILS, LENG, NUMP, INDXCNT, PRAMCNT
         COMMON/CDATA0/MONTH, YEAR, FILENAM, FORM, PARLIST

         CHARACTER REPLY1*1, REPLY2*1, MONTH*2, YEAR*4, FILENAM(25)*7,
     +             FORM(25)*120, CLEAR*15, PARLIST(25,40)*5
         INTEGER NUMFILS, FILENUM, LENG(25), NUMP(25)

*        RETRIEVE, OPEN AND REWIND FILE 'SETUP'.

         OPEN(8, FILE = 'SETUP', RECL = 202)
         REWIND 8

       5 FORMAT(A2,A4)
       6 FORMAT(I2)
       7 FORMAT(A7,I3,A120)
       8 FORMAT(12,40A5)

      20 WRITE(*,'(A)') CLEAR
      25 PRINT*
         PRINT*
         PRINT*,'                              CASPER CONFIGURATION FILE'
         PRINT*,'                              -------------------------'
         PRINT*
         PRINT*,'                               1 - MONTH/YEAR'
         PRINT*,'                               2 - NUMBER OF FILES'
         PRINT*,'                               3 - FILE INFORMATION'
         PRINT*,'                               4 - PARAMETER INFORMATION'
         PRINT*,'                               0 - EXIT TO MAIN MENU'
         PRINT*
```

```
      PRINT*
      PRINT*,' WARNING!! IMPROPERLY ALTERING THE CONFIGURATION',
     +       ' FILE MAY DISABLE'
      PRINT*,' ALL OR PART OF THE CASPER SYSTEM.  PLEASE CONSULT',
     +       ' THE CASPER'
      PRINT*,' USER''S GUIDE FOR MORE INFORMATION.'
      READ '(A)', REPLY1

      IF (REPLY1 .EQ. '0') THEN
          REWIND 0
          WRITE(0,5) MONTH, YEAR
          WRITE(0,6) NUMFILS

          DO 30 I = 1,NUMFILS
              WRITE(0,7) FILENAM(I), LENG(I), FORM(I)
   30     CONTINUE

          DO 32 I = 9, NUMFILS
              WRITE(0,8) NUMP(I), (PARLIST(I,J), J = 1, NUMP(I))
   32     CONTINUE

          RETURN

      ELSEIF (REPLY1 .EQ. '1') THEN
   35     WRITE(*,'(A)') CLEAR
          PRINT*, '      MONTH ', MONTH, ' YEAR ', YEAR
          PRINT*
          PRINT*, 'CHANGE? (Y/N)'
          READ '(A)', REPLY2

          IF (REPLY2 .EQ. 'Y') THEN
              PRINT*, 'ENTER NEW VALUES'
              PRINT*, '      MONTH (01-12)     YEAR'
              PRINT*, '          VV            VVVV'
              READ(*,'(T10,A2,T22,A4)')  MONTH, YEAR
              GOTO 35
          ENDIF
      ELSEIF (REPLY1 .EQ. '2') THEN
   40     WRITE(*,'(A)') CLEAR
          PRINT*, '      NUMBER OF FILES = ', NUMFILS
          PRINT*
          PRINT*, 'CHANGE? (Y/N)'
          READ '(A)', REPLY2

          IF (REPLY2 .EQ. 'Y') THEN
              PRINT*, 'ENTER NEW VALUE'
              READ*, NUMFILS
              GOTO 40
          ENDIF
      ELSEIF (REPLY1 .EQ. '3') THEN
   45     WRITE(*,'(A)') CLEAR
   46     PRINT*,'   FILE NAME  RECORD LENGTH  FORMAT'
          PRINT*,'   ---------  -------------  ------',
     +           '-----------------------------------'

          DO 55 I = 1,NUMFILS
              PRINT 50, I, FILENAM(I), LENG(I), FORM(I)
   50         FORMAT(I2,T5,A7,T21,I3,T31,A)
   55     CONTINUE
```

```
            PRINT*
            PRINT*, 'CHANGE? (Y/N)'
            READ '(A)', REPLY2

            IF (REPLY2 .EQ. 'Y') THEN
                 PRINT*, 'SELECT FILE TO BE CHANGED BY NUMBER (1-',
     +                   NUMFILS,')'
                 READ*, FILENUM

                 IF ((FILENUM .LT. 1) .OR. (FILENUM .GT. NUMFILS))
     +                 THEN
                      WRITE(*,'(A)') CLEAR
                      PRINT*,'INVALID SELECTION, PLEASE TRY AGAIN'
                      PRINT*
                      GOTO 46
                 ELSE
                      PRINT*, '    FILE NAME   RECORD LENGTH'
                      PRINT*, '    VVVVVVV          VVV'
                      READ (*,60) FILENAM(FILENUM), LENG(FILENUM)
   60                 FORMAT(T3,A7,T19,I3)
                      PRINT*,'ENTER FORMAT (USE STANDARD FORTRAN ',
     +                       'FORMAT CONVENTION'
                      READ '(A)', FORM(FILENUM)
                 ENDIF

                 GOTO 45
            ENDIF
       ELSEIF (REPLY1 .EQ. '4') THEN
   65        WRITE(*,'(A)') CLEAR
   66        PRINT*,'                    NUM. OF'
             PRINT*,'    FILE NAME   PARAMETERS PARAMETER CODES'
             PRINT*,'    ----------  ---------- ----------',
     +                '----------'

             DO 75 I = 9, NUMFILS
                  PRINT 70, I, FILENAM(I), NUMP(I), (PARLIST(I,J),
     +                 J = 1, NUMP(I))
   70             FORMAT(I2,T5,A7,T19,I2,T27,8(A5,1X),
     +                 4(/T27,8(A5,1X)))
   75        CONTINUE

             PRINT*
             PRINT*, 'CHANGE? (Y/N)'
             READ '(A)', REPLY2

             IF (REPLY2 .EQ. 'Y') THEN
                  PRINT*, 'SELECT FILE TO BE CHANGED BY NUMBER (1-',
     +                    NUMFILS,')'
                  READ*, FILENUM

                  WRITE(*,'(A)') CLEAR

                  IF ((FILENUM .LT. 1) .OR. (FILENUM .GT. NUMFILS))
     +                  THEN
                       PRINT*,'INVALID SELECTION, PLEASE TRY AGAIN'
                       PRINT*
                       GOTO 66
                  ELSE
                       PRINT*, 'FILE NUMBER ', FILENUM, ' ',
     +                         FILENAM(FILENUM)
```

```
                    PRINT*
                    PRINT*, 'ENTER NUMBER OF PARAMETERS IN THIS ',
     +                   'FILE'
                    READ*, NUMP(FILENUM)
                    PRINT*,'ENTER PARAMETER CODES, ONE PER LINE,',
     +                   'SEPARATED BY A (CR)'
                    READ (*,'(A5)') (PARLIST(FILENUM,J), J = 1,
     +                   NUMP(FILENUM))
               ENDIF

               GOTO 65
          ENDIF
     ELSE
          WRITE(*,'(A)') CLEAR
          PRINT*, 'INVALID SELECTION, PLEASE TRY AGAIN'
          GOTO 25
     ENDIF

     GOTO 26

99   RETURN
     END
```

This section has not been revised yet 5/27/87

Appendix C-1

~~CHAPTER V~~
The DATABASE MODEL

The efficient and effective control of the voluminous amount of data that is expected to be handled by the CASPER system necessitates that a professionally-developed database management system be integrated with the applications and utilities which comprise the system. Indeed, the DBMS lies at the very "heart" of CASPER; therefore, an understanding of the basic concepts of database management is essential to those charged with managing the system.

What is a database?

In general, a database is a "collection of interrelated data stored together, without harmful or unnecessary redundancy, to serve multiple applications; the data are stored so that they are independent of the programs which use the data" (Martin, 1977). This is to be distinguished from a data file, which is simply a collection of data items which generally does not have any well-defined relationships (within the file) between the individual data items.

The important distinction, therefore, between a database and a datafile is the presence, in a database, of a framework for establishing relationships between data items (also known as data elements). It is this framework which allows for the efficient and effective handling of data, independent of any

applications which may use the data.

Database Design

The CASPER system, which will initially reside on the University of Massachusetts CDC Cyber 175/730 computer, uses a case-oriented DBMS called Scientific Information Retrieval (SIR). A case as defined by the SIR User's Manual Version 2 (Robinson, et al., 1980) as "a collection of data records of one or more record types, which (correspond to) a single subject in the study." For the database being developed for CASPER, a case corresponds to a single treatment plant. A record is defined as a "logical grouping of several different data items"; a record type is a definition of the characteristics and format of any particular record. There are sixteen record types used in this version of CASPER; these are listed in Table 5-1.

One of the most important steps in the development of a usable database is the design of the individual record types, i.e. how should different data items be grouped together. The choices made at this stage of development will, for the most part, determine how efficient the database will be, both in terms of speed and memory requirements. Therefore, it is

Table 1. Record types defined in CASPER database model.

REC-TYPE NUMBER	REC-TYPE NAME	DESCRIPTION
1	INDEX	Facility Index
2	PLTDAT1	General Facility Data
3	PLTDAT2	Treatment/Disposal Data
4	PLTDAT3	Personnel Data
5	NPDES1	NPDES Permit Data
6	NPDES2	NPDES Limits Data
7	PARAM	Parameter Index
8	DESIGN	Facility Design Data
9	INFLOW	Influent Wasterwater Data
10	PRIMARY	Primary Treatment Data
11	SECNDRY	Secondary Treatment Data
12	TRTIARY	Tertiary Treatment Data
13	BIOPRO	Biological Process Data
14	GENERAL	General Operations Data
15	SLUDGE	Sludge Treatment Data
16	COMMENT	Operations Comment Data

important to carefully determine the size and composition of each particular record type.

Generally, record type design is controlled by the manner in which data items are to be retrieved. In the CASPER database, there are two categories of record types; those that contain "permanent" facility data (i.e. data that tends not to change from month to month), such as the address of the facility, the chief operator, facility layout (i.e. type of treatment units), NPDES permit limits, etc., and "temporary" operations data (data which will change from month to month), such as the daily values for process parameters, monthly averages, etc. Each category of data is handled by a separate group of record types, and are accessed in a different manner. The facility data, which would tend not to change over time, would generally remain intact after it is retrieved for use by the applications. On the other hand, operations data would be removed on a monthly basis from the database (actually, transferred to an "archive" file) and replaced by the next month's data. Furthermore, each individual record type represents a grouping of related data, e.g. general plant information, NPDES limits, and sludge treatment data.

Organization of Data: The Schema

The description, or model, of a database is referred to as a schema. The schema defines the logical representations of data (the way in which users of the database view data relationships), as opposed to the physical representations of data (how the computer itself views data relationships). This schema is constructed in SIR using schema definition commands, which supply information about the structure of the database (case definition), as well as the various record types (record definition).

For the CASPER database, all data is stored according to a rectype number, a case ID, and any sort IDs specified by the designer of the database. The rectype number (located in columns 1 and 2 of all data records) indicates to the DBMS to which record type a record belongs; the data in the record is assigned to data elements within the database according to the data element order and format specified in the schema for the particular record type. The case ID (located in columns 4 - 6 of all records) indicates to which case (facility) the data record belongs. Additional sort IDs may be necessary to define the precise location of a record in the database, such as when there are more than one record per case per record type. These sort IDs are typically data values which uniquely identify the record for the case and record type specified. Each record to be entered into the database must contain both the rectype and case ID values, and any sort IDs specified in

the schema, for it to be properly stored (and later retrieved) from the database.

The schema definition itself consists of two parts: the case definition, and the rectype definition. The case definition specifies:

* the data element to be used as the case ID;
* the location of the rectype number in each record;
* the location of the sequence number (for multi-line records);
* the approximate size of the data base (in terms of number of cases and average number of records per case);
* the maximum number of record types which may be defined in the database;
* the maximum number of records per case;
* the maximum size of the input record;
* the data elements found in the common information record.

The common information record defines a set of data elements (which may be part of any or all record types) which may be accessed while processing any record type. This set includes the case ID, as well as any data elements which may be used for sorting and selection of data during processing.

The corresponding values used for the CASPER case

definition are shown in Table 5-2. The values selected in defining the size of the database are a best estimate of what will eventually required for full implementation; provision has been made for up to 25 record types (16 exist currently), as well as up to 200 facilities (112 exist currently). Any further expansion of the database will require direct modification of the schema.

The rectype definition specifies, for each record type:

* the rectype number and name;
* sort IDs used, if any;
* a sequence check command, if multi-line records are used;
* a list of the data elements, the fields (columns) in which they are found, and the data type (e.g. integer, real, character);
* a "missing value" specification, which indicates what values the DBMS will recognize as "missing" (i.e. no data reported);
* value labels, which provide a descriptive label for data elements entered in code form (e.g. NE for Northeast administrative region).

Table 5-2. CASPER case definition values.

CASE ID:	PLTNUM	(defines PLTNUM as case id)
RECTYPE COLS:	1,2	(columns 1 and 2 contain the record type identifier)
SEQUENCE COLS	80	(column 80 contains the line number for multi-line records)
N OF CASES	200	(maximum number of cases)
RECS PER CASE	150	(avg. number of records per case)
MAX REC TYPES	25	(maximum number of record types)
MAX REC COUNT	200	(maximum number of records per case)
MAX INPUT COLS	80	(maximum width of a line of data record)
COMMON VARS	PLTNAM(A,3)/PLTNAM(A,60)/REGION(A,2)/ NPDES(A,9)	(definition of common variables)

The values for the NPDES2 rectype definition are given in Table 5-3 as an example. This record type will contain NPDES limits information for all facilities. The record type number is 6, so all records containing NPDES limits will have the value 06 in columns 1 - 2. Two sort IDS are specified (PARCOD and START), which, along with the case ID (PLTNUM) and the rectype number, will be found on every line of every record of this record type.

This is a multi-line record, so a sequence check is performed. This involves checking the sequence numbers in column 80, which indicate which line of a multi-line record is being processed. The data element list is then given, showing the names of the data elements (PLTNUM, PARCOD, START, etc.), their location in the record (line and field), and the format ('A' indicates character data, 'F4' indicates a real number with four places to the right of the decimal specified). Missing values are specified; in this case, a blank field is recognized as "missing data" for all data elements. Value labels are specified for those elements entered in code form. These labels may be retrieved and used in place of or in addition to the code form during processing of data.

The remaining rectype definitions are given in the schema listing (Appendix B).

Table 5-3. Rectype definition for record type 6, NPDES2.

Organization of the Data: Data Summary

The record types defined in the CASPER schema may be classified as facility data (types 1 - 8) or as operations data (types 9 - 16). As stated previously, facility data is more or less permanent, i.e., it remains constant from month to month. New operations data will be reloaded at least once per month, more often in the event that bad records are found that need to be reentered.

A brief discussion of each of the record types follows. A more complete summary of all of the data elements in the database may be found in Appendix C.

Rectype 1 - INDEX. The INDEX rectype is an index to all facilities found in the database. Data elements include the MDWPC identification number, facility name, administrative region, and NPDES identification number. There is one record per case.

Rectype 2 - PLTDAT1. The PLTDAT1 rectype contains general facility data, e.g. mailing address, telephone number, and the name of the drainage basin and receiving waters. There is one record per case. Each record contains five lines.

Rectype 3 - PLTDAT2. The PLTDAT2 rectype contains wastewater and sludge treatment and disposal information. This information is represented by numeric codes signifying each of the treatment units used by a particular facility; the

order of the codes represents the physical order of the units in the process stream. There is one record per case.

Rectype 4 - PLTDAT3. The PLTDAT3 rectype contains information on the personnel operating a facility, including name, title and operator class. There is one record per person, so multiple records per case are possible. Last name and first name are used as sort IDs.

Rectype 5 - NPDES1. The NPDES1 record type contains information about the NPDES permit, including major discharge indicator code, permit type, ownership type, date the permit was issued, date the permit expires, final limits indicator, facility inactive code, and discharge monitoring report mailing address. This information corresponds to similar information found on EPA's Permit Compliance System. There is one record per case. Each record contains five lines.

Rectype 6 - NPDES2. The NPDES2 record type contains information about the NPDES permit limits, including parameter codes, type of limit, frequency of analysis, monitoring location, sample type, period over which limit is in effect (for seasonal limits), and the limit values for daily, weekly (7-day running average), and monthly periods. There is one record per parameter per facility, so multiple records per case are possible. Parameter code and starting date are used as sort IDs.

Rectype 7 - PARAM. The PARAM record type is an index to the parameters used in the operations data. This includes the

parameter code, parameter name, and parameter units. In this case, parameter information is common to all cases, therefore, the facility ID number (a required field) is assigned the value '000'. Therefore, there are multiple records for the '000' case, and no records for all others. The parameter code serves as a sort ID.

Rectype 8 - DESIGN. The DESIGN record type contains information on the design of each facility, including type of unit, number of units of each type, unit configuration (shape) and dimensions (length, width, diameter, depth), design loadings (hydraulic, solids, volumetric), design flow, design food to microorganism ratio, and design recycle rate. There is one record per unit type per facility, so multiple records are possible per case. Unit type is used as a sort ID.

Rectype 9 - INFLOW. The INFLOW record type contains raw wastewater data, including biochemical oxygen demand (BOD), total suspended solids (SS), volatile suspended solids (VSS), settleable solids, dissolved oxygen (DO), pH, total phosphorus (P), total nitrogen (N), ammonia (NH3), nitrate (NO3), and nitrogenous BOD (NBOD). There is one record per day, so multiple records per case are possible. Day of month is used as a sort ID.

Rectype 10 - PRIMARY. The PRIMARY record type contains process evaluation data for primary clarification, including primary BOD, SS, settleable solids, DO, pH, and depth of

sludge blanket(DOB). There is one record per day per facility, so multiple records per case are possible. Day of month is used as a sort ID.

Rectype 11 - SECNDRY. The SECNDRY record type contains process evaluation data for secondary clarification, including secondary BOD, SS, settleable solids, DO, pH, DOB, P, N, NH3, NO3, and NBOD. The is one record per day per facility, so multiple records per case are possible. Day of month is used as a sort ID.

Rectype 12 - TRTIARY. The TRTIARY record type contains process evaluation data for advanced waste treatment (AWT). The parameters used for evaluation do not consider the separate processes available, but instead consider any AWT units as a single unit using the same evaluation parameters as in secondary clarification, as measured from the AWT unit. There is one record per day per facility, so multiple records per case are possible. Day of month is used as a sort ID.

Rectype 13 - BIOPRO. The BIOPRO record type contains process evaluation data for biological wastewater treatment units, including recycle flow, recycle SS, waste flow, mixed liquor SS, mixed liquor VSS, mixed liquor DO, mixed liquor pH, and air supplied. There is one record per day per facility, so multiple records per case are possible. Day of month is used as a sort ID.

Rectype 14 - GENERAL. The GENERAL record type contains data which is not classifiable under other process evaluation

rectypes, including rainfall, air temperature, wastewater temperature, minimum, maximum, and average flows, grit and screenings volume, chlorination dosage and residual, septage flow and pH, and total and fecal coliforms. There is one record per day per facility, so multiple records per case are possible. Day of month is used as a sort ID. There are two lines per record.

Rectype 15 - SLUDGE. The SLUDGE record type contains sludge processing data, including sludge wasted from primary and secondary units, percent total and volatile solids in the wasted sludge; percent solids and supernatant wasted from the thickener; digester flow, process temperature, process pH, supernatant wasted, gas produced, alkalinity, volatile acids, total and volatile solids; dewaterer flow, operating time, and percent solids; filter cake production and percent solids; volume drawn and removed from sand beds; and dosages applied for ferric chloride, lime, and polymer. There is one record per day per facility, so multiple records per case are possible. Day of month is used as a sort ID. There are three lines per record.

Rectype 16 - COMMENT. The COMMENT rectype contains general comments that the operator may wish to include along with the operations data. It simply consists of a line number, and the comment field. There is one record per comment line per facility, so multiple records are possible. The line number is used as a sort ID.

APPENDIX C-2

CASPER DATABASE SCHEMA

```
   COMMENT                    **************************
   COMMENT                    * CASPER DATABASE SCHEMA *
   COMMENT                    **************************

 5 RUN NAME                   COMPUTER ASST. PERFORMANCE EVALUATION AND
                              REPORTING SYSTEM - SCHEMA DEFINITION
   NEW FILE                   CASPER


10 COMMENT ********************************************************************
   COMMENT                                CASE DEFINITION
   COMMENT ********************************************************************

   DOCUMENT                   EACH CASE CORRESPONDS TO ONE MUNICIPAL WASTEWATER
15                            TREATMENT FACILITY, IDENTIFIED BY A THREE-DIGIT CASE
                              ID (PLTNUM)

   CASE ID                    PLTNUM
   RECTYPE COLS               1,2
20 SEQUENCE COLS              80
   N OF CASES                 200
   RECS PER CASE              225
   MAX REC TYPES              25
   MAX REC COUNT              150
25 MAX INPUT COLS             80

   COMMON VARS                PLTNUM(A,3)/ PLTNAM(A,60)/ REGION(A,2)/ NPDES(A,9)
```

```
TASK NAME          CASPER - FACILITY INDEX

COMMENT ************************************************************
COMMENT            SCHEMA DEFINITION FOR FACILITY INDEX RECORD TYPE
COMMENT                              (INDEX)
COMMENT ************************************************************

RECORD SCHEMA      1, INDEX

DOCUMENT           THIS RECORD TYPE CONTAINS AN INDEX TO ALL MUNICIPAL
                   FACILITIES, INCLUDING THE FACILITY NAME, REGION,
                   MDWPC ID NUMBER, AND NPDES PERMIT NUMBER.

DATA LIST          /1   PLTNUM      4- 6 (A)
                        PLTNAM      7-66 (A)
                        REGION     67-68 (A)
                        NPDES      69-77 (A)


ACCORDING TO YOUR FORMAT.

VARIABLE  FORMAT  LINE  COLUMN(S)
--------  ------  ----  ---------

PLTNUM    A3        1     4 - 6
PLTNAM    A60       1     7 - 66
REGION    A2        1    67 - 68
NPDES     A9        1    69 - 77

THE INPUT FORMAT PROVIDES FOR 1 LINE PER RECORD.
A MAXIMUM OF 77 COLUMNS ARE USED ON A LINE.

END SCHEMA
```

```
    TASK NAME           CASPER - WASTEWATER FACILITY DATA

    COMMENT ************************************************************
    COMMENT             SCHEMA DEFINITION FOR GENERAL FACILITY RECORD TYPE
55  COMMENT                              (PLTDAT1)
    COMMENT ************************************************************

    RECORD SCHEMA       2,PLTDAT1

60  SEQUENCE CHECK

    DOCUMENT            THIS RECTYPE CONTAINS GENERAL FACILITY DATA

    DATA LIST           (5)
65                      /1  PLTNUM          4- 6 (A)
                            MADD1           7-36 (A)
                            MADD2          37-66 (A)
                        /2  MCITY           7-36 (A)
                            MZIP           37-45 (A)
70                          TELNUM         46-59 (A)
                        /3  BASIN           7-36 (A)
                            RECWAT         37-66 (A)
                        /4  COMM21          7-78 (A)
                        /5  COMM22          7-78 (A)
75
```

ACCORDING TO YOUR FORMAT.

VARIABLE	FORMAT	LINE	COLUMN(S)
PLTNUM	A3	1	4 - 6
MADD1	A30	1	7 - 36
MADD2	A30	1	37 - 66
MCITY	A30	2	7 - 36
MZIP	A9	2	37 - 45
TELNUM	A14	2	46 - 59
BASIN	A30	3	7 - 36
RECWAT	A30	3	37 - 66
COMM21	A72	4	7 - 78
COMM22	A72	5	7 - 78

THE INPUT FORMAT PROVIDES FOR 5 LINES PER RECORD.
A MAXIMUM OF 78 COLUMNS ARE USED ON A LINE.

END SCHEMA

```
    TASK NAME           CASPER - TREATMENT/DISPOSAL DATA
80
    COMMENT ************************************************************
    COMMENT        SCHEMA DEFINITION FOR TREATMENT/DISPOSAL DATA RECORD TYPE
    COMMENT                          (PLTDAT2)
    COMMENT ************************************************************
85
    RECORD SCHEMA       3,PLTDAT2

    SEQUENCE CHECK

90  DOCUMENT            THIS RECTYPE CONTAINS WASTEWATER AND SLUDGE TREATMENT
                        AND DISPOSAL INFORMATION FOR EACH WASTEWATER TREAT-
                        MENT FACILITY

    DATA LIST           (5)
95                      /1  PLTNUM                  4- 6 (A)
                            WCOD1 TO WCOD15         7-36 (I)
                            SCOD1 TO SCOD15        37-66 (I)
                        /2  DESC31 TO DESC33        7-66 (A)
                        /3  DESC34 TO DESC36        7-66 (A)
100                     /4  COMM31                  7-78 (A)
                        /5  COMM32                  7-78 (A)
```

ACCORDING TO YOUR FORMAT.

VARIABLE	FORMAT	LINE	COLUMN(S)
PLTNUM	A3	1	4 - 6
WCOD1	I2	1	7 - 8
WCOD2	I2	1	9 - 10
WCOD3	I2	1	11 - 12
WCOD4	I2	1	13 - 14
WCOD5	I2	1	15 - 16
WCOD6	I2	1	17 - 18
WCOD7	I2	1	19 - 20
WCOD8	I2	1	21 - 22
WCOD9	I2	1	23 - 24
WCOD10	I2	1	25 - 26
WCOD11	I2	1	27 - 28
WCOD12	I2	1	29 - 30
WCOD13	I2	1	31 - 32
WCOD14	I2	1	33 - 34
WCOD15	I2	1	35 - 36
SCOD1	I2	1	37 - 38
SCOD2	I2	1	39 - 40
SCOD3	I2	1	41 - 42
SCOD4	I2	1	43 - 44
SCOD5	I2	1	45 - 46
SCOD6	I2	1	47 - 48
SCOD7	I2	1	49 - 50
SCOD8	I2	1	51 - 52
SCOD9	I2	1	53 - 54
SCOD10	I2	1	55 - 56
SCOD11	I2	1	57 - 58

SCOD12	I2	1	59 - 60
SCOD13	I2	1	61 - 62
SCOD14	I2	1	63 - 64
SCOD15	I2	1	65 - 66
DESC31	A20	2	7 - 26
DESC32	A20	2	27 - 46
DESC33	A20	2	47 - 66
DESC34	A20	3	7 - 26
DESC35	A20	3	27 - 46
DESC36	A20	3	47 - 66
COMM31	A72	4	7 - 78
COMM32	A72	5	7 - 78

THE INPUT FORMAT PROVIDES FOR 5 LINES PER RECORD.
A MAXIMUM OF 78 COLUMNS ARE USED ON A LINE.

MISSING VALUES WCOD1 TO SCOD15 (BLANK)

105 VALUE LABELS WCOD1 TO WCOD15

(10) NO PRELIMINARY
(11) RACKS-SCREENS
(12) COMMINUTOR
(13) GRIT CHAMBER
(14) PRE-CHLORINATION
110 (15) PRE-AERATION
(16) FLOW EQUALIZATION
(19) OTHER PRELIMINARY
(20) NO PRIMARY
(21) PRIMARY CLARIF.
115 (22) FLOCCULATION
(23) DIGESTION:AEROBIC
(24) DIGESTION:ANAEROBIC
(25) STABILIZATION POND
(29) OTHER PRIMARY
120 (30) NO SECONDARY
(31) A. S.:CONVEN.
(32) A. S.:STEP AER.
(33) A. S.:COMP. MIX
(34) A. S.:CON. STAB.
125 (35) A. S.:EXT. AER.
(36) A. S.:PURE O2
(37) A. S.:OTHER
(38) OXIDATION DITCH
(41) T. F.:HIGH RATE
130 (42) T. F.:LOW RATE
(43) T. F.:ROUGHING
(44) LAGOON:AEROBIC
(45) LAGOON:FACULTATIVE
(46) LAGOON:ANAEROBIC
135 (47) RBC
(48) SECOND. CLARIF.
(49) OTHER SECONDARY
(50) NO TERTIARY
(51) DISINFECTION:CL2
140 (52) DISINFECTION:O3
(53) DISINFECTION:UV
(54) POST-AERATION
(55) POLISH. LAGOON

```
                                                    (56) MICROSCREENING
145                                                 (57) RAPID SAND
                                                    (58) SLOW SAND
                                                    (59) OTHER FILTRATION
                                                    (61) P REMOVAL:BIOLOGICAL
                                                    (62) P REMOVAL:PHYS-CHEM
150                                                 (63) N REMOVAL:BIOLOGICAL
                                                    (64) N REMOVAL:NH3 STRIP.
                                                    (65) N REMOVAL:ION EXCH.
                                                    (66) N REMOVAL:B. P. CL2
                                                    (67) REF. ORG.:C ADSORP.
155                                                 (68) REF. ORG.:CHE. OXID.
                                                    (69) OTHER TERTIARY
                                                    (71) MAJOR RIVER OUTFALL
                                                    (72) MINOR RIVER OUTFALL
                                                    (73) LAKE OUTFALL
160                                                 (74) COASTAL OUTFALL
                                                    (75) DEEP OCEAN OUTFALL
                                                    (76) LAND APPLICATION
                                                    (77) REUSE-RECYCLE
                                                    (78) UNDERGROUND INJECTION
165                                                 (79) OTHER DISPOSAL/
                          SCOD1 TO SCOD15           (10) NO PROCESSING
                                                    (11) GRAVITY THICKENING
                                                    (12) FLOTATION THICKENING
                                                    (13) AEROBIC DIGESTION
170                                                 (14) ANAEROBIC DIGESTION
                                                    (15) VACUUM FILTRATION
                                                    (16) BELT FILTRATION
                                                    (17) PRESSURE FILTRATION
                                                    (18) CENTRIFUGE
175                                                 (19) CHEMICAL ADDITION
                                                    (20) HEAT DRYING
                                                    (21) HEAT TREATMENT
                                                    (22) PYROLYSIS
                                                    (23) DRYING BEDS
180                                                 (29) OTHER TREATMENT
                                                    (31) INCINERATION
                                                    (32) LANDFILL
                                                    (33) COMPOSTING
                                                    (34) LAND APPLICATION
185                                                 (35) OCEAN DISPOSAL
                                                    (39) OTHER DISPOSAL/

    END SCHEMA

190
```

```
     TASK NAME            CASPER - PERSONNEL DATA

     COMMENT ************************************************************
     COMMENT                SCHEMA DEFINITION FOR PERSONNEL RECORD TYPE
 195 COMMENT                                  (PLTDAT3)
     COMMENT ************************************************************

     RECORD SCHEMA        4,PLTDAT3

 200 SORT IOS             LNAME, FNAME

     MAX REC COUNT        20

     DOCUMENT             THIS RECTYPE CONTAINS PERSONNEL DATA
 205
     DATA LIST            /1   PLTNUM          4- 6 (A)
                               LNAME           7-24 (A)
                               FNAME          25-34 (A)
                               TITLE          35-64 (A)
 210                           CLASS          65-66 (A)


     ACCORDING TO YOUR FORMAT.

     VARIABLE   FORMAT   LINE   COLUMN(S)
     --------   ------   ----   ---------

     PLTNUM     A3         1      4 - 6
     LNAME      A18        1      7 - 24
     FNAME      A10        1     25 - 34
     TITLE      A30        1     35 - 64
     CLASS      A2         1     65 - 66

     THE INPUT FORMAT PROVIDES FOR 1 LINE PER RECORD.
     A MAXIMUM OF 66 COLUMNS ARE USED ON A LINE.

     END SCHEMA
```

```
TASK NAME           CASPER - NPDES PERMIT DATA

COMMENT ************************************************************
COMMENT             SCHEMA  DEFINITION FOR NPDES PERMIT DATA RECORD
COMMENT                              (NPDES1)
COMMENT ************************************************************

RECORD SCHEMA       5,NPDES1

SEQUENCE CHECK

DOCUMENT            THIS RECTYPE CONTAINS NPDES PERMIT DATA

DATA LIST           (5)
                    /1  PLTNUM      4- 6 (A)
                        MADI          7 (A)
                        EPST          8 (A)
                        TYPO        9-11 (A)
                        PERD       12-17 (A)
                        PERE       18-23 (A)
                        FLIM          24 (A)
                        IACC          25 (A)
                        IADT       26-31 (A)
                        DNAM       32-61 (A)
                    /2  DADD1       7-36 (A)
                        DADD2      37-66 (A)
                    /3  DCITY       7-36 (A)
                        DZIP       37-45 (A)
                    /4  COMM51      7-78 (A)
                    /5  COMM52      7-78 (A)
```

ACCORDING TO YOUR FORMAT.

VARIABLE	FORMAT	LINE	COLUMN(S)
PLTNUM	A3	1	4 - 6
MADI	A1	1	7
EPST	A1	1	8
TYPO	A3	1	9 - 11
PERD	A6	1	12 - 17
PERE	A6	1	18 - 23
FLIM	A1	1	24
IACC	A1	1	25
IADT	A6	1	26 - 31
DNAM	A30	1	32 - 61
DADD1	A30	2	7 - 36
DADD2	A30	2	37 - 66
DCITY	A30	3	7 - 36
DZIP	A9	3	37 - 45
COMM51	A72	4	7 - 78
COMM52	A72	5	7 - 78

THE INPUT FORMAT PROVIDES FOR 5 LINES PER RECORD.
A MAXIMUM OF 78 COLUMNS ARE USED ON A LINE.

```
      VALUE LABELS        MADI        ('M') MAJOR
                                      ('X') MINOR/
                          EPST        ('E') EPA
                                      ('S') STATE/
250                       TYPO        ('PUB') PUBLIC
                                      ('PRI') PRIVATE
                                      ('BPP') PUB-PRIV
                                      ('FED') FEDERAL
                                      ('STA') STATE/
255                       FLIM        ('F') FINAL
                                      ('X') NOT FINAL/
                          IACC        ('A') ACTIVE
                                      ('I') INACTIVE

260 END SCHEMA
```

```
    TASK NAME           CASPER - NPDES LIMITS

265 COMMENT ************************************************************
    COMMENT              SCHEMA DEFINITION FOR NPDES LIMITS RECORD TYPE
    COMMENT                                  (NPDES2)
    COMMENT ************************************************************

270 RECORD SCHEMA       6, NPDES2

    SORT IDS            PARCOD,START

    SEQUENCE CHECK
275
    MAX REC COUNT       40

    DOCUMENT            THIS RECTYPE CONTAINS THE ACTUAL NPDES LIMITS AS WELL
                        ASSOCIATED INFORMATION.
280
    DATA LIST           (3)
                        /1   PLTNUM        4- 6 (A)
                             PARCOD        7-11 (A)
                             START        12-15 (A)
285                          END          16-19 (A)
                             LIMTYP          20 (A)
                             MONLOC          21 (A)
                             FREQAN       22-26 (A)
                             SAMTYP       27-28 (A)
290                          DBOUND          29 (A)
                             DSTAT           30 (A)
                             DMAX         31-39 (F4)
                             DMIN         40-48 (F4)
                             WBOUND          49 (A)
295                          WSTAT           50 (A)
                             WMAX         51-59 (F4)
                             WMIN         60-68 (F4)
                        /2   MBOUND          16 (A)
                             MSTAT           17 (A)
300                          MMAX         18-26 (F4)
                             MMIN         27-35 (F4)
                             OBOUND          36 (A)
                             OSTAT           37 (A)
                             OMAX         38-46 (F4)
305                          OMIN         47-55 (F4)
                        /3   DESC6        16-35 (A)
                             COMM60       36-78 (A)
```

ACCORDING TO YOUR FORMAT.

VARIABLE	FORMAT	LINE	COLUMN(S)
PLTNUM	A3	1	4 - 6
PARCOD	A5	1	7 - 11
START	A4	1	12 - 15
END	A4	1	16 - 19
LIMTYP	A1	1	20

MONLOC	A1	1	21
FREQAN	A5	1	22 - 26
SAMTYP	A2	1	27 - 28
DBOUND	A1	1	29
DSTAT	A1	1	30
DMAX	D9.4	1	31 - 39
DMIN	D9.4	1	40 - 48
WBOUND	A1	1	49
WSTAT	A1	1	50
WMAX	D9.4	1	51 - 59
WMIN	D9.4	1	60 - 68
MBOUND	A1	2	16
MSTAT	A1	2	17
MMAX	D9.4	2	18 - 26
MMIN	D9.4	2	27 - 35
OBOUND	A1	2	36
OSTAT	A1	2	37
OMAX	D9.4	2	38 - 46
OMIN	D9.4	2	47 - 55
DESC6	A20	3	16 - 35
COMM60	A43	3	36 - 78

THE INPUT FORMAT PROVIDES FOR 3 LINES PER RECORD.
A MAXIMUM OF 78 COLUMNS ARE USED ON A LINE.

MISSING VALUES DMAX, DMIN, WMAX, WMIN, MMAX, MMIN, OMAX, OMIN (BLANK)

VALUE LABELS

LIMTYP	('I')	INITIAL
	('M')	INTERIM
	('F')	FINAL/
MONLOC	('1')	EFFL. GROSS VALUE
	('2')	EFFL. NET VALUE
	('4')	AFTER PRETREATMENT
	('5')	UPSTREAM MONITOR.
	('6')	DOWNSTREAM MONITOR.
	('9')	AFTER P REMOVAL
	('A')	AFTER DISINFECTION
	('B')	BEFORE DISINFECTION
	('C')	AFTER N REMOVAL
	('D')	AFTER TERTIARY
	('E')	AFTER SECONDARY
	('F')	AFTER PRIMARY
	('G')	RAW WASTEWATER
	('K')	% REMOVAL
	('L')	DIGESTOR
	('N')	IN AERATION UNIT
	('O')	OTHER/
SAMTYP	('CN')	CONTINUOUS
	('VI')	VISUAL
	('DI')	DISCRETE
	('ES')	ESTIMATE
	('RP')	REPRESENTATIVE
	('RC')	RECORDER
	('CP')	COMPOSITE
	('01')	1 HR. COMPOS.
	('02')	2 HR. COMPOS.
	('03')	3 HR. COMPOS.

```
                                    ('04') 4 HR. COMPOS.
                                    ('05') 5 HR. COMPOS.
                                    ('06') 6 HR. COMPOS.
                                    ('08') 8 HR. COMPOS.
                                    ('10') 10 HR. COMPOS.
                                    ('12') 12 HR. COMPOS.
                                    ('16') 16 HR. COMPOS.
                                    ('20') 20 HR. COMPOS.
                                    ('24') 24 HR. COMPOS.
                                    ('IN') INSTANTANEOUS
                                    ('IS') IN SITU
                                    ('GR') GRAB
                                    ('G2') 2 SAMPLE GRAB
                                    ('G3') 3 SAMPLE GRAB
                                    ('G4') 4 SAMPLE GRAB
                                    ('G5') 5 SAMPLE GRAB
                                    ('G6') 6 SAMPLE GRAB
                                    ('G7') 7 SAMPLE GRAB
                                    ('G8') 8 SAMPLE GRAB
                                    ('G9') 9 SAMPLE GRAB
                                    ('GM') 10+ SAMPLE GRAB
                                    ('MS') MEASURED
                                    ('DA') DAILY AVERAGE
                                    ('2H') 2 HR. AVERAGE
                                    ('4H') 4 HR. AVERAGE
                                    ('R4') RANGE DUR 4 HR. AVG.
                                    ('RD') RANGE DUR DAILY AVG.
                                    ('RG') RANGE DURING COMPOS.
                                    ('TM') TOTALIZING METER
                                    ('FI') FLOW INDICATOR/
                            DBOUND, WBOUND, MBOUND, OBOUND
                                    ('1') MAXIMUM
                                    ('2') MINIMUM
                                    ('3') RANGE
                                    ('4') % REMOVAL
                                    ('0') NOT/
                            DSTAT, WSTAT, MSTAT, OSTAT
                                    ('1') ARITH. MEAN
                                    ('2') GEOM. MEAN
                                    ('3') MAX.
                                    ('4') MIN.
                                    ('5') MEDIAN
                                    ('6') SINGLE VALUE
                                    ('0') APPLICABLE
    END SCHEMA
```

```
    TASK NAME           CASPER - PARAMETER LIST
390
    COMMENT ************************************************************
    COMMENT              SCHEMA DEFINITION FOR CASPER PARAMETER LIST
    COMMENT                              (PARAM)
    COMMENT ************************************************************
395
    RECORD SCHEMA       7, PARAM

    SORT IDS            PCODE

400 MAX REC COUNT       150

    DOCUMENT            THIS RECTYPE CONTAINS A LIST OF THE PARAMETERS USED IN
                        CASPER SYSTEM, ASSOCIATED PARAMETER CODES, AND APPROPR
                        UNITS.
405
    DATA LIST           /1  PLTNUM      4- 6 (A)
                            PCODE       7-11 (A)
                            PNAME1     12-21 (A)
                            PNAME2     22-31 (A)
410                         UNITS      32-41 (A)
                            COMM70     42-78 (A)


    ACCORDING TO YOUR FORMAT.

    VARIABLE  FORMAT  LINE  COLUMN(S)
    --------  ------  ----  ---------

    PLTNUM    A3        1     4 - 6
    PCODE     A5        1     7 - 11
    PNAME1    A10       1    12 - 21
    PNAME2    A10       1    22 - 31
    UNITS     A10       1    32 - 41
    COMM70    A37       1    42 - 78

    THE INPUT FORMAT PROVIDES FOR 1 LINE PER RECORD.
    A MAXIMUM OF 78 COLUMNS ARE USED ON A LINE.

    END SCHEMA

415
```

```
     TASK NAME          CASPER - DESIGN PARAMETERS

     COMMENT ************************************************************
     COMMENT          SCHEMA DEFINITION FOR DESIGN PARAMETER RECORD TYPE
420  COMMENT                              (DESIGN)
     COMMENT ************************************************************

     RECORD SCHEMA      8,DESIGN

425  SORT IDS           UNTYP, UNTNUM

     DOCUMENT           THIS RECORD TYPE CONTAINS PLANT DESIGN PARAMETERS

     DATA LIST
430                     /1  PLTNUM      4- 6 (A)
                            UNTYP         7 (A)
                            UNTNUM      8- 9 (I)
                            CONFIG       10 (A)
                            LENGTH     11-15 (F1)
435                         WIDTH      16-20 (F1)
                            DIAM       21-25 (F1)
                            DEPTH      26-29 (F1)
                            HLOAD      30-34 (F0)
                            SLOAD      35-38 (F1)
440                         DESQ       39-45 (F3)
                            VLOAD      46-49 (F0)
                            DESFM      50-53 (F2)
                            DESREC     54-57 (F2)
                            COMM80     58-78 (A)
445
```

ACCORDING TO YOUR FORMAT.

VARIABLE	FORMAT	LINE	COLUMN(S)
PLTNUM	A3	1	4 - 6
UNTYP	A1	1	7
UNTNUM	I2	1	8 - 9
CONFIG	A1	1	10
LENGTH	D5.1	1	11 - 15
WIDTH	D5.1	1	16 - 20
DIAM	D5.1	1	21 - 25
DEPTH	D4.1	1	26 - 29
HLOAD	D5.0	1	30 - 34
SLOAD	D4.1	1	35 - 38
DESQ	D7.3	1	39 - 45
VLOAD	D4.0	1	46 - 49
DESFM	D4.2	1	50 - 53
DESREC	D4.2	1	54 - 57
COMM80	A21	1	58 - 78

THE INPUT FORMAT PROVIDES FOR 1 LINE PER RECORD.
A MAXIMUM OF 78 COLUMNS ARE USED ON A LINE.

MISSING VALUES UNTNUM, LENGTH TO DESREC (BLANK)

```
    VALUE LABELS        UNTYP       ('1') FLOW
450                                 ('2') PRIMARY CLARIFIER
                                    ('3') AERATION UNIT
                                    ('4') TRICKLING FILTER
                                    ('5') SECOND. CLARIFIER
                                    ('6') OTHER/
455                     CONFIG      ('C') CIRCULAR
                                    ('R') RECTANGULAR

    END SCHEMA

460
```

```
    TASK NAME           CASPER - RAW WASTEWATER DATA

    COMMENT ************************************************************
    COMMENT                SCHEMA DEFINITION FOR RAW WASTEWATER DATA
465 COMMENT                              (INFLOW)
    COMMENT ************************************************************

    RECORD SCHEMA       9,INFLOW

470 SORT IDS            DAY

    MAX REC COUNT       31

    DOCUMENT            THIS RECORD TYPE CONTAINS RAW WASTEWATER DATA
475
    DATA LIST           /1  PLTNUM      4- 6 (A)
                            DAY         7- 8 (I)
                            INBOD       9-14 (F1)
                            INSS       15-20 (F1)
480                         INVSS      21-26 (F1)
                            INSETS     27-31 (F1)
                            INDO       32-35 (F1)
                            INPH       36-39 (F1)
                            INPHOS     40-44 (F2)
485                         INTOTN     45-50 (F2)
                            INAMM      51-56 (F2)
                            INNIT      57-61 (F2)
                            INNBOD     62-67 (F1)


    ACCORDING TO YOUR FORMAT.

    VARIABLE   FORMAT   LINE   COLUMN(S)
    --------   ------   ----   ----------

    PLTNUM     A3         1      4 - 6
    DAY        I2         1      7 - 8
    INBOD      D6.1       1      9 - 14
    INSS       D6.1       1     15 - 20
    INVSS      D6.1       1     21 - 26
    INSETS     D5.1       1     27 - 31
    INDO       D4.1       1     32 - 35
    INPH       D4.1       1     36 - 39
    INPHOS     D5.2       1     40 - 44
    INTOTN     D6.2       1     45 - 50
    INAMM      D6.2       1     51 - 56
    INNIT      D5.2       1     57 - 61
    INNBOD     D6.1       1     62 - 67

    THE INPUT FORMAT PROVIDES FOR 1 LINE PER RECORD.
    A MAXIMUM OF 67 COLUMNS ARE USED ON A LINE.

490 MISSING VALUES          DAY TO INNBOD (BLANK)

    END SCHEMA
```

```
TASK NAME           CASPER - PRIMARY TREATMENT PROCESS EVALUATION DATA

COMMENT ************************************************************
COMMENT     SCHEMA DEFINITION FOR PRIMARY TREATMENT PROCESS EVALUATION DA
COMMENT                              (PRIMARY)
COMMENT ************************************************************

RECORD SCHEMA       10, PRIMARY

SORT IOS            DAY

MAX REC COUNT       31

DOCUMENT            THIS RECTYPE CONTAINS PROCESS EVALUATION DATA FOR PRIM
                    TREATMENT

DATA LIST           /1   PLTNUM          4- 6 (A)
                         DAY             7- 8 (I)
                         PUNIT           9-10 (I)
                         PBOD           11-16 (F1)
                         PSS            17-22 (F1)
                         PSETS          23-27 (F1)
                         PDO            28-31 (F1)
                         PPH            32-35 (F1)
                         PDOB           36-39 (F1)

ACCORDING TO YOUR FORMAT.
```

VARIABLE	FORMAT	LINE	COLUMN(S)
PLTNUM	A3	1	4 - 6
DAY	I2	1	7 - 8
PUNIT	I2	1	9 - 10
PBOD	D6.1	1	11 - 16
PSS	D6.1	1	17 - 22
PSETS	D5.1	1	23 - 27
PDO	D4.1	1	28 - 31
PPH	D4.1	1	32 - 35
PDOB	D4.1	1	36 - 39

```
THE INPUT FORMAT PROVIDES FOR 1 LINE PER RECORD.
A MAXIMUM OF 39 COLUMNS ARE USED ON A LINE.

MISSING VALUES      DAY TO PDOB (BLANK)

END SCHEMA
```

```
    TASK NAME           CASPER - SECONDARY TREATMENT PROCESS EVALUATION DATA

    COMMENT ************************************************************
    COMMENT    SCHEMA DEFINITION FOR SECONDARY TREATMENT PROCESS EVALUATION D
530 COMMENT                              (SECNDRY)
    COMMENT ************************************************************

    RECORD SCHEMA       11, SECNDRY

535 SORT IDS            DAY

    MAX REC COUNT       31

    DOCUMENT            THIS RECTYPE CONTAINS PROCESS EVALUATION DATA FOR SECO
540                     TREATMENT

    DATA LIST           /1  PLTNUM      4- 6 (A)
                            DAY         7- 8 (I)
                            SUNIT       9-10 (I)
545                         SBOD       11-16 (F1)
                            SSS        17-22 (F1)
                            SSFTS      23-27 (F1)
                            SDO        28-31 (F1)
                            SPH        32-35 (F1)
550                         SDOB       36-39 (F1)
                            SPHOS      40-44 (F2)
                            STOTN      45-50 (F2)
                            SAMM       51-56 (F2)
                            SNIT       57-61 (F2)
555                         SNBOD      62-67 (F1)
```

ACCORDING TO YOUR FORMAT.

VARIABLE	FORMAT	LINE	COLUMN(S)
PLTNUM	A3	1	4 - 6
DAY	I2	1	7 - 8
SUNIT	I2	1	9 - 10
SBOD	D6.1	1	11 - 16
SSS	D6.1	1	17 - 22
SSETS	D5.1	1	23 - 27
SDO	D4.1	1	28 - 31
SPH	D4.1	1	32 - 35
SDOB	D4.1	1	36 - 39
SPHOS	D5.2	1	40 - 44
STOTN	D6.2	1	45 - 50
SAMM	D6.2	1	51 - 56
SNIT	D5.2	1	57 - 61
SNBOD	D6.1	1	62 - 67

THE INPUT FORMAT PROVIDES FOR 1 LINE PER RECORD.
A MAXIMUM OF 67 COLUMNS ARE USED ON A LINE.

MISSING VALUES DAY TO SNBOD (BLANK)

```
        END SCHEMA
    560
```

```
    TASK NAME           CASPER - TERTIARY TREATMENT PROCESS EVALUATION DATA

    COMMENT ************************************************************
565 COMMENT      SCHEMA DEFINITION FOR TERTIARY TREATMENT PROCESS EVALUATION D
    COMMENT                              (TERTIARY)
    COMMENT ************************************************************

    RECORD SCHEMA       12, TRTIARY
570
    SORT IDS            DAY

    MAX REC COUNT       31

575 DOCUMENT            THIS RECTYPE CONTAINS PROCESS EVALUATION DATA FOR TERT
                        TREATMENT (ALL PROCESSES)

    DATA LIST           /1    PLTNUM      4- 6 (A)
                              DAY         7- 8 (I)
580                           TUNIT       9-10 (I)
                              TBOD       11-16 (F1)
                              TSS        17-22 (F1)
                              TSETS      23-27 (F1)
                              TDO        28-31 (F1)
585                           TPH        32-35 (F1)
                              TPHOS      36-40 (F2)
                              TTOTN      41-46 (F2)
                              TAMM       47-52 (F2)
                              TNIT       53-57 (F2)
590                           TNBOD      58-63 (F1)


    ACCORDING TO YOUR FORMAT.

    VARIABLE   FORMAT   LINE   COLUMN(S)
    --------   ------   ----   ----------

    PLTNUM     A3         1     4 - 6
    DAY        I2         1     7 - 8
    TUNIT      I2         1     9 - 10
    TBOD       D6.1       1    11 - 16
    TSS        D6.1       1    17 - 22
    TSETS      D5.1       1    23 - 27
    TDO        D4.1       1    28 - 31
    TPH        D4.1       1    32 - 35
    TPHOS      D5.2       1    36 - 40
    TTOTN      D6.2       1    41 - 46
    TAMM       D6.2       1    47 - 52
    TNIT       D5.2       1    53 - 57
    TNBOD      D6.1       1    58 - 63

    THE INPUT FORMAT PROVIDES FOR 1 LINE PER RECORD.
    A MAXIMUM OF 63 COLUMNS ARE USED ON A LINE.

    MISSING VALUES      DAY TO TNBOD (BLANK)

    END SCHEMA
595
```

```
    TASK NAME          CASPER - BIOLOGICAL UNIT PROCESS DATA

    COMMENT ************************************************************
600 COMMENT            SCHEMA DEFINITION FOR BIOLOGICAL UNIT PROCESS DATA
    COMMENT                                 (BIOPRO)
    COMMENT ************************************************************

    RECORD SCHEMA      13,BIOPRO
605
    SORT IDS           DAY

    MAX REC COUNT      31

610 SEQUENCE CHECK

    DOCUMENT           THIS RECORD TYPE CONTAINS OPERATIONS DATA FOR EVALUATION
                       BIOLOGICAL UNIT PROCESSES (ACTIVATED SLUDGE, TRICKLING
                       FILTER, LAGOON, RBC)
615
    DATA LIST          /1     PLTNUM        4- 6 (A)
                              DAY           7- 8 (I)
                              BUNIT         9-10 (I)
                              RETQ         11-17 (F3)
620                           RETSS        18-23 (F0)
                              WASQ         24-30 (F3)
                              MLSS         31-36 (F0)
                              MLVSS        37-42 (F0)
                              MLDO         43-46 (F1)
625                           MLPH         47-50 (F1)
                              MLSETS       51-54 (F0)
                              AIR          55-60 (F0)


    ACCORDING TO YOUR FORMAT.

    VARIABLE   FORMAT   LINE   COLUMN(S)
    --------   ------   ----   ---------

    PLTNUM     A3          1     4 - 6
    DAY        I2          1     7 - 8
    BUNIT      I2          1     9 - 10
    RETQ       D7.3        1    11 - 17
    RETSS      D6.0        1    18 - 23
    WASQ       D7.3        1    24 - 30
    MLSS       D6.0        1    31 - 36
    MLVSS      D6.0        1    37 - 42
    MLDO       D4.1        1    43 - 46
    MLPH       D4.1        1    47 - 50
    MLSETS     D4.0        1    51 - 54
    AIR        D6.0        1    55 - 60

    THE INPUT FORMAT PROVIDES FOR 1 LINE PER RECORD.
    A MAXIMUM OF 60 COLUMNS ARE USED ON A LINE.

    MISSING VALUES          DAY TO AIR (BLANK)
630
    END SCHEMA
```

```
    TASK NAME           CASPER - GENERAL/MISC. PROC. CONTR. DATA
635
    COMMENT ************************************************************
    COMMENT SCHEMA DEFINITION FOR GENERAL PROCESS EVALUATION AND MISCELLANEOU
    COMMENT                              (GENERAL)
    COMMENT ************************************************************
640
    RECORD SCHEMA       14, GENERAL

    SORT IDS            DAY

645 SEQUENCE CHECK

    MAX REC COUNT       31

    DOCUMENT            THIS RECTYPE CONTAINS DATA NOT CLASSIFIABLE UNDER OTHE
650                     PROCESS EVALUATION RECTYPES

    DATA LIST           (2)
                        /1   PLTNUM        4- 6 (A)
                             DAY           7- 8 (I)
655                          RAIN          9-12 (F2)
                             ATEMP        13-16 (F0)
                             WTEMP        17-19 (F0)
                             QMIN         20-26 (F3)
                             QMAX         27-33 (F3)
660                          QAVG         34-40 (F3)
                             GRITS        41-45 (F0)
                             PREDOS       46-49 (F0)
                             PRERES       50-53 (F2)
                             POSDOS       54-57 (F0)
665                          POSRES       58-61 (F2)
                             SEPQ         62-67 (F0)
                             SEPPH        68-71 (F1)
                        /2   TOTCOL        9-14 (F0)
                             FECCOL       15-20 (F0)
670
```

ACCORDING TO YOUR FORMAT.

VARIABLE	FORMAT	LINE	COLUMN(S)
PLTNUM	A3	1	4 - 6
DAY	I2	1	7 - 8
RAIN	D4.2	1	9 - 12
ATEMP	D4.0	1	13 - 16
WTEMP	D3.0	1	17 - 19
QMIN	D7.3	1	20 - 26
QMAX	D7.3	1	27 - 33
QAVG	D7.3	1	34 - 40
GRITS	D5.0	1	41 - 45
PREDOS	D4.0	1	46 - 49
PRERES	D4.2	1	50 - 53
POSDOS	D4.0	1	54 - 57
POSRES	D4.2	1	58 - 61
SEPQ	D6.0	1	62 - 67

SEPPH	D4.1	1	68 - 71
TOTCOL	D6.0	2	9 - 14
FECCOL	D6.0	2	15 - 20

THE INPUT FORMAT PROVIDES FOR 2 LINES PER RECORD.
A MAXIMUM OF 71 COLUMNS ARE USED ON A LINE.

MISSING VALUES DAY TO FECCOL (BLANK)

END SCHEMA

```
     TASK NAME          CASPER - SLUDGE PROCESSING DATA

     COMMENT ************************************************************
     COMMENT              SCHEMA DEFINITION FOR SLUDGE PROCESSING DATA (SLUDGE)
680  COMMENT ************************************************************

     RECORD SCHEMA      15, SLUDGE

     SORT IDS           DAY
685
     SEQUENCE CHECK

     MAX REC COUNT      31

690  DOCUMENT           THIS RECTYPE CONTAINS SLUDGE PROCESSING DATA

     DATA LIST          (3)
                        /1   PLTNUM          4- 6 (A)
                             DAY             7- 8 (I)
695                          PWAST           9-15 (F3)
                             PTSOL          16-19 (F1)
                             PVSOL          20-23 (F1)
                             SWAST          24-30 (F3)
                             STSOL          31-34 (F1)
700                          SVSOL          35-38 (F1)
                             THKSOL         39-42 (F1)
                             THKWAS         43-49 (F3)
                             DIGQ           50-56 (F3)
                             DIGTEMP        57-60 (F1)
705                          DIGPH          61-64 (F1)
                             DIGWAS         65-71 (F3)
                             DIGSPH         72-75 (F1)
                        /2   DIGGAS          9-13 (F1)
                             DIGALK         14-18 (F2)
710                          DIGVOL         19-23 (F2)
                             DIGTSL         24-27 (F1)
                             DIGVSL         28-31 (F1)
                             DEWQ           32-38 (F3)
                             DEWHRS         39-42 (F1)
715                          DEWSOL         43-46 (F1)
                             FILPRO         47-53 (F1)
                             FILSOL         54-57 (F1)
                             BEDIN          58-64 (F3)
                             BEDOUT         65-71 (F3)
720                     /3   FECL3           9-14 (F3)
                             LIME           15-20 (F3)
                             POLY           21-26 (F3)
```

ACCORDING TO YOUR FORMAT.

VARIABLE	FORMAT	LINE	COLUMN(S)
PLTNUM	A3	1	4 - 6
DAY	I2	1	7 - 8
PWAST	D7.3	1	9 - 15

```
730
     COMMENT ************************************************************
     COMMENT          SCHEMA DEFINITION FOR GENERAL COMMENT RECORD TYPE  (COMMEN
     COMMENT ************************************************************

735  RECORD SCHEMA            16,COMMENT

     SORT IDS                 LINE

     MAX REC COUNT            20
740
     DOCUMENT                 THIS RECTYPE CONTAINS ANY COMMENTS THAT AN OPERATO
                              WISHES TO SUBMIT ALONG WITH THE MONTHLY REPORT

     DATA LIST                /1    PLTNUM      4- 6 (A)
745                                 LINE        7- 8 (I)
                                    COMMENT     9-78 (A)


     ACCORDING TO YOUR FORMAT.

     VARIABLE  FORMAT  LINE  COLUMN(S)
     --------  ------  ----  ---------

     PLTNUM    A3        1     4 - 6
     LINE      I2        1     7 - 8
     COMMENT   A70       1     9 - 78

     THE INPUT FORMAT PROVIDES FOR 1 LINE PER RECORD.
     A MAXIMUM OF 78 COLUMNS ARE USED ON A LINE.

     END SCHEMA
     FINISH
```

APPENDIX ~~B~~ C3

DATA ELEMENT SUMMARY

COMPUTER ASSISTED PERFORMANCE EVALUATION AND REVIEW SYSTEM

DATA ELEMENT SUMMARY

SECTION 1 - PERMANENT FACILITY DATA

* "permanent" data is data which typically will not change from month to month, and includes facility description, NPDES permit and limit information, and general and design parameters.

RECTYPE 1 - INDEX	Facility index.
RECTYPE 2 - PLTDAT1	General facility data.
RECTYPE 3 - PLTDAT2	Wastewater and sludge treatment and disposal process description.
RECTYPE 4 - PLTDAT3	Personnel information.
RECTYPE 5 - NPDES1	NPDES permit information.
RECTYPE 6 - NPDES2	NPDES limits information.
RECTYPE 7 - PARAM	Parameter index.
RECTYPE 8 - DESIGN	Facility design parameters.

RECTYPE1 - INDEX

* contains indexing parameters for each facility.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
(1)	4- 6	PLTNUM	MDWPC identification number. This serves as the primary key for the database; i.e. all data ia accessed and stored based on this number.	A3	-
	7-66	PLTNAM	Name of facility.	A60	NAM1 NAM2
	67-68	REGION	MDWPC administrative region code. NE - Northeast region SE - Southeast region CN - Central region WS - Western region	A2	-
	69-77	NPDES	NPDES identification number.	A9	NPID

RECTYPE2 - PLNTDAT1

A contains general facility data.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
				A3	-
	7-36	MADD1	Mailing address (characters 1-30).	A30	MST1
	37-66	MADD2	Mailing address (characters 31-60).	A30	MST2
(2)	4-6	PLTNUM	MDWPC facility ID number.	A3	-
	7-36	MCITY	Mailing city	A30	MCTY
	37-45	MZIP	Zip code	A9	MZIP
	46-59	TELNUM	Area code + 7-digit number + 5-digit extension.	A14	TELE
(3)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7-36	BASIN	Name of drainage basin.	A30	-
	37-66	RECWAT	Receiving waters for facility effluent.	A30	RWAT
(4)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7-78	COMM21	Comment field #1 for PLTDAT1	A72	-
(5)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7-78	COMM22	Comment field #2 for PLTDAT2	A72	-

RECTYPE3 - PLNTDAT2

* contains wastewater and sludge treatment and disposal information for each wastewater treatment facility. This information is represented by numeric codes signifying each of the treatment units used by a particular facility; the order of the codes corresponds to the physical order of the units in the process stream.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
			[illegible]	A3	-
	7- 8	WCOD1	Wastewater treatment stream code.	I2	-
	9-10	WCOD2	" " " "	I2	-
	11-12	WCOD3	" " " "	I2	-
	13-14	WCOD4	" " " "	I2	-
	15-16	WCOD5	" " " "	I2	-
	17-18	WCOD6	" " " "	I2	-
	19-20	WCOD7	" " " "	I2	-
	21-22	WCOD8	" " " "	I2	-
	23-24	WCOD9	" " " "	I2	-
	25-26	WCOD10	" " " "	I2	-
	27-28	WCOD11	" " " "	I2	-
	29-30	WCOD12	" " " "	I2	-
	31-32	WCOD13	" " " "	I2	-
	33-34	WCOD14	" " " "	I2	-
	35-36	WCOD15	Wastewater treatment stream code.	I2	-

Preliminary treatment
(10) No preliminary (11) Racks\screens
[illegible]
(14) Pre-chlorination (15) Pre-aeration
(16) Flow equalization
(19) Other preliminary

Primary treatment
(20) No primary (21) Primary clarifier
(22) Flocculation (23) Digestion:aerobic
(24) Digestion:anaerobic (25) Stabilization pond
(29) Other primary

Secondary treatment
(30) No secondary
(31) Activated sludge:conventional
(32) Activated sludge:step
(33) Activated sludge:complete mix
(34) Activated sludge:contact stabilization
(35) Activated sludge:extended aeration
(36) Activated sludge:pure oxygen
(37) Activated sludge:other
(38) Oxidation ditch
(41) Trickling filter:high rate

(42) Trickling filter:low rate
(43) Trickling filter:roughing
(44) Lagoon:aerobic (45) Lagoon:facultative
(46) Lagoon:anaerobic (47) RBC
(48) Secondary clarifier
(49) Other Secondary

Tertiary Treatment

(50) No tertiary (51) Disinfection:CL_2
(52) Disinfection:O_3 (53) Disinfection:UV
(54) Post-aeration (55) Polishing lagoon
(56) Microscreening (57) Rapid sand filtr.
(58) Slow sand filtr. (59) Other filtration
(61) P-Removal:Biological
(62) P-Removal:Physical-Chemical
(63) N-Removal:Biological
(64) N-Removal:Ammonia stripping
(65) N-Removal:Ion exchange
(66) N-Removal:Breakpoint chlorination
(67) Refractory Organics:Carbon adsorption
(68) Refractory Organics:Chemical oxidation
(69) Other Tertiary

Effluent Disposal

(71) Major river outfall
(72) Minor river outfall
(73) Lake outfall
(74) Coastal outfall
(75) Deep ocean outfall
(76) Land application
(77) Reuse\Recycle
(78) Underground injection
(79) Other disposal

37-38	SCOD1	Sludge processing stream code.	I2	-
39-40	SCOD2	" " " "	I2	-
[illegible]	[illegible]	" " " "	I2	-
43-44	SCOD4	" " " "	I2	-
45-46	SCOD5	" " " "	I2	-
47-48	SCOD6	" " " "	I2	-
49-50	SCOD7	" " " "	I2	-
51-52	SCOD8	" " " "	I2	-
53-54	SCOD9	" " " "	I2	-
55-56	SCOD10	" " " "	I2	-
57-58	SCOD11	" " " "	I2	-
59-60	SCOD12	" " " "	I2	-
61-62	SCOD13	" " " "	I2	-
63-64	SCOD14	" " " "	I2	-
65-66	SCOD15	" " " "	I2	-

Sludge treatment

---

(10) No processing (11) Gravity thickening
(12) Flotation thickening (13) Aerobic digestion
(14) Anaerobic digestion (15) Vacuum filtration
(16) Belt filtation (17) Pressure filtration

(18) Centrifuge (19) Chemical Addition
(22) Pyrolysis (23) Drying beds
(29) Other treatment

Sludge disposal
(31) Incineration (32) Landfill
(33) Composting (34) Land application
(35) Ocean disposal
(39) Other disposal

(2)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7-26	DESC1	Description #1 (used for 'other' processes and chemicals added)	A20	-
	27-46	DESC2	" #2	A20	-
	47-66	DESC3	" #3	A20	-
(3)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7-26	DESC4	" #4	A20	-
	27-46	DESC5	" #5	A20	-
	47-66	DESC6	" #6	A20	-
(4)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7-78	COMM31	Comment Field #1	A72	-
(5)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
(5)	7-78	COMM32	Comment Field #2	A72	-

RECTYPE4 - PLNTDAT3

* contains personnel data.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
(1)	4- 6	PLTNUM	MDWPC facility ID number	A3	-
	7-24	LNAME	Last name of operator.	A18	-
	25-34	FNAME	First name of operator.	A10	-
	35-64	TITLE	Title of operator.	A30	-
	65-66	CLASS	Operator class.	A2	-

RECTYPE5 - NPDES1

A contains information about the NPDES permit.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
(1)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7	MADI	Major discharge indicator code. M - indicates major discharger, otherwise blank.	A1	MADI
	8	EPST	Type of permit issued. E - EPA S - State	A1	EPST
	9-11	TYPO	Type of ownership. PUB - public PRI - private BPP - public/private FED - federal STA - state	A3	TYPO
	12-17	PERD	Permit date issued.	A6	PERD
	18-23	PERE	Permit date expired	A6	PERE
	24	FLIM	Final limits indicator F - indicates final limits; otherwise blank.	A1	FLIM
	25	IACC	Facility inactive code A - facility active I - facility inactive	A1	IACC
	26-31	IADT	Facility inactive date	A6	IADT
	32-61	DNAM	DMR mailing name	A30	ANAM
(2)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7-36	DADD1	DMR mailing address(characters 1-30)	A30	AST1
	37-66	DADD2	DMR mailing address (characters 31-60)	A30	AST2
(3)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7-36	DCITY	DMR mailing city	A30	ACTY
	37-45	DZIP	DMR zip code	A9	AZIP

(4)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7-78	COMM51	Comment field #1 for NPDES1	A72	-
(5)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7-78	COMM52	Comment field #2 for NPDES2	A72	-

RECTYPE 6 - NPDES2

* contains NPDES limit values.

		CASPER			PCS NAME
(1)	4- 6	PLTNUM	MDWPC facility ID number	A3	-
	7-11	PARCOD	Parameter (STORET) code	A5	PRAM
	12-15	START	Starting date of seasonal limit	A4	-
	16-19	END	Ending date of seasonal limit	A4	-
	20	LIMTYP	Type of limit I - initial M - interim F - final	A1	LTYP
	21	MONLOC	Monitoring location 1 - effluent gross value 2 - effluent net value 4 - after pretreatment 5 - upstream monitor 6 - downstream monitor 9 - after P removal A - after disinfection B - before disinfection C - after N removal D - after tertiary E - after secondary F - after primary G - [illegible]water K - % removal L - digestor N - in aerator unit O - other	A1	MLOC
	22-26	FREQAN	Frequency of analysis entered as XX/YY, where XX is the number of samples taken over period YY; values for YY are as follows: BA - per batch DS - per discharge ** - per ** day(s) IN - instantaneous 99 - other	A5	FRAN
	27-28	SAMTYP	Sample type CN - continuous VI - visual	A2	SAMP

DI - discrete
ES - estimate
RP - representative
RC - recorder
CP - composite
- ##-hour composite
IN - instantaneous
IS - in situ
GR - grab
G# - #-sample grab
GM - 10+ sample grab
MS - measured
DA - daily average
#H - #-hour average
R# - range during #-hour average
RD - range during daily average
RG - range during composite
TM - totalizing meter
FI - flow indicator

	29	DBOUND	Indicates whether daily limit is a:	A1	-
			1 - maximum 2 - minimum 3 - range 4 - % removal 0 - none		
	30	DSTAT	Statistical code (daily limit)	A1	-
			1 - Arithmetic mean 2 - Geometric mean 3 - Maximum 4 - Minimum 5 - Median 6 - Single value		
	31-39	DMAX	Maximum value for daily limit	F9.4	-
	40-48	DMIN	Minimum value for daily limit	F9.4	-
	49	WBOUND	Same as DBOUND for weekly limit.	A1	-
	50	WSTAT	Same as DSTAT for weekly limit.	A1	-
	51-59	WMAX	Maximum value for weekly limit.	F9.4	-
	60-68	WMIN	Minimum value for weekly limit.	F9.4	-
(2)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7-11	PARCOD	Parameter (STORET) code	A5	PRAM
	12-15	START	Starting date of seasonal limit	A4	-
	16	MBOUND	Same as DBOUND for monthly limit.	A1	-
	17	MSTAT	Same as DBOUND for monthly limit.	A1	-
	18-26	MMAX	Maximum value for monthly limit.	F9.4	-
	27-35	MMIN	Minimum value for monthly limit	F9.4	-

	36	OBOUND	Same as DBOUND for limit not classifiable above.	A1	-
	37	OSTAT	Same as DSTAT for limit not classifiable above.	A1	-
	38-46	OMAX	Maximum value for other limit.	F9.4	-
	47-55	OMIN	Minimum value for other limit.	F9.4	-
(3)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7-11	PARCOD	Parameter (STORET) code.	A5	PRAM
	12-15	START	Starting date of seasonal limit	A4	-
	16-35	DESC6	Description field.	A20	-
	36-78	COMM60	Comment field for NPDES2.	A43	-

RECTYPE 7 - PARAM

A contains list of parameters used, and their associated codes and units.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
(1)	4- 6	PLTNUM	MDWPC facility ID number (NOTE: While not directly applicable to this record type, PLTNUM is the case ID for the database and is a required value; user should enter '000' in this field)	A3	-
	7-11	PCODE	CASPER parameter code	A5	-
	12-21	PNAME1	Parameter name	A10	-
	22-31	PNAME2	Parameter name - part 2.	A10	-
	32-41	UNITS	Parameter units	A10	-
	42-78	COMM70	Comment field for PARAM	A37	-

RECTYPE 8 - DESIGN

* contains design parameters for facility.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
(1)	4- 6	PLTNUM	MDWPC facility ID number	A3	-
	7	UNTYP	Type of unit 1 - General (parameter is not particular to a unit process - i.e. flow) 2 - Primary clarifier 3 - Aeration unit 4 - Trickling filter 5 - Secondary clarifier 6 - Tertiary treatment unit 9 - Other	A1	-
	8- 9	UNTNUM	Number of units of this type.	I2	-
	10	CONFIG	Configuration of unit (clarifier) C - Circular R - Rectangular	A1	-
	11-15	LENGTH	Length of unit [ft]	F5.1	-
	16-20	WIDTH	Width of unit [ft]	F5.1	-
	21-25	DIAM	Diameter of unit [ft]	F5.1	-
	26-29	DEPTH	Depth of unit [ft]	F4.1	-
	30-34	HLOAD	Hydraulic loading rate [gal-ft-2-d-1]	F5.0	-
	35-38	SLOAD	Solids loading rate [lb-ft-2-d-1]	F4.1	-
	39-45	DESQ	Design flow [MGD]	F7.3	-
	46-49	VLOAD	Volumetric loading rate [lb BOD-103 ft3-d-1]	F4.0	-
	50-53	DESFM	Design F/M [lb BOD-lb MLVSS-1-d-1]	F4.2	-
	54-57	DESREC	Design recirculation rate	F4.2	-
	58-80	COMM80	Comment Field for DESIGN.	A21	-

SECTION 2 - FACILITY OPERATIONS DATA

* Operations data is obtained monthly from each facility and includes influent, effluent, unit process control and performance evaluation data.

RECTYPE 9 - INFLOW	Raw wastewater data.
RECTYPE 10 - PRIMARY	Primary treatment data.
RECTYPE 11 - SECNDRY	Secondary treatment data.
RECTYPE 12 - TRTIARY	Tertiary treatment data.
RECTYPE 13 - BIOPRO	Biological unit process data.
RECTYPE 14 - GENERAL	General operations data.
RECTYPE 15 - SLUDGE	Sludge processing data.

RECTYPE 9 - INFLOW

* contains raw wastewater data.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
(1)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7- 8	DAY	Day of month.	I2	-
	9-14	INBOD	Influent BOD [mg/l]	F6.1	-
	15-20	INSS	Influent suspended solids [mg/l]	F6.1	-
	21-26	INVSS	Influent volatile susp. solids [mg/l]	F6.1	-
	27-31	INSETS	Influent settleable solids [ml/l]	F5.1	-
	32-35	INDO	Influent dissolved oxygen [mg/l]	F4.1	-
	36-39	INPH	Influent pH	F4.1	-
	40-44	INPHOS	Influent phosphorus [mg/l]	F5.2	-
	45-50	INTOTN	Influent total nitrogen [mg/l]	F6.2	-
	51-56	INAMM	Influent ammonia-N [mg/l]	F6.2	-
	57-61	INNIT	Influent nitrate-N [mg/l]	F5.2	-
	62-67	INNBOD	Influent NBOD [mg/l]	F6.1	-

RECTYPE 10 - PRIMARY

* contains primary treatment data.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
(1)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7- 8	DAY	Day of month.	I2	-
	9-10	PUNIT	Unit number	I2	-
	11-16	PBOD	Primary BOD [mg/l]	F6.1	-
	17-22	PSS	Primary suspended solids [mg/l]	F6.1	-
	23-27	PSETS	Primary settleable solids [ml/l]	F5.1	-
	28-31	PDO	Primary dissolved oxygen [mg/l]	F4.1	-
	32-35	PPH	Primary pH	F4.1	-
	36-39	PDOB	Primary depth of sludge blanket [ft]	F4.1	-

RECTYPE 11 - SECNDRY

A contains secondary treatment data.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
(1)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7- 8	DAY	Day of month.	I2	-
	9-10	SUNIT	Unit number	I2	-
	11-16	SBOD	Second. BOD [mg/l]	F6.1	-
	17-22	SSS	Second. suspended solids [mg/l]	F6.1	-
	23-27	SSETS	Second. settleable solids [ml/l]	F5.1	-
	28-31	SDO	Second. dissolved oxygen [mg/l]	F4.1	-
	32-35	SPH	Second. pH	F4.1	-
	36-39	SDOB	Second. depth of sludge blanket [ft]	F4.1	-
	40-44	SPHOS	Second. phosphorus [mg/l]	F5.2	-
	45-50	STOTN	Second. total nitrogen [mg/l]	F6.2	-
	51-56	SAMM	Second. ammonia-N [mg/l]	F6.2	-
	57-61	SNIT	Second. nitrate-N [mg/l]	F5.2	-
	62-67	SNBOD	Second. NBOD [mg/l]	F6.1	-

RECTYPE 12 - TRTIARY

* contains tertiary treatment data.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
(1)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7- 8	DAY	Day of month.	I2	-
	9-10	TUNIT	Unit number	I2	-
	11-16	TBOD	Tertiary BOD [mg/l]	F6.1	-
	17-22	TSS	Tertiary suspended solids [mg/l]	F6.1	-
	23-27	TSETS	Tertiary settleable solids [ml/l]	F5.1	-
	28-31	TDO	Tertiary dissolved oxygen [mg/l]	F4.1	-
	32-35	TPH	Tertiary pH	F4.1	-
	36-39	TDOB	Tertiary depth of sludge blanket [ft]	F4.1	-
	40-44	TPHOS	Tertiary phosphorus [mg/l]	F5.2	-
	45-50	TTOTN	Tertiary total nitrogen [mg/l]	F6.2	-
	51-56	TAMM	Tertiary ammonia-N [mg/l]	F6.2	-
	57-61	TNIT	Tertiary nitrate-N [mg/l]	F5.2	-
	62-67	TNBOD	Tertiary NBOD [mg/l]	F6.1	-

RECTYPE 13 - BIOPRO

* contains biological unit process data.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
(1)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7- 8	DAY	Day of month.	I2	-
	9-10	BUNIT	Unit number	I2	-
	11-17	RETQ	Return flow [MGD]	F7.3	-
	18-23	RETSS	Return suspended solids [mg/l]	F6.0	-
	24-30	WASQ	Waste flow [MGD]	F7.3	-
	31-36	MLSS	Mixed liquor susp. solids [MGD]	F6.0	-
	37-42	MLVSS	Mixed liquor volatile susp. solids [mg/l]	F6.0	-
	43-46	MLDO	Mixed liquor dissolved oxygen [mg/l]	F4.1	-
	47-50	MLPH	Mixed liquor pH	F4.1	-
	51-54	MLSETS	Mixed liquor settleability	F4.0	-
	55-60	AIR	Air supplied	F6.0	-

RECTYPE 14 - GENERAL

* contains data not classifiable under other operations data record types.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
(1)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7- 8	DAY	Day of month.	I2	-
	9-12	RAIN	Rainfall [in]	F4.2	-
	13-16	ATEMP	Air temperature [°F]	F4.0	-
	17-19	WTEMP	Wastewater temperature [°F]	F3.0	-
	20-26	QMIN	Minimum flow [MGD]	F7.3	-
	27-33	QMAX	Maximum flow [MGD]	F7.3	-
	34-40	QAVG	Average flow [MGD]	F7.3	-
	41-45	GRITS	Grit/screening [cu. ft]	F5.0	-
	46-49	PREDOS	Prechlorination dosage [lb/day]	F4.0	-
	50-53	PRERES	Prechlorination residual [mg/l]	F4.2	-
	54-57	POSDOS	Postchlorination dosage [lb/day]	F4.0	-
	58-61	POSRES	Postchlorination residual [mg/l]	F4.2	-
	62-67	SEPQ	Septage flow [gal]	F6.0	-
	68-71	SEPPH	Septage pH	F4.1	-
(2)	4- 6	PLTNUM	MDWPC facility ID number	I3	-
	7- 8	DAY	Day of month.	I2	-
	9-14	TOTCOL	Total coliforms [/100 ml]	F6.0	-
	15-20	FECCOL	Fecal coliforms [/100 ml]	F6.0	-

RECTYPE 15 - SLUDGE

A contains sludge processing data.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
				A3	-
	7- 8	DAY	Day of month	I2	-
				F7.3	-
	16-19	PTSOL	Primary sludge % total solids	F4.1	-
	20-23	PVSOL	Primary sludge % volatile solids	F4.1	-
	24-30	SWAST	Secondary sludge wasted [1000 gal]	F7.3	-
	31-34	STSOL	Secondary sludge % total solids	F4.1	-
	35-38	SVSOL	Secondary sludge % volatile solids	F4.1	-
	39-42	THKSOL	Thickener: influent % solids	F4.1	-
	43-49	THKWAS	Thickener: supernatant wasted [1000 gal]	F7.3	-
	50-56	DIGQ	Digester: flow in [1000 gal]	F7.3	-
	57-60	DIGTMP	Digester: process temp. [oF]	F4.1	-
	61-64	DIGPH	Digester: process pH	F4.1	-
	65-71	DIGWAS	Digester: supernatant wasted	F7.3	-
	72-75	DIGSPH	Digester: supernatant pH	F4.1	-
(2)	4- 6	PLTNUM	MDWPC facility ID number	A3	-
	7- 8	DAY	Day of month	I2	-
	9-13	DIGGAS	Digester: Gas production [1000 cu. ft.]	F5.1	-
	14-18	DIGALK	Digester: alkalinity [mg/l]	F5.2	-
	19-23	DIGVOL	Digester: volatile acids [mg/l]	F5.2	-
	24-27	DIGTSL	Digester: total % solids	F4.1	-
	28-31	DIGVSL	Digester: volatile % solids	F4.1	-
	32-38	DEWQ	Dewaterer: flow in [1000 gal]	F7.3	-
	39-42	DEWHRS	Dewaterer: hours operating	F4.1	-
	43-46	DEWSOL	Dewaterer: influent % solids	F4.1	-
	47-53	FILPRO	Filter cake production [1000 lbs]	F7.3	-
	54-57	FILSOL	Filter cake % solids	F4.1	-
	58-64	BEDIN	Sludge bed: volume drawn [1000 gal]	F7.3	-
	65-71	BEDOUT	Sludge bed: volume removed [1000 gal]	F7.3	-
(3)	4- 6	PLTNUM	MDWPC facility ID number	A3	-
	7- 8	DAY	Day of month	I2	-
	9-14	FECL3	Ferric chloride added [1000 lb]	F6.3	-
	15-20	LIME	Lime added [1000 lb]	F6.3	-
	21-26	POLY	Polymer added [1000 lb]	F6.3	-

RECTYPE 16 - COMMENT

* contains general operator comments.

LINE	FIELD	CASPER NAME	DESCRIPTION	FORMAT	PCS NAME
(1)	4- 6	PLTNUM	MDWPC facility ID number.	A3	-
	7- 8	LINE	Comment line number.	I2	-
	9-78	COMMENT	Operator comment.	A70	-

APPENDIX D

CASPER COMMAND PROCEDURE FILE

```
.PROC,CASPER.
NOTE.+      ************************************************************
NOTE.+      *                          CASPER
NOTE.+      *     COMPUTER-ASSISTED PERFORMANCE EVALUATION AND REVIEW
NOTE.+      *                          VERSION 1.0
NOTE.+      *
NOTE.+      *                             BY
NOTE.+      *
NOTE.+      *          KEVIN T. LAUTZ, GRADUATE RESEARCH ASSISTANT
NOTE.+      *          RICHARD R. NOSS, ASST. PROF. OF CIVIL ENGR.
NOTE.+      *
NOTE.+      *              ENVIRONMENTAL ENGINEERING PROGRAM
NOTE.+      *        UNIVERSITY OF MASSACHUSETTS, AMHERST MA 01003
NOTE.+      *
NOTE.+      *     UNDER A GRANT FROM THE MASSACHUSETTS DIVISION OF
NOTE.+      *                   WATER POLLUTION CONTROL
NOTE.+      *
NOTE.+      *                       SEPTEMBER, 1987
NOTE.+      *
NOTE.+      ************************************************************
MENU.
REVERT,NOLIST.

.DATA,MENU.
.PROC,MENU*I"CASPER MAIN MENU",
OPTION"(L)OAD (D)UMP E(X)ECUTE (Q)UIT (?=HELP)"=(*S1..1(LDXQ)).
.HELP,OPTION,NOLIST.
(L)OAD UNPROCESSED DATA INTO DATABASE.
(D)UMP PROCESSED DATA INTO FILES.
E(X)ECUTE APPLICATION PROGRAM.
(Q)UIT FROM CASPER SYSTEM.
.ENDHELP.
IF,$OPTION$.EQ.$L$,M1.
      LOAD.
ENDIF,M1.
IF,$OPTION$.EQ.$D$,M2.
      DUMP.
ENDIF,M2.
IF,$OPTION$.EQ.$X$,M3.
      APPL.
ENDIF,M3.
IF,$OPTION$.EQ.$Q$,M4.
      REVERT,NOLIST
ELSE,M4.
      MENU.
ENDIF,M4.
REVERT,NOLIST.

.DATA,LOAD.
.PROC,LOAD*I,
TYPE"(I)NIT (F)AC (O)PER (? = HELP)"=(*S1..1(IFO)).
.HELP,TYPE.
(I) - INITIALIZE DATABASE.
(F) - LOAD FACILITY DATA.
(O) - LOAD OPERATIONS DATA.
.ENDHELP.
IF,$TYPE$.EQ.$I$,L0.
   NOTE.+INITIALIZING DATABASE.....
   GET,FACDATA,OPDATA.
```

```
   FINDLIB,SIR=SIR2.
   SIR(IN=LOADINT,OUT=LOADOUT).
ENDIF,L0.
IF,$TYPE$.EQ.$F$,L1.
   NOTE.+LOADING FACILITY DATA.....
   GET,FACDATA.
   FINDLIB,SIR=SIR2.
   SIR(IN=LOADFAC,OUT=LOADOUT).
ENDIF,L1.
IF,$TYPE$.EQ.$O$,L2.
   NOTE.+LOADING OPERATIONS DATA.....
   GET,OPDATA.
   FINDLIB,SIR=SIR2.
   SIR(IN=LOADOPS,OUT=LOADOUT).
ENDIF,L2.
PRINT,LOADOUT.
RETURN,OPDATA,FACDATA.
REVERT.

.DATA,LOADINT.

RUN NAME       CASPER DATA LOADER - INITIALIZATION
OLD FILE       CASPER

READ INPUT DATA  INPUT = FACDATA/ERRFILE=BADRECS
READ INPUT DATA  INPUT = OPDATA/ERRFILE=BADRECS


FINISH

.DATA,LOADFAC.

RUN NAME       CASPER DATA LOADER - FACILITY DATA
OLD FILE       CASPER

VERIFY FILE
READ INPUT DATA  INPUT = FACDATA/ERRFILE=BADRECS

FINISH

.DATA,LOADOPS.

RUN NAME       CASPER DATA LOADER - OPERATIONS DATA
OLD FILE       CASPER

VERIFY FILE
READ INPUT DATA  INPUT = OPDATA/ERRFILE=BADRECS

FINISH

.DATA,DUMP.
.PROC,DUMP.
NOTE.+TRANSFERRING DATA FROM DATABASE TO FILES....
   FINDLIB,SIR=SIR2.
   RETURN,LOAD,LOADOPS,LOADFAC.
   SIR(IN=DUMP1,OUT=DUMPOUT).
   REPLACE,DUMPOUT.
   SIR(IN=DUMP2,OUT=OUT2).
   APPEND,DUMPOUT,OUT2.
   SIR(IN=DUMP3,OUT=OUT3).
```

```
    APPEND,DUMPOUT,OUT3.
    SIR(IN=DUMP4,OUT=OUT4).
    APPEND,DUMPOUT,OUT4.
    SIR(IN=DUMP5,OUT=OUT5).
    APPEND,DUMPOUT,OUT5.
    SIR(IN=DUMP6,OUT=OUT6).
    APPEND,DUMPOUT,OUT6.
    SIR(IN=DUMP7,OUT=OUT7).
    APPEND,DUMPOUT,OUT7.
    SIR(IN=DUMP8,OUT=OUT8).
    APPEND,DUMPOUT,OUT8.
    SIR(IN=DUMP9,OUT=OUT9).
    APPEND,DUMPOUT,OUT9.
    SIR(IN=DUMP10,OUT=OUT10).
    APPEND,DUMPOUT,OUT10.
    SIR(IN=DUMP11,OUT=OUT11).
    APPEND,DUMPOUT,OUT11.
    SIR(IN=DUMP12,OUT=OUT12).
    APPEND,DUMPOUT,OUT12.
    SIR(IN=DUMP13,OUT=OUT13).
    APPEND,DUMPOUT,OUT13.
    SIR(IN=DUMP14,OUT=OUT14).
    APPEND,DUMPOUT,OUT14.
    SIR(IN=DUMP15,OUT=OUT15).
    APPEND,DUMPOUT,OUT7.
    SIR(IN=DUMP16,OUT=OUT16).
    APPEND,DUMPOUT,OUT16.
    REPLACE,INDEX,PLTDAT1,PLTDAT2,PLTDAT3,NPDES1,NPDES2,PARAM,DESIGN.
    REPLACE,INFLOW,PRIMARY,SECNDRY,TRTIARY,BIOPRO,GENERAL,SLUDGE,COMMENT.
    GET,DUMPOUT.
    PURGE,DUMPOUT.
REVERT.

.DATA,DUMPOUT.
                                CASPER FILE DUMP SUMMARY
                                ========================
*
*
*

.DATA,DUMP1.

OLD FILE       CASPER

RETRIEVAL
.    PROCESS CASES
.         PROCESS REC    1
.              MOVE VARS       PLTNUM TO NPDES
.              PERFORM PROCS
.         END PROCESS REC
.    AUTOSET
.    END PROCESS CASES


.    WRITE RECORDS        FILENAME = INDEX/
                          VARIABLES = PLTNUM TO NPDES/
                          FORMAT = (A3,A60,A2,A9)/
                          LRECL = 74
END RETRIEVAL
```

```
.DATA,DUMP2.
OLD FILE       CASPER

RETRIEVAL
.    PROCESS CASES
.         PROCESS REC     2
.              MOVE VARS       PLTNUM MADD1 TO COMM22
.              PERFORM PROCS
.         END PROCESS REC
.    AUTOSET
.    END PROCESS CASES


.    WRITE RECORDS        FILENAME = PLTDAT1/
                          VARIABLES = PLTNUM MADD1 TO COMM22/
                          FORMAT = (A3,3A30,A9,A14,2A30,2A72)/
                          LRECL = 320
END RETRIEVAL

.DATA,DUMP3.
OLD FILE       CASPER

RETRIEVAL
.    PROCESS CASES
.         PROCESS REC     3
.              MOVE VARS       PLTNUM WCOD1 TO COMM32
.              PERFORM PROCS
.         END PROCESS REC
.    AUTOSET
.    END PROCESS CASES


.    WRITE RECORDS        FILENAME = PLTDAT2/
                          VARIABLES = PLTNUM WCOD1 TO COMM32/
                          FORMAT = (A3,3012,6A20,2A72)/
                          LRECL = 327
END RETRIEVAL

.DATA,DUMP4.
OLD FILE       CASPER

RETRIEVAL
.    PROCESS CASES
.         PROCESS REC     4
.              MOVE VARS       PLTNUM LNAME TO CLASS
.              PERFORM PROCS
.         END PROCESS REC
.    AUTOSET
.    END PROCESS CASES


.    WRITE RECORDS        FILENAME = PLTDAT3/
                          VARIABLES = PLTNUM LNAME TO CLASS/
                          FORMAT = (A3,A18,A10,A30,A2)/
                          LRECL = 63/
                          SORT = PLTNUM,LNAME,FNAME
END RETRIEVAL

.DATA,DUMP5.
OLD FILE       CASPER
```

```
RETRIEVAL
.   PROCESS CASES
.        PROCESS REC     5
.             MOVE VARS       PLTNUM MADI TO COMM52
.             PERFORM PROCS
.        END PROCESS REC
.   AUTOSET
.   END PROCESS CASES


.   WRITE RECORDS        FILENAME = NPDES1/
                         VARIABLES = PLTNUM MADI TO COMM52/
                         FORMAT = (A3,2A1,A3,2A6,2A1,A6,4A30,A9,2A72)/
                         LRECL = 361
END RETRIEVAL

.DATA,DUMP6.
OLD FILE      CASPER

RETRIEVAL UPDATE
.   PROCESS CASES
.        PROCESS REC     6
.             RECODE          DMAX DMIN WMAX WMIN MMAX MMIN OMAX OMIN(BLANK
.             MOVE VARS       PLTNUM PARCOD TO COMM60
.             PERFORM PROCS
.        END PROCESS REC
.   AUTOSET
.   END PROCESS CASES


.   WRITE RECORDS        FILENAME = NPDES2/
                         VARIABLES = PLTNUM PARCOD TO COMM60/
                         FORMAT = (A3,A5,2A4,2A1,A5,A2,4(2A1,2F9.4),A20,A43
                         LRECL = 168
END RETRIEVAL

.DATA,DUMP7.
OLD FILE      CASPER

RETRIEVAL
.   PROCESS CASES
.        PROCESS REC     7
.             MOVE VARS       PLTNUM PCODE TO COMM70
.             PERFORM PROCS
.        END PROCESS REC
.   AUTOSET
.   END PROCESS CASES


.   WRITE RECORDS        FILENAME = PARAM/
                         VARIABLES = PLTNUM PCODE TO COMM70/
                         FORMAT = (A3,A5,3A10,A37)/
                         LRECL = 75
END RETRIEVAL

.DATA,DUMP8.
OLD FILE      CASPER

RETRIEVAL
```

```
.    PROCESS CASES
.         PROCESS REC     8
.              MOVE VARS       PLTNUM UNTYP TO COMM80
.              PERFORM PROCS
.         END PROCESS REC
.    AUTOSET
.    END PROCESS CASES


.    WRITE RECORDS        FILENAME = DESIGN/
                          VARIABLES = PLTNUM UNTYP TO COMM80/
                          FORMAT = (A3,A1,I2,A1,3F5.1,F4.1,F5.0,F4.1,F7.3,F4.
                             2F4.2,A21)/
                          LRECL = 126
END RETRIEVAL


.DATA,DUMP9.
OLD FILE       CASPER

RETRIEVAL UPDATE
.    PROCESS CASES
.         PROCESS REC     9
.              RECODE          INBOD TO INNBOD(BLANK = -1)
.              MOVE VARS       PLTNUM DAY TO INNBOD
.              PERFORM PROCS
.         END PROCESS REC
.    AUTOSET
.    END PROCESS CASES

.    WRITE RECORDS        FILENAME = INFLOW/
                          VARIABLES = PLTNUM DAY TO INNBOD/
                          FORMAT = (A3,I2,3F6.1,F5.1,2F4.1,F5.2,2F6.2,F5.2,F
                          LRECL = 64
END RETRIEVAL


.DATA,DUMP10.
OLD FILE       CASPER

RETRIEVAL UPDATE
.    PROCESS CASES
.         PROCESS REC     10
.              RECODE          PBOD TO PDOB(BLANK = -1)
.              MOVE VARS       PLTNUM DAY TO PDOB
.              PERFORM PROCS
.         END PROCESS REC
.    AUTOSET
.    END PROCESS CASES


.    WRITE RECORDS        FILENAME = PRIMARY/
                          VARIABLES = PLTNUM DAY TO PDOB/
                          FORMAT = (A3,2I2,2F6.1,F5.1,3F4.1)/
                          LRECL = 36
END RETRIEVAL


.DATA,DUMP11.
OLD FILE       CASPER
```

```
RETRIEVAL UPDATE
.    PROCESS CASES
.         PROCESS REC   11
.              RECODE          SBOD TO SNBOD(BLANK = -1)
.              MOVE VARS       PLTNUM DAY TO SNBOD
.              PERFORM PROCS
.         END PROCESS REC
.    AUTOSET
.    END PROCESS CASES


.    WRITE RECORDS        FILENAME = SECNDRY/
                          VARIABLES = PLTNUM DAY TO SNBOD/
                          FORMAT = (A3,2I2,2F6.1,F5.1,3F4.1,F5.2,2F6.2,F5.2,F
                          LRECL = 64
END RETRIEVAL


.DATA,DUMP12.
OLD FILE       CASPER

RETRIEVAL UPDATE
.    PROCESS CASES
.         PROCESS REC   12
.              RECODE          TBOD TO TNBOD(BLANK = -1)
.              MOVE VARS       PLTNUM DAY TO TNBOD
.              PERFORM PROCS
.         END PROCESS REC
.    AUTOSET
.    END PROCESS CASES


.    WRITE RECORDS        FILENAME = TRTIARY/
                          VARIABLES = PLTNUM DAY TO TNBOD/
                          FORMAT = (A3,2I2,2F6.1,F5.1,2F4.1,F5.2,2F6.2,F5.2,F
                          LRECL = 60
END RETRIEVAL


.DATA,DUMP13.
OLD FILE       CASPER

RETRIEVAL UPDATE
.    PROCESS CASES
.         PROCESS REC   13
.              RECODE          RETU TO AIR(BLANK = -1)
.              MOVE VARS       PLTNUM DAY TO AIR
.              PERFORM PROCS
.         END PROCESS REC
.    AUTOSET
.    END PROCESS CASES


.    WRITE RECORDS        FILENAME = BIOPRO/
                          VARIABLES = PLTNUM DAY TO AIR/
                          FORMAT = (A3,2I2,2(F7.3,F6.0),F6.0,2F4.1,F4.0,F6.0)
                          LRECL = 57
END RETRIEVAL
```

```
.DATA,DUMP14.
OLD FILE       CASPER

RETRIEVAL UPDATE
.    PROCESS CASES
.         PROCESS REC   14
.              RECODE          MAIN TO PECCOL(BLANK = -1)
.              MOVE VARS       PLTNUM DAY TO PECCOL
.              PERFORM PROCS
.         END PROCESS REC
.    AUTOSET
.    END PROCESS CASES


.    WRITE RECORDS        FILENAME = GENERAL/
                          VARIABLES = PLTNUM DAY TO PECCOL/
                          FORMAT = (A3,I2,F4.2,F4.0,F3.0,3F7.3,F5.0,2(F4.0,F
                             F6.0,F4.1,2F6.0)/
                          LRECL = 80
END RETRIEVAL


.DATA,DUMP15.
OLD FILE       CASPER

RETRIEVAL UPDATE
.    PROCESS CASES
.         PROCESS REC   15
.              RECODE          PWAST TO POLY(BLANK = -1)
.              MOVE VARS       PLTNUM DAY TO POLY
.              PERFORM PROCS
.         END PROCESS REC
.    AUTOSET
.    END PROCESS CASES


.    WRITE RECORDS        FILENAME = SLUDGE/
                          VARIABLES = PLTNUM DAY TO POLY/
                          FORMAT = (A3,I2,2(F7.3,2F4.1),F4.1,2F7.3,2F4.1,F7.
                             F4.1,F5.1,2F5.2,2F4.1,F7.3,2F4.1,F7.1,F4.1,2F7.
                             3F6.3)/
                          LRECL = 153
END RETRIEVAL


.DATA,DUMP16.
OLD FILE       CASPER

RETRIEVAL
.    PROCESS CASES
.         PROCESS REC   16
.              MOVE VARS       PLTNUM LINE COMMENT
.              PERFORM PROCS
.         END PROCESS REC
.    AUTOSET
.    END PROCESS CASES


.    WRITE RECORDS        FILENAME = COMMENT/
```

```
                        VARIABLES = PLTNUM LINE COMMENT/
                        FORMAT = (A3,I2,A70)/
                        LRECL = 75
END RETRIEVAL

.DATA,APPL.
.PROC,APPL.
GET,CASBIN.
GET,SETUP.
GET,INDEX,PLTDAT1,PLTDAT2,PLTDAT3,NPDES1,NPDES2,PARAM,DESIGN.
GET,INFLOW,PRIMARY,SECNDRY,TRTIARY,BIOPRD,GENERAL,SLUDGE.
CASBIN.
REPLACE,SETUP.
REVERT,NOLIST.
```

July 31, 1987

Mary Wheeler
Division of Water Pollution Control
DEQE
Westboro, Mass.

Dear Mary,

Enclosed is the "almost final" draft of the CASPER report. I would appreciate a timely review of the document to facilitate getting the completed version done by August 31, 1987.

I have attached my business card if you need to contact me directly. I also regularly check my Cyber mail (Mailer name = MDWPC-UMASS).

A working version of the CASPER system (as described in the report) will be available by Friday, August 7. I would encourage you to try it out, using the draft report as a guide. The necessary files will be available from my account (UN = 5103128).

Once again, thank you for your patience in this matter.

Sincerely,

Kevin T. Lautz