AD-787 295

ENVIRONMENTAL IMPACT COMPUTER SYSTEM

E. Y. S. Lee, et al

Army Construction Engineering Research Laboratory
Champaign, Illinois

September 1974

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER TECHNICAL REPORT E-37	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER AD 787295
4. TITLE (and Subtitle) ENVIRONMENTAL IMPACT COMPUTER SYSTEM		5. TYPE OF REPORT & PERIOD COVERED FINAL
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) E.Y.S. Lee B. Goettel R. K. Jain E.K.C. Lee		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Construction Engineering Research Laboratory P.O. Box 4005 Champaign, Illinois 61820		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 4A162121A896
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE September 1974
		13. NUMBER OF PAGES 113
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

environmental impact
data management
Army military programs

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report describes a pilot program in the computer storage and retrieval of environmental impact information. The basic concepts related to implementation and the modes of access to the data are discussed. Also, an outline of the nature of the data and the requirements for its management are given, followed by an expression of the reasons for choosing System 2000, a generalized data-base management system developed by MRI Systems Corporation, as the framework for the software. Lastly, the capabilities of this application of System 2000 are discussed in general terms.

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Block 20 (cont'd)

accompanied by an extensive set of specific examples and representative commands from the DA study, *Procedures for Evaluating Environmental Impact of Army Military Programs*, for which this computer system was initially developed. Several appendices, expanding on subjects mentioned in the report and serving as reference material, are provided.

FOREWORD

The study of the development of the Environmental Impact Computer System (EICS) and the associated data bases, computer codes, and manuals was conducted for the Directorate of Military Construction, Office of the Chief of Engineers, under Project 4A162121A896 "Environmental Quality for Construction and Operation of Military Facilities," Task 01, "Environmental Quality Management," Work Unit 001, "Procedures for Evaluating Environmental Impacts of All Military Programs," and Work Unit 002, "Development of Environmental Technical Information Systems." V. Gottschalk and D. Baldwin were the OCE Technical Monitors.

The environmental impact information was developed under Work Unit 001 with Dr. R. K. Jain as the Principal Investigator. The EICS and its associated data bases, computer codes, and manuals were developed partially under Work Unit 002, with Dr. E. Y. S. Lee serving as the Principal Investigator and Mr. B. Goettel serving as Associate Investigator. Valuable contributions and assistance were provided by E. K. C. Lee, S. Page, and J. Langford at the Construction Engineering Research Laboratory (CERL).

Administrative support and counsel provided by Mr. R. G. Donaghy, Chief, Environment and Energy Systems Division, is gratefully acknowledged. COL M.D. Remus is Director of CERL and Dr. L. R. Shaffer is Deputy Director.

CONTENTS

DD FORM 1473 1
FOREWORD 3

1 INTRODUCTION 5

2 DATA-BASE MANAGEMENT SYSTEMS 6
Alternative Approaches to Data and Information Storage and Retrieval
Generalized Data-Base Management Systems
Selection of System 2000

3 SYSTEM 2000 7
System Overview
System-Wide Operations
Control Module
Define Module
Access Module
Procedural Language Interface (PLI) Feature

4 APPLICATION OF SYSTEM 2000 TO THE DA STUDY 12
Introduction
Definition of the Data Structure
Extracting, Encoding, and Loading of Data
Retrieval
Updating the Data Base
Modification and Error Recovery
Input Format
Typical Input and Output

5 CONCLUSIONS AND RECOMMENDATIONS 26

APPENDIX A: EICS Data Base 29
APPENDIX B: Listing of PLI FORTRAN Program and Output for Batch Retrieval 39
APPENDIX C: Data Element Definitions 77
APPENDIX D: Sample Output From Interactive Retrieval 91
APPENDIX E: List of Strings by Numbers and Functions 101

GLOSSARY 105
REFERENCES 107
DISTRIBUTION

ENVIRONMENTAL IMPACT COMPUTER SYSTEM

1 INTRODUCTION

Much comprehensive research has been performed toward the development of a systematic method for environmental impact assessment. Most of these efforts have resulted in complex algorithms, compound-matrix approaches, or checklists of potential impacts, which should simplify the multitude of actions encountered in environmental research. The quantity and complexity of environmental information has prompted development of an Environment Impact Computer System (EICS) to process the information and to provide only relevant information in a timely and cost-effective manner. Flexibility and the ease of updating such a system are other reasons for its development.

The matrix approach can be efficiently employed to describe complex relationships between environmental attributes and the human activities which impact on those attributes. This study employs a matrix format much larger than any reported in previous studies. The CERL matrix allows the prediction of nearly 2 million potential impacts between combinations of basic activities associated with the accomplishment of Army programs (*BAAP's*) and environmental attributes. In addition, a descriptor package provides scientific information regarding environmental attributes. To describe the interaction of these activities and attributes, a relative, "need-to-consider" scale-of-impact is provided with associated remarks regarding ramifications of impacts and mitigation procedures for adverse impacts. Finally, relevant Federal environmental laws and regulations are referenced in an appendix to this report.

For the preliminary phase of this work unit, construction was chosen as the one Army functional area to be implemented. Although this pilot project represents only 10 to 15 percent of the final scope of the system, the procedures developed for this functional area can be applied to other areas. It is even possible to have separate data bases for functional areas with vastly different characteristics.

Data are stored, retrieved, and updated by the commercially available data-base management system (System 2000), a proprietary software package developed by MRI Systems Corporation of Austin, TX. More detailed discussions of data-base management systems and of System 2000 are presented in this report. The pilot system is currently capable of operating either in a remote, batch-processing mode or in an interactive mode. At present, only impact matrices with the lists of activities and environmental attributes are being stored in the data base. The various descriptive texts are referenced by code numbers and can be retrieved manually. In future versions of the system, some of the text materials will be incorporated directly into the data base.

To have environmental impact assessment guidelines processed under the batch mode, a user sends his request to CERL on a preprinted input form stating the title of the program, nature of the construction, Facility Classes and Construction Category (F4C) code, estimated amount of money, timeframe involved, and some descriptions of the local-site elements. Guided by this input information, the retrieval program screens the information in the data base and provides the user with a series of impact matrices relevant to his program. A list of the basic activities which have an impact on the environment and the list of impacted environmental attributes also are provided. A separate computer retrieval system obtains the descriptive text for information on ramifications of impacts, mitigation techniques, and relevant environmental standards and regulations. These ancillary outputs are reviewed by an interdisciplinary team of scientists before being mailed to a user.

In the interactive mode, a user can access the data base through an interactive terminal and software package developed by CERL. By answering a series of questions asked at the terminal, a user is guided through the simple procedure for requesting desired impact matrices, one at a time. The user also can request information on the descriptive packages and the ramifications and mitigation remarks, as well as on the laws and regulations pertaining to a specific area of interest. The Computerized Environmental Legislation Data System (CELDS) is available via Battelle's BASIS 70 computer system at Columbus, OH.

The output from the computer is not the environmental impact statement, nor is it the impact assessment itself, rather it provides guidelines for prepara-

tion of the environmental impact assessment and, perhaps, the impact statement. These guidelines, in the form of impact matrices and descriptive texts, are necessarily general, since complete information on a location where an Army military program is being conducted is usually not available. However, features are being incorporated into the system so that more specific guidelines can be provided by making more selective retrievals from the available data, if a more detailed description of the site base line is given.

The CERL reports footnoted below will provide more information on the DA Environmental Impact Study.[1]

2 DATA-BASE MANAGEMENT SYSTEMS

Alternative Approaches to Data and Information Storage and Retrieval. Although the decision to use computer storage and retrieval in the handling of large volumes of information is easy, the selection of the appropriate approach is more difficult. Two approaches are possible: specialized software packages may be developed to fit the problem at hand or existing software packages may be adapted or modified.

The first alternative may be realized through the use of such high-level languages as FORTRAN or COBOL, or through the direct use of assembly language. Among the advantages to this approach are complete flexibility in the design of the system and the capability of tailoring the system to the computer and to the needs of users, thereby optimizing its development and production costs. Once designed, however, the system has the important disadvantage that its file organization is fixed unless extensive design considerations have been incorporated to make it flexible. The modification of such a system would require a long lead time and the special talents of systems analysts, software development programmers, and others, and would be very expensive. The constraints of manpower, time, and other resources at CERL prohibit the use of this first approach.

To simplify the second alternative, many relevant software packages already exist, but the problem remains to select the one most suitable to the application envisioned. The available software packages can be divided into four categories:

a. File-management software packages are used for creating, maintaining, and manipulating data files on magnetic tapes or other mass-storage devices (e.g., disk, drum, etc.). Most manufacturers of mainframes for large computers provide such packages.

b. Retrieval software packages are used on files that are created or maintained by other systems; their sole purpose is to retrieve needed information and to output it in the correct format. The Qwick Qwery System is an example of a system in this category.

c. Specialized data-base management systems are available that will organize the data files automatically so that the loading, updating, or retrieval of information can be accomplished through simple system commands. Although these systems can be tailored, to a certain extent, to special requirements, usually their applications are strictly limited. Such systems are common for payroll processing, inventory control, ticket reservations, and similarly specialized applications. For example, the IBM Bill of Materials Processor belongs to this category.

d. Generalized data-base management systems are very similar to those in the previous category, but they are far more independent of any specific application. Without modifications, one system can process personnel records, manufacturing data, or financial data. The System 2000, developed by MRI, falls into this category.

For the present application, and given the existing constraints and requirements, a generalized data-base management system appeared most suitable for the storage, retrieval, and updating of environmental impact information.

Generalized Data-Base Management Systems.

Two types of generalized data-base management systems exist:

[1] R. K. Jain, L. A. Lewis, L. V. Urban, and H. E. Balbach, *Environmental Impact Assessment Study for Army Military Programs*, Interim Report D-13, AD771062 (Construction Engineering Research Laboratory (CERL), 1973); E. Lee, R. K. Jain, and B. Goettel, *Environmental Impact Computer System (EICS) Batch Retrieval*, Letter Report D-15 (CERL, 1973); E. Lee, R. K. Jain, and B. Goettel, *Environmental Impact Computer System (EICS) Interactive Retrieval*, Letter Report D-16 (CERL, 1973).

a. Procedural or host-language systems for which the special verbs used by the generalized data-base management system are embedded in a high-level language, such as COBOL. The IBM Information Management System is representative of this type.

b. Nonprocedural or self-contained systems for which the system's commands are not embedded in any high-level language. However, the system itself may be written in FORTRAN, COBOL, or assembly language, for example, Infodata Systems' Inquire.

There is a class of generalized data-base management systems which combines aspects of both types, for example, MRI's System 2000. While there is a special language for data definition, access, and update, commands also can be embedded in procedural languages, such as FORTRAN or COBOL, through the Procedural Language Interface (PLI) modules.

The evaluation and selection of the most appropriate generalized data-base management system is not a simple task. Merits of the two types of systems have been debated since the early 1960's. The issues are complex, ranging from the definition and specification of a data-base management system to the implementation of special verbs in a procedural language. A review of these issues is contained in the March 1972 issue of *EDP Analyzer*. From the user's viewpoint, some of these issues are irrelevant. The central concern is to evaluate and select a system for the current task from among the 12 or more generalized data-base management systems currently available on the market.

The five criteria applicable to this project which evaluate the available generalized data-base management systems are that the system should be readily usable on the CERL's present computer facility, which is a Control Data Corporation (CDC) Cybernet 200 User Terminal for either the CDC 6600 (SCOPE System) or the CDC 6400 (Kronos System); readily accessible to district and facility personnel; simple to use—without requiring extensive operator training; easy to handle without extensive data preparation or programming when structuring, loading, or updating the data base; and able to produce reports in matrix form without extensive programming.

Based on the management aspects of systems, many other evaluation criteria exist that were not considered because of the preliminary nature of the work. When the feasibility of the procedures have been demonstrated, and the final implementation is to be considered, more detailed criteria should be developed. A new evaluation should be made before the final selection of a generalized data-base management system or some other type of system. The time and manpower available for this study have not allowed a detailed investigation of the systems considered.

Selection of System 2000. Based on the above criteria, the generalized data-base management systems examined include: System 2000, developed by MRI Systems Corporation; Re-Act, created by Cybertech Data Systems and marketed by Boeing Computer Services, Inc.; INQUIRE, created by Infodata Systems, Inc., and available to government users through GSA Contract Number GS-005-11275; RAMIS, developed by Mathematica, Inc.; and UAIMS, developed by United Aircraft Research Laboratories. Of these, only System 2000 is currently available on the CDC data-center networks. The batch-processing mode is available on the CDC 6600 computer through the Cybernet network under the Scope Operating System (from Minneapolis, MN, and Montrose, MD). The interactive mode is available from Montrose, MD, under the Kronos system on the CDC 6400 computer. The other generalized data-base management systems either require a separate computer system or are implemented in a data center whose terminals are not compatible with the Control Data Corporation UT-200 terminal.

Aside from the criteria of availability and compatibility, the above systems also were evaluated on the basis of the last three criteria. Although some systems were found to have certain superior features, System 2000 was found, overall, to be much better than the others and was judged to be adequate for the current pilot program. In the future when a full-scale implementation is planned, more detailed evaluations will definitely be required.

3 SYSTEM 2000

System Overview. System 2000 is a generalized data-base management system which can be implemented on CDC 6000 and CYBER 70 series, UNIVAC 1100 series, and IBM 360 and 370 series

computers. It is available as the basic System 2000 with optional features including a user-oriented language with immediate access and a PLI. These two options are currently available on the CDC computers. Others, such as the report writer which is being implemented, extended optimization, the teleprocessing monitor, the multi-user capacity, and the multiple-thread features, are presently available only on IBM computers.

The basic System 2000 provides the user with the ability to define new data bases; to modify, to a certain extent, the definition of existing data bases; and to retrieve and update items which have been called values in these data bases. The basic components of the data-base definitions are data elements and repeating groups. The elements within a repeating group constitute a data set. Data values are stored in the elements while repeating groups describe a structure for storing multiple sets of data values. Repeating groups also link hierarchical levels of the data-base definition and represent the tree structure of the data.

The data values for each element and data set can vary in length. The user can specify, without restriction, which elements on the data base are to be keyed fields and to be inverted in the tree structure, and what hierarchical relationship an element will have with other elements in the data base. Data security is provided by password control to the data base and by additional password control to each component. The basic System 2000 provides archival copies of the data bases on magnetic tape and records an audit trail of the changes made to the updated data-base tape. From these tapes, it is then possible to reconstruct any data base by applying part or all of the audit trail to an archival copy of that data base. Ordinarily, a copy of the data base is held on a mass-storage device (e.g., disk, drum, etc.); however, if the data base is not in use for a while, it can be saved on magnetic tapes and reloaded onto the mass-storage device whenever it is needed.

The immediate-access feature provides a user-oriented language through which a nonprogrammer can request the retrieval or updating of a data base. The syntax of the language is English-like and is fairly easy to learn. A set of diagnostic messages is also included so that interactive use from remote keyboard terminals is possible. The PLI allows users to manipulate the data in a System 2000 data base with a procedural programming language, such as COBOL or FORTRAN. This feature provides the mechanism for addressing any part of the data base to the procedural program via the definition of schemas. Data of interest can be retrieved in a given sequence and formatted for procedural processing, while updating of the data base can be processed by the program.

The system is divided functionally into several operational modules, each of which has its own commands. These modules are: control, define, and access. To minimize the core residence requirement, only one module is in the core memory at any time; therefore, before any command is given, a user must be sure that the module to which the command belongs is in core or will be called into core first, otherwise errors in command processing will occur. In addition, one set of commands is system-wide and useable with any of the modules. The functions of the various modules, of the PLI feature, and of the system-wide commands are briefly explained in the remainder of this report.

System-Wide Operations. The system-wide commands can be placed in three basic categories:

a. Requests for entry into and exit from specific operating modules and from the system itself, for example:

CONTROL:
DEFINE:
ACCESS:

The colon is mandatory after each command. (In all of the examples, the portion of the command that would be specific to a user's application is *underlined*.)

b. Requests for the attachment of specific input/output devices to the input/output files, for example:

COMMAND FILE IS *MAC*:
DATA FILE IS *LDFILE*:
MESSAGE FILE IS *MSG:*

c. Specialized requests for changes in the input/output format and symbols, for example:

ENTRY TERMINATOR IS *FINI*:
SEPARATOR IS *?*:

The first command changes the entry terminator from the normal END to FINI, and the second command changes the system separator from the normal * to ?.

Control Module. The user is automatically assigned to the Control Module after acquiring access to the system. The commands for the control module can be divided into two classes:

1. For control purposes, there are functions for accessing data bases, for performing security checks, and for maintaining password control, for example:

USER, *CERL*:

where CERL is the password;

NEW DATA BASE IS *DASTUDY*,

DATA BASE NAME IS *DASTUDY*:

where DASTUDY is the data-base name; and

VALID PASSWORD IS *CERL1*:

where CERL1 is a new valid password assigned by the master password holder.

Many more commands belong to this class and relate to the control of passwords; detailed information about these commands is contained in the System 2000 Reference Manual. All commands in this class, except for the second and third examples given above, allow the user to remain assigned to the Control Module. NEW DATA BASE IS _____: causes control to be passed automatically to the Define Module: DATA BASE NAME IS _____: causes control to be passed automatically to the Access Module.

2. For updating files, some commands release data bases from the random-access storage devices, for example:

RELEASE:

Given DASTUDY is a valid data-base name. Also, some commands save and load archival data bases which are kept on external storage media such as magnetic tape, for example:

SAVE DASTUDY ON *T1234*:

LOAD DASTUDY FROM *T1234*:

LOAD DASTUDY FROM *T1234/T4567*:

where T1234 is the data-base tape Visual Serial Number (VSN) and the tape has been previously reserved, and T4567 is the VSN of the update tape on which the update is to be written. After the LOAD command has been issued and loading has been successful, control is passed automatically to the Access Module The System 2000 Reference Manual contains further explanation and examples of these commands.

Define Module. Since a data base is an organized collection of data about a certain subject, a user must define the nature and boundary of this subject. Although the Define Module allows the flexibility to organize data of different natures, the boundary and the nature or characteristic of the data must be known. However, in this application of System 2000, the boundary and the nature of the data are not clearly defined at the beginning of the implementation. Thus, the process of developing a data base is necessarily evolutional. As more information about the data develops, the data-base definition can be changed. More discussion of this topic is presented later.

The commands of the Define Module are few and simple. Two types of commands are available.

a. For component definition, examples of two similar commands are:

1* FUNCTION NAME (NON-KEY NAME X(20)):

10* PROGRAM CODE (KEY INTEGER NUMBER 9(5) IN 8):

The first command defines a component numbered "1" with no reference to any repeating group. The second command defines a component numbered "10" with reference to a repeating group, the component number of which is "8." The X(20) means that a picture size of 20 characters has been reserved for the name, while 9(5) means that a picture size of 5 digits has been reserved for the integer. The System 2000 Reference Manual contains additional information on component types, such as names, integers, and decimals, and on the picture-size designation.

b. For definition and deletion of user-defined functions and strings, examples of two commands are:

999* RATIO(DECIMAL FUNCTION? (C14/C15)?):

998* EXP1 (STRING? PRINT C16 WHERE C14 EXIST AND C15 NE O:?):

The first example allows a ratio to be calculated by the user-defined function, RATIO, and the second example conveniently abbreviates the command:

PRINT C16 WHERE C14 EXIST AND C15 NE O:

to just C998 or EXP1.

Access Module. The Access Module is the most complicated module with many commands and almost unlimited combinations. The five types of

commands including those associated with the immediate access feature are: retrieval (queue process and immediate access), update (queue process and immediate access), loading (queue process), strings and functions (queue process and immediate access), and system functions (immediate access).

The first type allows the retrieval of any elements, for example:

```
PRINT C1, C2:
LIST C3, C4, C4:
```

The second type allows update operations both for individual elements and for trees, for example:

```
CHANGE C1 EQ ABC WHERE C2 EQ 4:
```

The third type allows the loading of data in a loader-string format when the data base is first defined and data are being loaded onto the data base. The command LOAD: is equivalent to

```
QUEUE:
REPEAT/APPEND TREE ENTRY
  EQ*DATA*:/:
TERMINATE:
```

where QUEUE: evokes the queue process on the access module and TERMINATE: terminates it. The fourth type of command evokes user-defined functions or strings, for example:

```
PRINT *RATIO* WHERE C14 EXIST AND
  C15 NE O:
```

This command evokes the user-defined function, RATIO. Equivalently, *C999* will call for the string defined in C999. (There is no colon after *C999*.) The last type of command involves the use of system functions and is available only through the immediate access feature, for example:

```
PRINT MAX C1, MIN C1, COUNT C1,
  SUM C1, SIGMA C1, AVG C1:
```

where MAX, MIN, COUNT, SUM, SIGMA and AVG are the six system functions available.

Procedural Language Interface (PLI) Feature. A PLI is currently available for either of two procedural languages—COBOL or FORTRAN. The PLI allows an application programmer to use special statements to interface with data bases in System 2000. A flow chart of the FORTRAN PLI is shown in Figure 1. The FORTRAN PLI is primarily used to access the data base and to produce the final reports. The following explanation applies only to the FORTRAN PLI; however, the COBOL PLI, based on the syntax and logic of the COBOL language, is very similar in principle.

Four types of FORTRAN PLI statements can be used by the programmer to communicate with System 2000 data bases. These statements start in the standard format column 7, with the required prefix *PL starting in column 1. These statements must end with a period. For statements that are longer than 72 columns, a comma must be the last character on the first card. These statements are translated first into valid FORTRAN statements during the precompiling. Then, the expanded FORTRAN program is compiled by the FORTRAN compiler.

The four types of FORTRAN PLI statements are:

a. Data definition statements define the common data between the PLI FORTRAN program and the data base, for example:

```
*PL  COMMBLOCK/DASTUDY COM1,
     COM2, COM3, COM4,
*PL  COM5, COM6, COM7, COM8,
     COM9, COM10, COM11, COM12,
     COM13,
*PL  COM14.
```

This single statement, extending over three cards, might be used to communicate details about the status of the data base. Only one such statement is allowed per data base.

```
*PL  SCHEMA/L1FUNC of
     DASTUDY/C1, C2(2).
```

The above statement defines a schema named L1FUNC for the data base named DASTUDY such that the components C1 and C2 are included in the schema. (A schema must be defined for each type of repeating group to be accessed by the PLI program.) Component C2 is further defined by (2) to be an array, since the maximum length of the values stored in the component C2 is two words.

b. Control statements have functions very similar to the commands available through the control module, for example:

```
*PL  OPEN DASTUDY.
```

allows access to the data base named DASTUDY: and

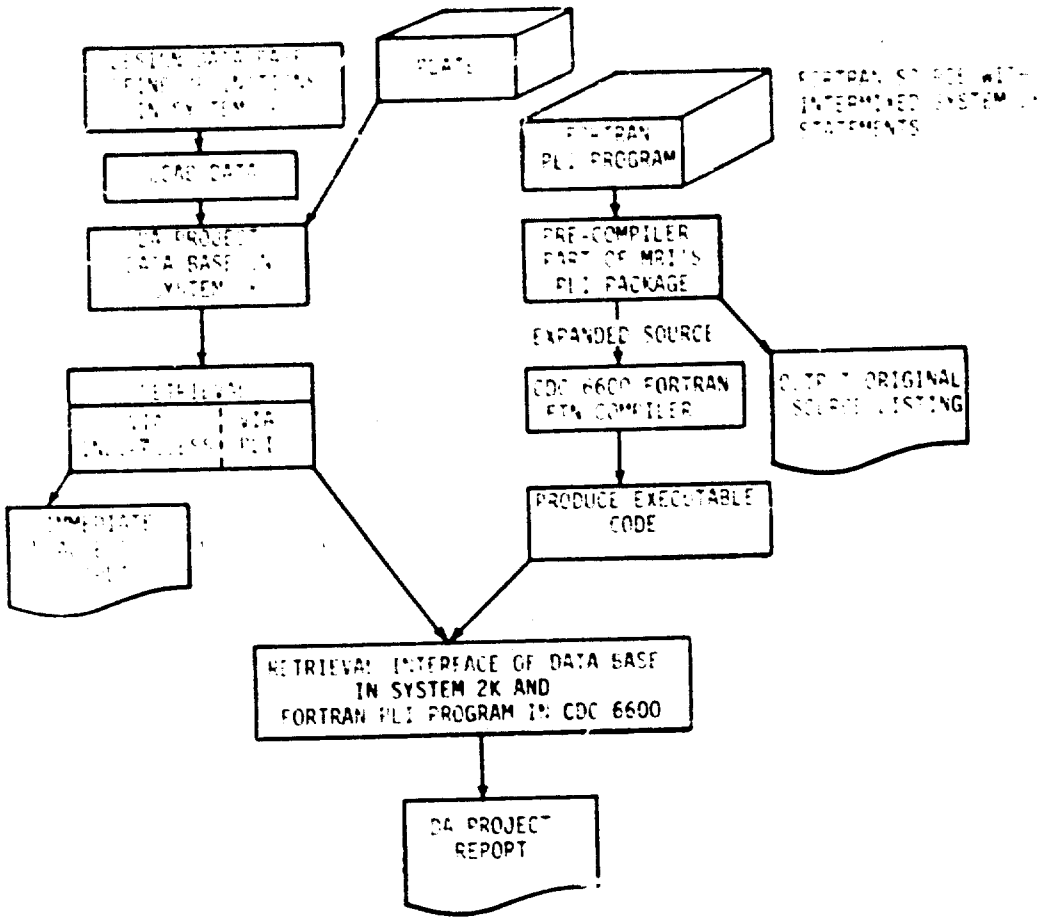


Figure 1. System logic flow chart.

*PL QUEUE.

allows access to the queue process in the access module.

c. Retrieval statements have functions very similar to the commands in the access module, for example:

*PL GET LIFUNC WHERE C1 EQ IFUNC.

allows the retrieval of the schema LIFUNC (defined above by the SCHEMA LIFUNC statement); the WHERE clause narrows down the desired data set.

d. Update statements have functions very similar to the update commands in the access module, for example:

*PL MODIFY LIFUNC C1, C2(1), C2(2).

allows the values of C1 and C2 to be modified to those currently stored in the FORTRAN program. In this statement, the parenthesized numbers indicate the specific, subscripted elements of the C2 array.

4 APPLICATION OF SYSTEM 2000 TO THE DA STUDY

Introduction. The overview of the system is represented in Figure 1. The blocks on the left represent the flow processes involved in the creation of the data base through System 2000 (System 2K). After the initial loading of data into the data base, additional data can be stored through the update commands of the access module; however, very few changes in the data definition can be made. Only the addition and deletion of strings and user-defined functions and the addition of components to the last repeating group along the tree are permitted. Therefore, if changes other than those described above have to be performed, a new data definition must be created, and the data must be reloaded. In most cases, the original loader strings for the old data base can be used, perhaps with only minor changes. If the loader strings are not available, then an unload command can transfer the data from the old data base onto an output file before the old data-base structure is released.

The FORTRAN PLI program can be developed as soon as the data definition is fixed and the required retrieval and report formats are known; however, in most cases, the data definition evolves with the development of new requirements and the PLI program must be changed to match the current data definition. In this pilot application, there have been four versions of the definition and at least that many versions of the FORTRAN PLI program.

From the standpoint of operation, the data base should be on a random-access device (disk, drum, etc.) while access is to be made. At any other time, it should be stored on magnetic tape from which it can be loaded onto a disk, for example, via the command, LOAD *DATA-BASE NAME* FROM *TAPE1*:. The same command can be used to reload the data base if it should become damaged for any reason. Whenever an update is performed, the update plus audit trails should be stored on the update tape via the KEEP: command.

The major retrieval format is the report, with the impact matrices and the listing of the basic activities (BAAP's), created via the PLI FORTRAN program; however, many different retrievals also can be performed using the immediate-access features. Some of these will be discussed later, in the section dealing with retrieval.

Definition of the Data Structure. The data collected for the DA study of the environmental impact of Army activities are specially structured to facilitate comprehension of the data base and retrieval of the data via the PLI program. A graphic illustration of the data-base structure is shown in Figure 2.

The levels of information—the hierarchy of the source data—are shown in the illustration. Eight levels exist in the structure, though only six levels are currently referenced in the PLI program. Each box in the illustration represents a data set. A data tree is defined as any data set at a given level plus all its directly descendant data sets. Each box also represents a repeating group containing a varying number of data elements. Data elements are used for storing data values, whereas repeating groups describe a structure for storing multiple sets of data values and also serve to link hierarchical levels of the definition. For example, data for a repeating group, its functional areas, and all its descendant data sets will occur in the data base for each of the nine functional areas.

The data base for the DA study consists of two major logical branches at level one: functional areas

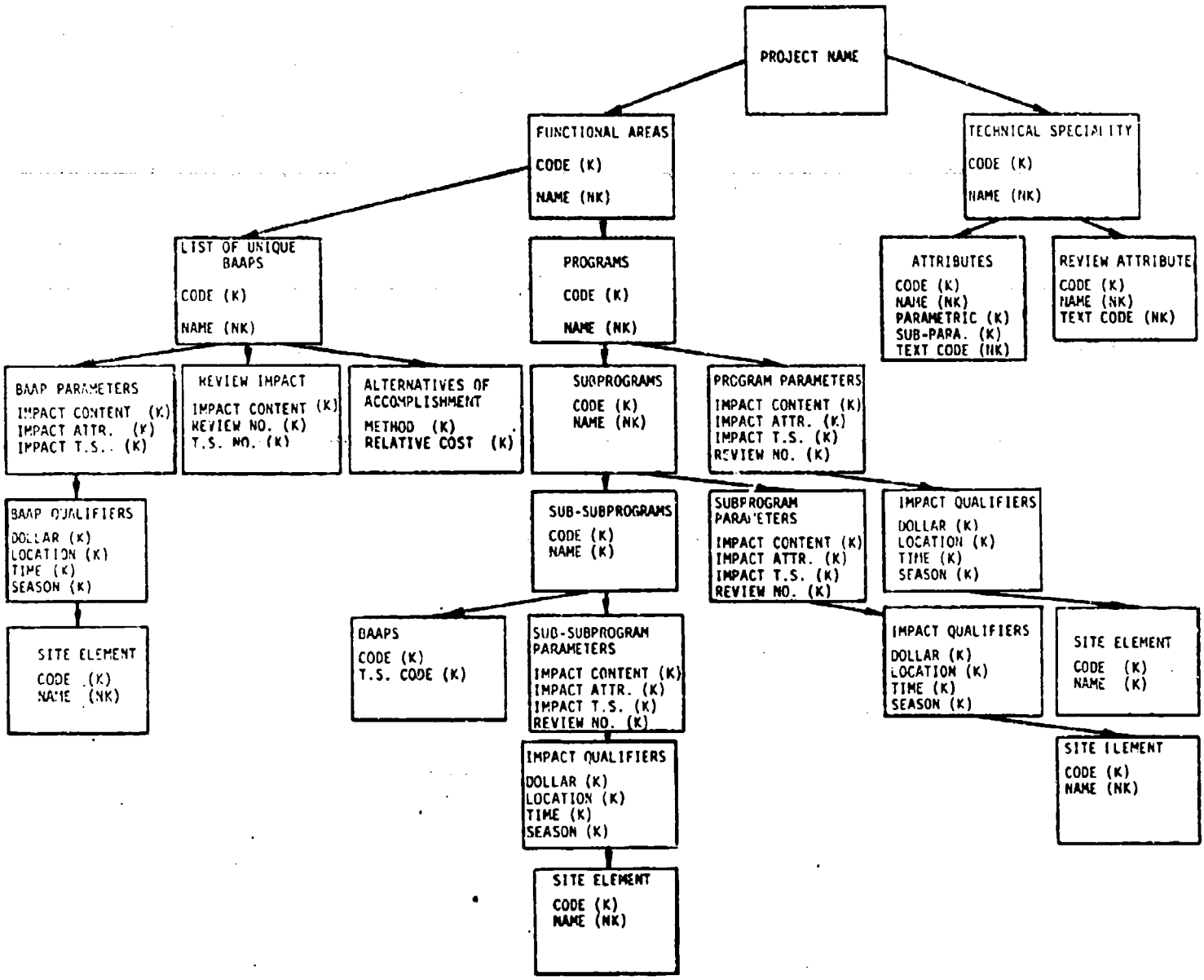


Figure 2. Data structure of EICS data base.

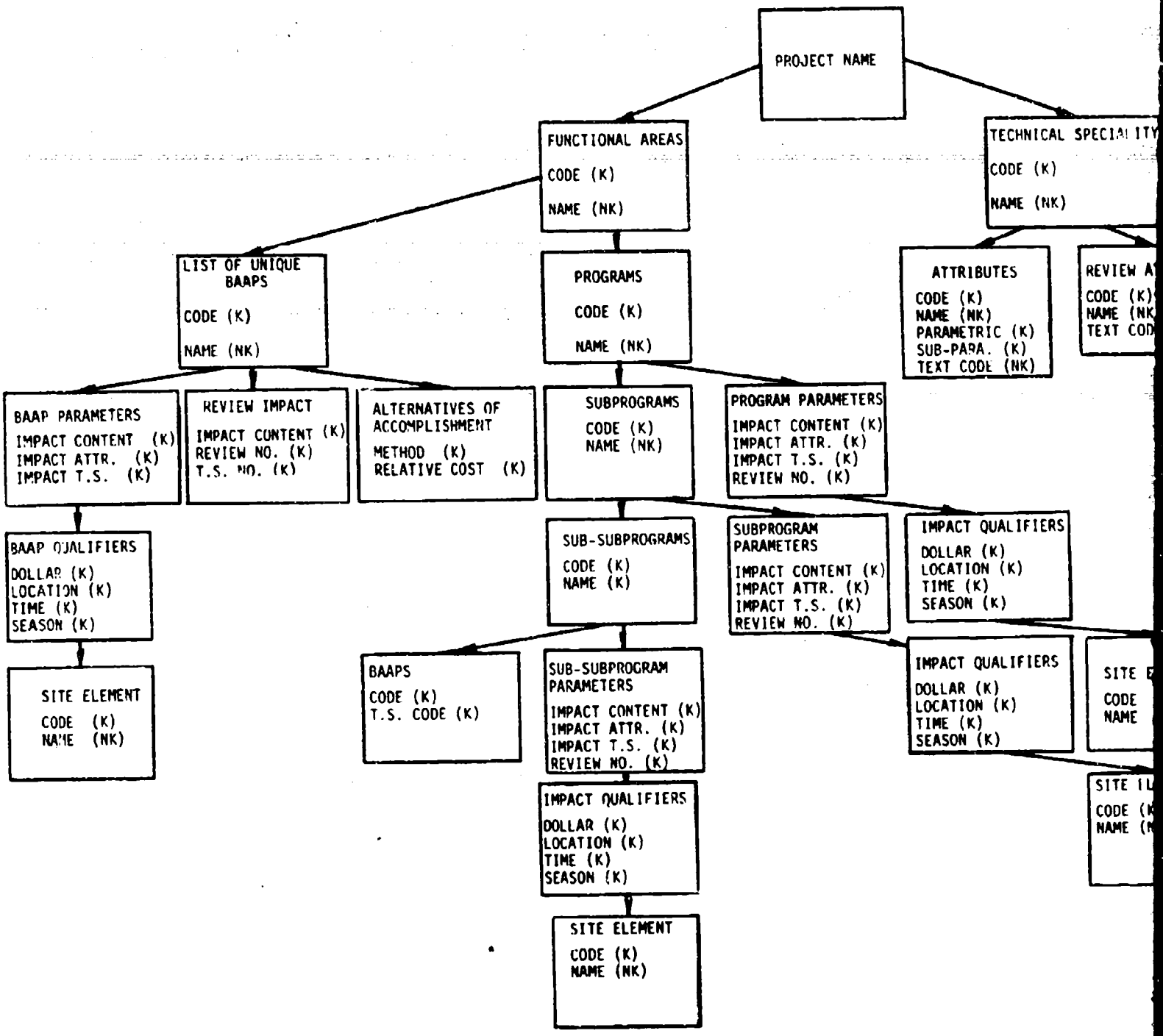
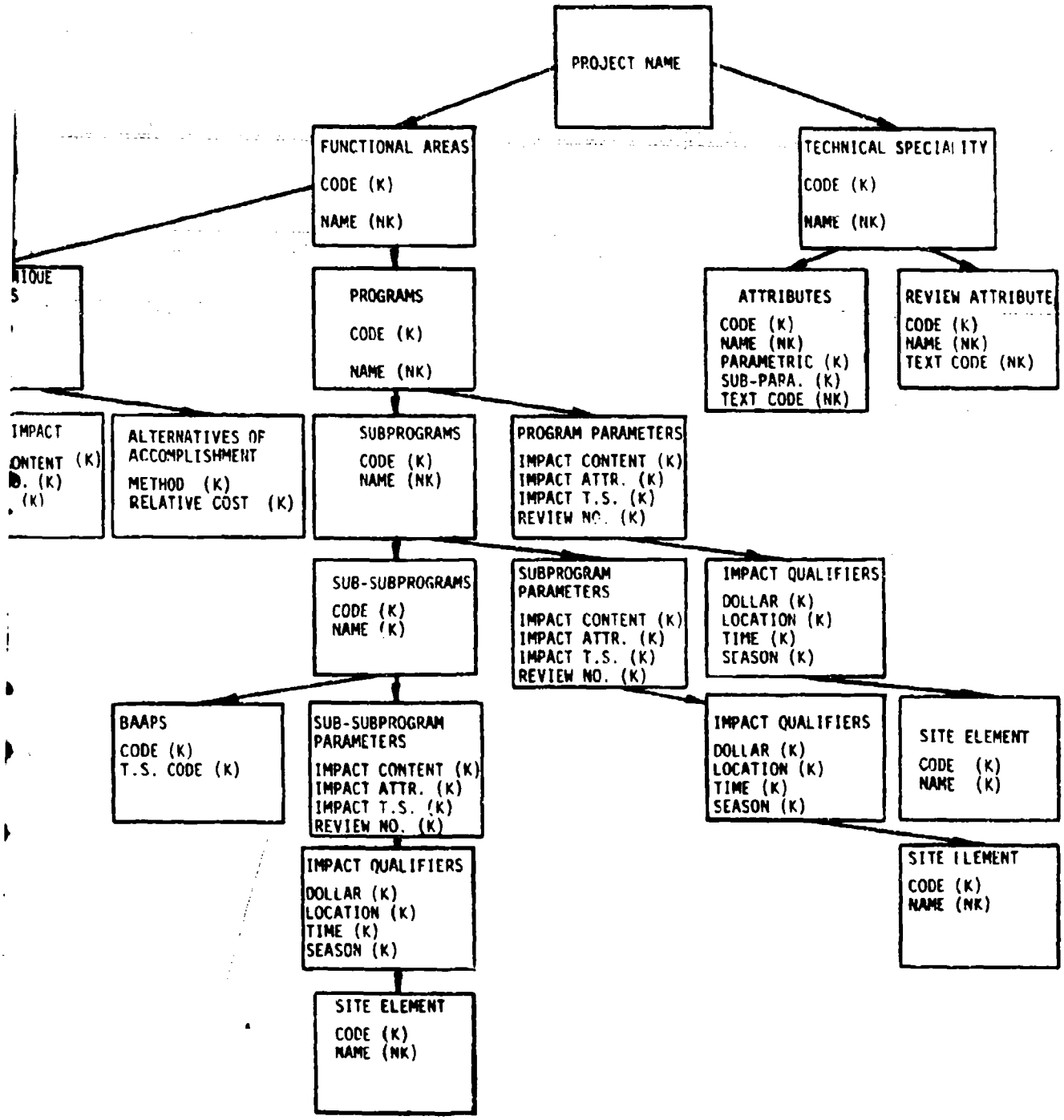


Figure 2. Data structure of EICS data base.



tructure of EICS data base.

and technical specialties occurring after the entry of the project name at level zero. The data within the functional areas are distributed into six levels. At the first of the levels within this branch, level two of the overall definition, are two data sets listing unique BAAP's and programs. Each of these also has descendant-data sets. Under the list of unique BAAP's, the three repeating groups are: BAAP parameters, reviews of impacts, and alternative methods of accomplishment. BAAP parameters contain the repeating groups of BAAP qualifiers and site elements.

Under the list of programs branching from functional areas is a hierarchy of programs, subprograms, and sub-subprograms, each having a data tree of parameters, impact qualifiers, and site elements. Additionally, sub-subprogram entries have the descendant-data-set BAAP's. The other logical branch, technical specialties, has only two descendant-data sets: attributes and review attributes.

The current data-base definition (Appendix A) consists of an orderly arrangement of component names or labels indicating the type of data loaded into the data base. These are not the data values, but identification tags used in accessing the data. The data base definition was created via System 2000's Define Module.

Each component declaration consists of a unique component number, an asterisk or system separator, an arbitrarily determined name, and a description enclosed in parentheses. Included within this description are the following terms: key or non-key, data type, picture designation, and repeating-group relationship.

By designating an element as a key element, an inverted index is established which allows the key element to be used without restriction in determining access criteria. If neither key nor non-key is specified, key is assumed.

The three types of data in the DA study data base are: name, integer, and decimal. Name data are any alphanumeric data; integer data are positive or negative strings of numerals; and decimal data are positive or negative strings of numerals, each string with a decimal point.

The field length of each data element is specified via the picture designation. For name data, the character "X" is used to represent an alphanumeric character. For example, either XXX or X(3) indicates that the item being defined will consist of three characters. The same approach is used with the integer and decimal data, except that the character "9" is used to represent a numeral. An example of the picture designation for a decimal number might be 9(3).9(2) or, equivalently, 999.99. For efficient utilization of computer storage, the sum of the field lengths of all the items within a repeating group is made to equal a multiple of ten characters, which is the number of characters in a CDC-6600/6400 word.

The repeating-group relationship shows to which repeating group a particular component belongs, and how each set of data is related to the others through the tree structure. In defining the data structure, one should be aware of the restrictions imposed on retrieval operations, especially those involving different trees. The data-base structure and definition are subject to frequent reevaluation to determine if there are changes that would result in a more efficient application, thereby reducing costs in the area of data storage, data loading, and processing via the PL1 program.

Extracting, Encoding and Loading of Data Retrieval.

Background. The primary sources of data for the DA study are impact matrices prepared by project scientists. The horizontal indices of the matrices are the technical specialties. The vertical indices are the possible impacts on the program level, subprogram level, sub-subprogram level, or BAAP level.

The format for setting up the data base was developed in the System 2000 language. Several basic points may be of help in understanding the System 2000 language and the formats for loading data.

a. An asterisk is used to separate the data from the component numbers of the system and is called the system separator. It must be used after each component number and also after any data values which are present.

b. Elements are names standing for data and are the only components which contain data.

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c. Repeating groups are components used to indicate the hierarchical relationships of repeatable groups within a logical entry, to relate elements, and to relate repeating groups.

The text below and the hierarchical structure of the data tree, shown in Figure 2, may be helpful in comprehending the order of data loading.

Procedure. Data are loaded onto the data base in alphanumeric data strings associated with the data elements. The general format is:

RG NO * COMPONENT NO (CN) * DATA VALUE *

where the asterisk (*) is the system separator used to separate each item in the string. Any other special character can be used as the system separator if so designated beforehand. The repeating-group component number "RG NO" must be mentioned if the data are associated with the given repeating group.

In the initial loading of the data base, the project name must be inserted before the data from the matrices can be inserted. This name is inserted only once in the data base. The format of its entry is as follows: 201* 1*01*2*CONSTRUCTION*

The BAAP's for each functional area are loaded next. Every technical specialty uses the same BAAP's for each functional area. The format for the BAAP's is as follows: with 66 arbitrarily chosen as the repeating group number, 67 as the component number for the BAAP code, and 68 as the number for the BAAP name:

66* 67*11*68RAILROAD*
66* 67*12*68*ROADS*

The matrices, prepared by the project scientists, are then searched to determine if any technical specialty is impacted by the given BAAP at the detailed level. If an impact exists, the review-level impacts also are checked against that BAAP, and the ramification and mitigation column for the BAAP is searched. If there is an "X" in the ramification column, an "X" is placed after component number 16 in the first entry of that technical specialty. If there is an "X" in the ramification column and in the mitigation column, a "Z" is entered after "16." In all three of these instances, after component number "17," the code for the ramification and mitigation text is entered. These codes are explained in Appendix C. The format is as follows, with "15" as the repeating group number, "16" as the component number for the impact, "17" as the component number for the ramification and mitigation text code, and "18" as the component number for the technical specialty code:

15* 16*X*17*1030111*18*03*

After establishing the ramification or mitigation format for the BAAP, the detailed-level impact values are entered. The format is shown with "15" as the repeating group number, "16" as the component number for the impact value (A,B,C, + or —), "17" as the component number for the attribute number or code for the given technical specialty, and "18" as the component number for the technical specialty code. The example below also includes the ramification and mitigation format as the first string:

15* 16*X*17*1030111*18*03*
15* 16*A*17*013*18*03*
15* 16*B*17*019*18*03*

The review-level data for the given BAAP are the next items entered. They are obtained from the same line of the matrix as the ramification and mitigation codes and as the impact at the detailed level. The format for the review level is as follows: with "20" as the repeating group number, "21" as the component number for the impact content, "22" as the component number for the review number, and "23" as the component number for the technical specialty code:

20* 21*B*22*01*23*03*

Next, the alternate methods of accomplishment for the given BAAP are encoded as follows, with "100" as the repeating group number, and "101" as the component number for the alternate method:

100* 101* BUILD TEMPORARY*

After all the alternate methods have been encoded, the next BAAP is searched for any impacts on the matrix for that BAAP. Searching is repeated until all the matrices are encoded in similar data strings.

The program is the next item entered. Programs will not be on the matrix unless there is an impact on the program level. The programs, subprograms, and sub-subprograms can be obtained from AR 415-28[2] for the construction field application (Appendix C). The format for a program entry is as follows with "4" as the repeating group number, "5" as the

[2] *Department of the Army Facility Classes and Construction Categories*, AR 415-28.

component number for program code, and "6" as the component number for the program name:

4* 5*01100*6*OPERATION AND TRAINING FACILITIES*

The program may have impacts on the matrix at the program level. If so, the format is as follows with "54" as the repeating group number, "55" as the component number for the impact content, "56" as the component number for the impacted attribute, "57" as the component number for the impacted technical specialty, and "58" as the component number for the review number, if any. If there is a value for component number "58," there will be no value for component number "56," for example:

54* 55*A*57*01*58*05*

The subprogram is the next entry. Subprograms for construction are obtained from AR 415-28 (Appendix C). The format for a subprogram entry is as follows with "7" as the repeating group number, "8" as the component number for the code number, and "9" as the component number for the name:

7* 8*01110*9*AIRFIELD PAVEMENTS*

The program can have impacts on the matrix at the subprogram level. If so, the format has "42" as the repeating group number, "43" as the component number for the impact content, "44" as the component number for the impacted attribute, "45" as the component number for the impacted technical specialty number, and "46" as the component number for the review number, if any. Again, if there is a value for component number "46," there will be no value for component number "44," for example:

42* 43*B*44*13*45*09*

or

42* 43*A*45*09*46*04*

The sub-subprogram level would be the next level of classification under the subprogram level. However, this level is not implemented at this time. The next repeating groups would contain the list of BAAP codes *not* applicable to the construction of the given subprograms and sub-subprograms. This list would be developed by engineers and scientists at CERL who are familiar with construction of the various facilities.

The format for this specification is as follows: with "10" as the sub-subprogram repeating group number, "13" as the excluded BAAP repeating group number, and "14" as the component number for the excluded BAAP code:

10* 13*14*105*

Eleven technical specialties are to be loaded into the system. The repeating groups for the attributes and for the review attributes follow immediately after a technical specialty. The format for the loading of the names and codes of the technical specialties is as follows: with "202" as the repeating group number, "301" as the component number for the technical specialty code, and "3" as the component number for the technical specialty name:

202* 301*01*3*ECOLOGY*

The technical specialties are divided and grouped by subparametric and parametric attributes. These are found numbered on the matrices, for example:

1	- Parametric
1.1	- Subparametric
1.1.1	- Attribute 1
1.1.2	- Attribute 2
2	- Parametric

The attributes are given a sequential code with occasional blank spaces so new attributes can be added later. The format for the attributes is as follows: "76" as the repeating group number, "77" as the component number for the attribute code number, "78" as the component number for the attribute name, "79" as the component number for the parametric name, and "80" as the component number for the subparametric name:

76* 77*85*78*CLIMATE*79*CNTRVSL*

The review attributes are also given sequential codes which are found on the horizontal lines of the matrices. The format for the review level is as follows with 88 as the repeating group name, "89" as the component number for the review code, and "90" as the component number for the review attribute name:

88* 89*01*90*RARE AND ENDANGERED SPECIES*

Similar to the attributes at the detailed level, there are also ten or fewer controversial attributes for the review level. These attributes are distinguished from the regular review-level attributes by their code numbers, which are greater than "9." Furthermore, in the PLI program, these attributes are marked

"controversial" after their code is checked. An example of such a loading string is as follows:

88* 89*21*90*SOIL S*

An example of the sequence of steps in the loading operation is shown in Appendix A to give the reader a clearer understanding of the process.

Estimating the Size of the Data Base. A size estimate may be of help in understanding the physical nature of the data base. The estimate given here is only for one functional area, construction, and is based on the assumption that the BAAP's will total 150. Each BAAP impacting approximately 150 attributes means an average of only 14 impacted attributes per technical specialty per BAAP. Each data set requires ten characters: one for the impact code, two for the technical specialty code, and seven for the attribute code. Also, there is an expansion factor of three to the data base from the input data. With this information the estimated size of the data base can be calculated as follows: 150 BAAP's, each impacting an average of 150 attributes, gives 22,500 impact data sets or 225,000 characters. Adding 100,000 characters for the rest of the input data and applying an expansion factor of three for the input data gives 3 x (225,000 + 100,000) = 975,000 characters for the estimated size of the data base. The actual size of the implemented data base for the functional area of construction is very close to the estimated size.

Retrieval. As mentioned in the introduction to this chapter, simple retrieval operations, in addition to the report retrieval via PL1 FORTRAN programs, can be performed on the data base via the queue process or through the immediate-access commands available in the access module. Retrievals of the statistics of the data base can be readily obtained, such as number of BAAP's, number of attributes per technical specialty, and number of BAAP's that have the "need-to-consider" scale of A, B, or C by technical specialty. These simple retrievals can be requested by nonprogrammers via the queue process or through immediate access; however, users still must understand the data base structure before they can construct these requests. Some of the anticipated, common requests will be defined as strings or as user-defined functions so that users can call for them with the required parameters by name or by component number.

Queue Process. The queue process is mainly for use in batch processing since all command interpretations are batched together, and since the data base is accessed only once within the QUEUE: and TERMINATE: commands. For example, the following commands will list all the unique BAAP codes and names with an A impact for the technical specialty, ecology (code 01), and list review-level attributes for the technical specialty, health science (code 02).

```
QUEUE:
PRINT C66 WHERE ALL OF (C16 EQ A*,
  C18 EQ 1*):
PRINT C88 WHERE C301 EQ 2*:
TERMINATE:
```

The output of the above retrieval is given in Appendix A. Since the queue process is used more often for updating, more examples have been given in the section dealing with updating.

Immediate Access. Many more commands are in the immediate access feature than in the queue process, and they are also more versatile. In addition, system functions have been defined to determine the maximum value, minimum value, count, sum, average, and standard deviation. Valuable tools are available for keeping accurate statistics and for validating data in the data base. For example, the following commands will illustrate some of the usefulness of these features:

```
a. ELEMENT-      B IMP CONT
   FREQUENCY VALUE
      2224        A
      1196        B
      1615        C
          3 UNIQUE VALUES
      5035 OCCURRENCES
```

The output gives the total number of impacted, detail-level attributes for the A, B, and C scales, and also the total number of impacted attributes (occurrences).

```
b. TALLY- EACH- B IMP TS:
   ELEMENT-      B IMP TS
   FREQUENCY     VALUE
      1222          1
      1114          2
        96          3
       184          4
       354          5
```

331	6
464	8
486	9
620	10
164	11

10 UNIQUE VALUES
5035 OCCURRENCES

The output gives the total number of impacted attributes or occurrences at the detailed level. The number should agree with that obtained via the queue process. In addition, for each of the technical specialties, the number of impacted attributes is listed under FREQUENCY. The numbers in the VALUE column are technical specialty codes. (Appendix C contains an explanation of codes.)

c. To determine how many detailed-level attributes are impacted by a given BAAP with a scale of A, for a given technical specialty, or for all technical specialties, the COUNT system function can be used as follows:

PRINT COUNT C16 WHERE C16 EQ A AND
C67 EQ 73:
CNT 16* 55

The above command causes a count of the number of A-scale impacts of BAAP 73, a clearing site, for all the technical specialties. The resulting count is 55, given in the format shown.

To narrow the count to a given technical specialty which in this case is ecology, with code (01), the following commands can be used:

PRINT COUNT C16 WHERE C16 EQ A AND
C18 EQ 1 AND C67 EQ 73:
CNT 16* 9

The resulting count shows that, of the 55 A-scale impacts for BAAP 73, nine are attributed to the technical specialty, ecology.

The PL1 FORTRAN Program. Most data retrieval is accomplished through the System 2000 PL1. The FORTRAN source code is written in the normal manner with System 2000 PL1 statements intermixed. All System 2000 statements begin in column seven of the FORTRAN field, with a required FORTRAN identifier of *PL prefixing each of the statements and starting in column one. The completed source code is screened by a precompiler for System 2000 statements that are expanded into an acceptable FORTRAN source code. The expanded source code is then processed by the normal FORTRAN compiler creating an executable code. This process is illustrated in Figure 1.

The PL1 program reads in the functional areas to be processed, the programs and subprograms to be processed, and the level (either review or detailed), at which the processing will take place. A list of all the BAAP's in the function being processed will be printed first, followed by a matrix of the impacted levels for each technical specialty impacted in a subprogram.

Two areas in the PL1 program are used for communication between System 2000 and the user program. These areas are COMMBLOCK and SCHEMA. COMMBLOCK is employed to advise the user program of the successful or unsuccessful completion of an interface statement and to give other pertinent information about the operation. SCHEMA acts as a repository for data elements retrieved by System 2000 from a data set or for user-supplied element values to modify data or to create a new data set. These two areas must be declared before the program logic begins. Figure 3 is an overview flow chart of these processes.

After the COMMBLOCK, SCHEMA, and other arrays have been dimensioned, the first data card is read and printed. This card contains a one-sentence heading that describes the job to be printed at the start of the output. Next, the number of functional areas to be processed will be read and printed. Finally, the data base is opened after the correct password has been given to the system to allow the user access to the data base.

A loop is started after access is obtained; the number of cycles in the loop depends on the number of functional areas to be processed. The next data card contains the function code, the number of programs to be processed, and the level at which the processing will take place. Regardless of the level, the BAAP codes and names for the requested function are retrieved next and are printed.

Another loop is now started; the number of cycles depends upon the number of programs to be processed. This loop is within the loop that depends on the number of functional areas. The next data card, containing the program code and the number of subprograms, is read and printed. For these programs, the data base is searched for impacts on the

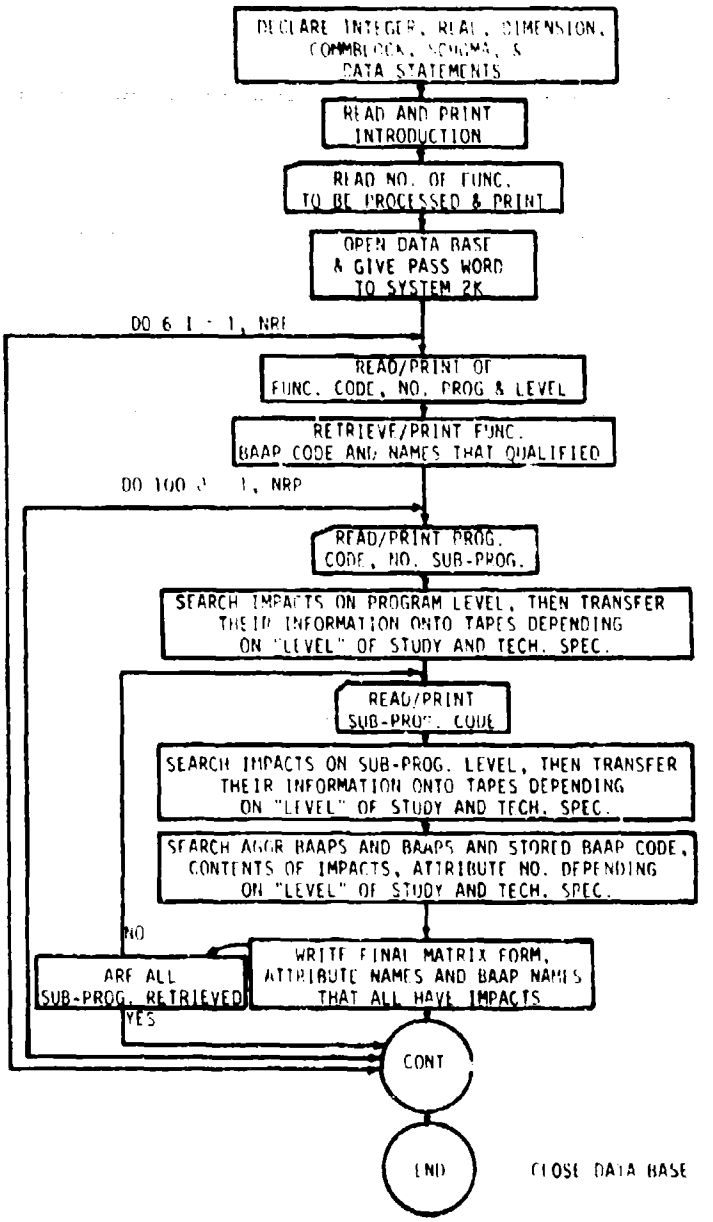

Figure 3. PLI FORTRAN program flow chart.

program level. These data are transferred onto tapes, depending on the level of the study and the technical specialties impacted.

The subprogram code card is read and printed next. A search is made for impacts on the subprogram level, and these data are transferred onto tapes, depending on the level of the study and the technical specialties impacted. The excluded BAAP's are searched and stored in a table for the next processing step.

The tabulated BAAP's are then retrieved and compared with the list of excluded BAAP's. The BAAP's that match are not searched for impacts. The level is checked for the BAAP's that have not been excluded and, depending on the level, either the detailed-level impacts or the review-level impacts are transferred onto tapes for their respective technical specialties.

At this point a matrix is written for each technical specialty under the subprogram, along with the attributes and BAAP names in separate lists, and the subprogram number is checked to see if all the subprograms have been printed. If they have not been printed, another card is read, and the search for the impacts begins again.

After all the subprograms have been completed, there is a check of the number of programs to be processed. If more programs need to be processed, the second loop is started again to read-in more programs. If all the programs have been processed, the number of functional areas to be processed is examined. If more functional areas need to be processed, the first loop is started again to read-in more codes for the functional areas. After all the functional areas have been completely processed, the data base is closed and the program ends. A listing of the PLI program is contained in Appendix B.

Updating the Data Base. The three methods for updating a data base in System 2000 are: basic access, immediate access, and PLI. All the updating that has been attempted so far has been done either through basic access or through immediate access. Because large or consistent changes of the data base are not required at present, no attempt has been made to write a program to update through the PLI. The System 2000 Reference Manual contains a discussion of the updating process in this language.

The Access Module of System 2000 provides updating operations in a queue or batch-processing environment. The Access Module is made available by the ACCESS: command. From this point, one of several general operations and commands can be issued, including LOAD: or DESCRIBE:, or the user may enter queue processing by issuing the QUEUE: command. Thereafter, update commands may be issued in a batch-processing mode. Batch processing is ended by the TERMINATE: command.

The loading of the initial set of data values and much of the data-base maintenance will be performed in the basic-access mode. Commands can be issued to enable users to LOAD, ADD, ASSIGN, APPEND, REMOVE, and CHANGE values in the data base.

The purpose of the LOAD command is to load into the data base large quantities of data in loader-string format for each logical entry. The format is:

ACCESS:
LOAD:

The data string follows immediately.

The ADD command adds data to existing data sets where no data currently exists. It only affects data sets at a single level.

ACCESS:
ADD C16 EQ A*, ADD C17 EQ 05*, ADD C18 EQ 03*
WHERE C67 EQ 11*:

This command places data under C67, which is the BAAP code.

The ASSIGN command assigns data within existing data sets, whether or not the data sets contain data. This command first *removes* all the contents of the selected data sets, and then adds only the data accompanying the command. The previous values are lost.

ACCESS:
ASSIGN C16 EQ B*, ASSIGN C17 EQ 05*,
ASSIGN C18 EQ 03*,
WHERE C67 EQ 11*:

In the above example, the information in repeating group C15, under BAAP 11, is removed and replaced with the information contained in the command.

The APPEND TREE command adds new trees

where data trees did not exist.

ACCESS:
APPEND TREE C88 EQ C89* 01* C90*
AQUATIC LIFE* END *
WHERE C301 EQ 03*:

This command adds a review attribute to the technical specialty, surface water.

The REMOVE command removes data from selected data sets. It also has another form, REMOVE TREE, which removes not only the data from the selected data set, but all the data sets lying below it. The following command removes the technical specialty, surface water, and the data sets lying under it.

ACCESS:
REMOVE TREE C202 WHERE C200 EQ D.A. PROJECT*:

The purpose of the CHANGE command is to change data within existing data sets, where data exists. It changes data at a single level only. The following command changes the name of the technical specialty, indicated by the C3 code, to earth science:

ACCESS:
CHANGE C3 EQ EARTH SCIENCE* WHERE C301 EQ 01*:

The immediate access feature also can be used to update the data base. This feature includes a user-oriented language with which a nonprogrammer can request the updating of a data base. It can be used for single- and multiple-element updates, *ad hoc* updating, small-batch updates, and positioning updating. The user gains direct access to its capabilities and commands by issuing the ACCESS: command or, indirectly, by issuing a DATA BASE NAME IS _____ _____: command.

The available commands allow users to ADD, ASSIGN, INSERT, CHANGE and REMOVE values from data bases. The operations can be directed by a WHERE clause or, in the case of the INSERT command, by a BEFORE AFTER syntax.

The ADD command adds data within existing data sets, where no data currently exists. This command can affect existing data sets at a single level only:

ADD C15 EQ 16*A*17*31*18*03*END*
WHERE C67 EQ 11:

This command adds another impact to BAAP 11.

The purpose of the CHANGE command is to change data within existing data sets, where data exists. It changes data at a single level only. The following command changes the name of a technical specialty, indicated by the C3 code, to earth science:

CHANGE C3 EQ EARTH SCIENCE* WHERE C301 EQ 01:

The purpose of the ASSIGN command is to assign data within existing data sets, regardless of whether the existing data sets contain data. This command always alters the contents of all the selected data sets at a single level. The following command removes all the information in repeating group C15 under BAAP 11 and places into it just the information contained in the command:

ASSIGN C15 EQ 16*13*17*02*18*03*END*
WHERE C67 EQ 11:

An ASSIGN TREE command also works the same way, except that it alters the contents of the data sets in the entire tree rather than in just one data set.

Similarly, the REMOVE command removes data from selected data sets at a single level; the REMOVE TREE command removes each selected data set and all its descendant data sets. The following command will remove a technical specialty:

REMOVE TREE C202 WHERE C301 EQ SURFACE WATER:

The purpose of the INSERT TREE command is to add new data trees where data trees do not exist. This command differs from all other update commands available through immediate access because it creates a new data tree where no data tree existed. All other commands modify existing data sets in some way. This command also allows the use of a BEFORE AFTER syntax in place of a WHERE clause and the use of a trace notation with which one can select a data set by its position in the data base—without regard to the condition of data values. The first example below inserts the technical specialty, air quality, before surface water (03). Using trace notation, the second example also inserts the technical specialty, air quality, before surface water.

INSERT TREE C202 EQ 301*02*3*AIR QUALITY*
END* BEFORE C301 EQ 03:

or

INSERT TREE C202*2 EQ 301*02*3*AIR

QUALITY*
END* WHERE C200 EQ D.A. PROJECT:

A further discussion of these updating processes may be found in the System 2000 Reference Manual.

Modification and Error Recovery

Modification. During the initial phase of implementation, frequent changes were made to the data and to the output requirements, depending on the flexibility of the definition and on the PL1 FORTRAN program. For major changes, the data-structure definitions had to be altered, which required release of the old structure and reloading of the data; however, in most cases, the data prepared for loader-string loading needed only minor changes and reshuffling, which should be considered when defining a new data structure. For minor changes, no redefinitions were needed.

For example, during the course of development, it was decided that controversial attributes should be added for each technical specialty and that the impacts on these should be printed out after both the detailed-level and the review-level attributes. A change of the data-structure definition could have been required, but after careful examination of the definition a solution was found that did not require such a change. First, the repeating group C15 (BAAP parameter) is converted for use with two types of data sets: the original, detailed-level attribute impacts and the additional, controversial attributes. The elements of both types are essentially the same except that the impact attribute numbers for the controversial attributes are always higher than those for the detailed attributes. Secondly, the repeating group C76 attribute is also converted to store two types of data sets, namely detailed-level and controversial attributes. Here, the elements C79 and C80 are used differently. For the controversial attributes, C79 will always have the value, CONTRVRSL, and element C80 will never have data. Thus, controversial attributes can be distinguished in two ways. Similar changes are made in the repeating group C88 or review attribute. Here, only the value contained in element C89 is used to make the distinction. All review-level attributes will have code numbers between 1 and 9; controversial attributes will have code numbers greater than 9.

Other changes in the data require changes in the data-structure definition. For example, the tree starting with repeating group C15 (Figure 2) was originally part of the tree under repeating group C13, with the elements BAAP Code (C14) and BTS Code (C28) having different meanings. As the pilot run progressed, the large amount of data involved made such a definition impractical. The old data base was released, and the new definition was built as shown in Figure 2. With some minor changes and reshuffling most of the original data in the loader strings was reused to load data into the new data base.

Error Recovery. Since the data base resides on a random access device (disk, drum, etc.), it can be damaged anytime there is a hardware or a software failure; therefore, a current copy of the data base is always stored on magnetic tape for reloading onto the random-access device. Also, whenever the data base is not in use for more than 2 days, it is advisable to release it from the random-access storage and to reload it from tape when it is requested again.

For a second-level backup, an archival copy of the data base is kept on tape. It is not the current version, and an update tape is used to record all updates since the archival version was created. Thus, if the current version on tape is damaged, the data base can be recreated by applying the update tape to the archival tape. The method also allows the recreation of previous versions of the data base since each cycle of the update can be applied at will by the user. Only three tapes are needed for a single-reel data base.

All operations are assumed to be in the indirect mode which means that all updates are first stored on disk and then transferred to the update tape. All of the following tapes would have been requested previously and are assumed ready to use:

Archival tape	VSN	=	T1102
Update tape	VSN	=	T2133
Current tape	VSN	=	T3421

The following commands illustrate the procedures for implementing the feature mentioned above. When the data base has been created, the command causes a copy to be saved on the archival tape, arms the update tape for later use, and creates an update file on the random-access device.

SAVE DATA BASE ON T1102/T2133:

To save the current version, the following type of command is employed:

SAVE DATA BASE ON T3421:

If the data base has been damaged or released, the current version can be reloaded using:

LOAD DATA BASE FROM T3421:

If each update is successful, and if a record of the updates is desired on the update-file tape, the following command is given:

KEEP:

No mention of the update-file tape is necessary since the tape was already armed to receive the update information. In this example, all update data plus the audit trial are transferred to VSN -- T2133.

After several updates, if it is discovered that the last two updates contain errors (i.e., cycles 6 and 5), corrections can be easily made. Using the following commands, the data base can be recreated as it was at cycle 4. The current data base is released first.

RELEASE:

LOAD DATA BASE FROM T1102:

APPLY THRU CYCLE 4:

Again no mention of the update-file tape is necessary.

Input Format. In order to retrieve the appropriate information to assist in assessment of the impact on the environment of any activity, the activity must be carefully identified. Such identification is achieved by selecting one or more functional areas to which certain projects can be best classified. Then, under each functional area, it is necessary to identify the program(s), and under each program, to identify the subprogram(s). All programs under the same functional area and all subprograms under the same program should be grouped together as a set.

After the functional areas, programs, and subprograms have been determined, certain information is required to be input via data cards in order to retrieve the desired information. A description of these cards follows.

Identification Card

Columns 1 to 70—Title of project or other identification, to a maximum of 70 characters.

Control Card

Columns 1 to 2 —Number of functional areas to be considered (2 digits).

Functional Area Card

Columns 1 to 2 —Functional-area code (2 digits).

Columns 3 to 4 —Number of programs to be considered under this functional area (2 digits).

Column 5 —Level code (1 digit)
1 is for detailed-level environmental attributes
2 is for review-level environmental attributes.

Columns 6-7 —Need-to-consider scale (2 alpha characters).
Blanks will mean A, B, and C impacts will be output.
A will mean only A impacts will be output.
AB will mean only A and B impacts will be output.

Program Cards. There should be as many program cards for each set as there are programs indicated on the functional area card. The order of this set of cards should also correspond to the order of the functional area checked.

Columns 1 to 5 —Program code number (5 digits).

Columns 6 to 7 —Number of subprograms to be considered under this program (2 digits, 00 if only the program level is to be considered).

Columns 8 to 9 —Dollar-value code (2 digits).

Columns 10 to 11—Location code (2 digits).

Columns 12 to 13—Time-frame code (2 digits).

Columns 14 to 15—Season code (2 digits).

Columns 16 to 17—Number of site elements to be input (2-digit number less than 30).

Column 18 —1 indicates that site elements are the same as in the *previous program*; 0 or blank means no repetition.

Columns 19 to 72—3-digit site-element codes. If column 18 contains a 1, no data should be here. Up to 18 site elements can be coded on this card. If there are more than 18 site elements, this card should be followed by a continuation program card formatted as follows:

Columns 1 to 36—3-digit site-element codes. Up to 12 more site elements

can be coded on this continuation card.

Subprogram Cards. Immediately after each program card and any continuation program card, there should be as many sets of subprogram cards as indicated on the program card. A subprogram card is very similar to a program card, except that columns 6 and 7 contain the number of sub-subprograms to be considered under this subprogram.

Columns 1 to 5 —Subprogram code number (5 digits).
Columns 6 to 7 —Number of sub-subprograms to be considered under this subprogram (2 digits, 00 if only the subprogram level is to be considered).
Columns 8 to 9 —Dollar-value code (2 digits).
Columns 10 to 11—Location code (2 digits).
Columns 12 to 13—Time-frame code (2 digits).
Columns 14 to 15—Season code (2 digits).
Columns 16 to 17—Number of site elements to be input (2-digit number less than 30).
Column 18 —1 indicates that site elements are the same as in the *present program*; 2 indicates that site elements are the same as in the *preceding subprogram*; and 0 or a blank indicates that there are no repetitions.
Columns 19 to 72—3-digit site-element codes. If column 18 contains 1 or 2, there should be no data here. Up to 18 site-elements may be coded on this card. If there are more than 18 site elements, this card should be followed by a continuation subprogram card formatted as follows:
Columns 1 to 36—3-digit site-element codes. Up to 12 more site elements can be coded on this card.

Sub-Subprogram Card (optional). If the sub-subprogram level is to be considered, as many sets of sub-subprogram cards should be immediately after each subprogram card (and any continuation card) as indicated on the subprogram card. The sub-subprogram card is very similar to the subprogram card except that columns 6 and 7 are always blank.

Columns 1 to 5 —Sub-subprogram code number (5 digits).
Columns 6 to 7 —Blanks.
Columns 8 to 9 —Dollar-value code (2 digits).
Columns 10 to 11—Location code (2 digits).
Columns 12 to 13—Time-frame code (2 digits).
Columns 14 to 15—Season code (2 digits).
Columns 16 to 17—Number of site elements to be input (a 2-digit number less than 30).
Column 18 —1 indicates that the site elements are the same as in the *parent* subprogram; 2 indicates that the site elements are the same as in the *preceding subprogram*; 3 indicates that the site elements are the same as in the *grandparent programs*; 0 or blank indicates that there are no repetitions.
Columns 19 to 72—3-digit site-element codes. If column 18 contains 1, 2, or 3, there should be no data here. Up to 18 site elements can be coded on this card. If there are more than 18 site elements, there should be a continuation sub-subprogram card formatted as follows:
Columns 1 to 36—3-digit site-element codes. Up to 12 more site elements can be coded on this card.

Appendix C contains the codes for the programs and subprograms under the functional area of construction.

Typical Input and Output. The following discussion gives an example of the input given to retrieve certain information and the resulting output. The input cards considered are:

1. DA PROJECT DATA BASE PILOT MODEL ON SYSTEM 2K PLI
2. 1
3. 01012
4. 01100 2
5. 01110 0
6. 01170 0

Card 1 is the identification card. Card 2 indicates that only one functional area is to be considered. On card 3, the first two digits are the functional-area code (in this example, 01 for construction); digits 3 and 4 (01) tell the number of programs to be considered; and digit 5 (2) requests the review level of environmental attributes, rather than the detailed level. Digits 1 through 5 of card 4 are the code numbers of the program to be considered (01100 represents operational and training facilities); and digits 6 and 7 tell the number of subprograms to be considered. Cards 5 and 6 are the subprogram cards, on which digits 1 through 5 are the subprogram code numbers, and digits 6 and 7 are the number of sub-subprograms to be considered. Since the dollar-value and certain other codes are not implemented in the present version, no such codes are shown in the example. The given cards reference the airfield pavement (01110) and training facilities (01170) subprograms, with no sub-subprograms to be considered.

Appendix B contains some selected output resulting from input of the above cards. The first items output are the data on the identification card, the control card, and the functional area card. This information is followed by a list of all BAAP's in the function being processed and by the program code and the number of subprograms. Then, for each subprogram within the program being processed, the program code, program name, subprogram code, subprogram name, and a matrix relating the BAAP's to the environmental attributes for each technical specialty that is impacted by the subprogram are given. Following each matrix, there is a list of the impacted attributes, the numbers of which are listed across the top of the matrix, followed by a list of the BAAP's that affected the impacts, the numbers of which are listed down the side of the matrix. The contents of the matrix intersections are either A, B, or C, indicating the need-to-consider scale of the impact.

5 CONCLUSIONS AND RECOMMENDATIONS

The EICS was developed to manage the large quantity of complex information necessary to relate Army activities to potential environmental impacts. This computer system processes all the stored information and provides only the relevant information in a timely and cost-effective manner. In addition, the flexibility of the system and the ease with which it can be updated were other reasons for its development.

A user of the EICS need not understand the details of the data-base management system or of the PLI in order to store or retrieve information. The technical details of the system and its use have been outlined in this report and include: basic concepts behind data-base management systems; an outline of the nature of the data and the associated management requirements; reasons for selecting System 2000 and a discussion of its capabilities; and application of the EICS, created with System 2000 and the PLI, to the DA study.

At the time of this report, only the functional area of construction has been implemented on the EICS. Programs, subprograms, and basic activities are to be delineated for the following functional areas: operation, maintenance and repair, and mission change. The description and development of training activities are also to be initiated.

Currently the EICS, with one functional area complete, is only 10 to 15 percent of its eventual size. With completion of nine functional areas the system will be fully developed. The projected annual growth rate for the system is 15 to 20 percent of its final size. The existing pilot system has been developed primarily to demonstrate the feasibility of the EICS concept. The complete operational system, retaining the good features of the pilot system, can be implemented differently. Indeed, a system which is to be accessed regularly will have to be managed in a manner entirely different than such a pilot system for experimental purposes.

The choice of System 2000 for data-base management must be reevaluated before the full-scale system is developed. System 2000 has proven very satisfactory for the pilot study, but its use to maintain a full-scale system would be very expensive; therefore, efforts have been initiated to convert the System 2000 data bases into a number of sequential files. These files could then be accessed by interface FORTRAN programs in the remote, batch-processing mode or in the on-line, interactive mode.

The choice of hardware—selecting the computer mainframe and all the necessary peripheral devices—must also be considered. Toward this end, OCE is

conducting a survey for an 8-year plan. Again, as in the case of data-base management software, the most cost-effective operation would probably not employ a commercial, time-sharing computer network such as the one currently in use. Before development of the EICS proceeds, a detailed study of the hardware and software requirements should be conducted.

In conclusion, it is recommended that the EICS and its associated data bases and computer codes be developed according to an orderly program for growth. Decisions about the hardware, software, or personnel requirements of the full-scale system must be made in the immediate future so that a comprehensive plan for orderly implementation can be formulated.

APPENDIX A:

EICS DATA BASE

1 DATA BASE DEFINITIONS

```
LOADED   DAPJCT                16     605              73/06/28. 15.29.40.
         DESCRIBE:
 SYSTEM RELEASE NUMBER         2.23F
 DATA BASE NAME IS DAPJCT
 DEFINITION NUMBER      16
 DATA BASE CYCLE       605
  200*  PROJECT NAME (NAME X(10))
  201*  FUNCTION AREA (RG)
      1*  FUNCTION CODE (INTEGER NUMBER 99 IN 201)
      2*  FUNCTION NAME (NON-KEY NAME X(12) IN 201)
     66*  UNIQUE BAAPS (RG IN 201)
       67*  UNIQUE BAAP CODE (INTEGER NUMBER 9(5) IN 66)
       68*  UNIQUE BAAP NAME (NON-KEY NAME X(25) IN 66)
       15*  BAAP PARAMETER (RG IN 66)
         16*  B IMP CONT (NAME X IN 15)
         17*  B IMP ATTR (INTEGER NUMBER 9(7) IN 15)
         18*  B IMP TS (INTEGER NUMBER 99 IN 15)
         69*  UNI BAAP QUALIFIER (RG IN 15)
           70*  BAAP DOLLAR (INTEGER NUMBER 999 IN 69)
          120*  B DOL NAME (NON-KEY NAME X(17) IN 69)
           71*  BAAP LOCAT (INTEGER NUMBER 999 IN 69)
          121*  B LOC NAME (NON-KEY NAME X(17) IN 69)
           72*  BAAP TIME (INTEGER NUMBER 999 IN 69)
          122*  B TIME NAME (NON-KEY NAME X(17) IN 69)
           73*  BAAP SEASON (INTEGER NUMBER 999 IN 69)
          123*  B SEA NAME (NON-KEY NAME X(17) IN 69)
           74*  BAAP SITE ELEM (RG IN 69)
             75*  BAAP SITE (INTEGER NUMBER 999 IN 74)
            124*  B SITE NAME (NON-KEY NAME X(17) IN 74)
        20*  REV IMPACT (RG IN 66)
          21*  IMP CONTENT (NAME X IN 20)
          22*  REV NO (INTEGER NUMBER 9(5) IN 20)
          23*  TS NO (INTEGER NUMBER 9999 IN 20)
       100*  ACCOMPLISHMENT (RG IN 66)
         101*  METHOD (NAME X(16) IN 100)
         102*  REL COST (DECIMAL NUMBER 9.99 IN 100)
       4*  PROGRAM (RG IN 201)
         5*  PROG CODE (INTEGER NUMBER 9(5) IN 4)
         6*  PROG NAME (NON-KEY NAME X(25) IN 4)
         7*  SUB PROGRAM (RG IN 4)
           8*  S PROG CODE (INTEGER NUMBER 9(5) IN 7)
           9*  S PROG NAME (NON-KEY NAME X(25) IN 7)
          10*  SS PROGRAM (RG IN 7)
            11*  SS PROG CODE (INTEGER NUMBER 9(5) IN 10)
            12*  SS PROG NAME (NON-KEY NAME X(25) IN 10)
            13*  BAAPS (RG IN 10)
```

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```
      14*  RAAP CODE (INTEGER NUMBER 9(5) IN 13)
      28*  RTS CODE (INTEGER NUMBER 9(5) IN 13)
    30*  SS PROG PARAMETER (RG IN 10)
      31*  SSP IMP CONT (NAME X IN 30)
      32*  SSP IMP ATTR (INTEGER NUMBER 999 IN 30)
      33*  SSP IMP TS (INTEGER NUMBER 99 IN 30)
      34*  SSP IMP REV NO (INTEGER NUMBER 99 IN 30)
      35*  SSP QUALIFIER (RG IN 30)
        36*  SSP DOLLAR (INTEGER NUMBER 999 IN 35)
       140*  SSP DOL NAME (NON-KEY NAME X(17) IN 35)
        37*  SSP LOCAT (INTEGER NUMBER 999 IN 35)
       141*  SSP LOC NAME (NON-KEY NAME X(17) IN 35)
        38*  SSP TIME (INTEGER NUMBER 999 IN 35)
       142*  SSP TIME NAME (NON-KEY NAME X(17) IN 35)
        39*  SSP SEASON (INTEGER NUMBER 999 IN 35)
       143*  SSP SEA NAME (NON-KEY NAME X(17) IN 35)
       144*  SSP SITE NAME (NON-KEY NAME X(17) IN 35)
        40*  SSP SITE ELEM (RG IN 35)
          41*  SSP SITE (INTEGER NUMBER 999 IN 40)
  42*  S PROG PARAMETER (RG IN 7)
    43*  SP IMP CONT (NAME X IN 42)
    44*  SP IMP ATTR (INTEGER NUMBER 999 IN 42)
    45*  SP IMP TS (INTEGER NUMBER 99 IN 42)
    46*  SP IMP REV NO (INTEGER NUMBER 99 IN 42)
    47*  SP QUALIFIER (RG IN 42)
      48*  SP DOLLAR (INTEGER NUMBER 999 IN 47)
     130*  SP DOL NAME (NON-KEY NAME X(17) IN 47)
      49*  SP LOCAT (INTEGER NUMBER 999 IN 47)
     131*  SP LOC NAME (NON-KEY NAME X(17) IN 47)
      50*  SP TIME (INTEGER NUMBER 999 IN 47)
     132*  SP TIME NAME (NON-KEY NAME X(17) IN 47)
      51*  SP SEASON (INTEGER NUMBER 999 IN 47)
     133*  SP SEA NAME (NON-KEY NAME X(17) IN 47)
      52*  SP SITE ELEM (RG IN 47)
        53*  SP SITE (INTEGER NUMBER 999 IN 52)
       134*  SP SITE NAME (NON-KEY NAME X(17) IN 52)
54*  PROG PARAMETER (RG IN 4)
  55*  P IMP CONT (NAME X IN 54)
  56*  P IMP ATTR (INTEGER NUMBER 999 IN 54)
  57*  P IMP TS (INTEGER NUMBER 99 IN 54)
  58*  P IMP REV NO (INTEGER NUMBER 99 IN 54)
  59*  P QUALIFIER (RG IN 54)
    60*  P DOLLAR (INTEGER NUMBER 999 IN 59)
   135*  P DOL NAME (NON-KEY NAME X(17) IN 59)
    61*  P LOCAT (INTEGER NUMBER 999 IN 59)
   136*  P LOC NAME (NON-KEY NAME X(17) IN 59)
    62*  P TIME (INTEGER NUMBER 999 IN 59)
   137*  P TIME NAME (NON-KEY NAME X(17) IN 59)
    63*  P SEASON (INTEGER NUMBER 999 IN 59)
   138*  P SEA NAME (NON-KEY NAME X(17) IN 59)
```

```
        64*  P SITE ELEM (RG IN 59)
          65*  P SITE (INTEGER NUMBER 999 IN 64)
         139*  P SITE NAME (NON-KEY NAME X(17) IN 64)
202*  TECH SPEC (RG)
  301*  TECH SPEC CODE (INTEGER NUMBER 99 IN 202)
    3*  TECH SPEC NAME (NON-KEY NAME X(18) IN 202)
   76*  ATTRIBUTES (RG IN 202)
     77*  ATTR CODE (INTEGER NUMBER 9(5) IN 76)
     78*  ATTR NAME (NON-KEY NAME X(24) IN 76)
     79*  PARAMETRIC (NAME X(16) IN 76)
     80*  S PARAMETRIC (NAME X(20) IN 76)
     82*  ATTR TEXT (NON-KEY INTEGER NUMBER 9(5) IN 76)
   88*  REVIEW ATTR (RG IN 202)
     89*  REV ATTR CODE (INTEGER NUMBER 9(5) IN 88)
     90*  REV NAME (NON-KEY NAME X(20) IN 88)
     91*  REV TEXT (NON-KEY INTEGER NUMBER 9(5) IN 88)
```

2 SAMPLE DATA LOADING STRINGS

The following is an example of the loader strings which contain data for the BAAP; the detailed, controversial, and review impacts; and the alternative methods of accomplishment.

```
66* 67*160*68*FOUNDATIONS*
66* 67*161*66*SURGDAVE DOCDAVATIONS
150 160C*170*39*18*10*
150 160C*170*47*18*10*
150 160A*170*53*18*10*
150 160C*170*55*18*10*
150 160C*170*56*18*10*
150 160C*170*57*18*10*
150 160C*170*58*18*10*
150 160C*170*59*18*10*
150 160A*170*14*18*02*
150 160C*170*001*18*04*
150 160C*170*006*18*04*
150 160C*170*009*18*04*
150 160C*170*011*18*04*
150 160C*170*036*18*04*
150 160C*170*041*18*04*
150 160C*170*02*18*01*
150 160C*170*07*18*01*
150 160A*170*20*18*07*
150 160A*170*13*18*07*
150 160A*170*43*18*07*
150 160A*170*050*18*02*
150 160A*170*54*18*07*
200 210A*220*03*23*02*
200 210B*220*01*23*04*
200 210C*220*02*23*04*
200 210C*220*03*23*04*
200 210A*220*1*23*07*
200 210A*220*05*23*07*
200 210A*220*10*23*02*
200 210A*220*20*23*07*
100* 101*NATURAL*
100* 101*VIBRATORY*
100* 101*DEFORMATION*
100* 101*DEAD WEIGHT*
66* 67*162*68*PASS*
```

The following is an example of the loader strings which contain data on the program and subprogram, the excluded BAAP's, and the subprogram-level impacts.

```
4*
5*01300*6*RESEARCH, DEV + TEST FAC*
7* B*01310*9*0 AND D AND TEST BUILDINGS*
10* 13* 14*075*
10* 13* 14*081*
10* 13* 14*082*
10* 13* 14*083*
10* 13* 14*084*
10* 13* 14*105*
10* 13* 14*106*
10* 13* 14*121*
10* 13* 14*126*
10* 13* 14*130*
10* 13* 14*131*
10* 13* 14*132*
10* 13* 14*133*
10* 13* 14*134*
10* 13* 14*135*
10* 13* 14*136*
10* 13* 14*142*
10* 13* 14*165*
10* 13* 14*166*
10* 13* 14*167*
10* 13* 14*260*
10* 13* 14*261*
10* 13* 14*262*
10* 13* 14*263*
10* 13* 14*264*
10* 13* 14*265*
10* 13* 14*277*
10* 13* 14*282*
42* 43*C*44*013*45*08*
42* 43*C*44*016*45*08*
42* 43*C*44*012*45*08*
42* 43*A*44*013*45*08*
42* 43*C*44*016*45*08*
42* 43*A*44*017*45*08*
42* 43*C*44*018*45*08*
42* 43*B*44*019*45*08*
42* 43*A*44*020*45*08*
42* 43*B*44*021*45*08*
42* 43*A*44*022*45*08*
42* 43*B*44*023*45*08*
42* 43*A*44*024*45*08*
42* 43*C*44*026*45*08*
42* 43*A*44*028*45*08*
42* 43*B*44*029*45*08*
42* 43*B*44*031*45*08*
42* 43*A*44*033*45*08*
42* 43*B*44*035*45*08*
```

The following is an example of the loader strings which contain data for the detailed, controversial, and review-level attributes, and parametric and subparametric attributes for the technical specialty, ecology.

```
202* 301*06*3*ECOLOGY*
        76* 77*01*78*LARGE MAMMALS*
        79*ECOSYSTEM*80*SPEC DIVERSITY FAUNA*
        76* 77*02*78*SMALL MAMMALS*
        79*ECOSYSTEM*80*SPEC DIVERSITY FAUNA*
        76* 77*03*78*BIRDS*
        79*ECOSYSTEM*80*SPEC DIVERSITY FAUNA*
        76* 77*04*78*FISH*
        79*ECOSYSTEM*80*SPEC DIVERSITY FAUNA*
        76* 77*05*78*REPTILES*
        79*ECOSYSTEM*80*SPEC DIVERSITY FAUNA*
        76* 77*06*78*INSECTS*
        79*ECOSYSTEM*80*SPEC DIVERSITY FAUNA*
        76* 77*07*78*OTHER FAUNA*
        79*ECOSYSTEM*80*SPEC DIVERSITY FAUNA*
        76* 77*08*78*ENDANGERED SPECIES-FAUNA*
        79*ECOSYSTEM*80*SPEC DIVERSITY FAUNA*
        76* 77*09*78*ANGIOSPERMS TREES*
        79*ECOSYSTEM*80*SPEC DIVERSITY FLORA*
        76* 77*10*78*ANGIOSPERMS SHRUBS*
        79*ECOSYSTEM*80*SPEC DIVERSITY FLORA*
        76* 77*11*78*ANGIOSPERMS HERBS*
        79*ECOSYSTEM*80*SPEC DIVERSITY FLORA*
        76* 77*12*78*GYMNOSPERMS*
        79*ECOSYSTEM*80*SPEC DIVERSITY FLORA*
        76* 77*13*78*LOWER VASCULAR*
        79*ECOSYSTEM*80*SPEC DIVERSITY FLORA*
        76* 77*14*78*ALGAE*
        79*ECOSYSTEM*80*SPEC DIVERSITY FLORA*
        76* 77*15*78*FUNGI*
        79*ECOSYSTEM*80*SPEC DIVERSITY FLORA*
        76* 77*16*78*LICHENS*
        79*ECOSYSTEM*80*SPEC DIVERSITY FLORA*
        76* 77*17*78*ENDANGERED SPECIES-FLORA*
        79*ECOSYSTEM*80*SPEC DIVERSITY FLORA*
        76* 77*18*78*STRATIFICATION*
        79*ECOSYSTEM*80*SYSTEM STABILITY*
        76* 77*19*78*CLIMAXNESS*
        79*ECOSYSTEM*80*SYSTEM STABILITY*
        76* 77*20*78*TEMPORALITY*
        79*ECOSYSTEM*80*SYSTEM STABILITY*
        76* 77*21*78*MIGRATION*
        79*ECOSYSTEM*80*SYSTEM STABILITY*
        76* 77*22*78*SEASONALITY*
        79*ECOSYSTEM*80*SYSTEM STABILITY*
        76* 77*23*78*REPRODUCTIVE BEHAVIOR*
        79*ECOSYSTEM*80*SYSTEM STABILITY*
```

76* 77*24*78*FEEDING ACTIVITIES*
79*ECOSYSTEM*80*SYSTEM STABILITY*
76* 77*25*78*SMALL GAME, HUNTING*
79*WILDLFE MT*80*HUNTING*
76* 77*26*78*WATERFOWL, HUNTING*
79*WILDLFE MT*80*HUNTING*
76* 77*27*78*BIG GAME, HUNTING*
79*WILDLFE MT*80*HUNTING*
76* 77*28*78*POND + RIVER, FISHING*
79*WILDLFE MT*80*FISHING*
76* 77*29*78*COLD WATERS FISHING*
79*WILDLFE MT*80*FISHING*
76* 77*30*78*LARGE LAKES, FISHING*
79*WILDLFE MT*80*FISHING*
76* 77*31*78*COASTAL WATERS, FISHING*
79*WILDLFE MT*80*FISHING*
76* 77*32*78*SHELLFISH, FISHING*
79*WILDLFE MT*80*FISHING*
76* 77*33*78*DEEP SEA FISHING*
79*WILDLFE MT*80*FISHING*
76* 77*34*78*HATCHERY ACTIVITIES, FISHING*
79*WILDLFE MT*80*FISHING*
76* 77*35*78*UNDESIRABLE SPECIES*
79*WILDLFE MT*80*UNDES SPECIES*
76* 77*38*78*IMPACTS ON GAME ANIMALS*
79*CNTRVSL*
76* 77*39*78*ENCROACHMENT ON NATURAL HABITATS*
79*CNTRVSL*
76* 77*40*78*RARE AND ENDANGERED SPECIES*
79*CNTRVSL*
88* 89*01*90*FORESTS*
88* 89*02*90*GROUND COVER*
88* 89*03*90*GAME ANIMALS*
88* 89*04*90*GAME FISH*
88* 89*05*90*RARE + ENDANGERED SPECIES*
88* 89*10*90*IMPACTS ON GAME ANIMALS*
88* 89*11*90*ENCROACHMENT ON NATURAL HABITATS*
88* 89*12*90*RARE AND ENDANGERED SPECIES*

3 SAMPLE QUEUE PROCESS RETRIEVAL

The following example shows that in Queue Process the retrieval is not performed until the TERMINATE command is encountered. Sequence numbers are assigned so that each retrieval can be identified. For explanation of the retrieval command, please see main text.

```
 ---
? QUEUE:
 ---
? PRINT C66 WHERE C67 GT 239*:
 --SEQUENCE NUMBER--      1

?-PRINT C66 WHERE C201 EQ 2*:
 --SEQUENCE NUMBER--      2

?-TERMINATE:

 --SEQUENCE NUMBER--      1

     67*    240
     68* STEEL CONSTRUCTION
     67*    241
     68* STEEL MATERIALS DELIVERY
     67*    242
     68* FABRICATION
     67*    243
     68* STRESS RELIEVING
     67*    244
     68* FABRICATED MATERIAL HAULING
     67*    245
     68* ERECTION
     67*    246
     68* FASTENING
     67*    260
     68* LUMBER CONSTRUCTION
     67*    261
     68* LUMBER MATERIALS DELIVERY
     67*    262
     68* PEST/INSECT PROTECTION
     67*    263
     68* FASTENING
     67*    264
```

68* [illegible]
67* 165
68* [illegible]
67* 170
68* FINISHING OPERATIONS
67* 171
68* [illegible], MILLWORK
67* 172
68* ELECTRIC
67* 173
68* PLUMBING
67* 174
68* [illegible]
67* 175
68* AIR CONDITIONING
67* 176
68* INSULATION
67* 177
68* [illegible]
67* 178
68* [illegible]
67* 179
68* FLOORING
67* 181
68* WALL
67* 182
68* CEILING
67* 183
68* DEMOLITION
67* 184
68* PAINTING
67* 185
68* FINISHING(LANDSCAPE-PLANTING-SEEDING)
67* 186
68* COMMUNICATIONS

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--SEQUENCE NUMBER-- 2

89* 1
90* BIOLOGICAL STRESSORS
89* 2
90* CHEMICAL STRESSORS
89* 3
90* PHYSICAL STRESSORS
89* 4
90* BEHAVIORAL STRESSORS
89* 5
90* SAFETY/ACCIDENT HAZARDS
89* 10
90* EXPOSURE TO CARCINOGENS/MUTAGENS
89* 11
90* HARMFUL FOOD/WATER ADDITIVES
89* 12
90* PSYCHOLOGICAL STRESSORS
89* 13
90* DRUG + NARCOTICS ABUSE
89* 14
90* ENDANGERING COMMUNITY HEALTH
89* 15
90* ENDANGERING COMMUNITY SAFETY

APPENDIX B:

LISTING OF PLI FORTRAN PROGRAM AND OUTPUT FOR BATCH RETRIEVAL

1 PLI FORTRAN PROGRAM

The first series of cards up to the SYS cards are the control cards for compiling the FORTRAN codes. The cards with 22 "0" are the end-of-record cards. The main text of PLI program codes starts with the program cards. The last five cards before the END-OF-INFORMATION card are the data cards for the PLI program.

```
$SEQUENCE,RCG.
$CHARGE.
DAPR,CM10000,CL140000,T200,IO700,P4.
ATTACH,PLI,PLIFOR.
RFL,100000.
PLI.
RETURN,PLI.
REWIND,TAPE3.
RFL,60000.
FTN,A,I=TAPE3.
RFL,20000.
REWIND,LGO.
ATTACH,X,PLILGO.
REWIND,X.
COPYBR,X,F,2.
COPYBF,LGO,F.
BKSP,F,1.
COPYBF,X,F.
RETURN,X.
RFL,140000.
NAP(OFF)
SET(0)
LOADER,CPLOADR.
LOAD,F.
NOGO.
ATTACH,BUILD,BUILD.
REWIND,SYS.
BUILD,SYS.
SYS.
0000000000000000000000
A,B,I
0000000000000000000000
      PROGRAM DATABASE(INPUT=1002B,OUTPUT,TAPE1=1002B,TAPE2=1002B,TAPE3=
     11002B,TAPE4=1002B, TAPE5=1002B,TAPE6=1002B,TAPE7=1002B,TAPE8=
     21002B,TAPE9=1002B, TAPE10=1002B,TAPE11=1002B)
C
      INTEGER SCHNME,RCODE,FILLER,LDSET,PASS,NUMRG,PGPOS,LEVE,TIMEX,
     1DATE,CYCLE,SEPSYM,ENDTERM,STATUSX
      INTEGER C1,C67,C5,C8,C11,C17,C14,C18,C22,C23,C32,C33,C34,C44,C45,
     1C46,C56,C57,C58,C301,C3,C77,C89,C82,C6,C9,C91
```

```
C
      INTEGER NBAAPC(300),NTIA(11),NTS(11),NTSS(11),NATTRI(11,173),
     1TSN(11,2)
      INTEGER R
      REAL NAGR(11,173),DMA(100,36),MRC(100)
      DIMENSION ICC(150),AGR(35),NPC(11)
C
C     THE DIMENTION OF NAGR(11,173) AND NATTRI(11,173) MAY NEED TO BE
C     ENLARGED TO NAGR(11,180) AND NATTRI(11,180) WHEN ALL TECHNICAL
C     SPECIALTIES ARE LOADED INTO THE DATA BASE.
C
*PL   COMMPLOCK /DAPJCT/SCHNME,RCODE,FILLER,LDSET,PASS,NUMRG,RGPOS,
*PL  1LEVE,TIMEX,DATE,CYCLE,SEPSYM,ENDTERM,STATUSX.
C
C     SCHEMA FOR LEVEL ONE ELEMENTS
C
*PL   SCHEMA/L1FUNC OF  DAPJCT/C1,C2(2).
*PL   SCHEMA/L1TS OF  DAPJCT/C301,C3(2).
C
C     SCHEMA FOR LEVEL TWO ELEMENTS
C
*PL   SCHEMA/L2BAAP OF  DAPJCT/C67,C68(6).
*PL   SCHEMA/L2PROG OF  DAPJCT/C5,C6(3).
*PL   SCHEMA/L2ATTR OF  DAPJCT/C77,C78(8),C79(2),C80(3),C82.
*PL   SCHEMA/L2REV OF DAPJCT/C89,C90(4),C91.
C
C     SCHEMA FOR LEVEL THREE ELEMENTS
C
*PL   SCHEMA/L3ACOM OF  DAPJCT/C101(2),C102.
*PL   SCHEMA/L3REVA OF  DAPJCT/C21,C22,C23.
*PL   SCHEMA/L3TBPA OF  DAPJCT/C16,C17,C18.
*PL   SCHEMA/L3SP OF  DAPJCT/C8,C9(3).
*PL   SCHEMA/L3PPAR OF  DAPJCT/C55,C56,C57,C58.
C
C     SCHEMA FOR LEVEL FOUR ELEMENTS
C
*PL   SCHEMA/L4SSP OF  DAPJCT/C11,C12(3).
*PL   SCHEMA/L4SPPA OF  DAPJCT/C43,C44,C45,C46.
C
C     SCHEMA FOR LEVEL FIVE ELEMENTS
C
*PL   SCHEMA/L5TBAP  OF  DAPJCT/C14.
*PL   SCHEMA/L5SSPA  OF  DAPJCT/C31,C32,C33,C34.
C
*PL   END SCHEMAS.
C
C     NTIA(I) CONTAINS THE MAXIMUM NUMBER OF ATTRIBUTES FOR TECHNICAL
C     SPECIALTY I. REVISE THIS DATA STATEMENT IF THE NUMBER OF ATTRI-
C     BUTES CHANGES.
C
      DATA NTIA/40,70,105,81,58,75,141,56,54,173,32/
```

```
      DATA TSN(1,1),TSN(2,1),TSN(2,2),TSN(3,1),TSN(3,2),TSN(4,1),
     1TSN(4,2),TSN(5,1),TSN(5,2),TSN(6,1),TSN(7,1),TSN(7,2),TSN(8,1),
     2TSN(9,2),TSN(9,1),TSN(10,1),TSN(11,1),TSN(11,2)/7HECOLOGY,
     310HHEALTH SCI,4HENCE,10HAIR QUALIT,1HY,10HSURFACE WA,3HTER,
     410HGROUND WAT,2HER,9HSOCIOLOGY,10HREGIONAL E,8HCONOMICS,
     510HEARTH SCIE,3HNCE,8HLAND USE,5HNOISE,10HTRANSPORTA,4HTION/
C
C*****************************************************************
C
      X = 1HX
      Y =1HY
      Z = 1H7
      R = 6H-NULL-
C
C     READ AND PRINT PROGRAM HEADING AND THE NUMBER OF FUNCTIONAL AREAS
C     TO BE PROCESSED.  ENTER THE PASSWORD AND OPEN THE DATA BASE.
C
      READ 10,(DMA(I),I=1,8),NRF
10    FORMAT (7A10,A5/I2)
      PRINT 20,(DMA(I),I=1,8),NRF
20    FORMAT(1H1,7A10,A5,//* TOTAL NUMBER OF FUNCTIONAL AREAS TO BE PROC
     1ESSED = *,I2)
      PASS=4HEYSL
*PL   OPEN DABJCT.
C
C     CHECK STATUS OF DATA BASE. IF DAMAGED, TERMINATE THE JOB.
C
      IF (STATUSX .EQ. 0) GO TO 60
      PRINT 50
50    FORMAT(1H *DATA BASE DAMAGED, RETRIEVED INFORMATION UNRELIABLE. JO
     1B TERMINATED*)
      GO TO 1240
C
C     THIS BEGINS THE LOOP TO PROCESS ONE FUNCTIONAL AREA. READ AND
C     PRINT FUNCTION CODE, NUMBER OF PROGRAMS IN THE FUNCTION, LEVEL OF
C     STUDY DESIRED, AND RESTRICTIONS ON DATA RETRIEVAL.
C
60    CONTINUE
      DO 1230 I=1,NRF
      READ   70, IFUNC,NRP,LEVEL,AC
70    FORMAT (I2,I2,I1,A3)
      IF(AC .EQ. 1H ) AC=3HABC
      PRINT 80,IFUNC,NRP,LEVEL,AC
80    FORMAT(/* FUNCTIONAL AREA = *,I3,5X,*NUMBER OF PROGRAMS = *,I3,5X,
     1*LEVEL OF STUDY = *,I1,5X,*REQUEST OUTPUT ONLY OF IMPACTS WHOSE VA
     2LUES ARE *,A3)
C
C     ACCESS THE DESIRED FUNCTIONAL AREA.  IF END-OF-FILE IS ENCOUNTERED
C     OR IF AN ERROR OCCURS, FLUSH ALL PROGRAM AND SUB-PROGRAM CARDS FOR
C     THIS FUNCTION AND TRY THE NEXT FUNCTIONAL AREA.
C
```

```
*PL    GETI L1FUNC WHERE C1 EQ IFUNC.
       IF (RCODE.EQ.04) GO TO 1230
       IF (RCODE .EQ.0) GO TO 120
       PRINT 90,RCODE,C1
90     FORMAT(/* RETURN CODE = *,I2,* FOR FUNCTION CODE = *,I4)
       DO 110 K=1,NRP
       READ 270,M,NRSP
       DO 100 I=1,NRSP
100    READ 270,M
110    CONTINUE
       GO TO 1230
C
C      PRINT THE HEADER FOR THIS FUNCTIONAL AREA.
C
120    CONTINUE
       PRINT 130,C2(1),C2(2)
130    FORMAT(//* REQUESTED FUNCTIONAL AREA = *,2A10///3X,*BAAP NO.*,6X,
      1*BAAP NAME*,46X,*METHOD OF ACCOMPLISHMENT (RELATIVE COST)*/3X,
      28(1H-),6X,9(1H-),46X,24(1H-))
C
C      RETRIEVE ALL BAAP CODES AND NAMES WHICH QUALIFY FOR THE CURRENT
C      FUNCTIONAL AREA.
C
140    CONTINUE
*PL    GETD  L2BAAP NEXT.
       IF (RCODE .EQ. 04) GO TO 230
       IF (RCODE .EQ. 0) GO TO 160
       PRINT  90,RCODE,IFUNC
       GO TO 140
C
C      PRINT A BAAP CODE AND NAME THAT QUALIFIES ON THIS FUNCTIONAL AREA.
C
160    CONTINUE
       IF (C67 .NE. (C67/10)*10 ) GO TO 173
       PRINT 170,   C67,C68(1),C68(2),C68(3),C68(4)
170    FORMAT (2X,I3,4X,4A10)
       GO TO 177
173    PRINT 175,   C67,C68(1),C68(2),C68(3),C68(4)
175    FORMAT (5X,I3,4X,4A10)
177    NBAPC=C67
       LC=0
C
C      RETRIEVE METHOD OF ACCOMPLISHMENT AND RELATIVE COST DATA FOR BAAP
C      JUST PRINTED.
C
180    CONTINUE
*PL    GETD  L3ACOM NEXT.
       IF (RCODE .EQ. 04) GO TO 210
       IF (RCODE .EQ. 0) GO TO 200
       PRINT 190,RCODE,NBAPC
190    FORMAT(/* RETURN CODE = *,I2,* FOR BAAP CODE = *,I5)
       GO TO 180
```

```
200   CONTINUE
      LC=LC+1
      DMA(LC,1)=C101(1)
      DMA(LC,2)=C101(2)
      GO TO 180
C
C     ON SAME PRINT LINE AS HAAP, PRINT METHOD OF ACCOMPLISHMENT AND
C     RELATIVE COST.
C
210   IF(LC .EQ. 0) GO TO 140
      PRINT 220,((DMA(K,J),J=1,2),K=1,LC)
220   FORMAT (T49,2A10,1X,2A10,1X,2A10)
      GO TO 140
C
C     THIS BEGINS LOOP TO PROCESS A PROGRAM UNDER THE CURRENT FUNCTIONAL
C     AREA. REWIND ALL SCRATCH TAPES AND SET ALL STORAGE TO ZERO.
C
230   CONTINUE
      DO 1220 J=1,NRP
      DO 240 M=1,11
240   REWIND M
C
      MRC(1)  = 0
      DO 260 K  = 1,11
      NPC(K)=0
      NIA = NTIA(K)
      NTS(K)  = 0
      NTSS(K)  =0
      DO 250 L  = 1,NIA
      NATTRI(K,L)=0
250   NAGR(K,L)=0
260   CONTINUE
C
C     READ AND PRINT THE PROGRAM CODE AND THE NUMBER OF SUBPROGRAMS
C     UNDER THE CURRENT PROGRAM.
C
      READ 270,IPROG,NRSP
270   FORMAT(I5,I3)
C
C     ACCESS THE DESIRED PROGRAM. IF END-OF-FILE IS ENCOUNTERED, GO TO
C     THE END OF THE PROGRAM LOOP. IF AN ERROR OCCURS IN ACCESS ATTEMPT,
C     SKIP THE PROGRAM AND TRY TO RETRIEVE THE SUB-PROGRAM DATA.
C
*PL   LOCATE L2PROG WHERE C5 EQ IPROG.
*PL   GET L2PROG NEXT.
      IF(RCODE .EQ. 04) GO TO 1220
      IF(RCODE .EQ. 0) GO TO 380
      PRINT 290,RCODE,IPROG
290   FORMAT(/* RETURN CODE = *,I2,3X,* FOR PROGRAM CODE = *,I6)
      GO TO 380
```

```
C ******************************************************************
C
C     RETRIEVE PROGRAM IMPACTS AS SOON AS IMPLEMENTED IN DATA BASE.
C
C ******************************************************************
C
C     IF SUB-PROGRAMS EXIST, RESET STORAGE AREAS TO ZERO.
C
380   CONTINUE
      IF(NRSP .LT. 1) GO TO 510
C
      ISP = 0
390   ISP = ISP + 1
      MRC(1)=0
      DO 400  L  = 1, 11
      NTS(L)    = 0
      NIA = NTIA(L)
      DO 400 K  = 1,NIA
      NAGR(L,K)=0
400   CONTINUE
C
C     READ SUB-PROGRAM CODE AND NUMBER OF SUB-SUB-PROGRAMS.
C     ACCESS A SUB-PROGRAM.
C
      READ    270, ISPROG, NRSSP
*PL   GET1 L3SP WHERE C1 EQ IFUNC, AND C5 EQ IPROG, AND C8 EQ ISPROG.
      IF(RCODE .EQ. 04) GO TO 1200
      IF(RCODE .EQ. 0) GO TO 420
      PRINT 410, RCODE, ISPROG
410   FORMAT(/* RETURN CODE = *,I2,* FOR SUB-PROGRAM CODE = *,I4)
      GO TO 1200
C
C     PRINT THE SUB-PROGRAM HEADING.
C
420   CONTINUE
      PRINT 430,IPROG,NRSP,C5,C6(1),C6(2),C6(3),C8,C9(1),C9(2),C9(3)
430   FORMAT(1H1,*PROGRAM CODE = *,I6,5X,*NO. OF SUB-PROGRAMS = *,I6
     1////* PROGRAM CODE = *,I6,5X,*PROGRAM NAME = *,3A10////1H
     2*SUB-PROGRAM CODE = *,I6,5X,*SUB-PROGRAM NAME = *,3A10/)
C
C     RETRIEVE IMPACTS FOR THE CURRENT SUB-PROGRAM.
C
450   CONTINUE
*PL   GETD L4SPPA NEXT.
      IF(RCODE .EQ. 04) GO TO 490
      IF(RCODE .EQ. 0) GO TO 470
      PRINT 410, RCODE,ISPROG
      GO TO 450
C
C     IF THIS IS THE REVIEW LEVEL, SAVE REVIEW ATTRIBUTE CODE. OTHERWISE
C     SAVE ATTRIBUTE CODE.
```

```
C
470     IPA=C44
        IF(LEVEL .EQ. 2)  IPA = C46
        IF (IPA .EQ. 8) GO TO 450
C
C       IF THIS IS REVIEW LEVEL, SAVE RETRIEVED DATA. OTHERWISE, TEST DATA
C       OUTPUT RESTRICTIONS. IF THE DATA MATCHES DESIRED OUTPUT, SAVE IT.
C       SET FLAGS FOR ALL SAVED DATA.
C
        IF (LEVEL .EQ. 2) GO TO 480
        IF (AC .EQ. 1HA .AND. C43 .NE. 1HA) GO TO 450
        IF (AC .EQ. 2HAB .AND. C43 .EQ. 1HC) GO TO 450
480     NAGB(C45,IPA)=C43
        NPC(C45)=NPC(C45)+2
        NTS(C45)=1
        NTSS(C45)=1
        NATTRI(C45,IPA)=IPA
        GO TO 450
C
C       WRITE ALL SAVED IMPACT VALUES ON SCRATCH TAPES.
C
490     DO 500 L=1,11
        IF(NTS(L)    .EQ. 0) GO TO 500
        NIA = NTTA(L)
        WRITE(L) CB,(NAGB(L,M),M=1,NIA),MRC(1)
500     CONTINUE
C
C       ZERO OUT MATRIX WHICH IS TO CONTAIN THE LIST OF UNWANTED BAAPS.
C       (THIS LIST IS KEPT IN THE DATA BASE BECAUSE IT IS SHORTER IN MOST
C       CASES THAN THE LIST OF WANTED BAAPS).
C
510     CONTINUE
        DO 520 K=1,100
520     NBAAPC(K)=0
        LC=1
C
C       RETRIEVE AN UNWANTED BAAP AND STORE IT IN THE MATRIX.
C
530     CONTINUE
*PL     GETD LSIBAP NEXT.
        IF(RCODE .EQ. 04) GO TO 550
        IF(RCODE .EQ. 0) GO TO 540
        PRINT 90,RCODE,IFUNC
        GO TO 530
C
540     NBAAPC(LC)=C14
        LC=LC+1
        GO TO 530
C
C       WHEN ALL UNWANTED BAAPS HAVE BEEN RETRIEVED, PUT AN END-OF-DATA
C       MARKER AFTER THEM IN THE MATRIX.
```

```
C
550     CONTINUE
        NRAAPC(LC)=999
C
C       RETURN TO THE LIST OF RAAPS QUALIFYING FOR THE CURRENT FUNCTIONAL
C       AREA. IF AN ERROR OCCURS IN TRYING TO ACCESS THE FUNCTION, FLUSH
C       THE REMAINING PROGRAM AND SUBPROGRAM CARDS AND GO TRY THE NEXT
C       FUNCTIONAL AREA. NO DATA CAN BE RETRIEVED AFTER THIS TYPE OF ERROR
C
*PL     GET1 L1FUNC WHERE C1 EQ IFUNC.
        IF(RCODE .EQ. 0) GO TO 610
        PRINT 90,RCODE,IFUNC
        IF (ISP .EQ. NRSP) GO TO 575
        N=ISP+1
        DO 560 L=N,NRSP
560     READ 270,M
575     DO 600 K=1,NRP
        READ 270,M,NRSP
        DO  590 L =1,NRSP
590     READ 270,M
600     CONTINUE
        GO TO 1230
C
C       RETRIEVE A RAAP AND BEGIN BUILDING THE LIST OF WANTED RAAPS.
C
610     LC=0
620     LC=LC+1
630     CONTINUE
*PL     GET0  L2RAAP NEXT.
        IF(RCODE .EQ. 04) GO TO 780
        IF(RCODE .EQ.  0) GO TO 640
        PRINT  90,RCODE,IFUNC
        GO TO 630
C
C       STORE THE RAAP CODE AND SET FLAGS.
C
640     NRAPC= C67
        DO 660 M=1,11
        NTS(M)=0
        NIA=NTIA(M)
        MRC(M) =0
        DO 650 K=1,NIA
650     NAGB(M,K)=0
660     CONTINUE
C
C       IF THE NEWEST RAAP APPEARS IN THE MATRIX OF UNWANTED RAAPS, THROW
C       IT OUT AND GO RETRIEVE ANOTHER ONE. OTHERWISE, CHECK THE LEVEL
C       CODE. IF THIS IS THE REVIEW LEVEL, BRANCH DOWN TO 730.
C
670     IF (NRAAPC(LC) .EQ. C67) GO TO 620
        IF (NRAAPC(LC) .GT. C67) GO TO 680
        LC=LC+1
        GO TO 670
```

```
680   CONTINUE
      IF (C67 .NE. (C67/10)*10) GO TO 683
      PRINT 170,C67,C68(1),C68(2),C68(3),C68(4)
      GO TO 687
683   PRINT 175,C67,C68(1),C68(2),C68(3),C68(4)
687   CONTINUE
      IF (LEVEL .EQ. 2) GO TO 730
C
C     RETRIEVE ALL IMPACT VALUES FOR THIS BAAP.
C
690   CONTINUE
*PL   GETD L3IMPA NEXT.
      IF(RCODE .EQ. 04) GO TO 760
      IF(RCODE .EQ. 0) GO TO 710
      PRINT  90,RCODE,IFUNC
      GO TO 690
C
C     IF THE IMPACT VALUES MEET THE OUTPUT RESTRICTIONS, THEN STORE IT
C     AND SET FLAGS TO INDICATE ITS PRESENCE.
C
710   CONTINUE
      IF (C17 .EQ. B) GO TO 690
      IF (C16 .EQ. X .OR. C16 .EQ. Y .OR. C16 .EQ. Z) GO TO 720
      IF (AC .EQ. 1HA .AND. C16 .NE. 1HA) GO TO 690
      IF (AC .EQ. 2HAB .AND. C16 .EQ. 1HC) GO TO 690
      NAGB(C18,C17)=C16
      NTS(C18)=1
      NTSS(C18)=1
      NATTRI(C18,C17) = C17
      GO TO 690
C
720   MRC(C18) =C17
      GO TO 690
C
C     RETRIEVE ALL REVIEW LEVEL IMPACT VALUES FOR THIS BAAP. (THIS CODE
C     IS ONLY EXECUTED WHEN IN THE REVIEW LEVEL).
C
730   CONTINUE
*PL   GETD L3REVA NEXT.
      IF(RCODE .EQ. 04) GO TO 760
      IF(RCODE .EQ. 0) GO TO 740
      PRINT  90,RCODE,IFUNC
      GO TO 730
C
C     STORE THE REVIEW-LEVEL IMPACT VALUES AND SET FLAGS.
C
740   CONTINUE
      IF (C22 .EQ. B) GO TO 730
      IF (C21 .EQ. X .OR. C21 .EQ. Y .OR. C21 .EQ. Z) GO TO 750
      NAGB(C23,C22)=C21
      NTS(C23)=1
```

```
      NTSS(C23)=1
      NATTRI(C23,C22)=C22
      GO TO 730
C
750   MRC(C23) = C22
      GO TO 730
C
C     WRITE ALL IMPACT VALUES ONTO SCRATCH TAPES -- ONE TECHNICAL
C     SPECIALTY PER TAPE.
C
760   CONTINUE
      DO 770 L=1,11
      IF (NTS(L) .EQ. 0) GO TO 770
      NIA=NTIA(L)
      WRITE(L) NRAPC,(NAGR(L,M),M=1,NIA),MRC(L)
770   CONTINUE
      GO TO 630
C
C     ALL HAARS AND IMPACTS (BOTH PROGRAM AND SUB-PROGRAM LEVELS) ARE
C     NOW ON SCRATCH TAPES, ONE TECHNICAL SPECIALTY TO A TAPE. FOR EACH
C     RAAP ON TAPE, THERE IS A SPACE FOR DATA FOR EVERY ATTRIBUTE.
C     HOWEVER, SOME ATTRIBUTES HAVE NO IMPACT ON A GIVEN TECHNICAL
C     SPECIALTY. BEFORE PRINTING THE IMPACT MATRIX, THESE BLANK COLUMNS
C     MUST BE SQUEEZED OUT.
C
C     REWIND ALL SCRATCH TAPES.
C
780   CONTINUE
      DO 790 M=1,11
      END FILE M
790   REWIND M
C
C     ZERO OUT STORAGE WHICH WILL CONTAIN IMPACT DATA.
C
      DO 1190 L=1,11
      DO 800 K=1,150
      ICC(K)=0
      NRAAPC(K)=0
800   NRAAPC(K+150)=0
C
C     WHEN NTSS(L) = 0, IT SHOWS THAT NO IMPACT DATA FOR TECHNICAL
C     SPECIALTY  L  EXISTS FOR THE FUNCTIONAL AREA BEING PROCESSED.
C
      IF(NTSS(L)    .EQ. 0) GO TO 1190
      NIA = NTIA(L)
C
C     BECAUSE A PRINT-LINE IS ONLY 132 CHARATERS LONG,  ONLY 35 ATTRI-
C     BUTES CAN BE OUTPUT PER LINE. THIS MEANS THAT THE IMPACT MATRIX
C     MUST BE PRINTED IN UP TO 3 PIECES. THIS SECTION SETS UP THE BEGIN-
C     NING AND ENDING COLUMN NUMBERS FOR THE MATRIX SEGMENT TO BE OUTPUT
C     NEXT AND PRINTS THE OUTPUT HEADER AND THE MATRIX HEADING.
```

```
C
      LC = 0
      DO 810 M = 1, NIA
      IF (NATTRI(L,M) .EQ. 0) GO TO 810
      LC = LC + 1
      ICC(LC) = M
810   CONTINUE
C
      LTIM =0
      DO 930 K=1,LC,35
      PRINT 820,C8,C9(1),C9(2),C9(3),(TSN(L,M),M=1,2)
820   FORMAT(1H1,25X,*SUB-PROGRAM CODE = *,I6,4X,*SUB-PROGRAM NAME = *,
     13A10///40X,*TECHNICAL SPECIALTY = *,2A10/40X,41(1H-)///)
      PRINT 825
825   FORMAT(50X,*ATTRIBUTES*)
      IF(K+35 .GT. LC) PRINT 830
830   FORMAT(1H+,104X,*CONTROVERSIAL*)
      PRINT 840
840   FORMAT(/119X,*MIT C  RAM C*)
      LC6=K+34
      IF (LC6 .GT. LC) LC6=LC
      PRINT 850,(ICC(M),M=K,LC6)
850   FORMAT(2X,*BAAP NO.*,1X,35I3)
      PRINT 855
855   FORMAT(2X,115(1H-)//)
      IF (K .NE. 1) GO TO 910
C
C     READ IN IMPACT VALUES FOR ONE BAAP FOR THIS TECHNICAL SPECIALTY.
C     IF ALL BAAPS HAVE BEEN READ, GO PRINT SECOND AND THIRD PARTS OF
C     IMPACT ARRAY.  OTHERWISE, FORM PRINT LINE (IN 3 PARTS).  PRINT
C     FIRST PART AND STORE THE REST.
C
860   CONTINUE
      LTIM=LTIM+1
      READ(L) NBAPC,(NAGB(L,M),M=1,NIA),MRC(LTIM)
      IF (EOF(L))930,870
C
870   CONTINUE
      LC2=0
      DO 890 M=1,NIA
      IF (NATTRI(L,M) .EQ. 0) GO TO 890
      LC2=LC2+1
      IF (LC2 .GT.35) GO TO 880
      AGB(LC2)=NAGB(L,M)
      GO TO 890
C
880   CONTINUE
      IF(LTIM .LE. 100) DMA(LTIM,LC2-35) = NAGB(L,M)
890   CONTINUE
```

```
C
      NRAAPC(LTIM)=NRAPC
      PRINT 900,NRAPC,(AGR(M),M=1,LC6)
900   FORMAT (4X,I5,3X,35(1X,A1,1X),2X,I7)
      PRINT 905,MRC(LTIM)
905   FORMAT(1H+,11HX,I7)
      GO TO 860
C
C     WHEN ALL RAAPS HAVE BEEN READ, PRINT THE SECOND AND THIRD PARTS
C     OF THE IMPACT ARRAY.
C
910   CONTINUE
      LTIM = LTIM - 1
      DO 920 N=1,LTIM
920   PRINT 900,NRAAPC(N),(DMA(N,M-35),M=K,LC6)
      PRINT 905,MRC(N)
930   CONTINUE
C
C     RETRIEVE NAMES AND CODES OF ALL ATTRIBUTES HAVING AN IMPACT ON
C     THIS TECHNICAL SPECIALTY.
C
*PL   GETI LITS WHERE C301 EQ L.
      IF(RCODE .EQ. 04) GO TO 1190
      IF(RCODE .EQ. 01 GO TO 950
      PRINT 940,RCODE,L
940   FORMAT(/* RETURN CODE = *,I3,* FOR TECHNICAL SPECIALTY *,I3)
      GO TO 1190
C
C     PRINT HEADER FOR LIST OF ATTRIBUTES.  IF REVIEW LEVEL, GO TO 1020.
C
950   PRINT 820,C8,C9(1),C9(2),C9(3),C3(1),C3(2)
      IF(LEVEL .EQ. 2) GO TO 1020
      PRINT 970
970   FORMAT(//1X,*IMP. ATTRI. CODE*, 3X,*ATTRI. NAME*,32X,*SUB-PARAMETR
     1IC NAME*,13X,*PARAMETRIC NAME*,7X,*TEXT CODE*/1X,16(1H-),3X,
     211(1H-),32X,19(1H-),13X,15(1H-),7X,9(1H-)/)
C
980   CONTINUE
*PL   GETD L2ATTR NEXT.
      IF(RCODE .EQ. 04) GO TO 1080
      IF(RCODE .EQ. 0) GO TO 1000
      PRINT 940,RCODE,L
      GO TO 980
C
C     PRINT A LISTING OF ALL ATTRIBUTES HAVING AN IMPACT ON THIS TECHNI-
C     CAL SPECIALTY.
C
1000  IF(NATTRI( L ,C77) .NE. C77) GO TO 980
      IF(C80(1) .NE. 6H-NULL-) GO TO 1005
      C80(1)=10H
      C80(2)=10H
      C80(3)=10H
```

```
1005  CONTINUE
      PRINT 1010,C77,C78(1),C78(2),C78(3),C78(4),C80(1),C80(2),C80(3),
     1C79(1),C79(2),C82
1010  FORMAT( 7X,I3,10X,4A10,3X,3A10,2X,2A10,5X,I3)
      GO TO 980
C     PRINT HEADING FOR THE REVIEW ATTRIBUTES.
C
1020  PRINT 1030
1030  FORMAT(//5X,*REV. ATTRI. CODE*,10X,*REVIEW ATTRIBUTE NAME*,40X,
     1*TEXT CODE*/5X,15(1H-),10X,21(1H-),40X,9(1H-)//)
C
C     RETRIEVE REVIEW LEVEL ATTRIBUTES HAVING AN IMPACT ON THIS TECHNI-
C     CAL SPECIALTY. PRINT THE LISTING OF REVIEW ATTRIBUTES.
C
1040  CONTINUE
*PL   GET0 L2REV NEXT.
      IF(RCODE .EQ. 04) GO TO 1080
      IF(RCODE .EQ. 0) GO TO 1060
      PRINT  940,RCODE,L
      GO TO 1040
C
1060  IF (NATTRI(L,C89) .NE. C89) GO TO 1040
      PRINT 1070,  C89, C90(1), C90(2), C90(3),C90(4),C91
1070  FORMAT(12X,I2,16X,4A10,25X,I3)
      GO TO 1040
C
C     PRINT HEADER FOR BAAP LISTING. RETRIEVE NAMES AND CODES OF BAAPS
C     HAVING AN IMPACT ON THIS TECHNICAL SPECIALTY.
C
1080  CONTINUE
      PRINT 820,C8,C9(1),C9(2),C9(3),C3(1),C3(2)
      PRINT 1090
1090  FORMAT(//2X,*IMP. BAAP CODE*,4X,*IMP. BAAP NAME*/2X,14(1H-),4X,
     114(1H-)//)
      IF(NPC(L) .EQ. 1) PRINT 1100,C5,C6(1),C6(2),C6(3)
1100  FORMAT(5X*P*I5,8X,3A10)
      IF(NPC(L) .GT. 1) PRINT 1120,C8,C9(1),C9(2),C9(3)
1120  FORMAT(4X*SP*I5,8X,3A10)
C
1130  CONTINUE
*PL   GET1 L1FUNC WHERE C1 EQ IFUNC.
      IF(RCODE .EQ. 04) GO TO 1190
      IF(RCODE .EQ. 0) GO TO 1140
      PRINT 90,RCODE,IFUNC
      GO TO 1200
C
1140  CONTINUE
      LC = 1
C
1150  CONTINUE
```

```
*PL    GETD L2BAAP NEXT.
       IF(RCODE .EQ. 04) GO TO 1190
       IF(RCODE .EQ. 0) GO TO 1170
       PRINT  90 ,RCODE,IFINC
       GO TO 1150
C
C      PRINT A LISTING OF THOSE BAAPS HAVING AN IMPACT ON THIS TECHNICAL
C      SPECIALTY.
C
1170   CONTINUE
       IF (NBAAPC(LC) .GT. C67) GO TO 1150
       PRINT 1180,C67,C68(1),C68(2),C68(3),C68(4)
1180   FORMAT (5X,I5,8X,4A10)
       LC=LC+1
       IF (LC .LE. LTIM) GO TO 1150
C
C      END OF SUB-PROGRAM LOOP. REWIND ALL TAPES. GO PROCESS THE NEXT
C      SUB-PROGRAM.
C
1190   CONTINUE
1200   DO 1210 M=1,11
1210   REWIND M
       IF (ISP .LT. NRSP) GO TO 390
C
C      END OF PROGRAM LOOP. GO PROCESS NEXT PROGRAM.
C
1220   CONTINUE
C
C      END OF FUNCTION LOOP. GO PROCESS NEXT FUNCTION.
C
1230   CONTINUE
C
C      CLOSE THE DATA BASE AND TERMINATE THE PROGRAM.
C
1240   CONTINUE
*PL    CLOSE DABJCT.
*PL    END PROCEDURE.
*PL    STOP S2K.
       CALL EXIT
       STOP
       END
0000000000000000000000
DA-PROJECT DATA BASE PILOT MODEL ON SYSTEM 2K PLI.
01
01012ABC
01900  1
01910  0
0000000000000000000000          END - OF - INFORMATION
```

2 SAMPLE OUTPUT

For the construction of airfield pavements, the Technical Specialties groundwater and earth science were selected; for the construction of training facilities, the Technical Specialties ecology and regional economics were selected.

FUNCTIONAL AREA 1 -- CONSTRUCTION

BAAP NO.	BAAP NAME	METHOD OF ACCOMPLISHMENT (RELATIVE COST)		
10	SITE ACCESS/DELIVERY			
11	RAILROAD ACCESS/DELIVERY	USE EXISTING	BUILD TEMPORARY	BUILD PERMANENT
12	ROAD ACCESS/DELIVERY	USE EXISTING	BUILD TEMPORARY	BUILD PERMANENT
		NO ROAD		
13	WATER ACCESS/DELIVERY	BRIDGES	FORDS	CULVERTS
		PORTABLE BRIDGES	BARGES	FERRIES
		SHIPS	CANALS	
14	AIR ACCESS/DELIVERY	AIRPLANE	HELICOPTER	AIRDROP
		BALLOONS		
15	PIPELINE DELIVERY	USE EXISTING	BUILD TEMPORARY	BUILD PERMANENT
16	CONTINUOUS BELT DELIVERY	USE EXISTING	BUILD TEMPORARY	BUILD PERMANENT
17	CABLEWAY ACCESS/DELIVERY	USE EXISTING	BUILD TEMPORARY	BUILD PERMANENT
18	ELECTRICAL POWER DELIVERY	USE EXISTING	BUILD TEMPORARY	BUILD PERMANENT
		UNDERGROUND	POLE AND LINE	
30	PRELIMINARY WORKS-PERM OR TEMP			
31	ASPHALT OPERATIONS	CENTRAL PLANT	TRAVEL PLANT	ROAD MIX
32	CANTEEN OPERATION	MOBILE UNIT	SNACK-BAR	USE EXISTING
33	CONCRETE OPERATIONS	HAND MIX	PORTABLE MIXERS	WET BATCH PLANT
		DRY BATCH PLANT		
34	AGGREGATE PRODUCTION	USE EXISTING	BUILD TEMPORARY	
35	FIELD MAINT FAC OPERATION	ON-SITE	CENTRAL SHOP	CONTRACT SHOP
36	FIELD TESTING LAB OPERATION	CENTRAL SHOP	MOBILE LAB	CONTRACT LAB
37	CRAFT SHOP OPERATION	CENTRAL SHOP	MOBILE SHOP	CONTRACT SHOP
38	FUEL STOR + DISP-TRUCKS ETC	USE EXISTING	MOBILE SUPPLY	CENTRAL SUPPLY
		JOB SITE SUPPLY		
39	FIELD LAUNDRY OPERATION	USE EXISTING SOURCES	ON-SITE SELF SERVICE	CONTRACT LAUNDRY
41	MEDICAL FACILITY OPERATION	ON-SITE FACILITIES	ON-CALL UNITS	OFF-SITE EXISTING
42	MESS HALL OPERATION	TEMP ON-SITE	PERM ON-SITE	OFF-SITE EXISTING
43	OFFICES OPERATION	ON-SITE TRAILER	ON-SITE TEMP BLDS	RENT OFF-SITE
44	QUARTERS OPERATION	ON-SITE TEMP BLDS	ON-SITE TENTS	OFF-SITE EXISTING
		NO SET QUARTERS		
45	STORAGE YARD OPERATION	CENTRAL SUPPLY	JOB SITE SUPPLY	
46	STORES-WAREHOUSES OPERATION	ON-SITE TEMP BLDS	USE EXISTING	
47	SURFACE DRAINAGE CONTROL	DIVERSION STRUCTURES	DITCHING	TEMP PONDING
		USE EXIST DRAINAGE		
48	GROUND-WATER CONTROL	PUMPS	DRAINS	SHEET PILING
		FREEZING	GROUTING	MEMBRANES
		WELL POINTS		
60	UTILITIES			
61	COMPRESSED AIR PRODUCTION	USE EXISTING	ELECTRIC COMPRESSOR	GASOLINE COMPRESSOR

		BATTERY COMPRESSOR	LP GAS COMPRESSOR	DIESEL COMPRESSOR
		STEAM COMPRESSOR		
62	ELECTRIC UTILITIES PROVISION	MOBILE GENERATORS	COMMERCIAL TIE-IN	
63	HEAT PROVISION	OIL	GAS	ELECTRIC
		WOOD	COAL	STEAM
64	SOLID WASTE HANDLING	OPEN BURNING	AIR CURTAIN INCNRT	ON-SITE LANDFILL
		OFF-SITE INCNRT	OFF-SITE LANDFILL	
65	TOXIC LIQ/INDUST WASTE HANDLING	OFF-SITE TREATMENT	ON-SITE PLANT	
66	SEWAGE WORKS PROVISION	PIT	HOLDING POND	SEPTIC SYSTEM
		PORT CHEMICAL UNIT	BURNOUT LATRINE	SEWER TIE-IN
		ON-SITE PLANT	NO TREATMENT	
67	WATER WORKS PROVISION	COMMERCIAL TIE IN	CENTRAL PICK-UP	PORTABLE TREATMENT
		MOBILE PICK-UP	NO TREATMENT	
68	AIR CONDITIONING PROVISION	GASOLINE	GAS	ELECTRIC
		STEAM		
70 SITE PREPARATION				
71	EXPLORATION OF SITE			
72	SURVEY LAYOUT OF SITE			
73	CLEARING SITE	DOZER	EXPLOSIVES	HAND
		CHAIN SAW	FRONT-END LOADER	
74	GRUBBING SITE	DOZER	GRADER	FRONT-END LOADER
		HAND		
75	STUMPING SITE	DOZER	RIPPER	SHOVEL
		BACKHOE	FRONT-END LOADER	EXPLOSIVES
		HAND		
80 DEMOLITION				
81	CONCRETE DEMOLITION	PNEUMATIC TOOLS	HAND TOOLS	HYDRAULIC TOOLS
		EXPLOSIVES	DOZER	BACKHOE
		CUTTING	STEEL BALL	
82	STEEL DEMOLITION	BULLDOZER	EXPLOSIVES	CUTTING
83	LUMBER DEMOLITION	DISMANTLING	INCINERATION	BULLDOZER
84	BRICK DEMOLITION	PNEUMATIC TOOLS	HAND TOOLS	HYDRAULIC TOOLS
		EXPLOSIVES	DOZER	
90 REMOVAL AND DISPOSAL				
91	BRUSH REMOVAL/DISPOSAL	MARKETABLE GOODS	OPEN BURNING	AIR CURTAIN BURNING
		INCINERATION	CHIPPER	LANDFILL
92	TREE REMOVAL/DISPOSAL	MARKETABLE GOODS	OPEN BURNING	AIR CURTAIN BURNING
		INCINERATION	LANDFILL	CHIPPER
93	LUMBER REMOVAL/DISPOSAL	MARKETABLE GOODS	OPEN BURNING	AIR CURTAIN BURNING
		LANDFILL		
94	CONCRETE REMOVAL/DISPOSAL	RIP RAP	LANDFILL	AGGREGATE
95	STEEL REMOVAL/DISPOSAL	SALVAGE	LANDFILL	
100 EXCAVATION				
101	TOPSOIL STRIPPING	STRIP + STORE	HAUL + FILL	AREA STRIP
		CONTOUR STRIP	FAIRWAY STRIP	CUT + DISPOSE
102	GRADING	GRADER	BULLDOZER	SCRAPER
		FRONT-END LOADER	HAND	
103	FOOTINGS EXCAVATION	BACKHOE	TRENCHER	SHOVEL

104	TRENCH AND BACKFILL OPERATIONS	HAND	EXPLOSIVES	DRAGLINE
		BACKHOE	TRENCHER	POWER SHOVEL
		DOZER	HAND	FRONT-END LOADER
		DRAGLINE		
105	CHANNELING	DRAGLINE	BACKHOE	POWER SHOVEL
		FRONT-END LOADER	DOZER	HAND
106	DREDGING	HOPPER DREDGE	PIPELINE DREDGE	
120	EARTHWORKS AND BORROWING			
121	LOOSEN-EARTHWORKS	RIPPER	PLOW	EXPLOSIVES
		HAND		
122	EXCAVATE	DOZER	SCRAPER	GRADER
		SHOVEL	HAND	FRONT-END LOADER
		DRAGLINE		
123	LOAD	DOZER	FRONT-END LOADER	SHOVEL
		BACKHOE	HAND	DRAGLINE
124	HAUL	SCRAPER	TRUCK	HAND
125	DUMP	HAND	TRUCK	SCRAPER
126	CONSOLIDATE/COMPACT SOIL	FLOATATION	TAMPING ROLLERS	SMOOTH WHEEL ROLLERS
		PNEU. TIRED ROLLERS	VIBRATING ROLLERS	MANUAL COMPACTOR
127	TRIM AND FINISH	DOZER	GRADER	FRONT-END LOADER
		HAND		
130	ROCK EXCAVATION AND QUARRYING			
131	CUT	HAND	ROCK SAW	JACK HAMMER
		WATER/SAND JET		
132	DRILL	CORE	SHOT	PERCUSSION
		ROTARY	FUSION-PIERCING	CHURN
133	LOOSEN	PRE-SPLITTING	HYDRAULIC BUSTERS	HAND
		EXPLOSIVES		
134	LOAD	DOZER	HAND	FRONT-END LOADER
		SHOVEL	BACK-HOE	STIFF LEG DERRICK
135	HAUL	RAILROAD CARS	HAND	TRUCK
		DOZER W/TRAILER	STONE BOAT	
136	DUMP	SIDE DUMP	BOTTOM DUMP	REAR DUMP
		CRANE ASSISTED		
140	TUNNELING AND SUBSURFACE EXCVTN			
141	CUT	TUNNELING MACHINE	JACK HAMMER	ROCK-SAW
		HAND	PLUG + FEATHER	
142	DRILL	CORE	SHOT	PERCUSSION
		ROTARY	FUSION-PIERCING	CHURN
143	LOOSEN	PRE-SPLITTING	HYDRAULIC BUSTERS	HAND
		EXPLOSIVES	RIPPING	DIGGING
		LINE DRILLING		
144	LOAD	DOZER	POWER SHOVEL	FRONT-END LOADER
		HAND	MUCKING MACHINE	
145	HAUL	RAILROAD CARS	TRUCK	WHEELBARROW
		CONVEYOR BELT		
146	DUMP	FROM WHEELBARROW	FROM TRUCK	FROM CONVEYOR BELT
		FROM RAILROAD CARS		

147	DRAIN	GRAVITY	PUMP	
148	SUPPORT LINE	CONCRETE	TIMBER	MASONRY
		STEEL		
160	FOUNDATIONS(BLDGS AND ROADS)			
161	SUBGRADE CONSOLIDATION/COMPACTION	NONE	TAMPER	ROLLER
162	BASE COURSE	GRAVEL	COMPACTED SOIL	CRUSHED ROCK
		BITUMINOUS MIX		
163	FOOTINGS	CRANE PLACED	HAND PLACED	CHUTE PLACED
		PUMP PLACED		
164	PILES	TIMBER	STEEL H	STEEL PIPE
		STEEL SHELL	PRE-CAST CONCRETE	CAST IN PLACE CONCRT
		COMPOSITE		
165	MAT OR RAFT			
166	CASSIONS			
167	COFFERDAMS	EARTH	SHEET PILING	
168	DEWATERING	PUMPS	ELECTRO-OSMOSIS	WELL POINTS
		MEMBRANES	GROUTING	
169	DRAINING	GRAVITY		
180	BITUMINOUS CONSTRUCTION			
181	RAW MATERIALS DELIVERY	RAILROAD	ROAD	WATER
		PIPELINE		
182	MIXING-BITUM	GRADER	ROTARY TILLER	HOT MIX PLANT
183	LOADING-BITUM	HOPPER	FRONT-END LOADER	CONVEYOR
		POWER SHOVEL		
184	HAULING-BITUM	ASPHALT DISTRIBUTOR	TRUCK	
185	PLACING-BITUM	PAVER	SPREADER	GRADER
		FINISHER		
186	ROLLING	PNEU. TIRED ROLLER	VIBRATORY ROLLER	STEEL WHEEL ROLLER
		TAMPING FOOT		
187	CURING/SEALING-BITUM	RAPID CURE	SLOW CURE	TACK COAT
		SLURRY SEAL		
200	CONCRETE CONSTRUCTION			
201	RAW MATERIALS DELIVERY	RAILROAD	ROAD	WATER
		PIPELINE	CONVEYOR	
202	FORMING	WOOD	METAL	SLIP FORM
		LIFT SLAB	PAPER TUBING	FIBREGLASS
203	REINFORCING	MESH	PRE-STRESSED BARS	REBARS
		MATS	FIBROUS	
204	MIXING	PORTABLE MIXERS	BATCH PLANT	PAVER
205	LOADING	HOPPER	HAND	FRONT-END LOADER
		CRANES	CONVEYORS	
206	HAULING	TRUCK	CONVEYORS	HAND BUGGIES
		BUCKETS	SLIDES	POWER BUGGIES
207	PLACING CONCRETE	BUCKET	CHUTE	PUMP
		HAND BUGGIES	PAVERS	FORMRIDING SPREADERS
		CONVEYORS	POWER BUGGIES	TREMIES

208	FINISHING CONCRETE	VIBRATORS	MACHINE FINISH	BURLAP DRAG
		HAND FINISH	EXPOSED AGGREGATE	
209	CURING/SEALING	SPRINKLING	FORCED AIR	MOIST COVERINGS
		ELECTRIC DRYING	BITUMEN SEAL	WATERPROOFING
		SILICONE		
211	STRIP AND CLEAN FORMS	HAND CLEAN	ACID CLEAN	
212	SAWING AND JOINT INSTALLATION	WET SAW	DRY SAW	
220	MASONRY CONSTRUCTION			
221	RAW MATERIALS DELIVERY	RAILROAD	AIR	WATER
		ROAD		
222	MORTAR MIX	HAND MIX	DRUM MIX	
223	SCAFFOLDING	PRE-FAB	ON-SITE FABRICATION	
224	HOIST	HAND	CRANE	ELEVATOR
		CONVEYOR		
225	PLACE-MASONRY	HAND	BUCKET	
226	POINTING			
227	CLEANING	ACID WASH	SANDBLAST	
240	STEEL CONSTRUCTION			
241	RAW MATERIALS DELIVERY	RAILROAD	HELICOPTER	WATER
		ROAD		
242	FABRICATION	SUPPLY YARD FAB	ON-SITE	PLANT
243	STRESS RELIEVING	HEAT TREATING	VIBRATORY	
244	MATERIAL HAULING	TRUCK	HELICOPTER	CRANE
245	ERECTION	PLATFORM HOIST	BUILDING CRANE	MOBILE CRANE
		JACKS		
246	FASTENING	RIVETS	WELDING	BOLTS
260	LUMBER CONSTRUCTION			
261	RAW MATERIALS DELIVERY	RAILROAD	AIR	WATER
		ROAD		
262	PEST/INSECT PROTECTION	PAINT	VARNISH	CREOSOTE
		INSECTICIDE	PENTA	
263	FASTENING	NAILS	SCREWS	BOLTS
		GLUE	STAPLES	
264	FRAMING	PRE-FAB	ON-SITE	
265	SHEATHING	WOOD PLANK	PLYWOOD	INSULATION BOARD
		COMPOSITION BOARD		
270	FINISHING OPERATIONS			
271	DOORS, WINDOWS	WOOD	METAL	PLASTIC/VINYL
272	ELECTRIC	SILVER(SPEC APPLIC)	COPPER	ALUMINUM
273	PLUMBING	ALUMINUM	GLASS	COPPER
		STEEL	CAST IRON	RUBBER
		PLASTIC	CERAMIC	
274	HEATING	GAS	OIL	COAL
		ELECTRIC	STEAM	SOLAR
		HEAT PUMP		
275	AIR CONDITIONING	GAS	ELECTRIC	STEAM

		REVERSE HEAT PUMP	EVAPORATIVE	
276	INSULATION	GLASS WOOL	ASBESTOS	VOID SPACE
		VACUUM	VERMICULITE PELLETS	CORK
		ALUMINUM FOIL	INSULATING BOARD	FIBREGLASS
		PRECAST FOAM	FOAM IN PLACE	
277	SIDING	ALUMINUM	STEEL	WOOD
		VINYL	BRICK	STONE
		BLOCK	FIBREGLASS	ASBESTOS
		MASONITE		
278	ROOFING	WOOD	CONCRETE	LITE-WEIGHT CONCRETE
		CLAY TILES	STEEL	COPPER
		COMPOSITION SHINGLE	ROLL	BUILT-UP
279	FLOORING	WOOD	STEEL	CONCRETE PLANK
		CONCRETE	STONE	CERAMIC
		VINYL TILE	CARPETING	SHEET FLOORING
		QUARRY TILE		
281	WALL	DRYWALL	PLASTER	PANELLING
		STONE	BRICK	BLOCK
		GLASS BLOCK	SPRAYED ASBESTOS	
282	CEILING	PLASTER	EXPOSED BEAM	SUSPENDED TILE
		DRYWALL	SPRAYED ASBESTOS	PLYWOOD
283	ORNAMENTATION			
284	PAINTING	LATEX	LEAD	OIL(NON-LEAD)
		URETHANES		
285	FURBISHING(LANDSCAPE-PLANTING-SEEDING)	SEED LAWNS	SHRUBS	ANNUALS
		TREES	SOD LAWNS	MULCH
286	COMMUNICATIONS	TELEPHONE	TELETYPE	RADIO
		TELEVISION	INTERCOM	MICROWAVE

PROGRAM -- OPER AND TRAIN FAC
SUB-PROGRAM 1110 -- AIRFIELD PAVEMENTS

BAAP NO.	BAAP NAME
10	SITE ACCESS/DELIVERY
11	RAILROAD ACCESS/DELIVERY
12	ROAD ACCESS/DELIVERY
13	WATER ACCESS/DELIVERY
14	AIR ACCESS/DELIVERY
15	PIPELINE DELIVERY
16	CONTINUOUS BELT DELIVERY
17	CABLEWAY ACCESS/DELIVERY
18	ELECTRICAL POWER DELIVERY
30	PRELIMINARY WORKS-PERM OR TEMP
31	ASPHALT OPERATIONS
32	CANTEEN OPERATION
33	CONCRETE OPERATIONS

34 AGGREGATE PRODUCTION
35 FIELD MAINT FAC OPERATION
36 FIELD TESTING LAB OPERATION
37 CRAFT SHOP OPERATION
38 FUEL STOR + DISP-TRUCKS ETC
39 FIELD LAUNDRY OPERATION
41 MEDICAL FACILITY OPERATION
42 MESS HALL OPERATION
43 OFFICES OPERATION
44 QUARTERS OPERATION
45 STORAGE YARD OPERATION
46 STORES-WAREHOUSES OPERATION
47 SURFACE DRAINAGE CONTROL
48 GROUND-WATER CONTROL

60 UTILITIES
61 COMPRESSED AIR PRODUCTION
62 ELECTRIC UTILITIES PROVISION
63 HEAT PROVISION
64 SOLID WASTE HANDLING
65 TOXIC LIQ/INDUST WASTE HANDLING
66 SEWAGE WORKS PROVISION
67 WATER WORKS PROVISION
68 AIR CONDITIONING PROVISION

70 SITE PREPARATION
71 EXPLORATION OF SITE
72 SURVEY LAYOUT OF SITE
73 CLEARING SITE
74 GRUBBING SITE
75 STUMPING SITE

80 DEMOLITION
81 CONCRETE DEMOLITION
83 LUMBER DEMOLITION

90 REMOVAL AND DISPOSAL
91 BRUSH REMOVAL/DISPOSAL
92 TREE REMOVAL/DISPOSAL
93 LUMBER REMOVAL/DISPOSAL
94 CONCRETE REMOVAL/DISPOSAL

100 EXCAVATION
101 TOPSOIL STRIPPING
102 GRADING
103 FOOTINGS EXCAVATION
104 TRENCH AND BACKFILL OPERATIONS

120 EARTHWORKS AND BORROWING
121 LOOSEN-EARTHWORKS
122 EXCAVATE
123 LOAD
124 HAUL
125 DUMP

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   126     CONSOLIDATE/COMPACT SOIL
   127     TRIM AND FINISH
160     FOUNDATIONS(BLDGS AND ROADS)
   161     SUBGRADE CONSOLIDATION/COMPACTION
   162     BASE COURSE
   163     FOOTINGS
   165     MAT OR RAFT
   169     DRAINING
180     BITUMINOUS CONSTRUCTION
   181     RAW MATERIALS DELIVERY
   182     MIXING-BITUM
   183     LOADING-BITUM
   184     HAULING-BITUM
   185     PLACING-BITUM
   186     ROLLING
   187     CURING/SEALING-BITUM
200     CONCRETE CONSTRUCTION
   201     RAW MATERIALS DELIVERY
   202     FORMING
   203     REINFORCING
   204     MIXING
   205     LOADING
   206     HAULING
   207     PLACING CONCRETE
   208     FINISHING CONCRETE
   209     CURING/SEALING
   211     STRIP AND CLEAN FORMS
   212     SAWING AND JOINT INSTALLATION
270     FINISHING OPERATIONS
   272     ELECTRIC
   284     PAINTING
   285     FURBISHING(LANDSCAPE-PLANTING-SEEDING)
   286     COMMUNICATIONS

FOR THIS SUBPROGRAM, IMPACTS ABC WILL BE PRINTED AT LEVEL 1
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SUB-PROGRAM 1110 -- AIRFIELD PAVEMENTS
TECHNICAL SPECIALTY 5 -- GROUND WATER

ATTRIBUTES

BAAP NO.	1	2	4	6	7	8	9	10	11	12	14	15	17	18	32	33	36	37	41	42	50	55	56
71		C								C	C		C	C	C		C	C	C	C	C		
73			B	A			A						B		B	B	B						
74			B	A			A						B		B	B	B						
75			B	A			A						B		B	B	B						
81				C			B						B		B	B	B						
83				C			C						B		B	B	B						
91			B	A			A			B	A	A	B		B	A			B	B			A
92			B	A			A			B	A	A	B		B	A			B	B			A
93			C	C			C			B	A	A	B		B	A			B	B			A
94				C			B			B	A	A	B		B	A			B	B			A
101	C			A		C	B	B									B		C				
102	C			A		C	B	B									B		C				
103	C			A		C	B	C									B		C				
104	C			A		C	B	B									B		C				
121	C			B		C	B	B	B								B		C			A	
122	C			B		C	B	B	B								B		C			A	
125	C			B		C	B	C	C								B		C			A	
126	C			B		C	B	B	B								B		C			A	
161	C			B			C		C								B		C				
162	C			B			A		C								B		C				
163	C			B			C		C								B		C			A	
165				B			C																
169				A	A	B	B	B	A								B		C				
185				B			B		B														
207				B			B		B														

SUB-PROGRAM 1110 -- AIRFIELD PAVEMENTS
TECHNICAL SPECIALTY 5 -- GROUND WATER

ATTRIBUTES

IMP. ATTR. CODE	ATTR. NAME	SUB-PARAMETRIC NAME	PARAMETRIC NAME	TEXT CODE
1	TURBIDITY	WATER QUALITY	PHYS ENVRN	X
2	WATER TEMPERATURE	WATER QUALITY	PHYS ENVRN	X
4	DISSOLVED GASES	WATER QUALITY	PHYS ENVRN	X
6	DEPTH TO WATER TABLE	AQUIFER CHAR	PHYS ENVRN	X
7	DEPTH TO PIEZOMETRIC SUR	AQUIFER CHAR	PHYS ENVRN	X
8	AQUIFER PARAMETERS	AQUIFER CHAR	PHYS ENVRN	X
9	RECHARGE RATES	AQUIFER CHAR	PHYS ENVRN	X
10	DISCHARGE RATES	AQUIFER CHAR	PHYS ENVRN	X
11	AVLBLTY OF GROUND WATER	AQUIFER CHAR	PHYS ENVRN	X
12	IRON	INORGANIC	CHEM ENVRN	X
14	SODIUM	INORGANIC	CHEM ENVRN	X
15	CALCIUM	INORGANIC	CHEM ENVRN	X
17	NITROGEN	INORGANIC	CHEM ENVRN	X
18	PHOSPHORUS	INORGANIC	CHEM ENVRN	X
32	ALKALIMITY AND ACIDITY	INORGANIC	CHEM ENVRN	X
33	HYDROGEN ION (PH)	INORGANIC	CHEM ENVRN	X
36	TOTAL DISSOLVED SOLIDS	INORGANIC	CHEM ENVRN	X
37	CHLORIDE	INORGANIC	CHEM ENVRN	X
41	BOD	ORGANIC	CHEM ENVRN	X
42	COD	ORGANIC	CHEM ENVRN	X
50	BIOCIDES	PESTICIDES	CHEM ENVRN	X
55	AQUIFER YIELD		CNTRVSL	X
56	CHEMICAL WATER QUALITY		CNTRVSL	X

SUB-PROGRAM 1110 -- AIRFIELD PAVEMENTS
TECHNICAL SPECIALTY 5 -- GROUND WATER

BAAPS

IMP. BAAP CODE	IMP. BAAP NAME
71	EXPLORATION OF SITE
73	CLEARING SITE
74	GRUBBING SITE
75	STUMPING SITE
81	CONCRETE DEMOLITION
83	LUMBER DEMOLITION
91	BRUSH REMOVAL/DISPOSAL
92	TREE REMOVAL/DISPOSAL
93	LUMBER REMOVAL/DISPOSAL
94	CONCRETE REMOVAL/DISPOSAL
101	TOPSOIL STRIPPING
102	GRADING
103	FOOTINGS EXCAVATION
104	TRENCH AND BACKFILL OPERATIONS
121	LOOSEN-EARTHWORKS
122	EXCAVATE
125	DUMP
126	CONSOLIDATE/COMPACT SOIL
161	SUBGRADE CONSOLIDATION/COMPACTION
162	BASE COURSE
163	FOOTINGS
165	MAT OR RAFT
169	DRAINING
185	PLACING-BITUM
207	PLACING CONCRETE

SUB-PROGRAM 1110 -- AIRFIELD PAVEMENTS
TECHNICAL SPECIALTY A -- EARTH SCIENCE

ATTRIBUTES

BAAP NO.	3	8	9	10	13	14	15	16	17	18	19	21	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	44	45	46
73	A	A	B	A	A	A		A	C	C	C	A	A	B	B	B	B	B	B	A	B	B	B	B	B	B	B	B	A		A	A	A		A
74	A	A	B																			B	B	B	B	B	B	B	A				A		A
75	A	A	B																			B	B	B	B	B	B	B	A			A	A		A
81																													B		B	B	B		B
83																															B	B	B		B
94																																B			
101	A	A		A	A	A		A					A	C	C	A	A	C	B	C		B	B	B	B	B	B	B	A		A	A	A		A
102	A	A	A		A	A		A					A	C	C	C	C	C				B	B	B	B	B	B	B	A		A	A	A		A
103	C	C	C																																
104	C	C	C																										C						
121	A	A	A		A	A							A								B								A		B	A	A		B
122	A	A	A		A	A							A								B								A		A	A	A		A
123																																			
125	A	A	A		A	A								A	A	A	A	A			B	A	A	A	A	A	A	A	A		A	A	A		A
185				A		A		A	C	B	B	C		A	C	A	A	A		A		A	A	A	A	A	A	A	A						
207				A		A		A	C					A	B	A	A	A		A		A	A	A	A	A	A	A	A						
285		A	A	A		A	C	A	C	C	C	C		A	B	A	A	A		A		A	A	A	A	A	A	A	A	C			A	C	

BAAP NO.	47	51	52	54	55
73	A	A	A	A	
74					
75					
81					
83	B				
94					
101	A	A	A	A	
102	A	A	A	A	
103					
104					
121		A	A		
122		A	A		
123		A	A		
125					
185			A	A	A
207			A	A	A
285			A	A	A

SUB-PROGRAM 1110 -- AIRFIELD PAVEMENTS
TECHNICAL SPECIALTY A -- EARTH SCIENCE

ATTRIBUTES

IMP. ATTR. CODE	ATTR. NAME	SUB-PARAMETRIC NAME	PARAMETRIC NAME	TEXT CODE
3	SLOPE	TOPOGRAPHY	SITE ATT	X
8	WEATHERED MANTLE	SUBSTRATUM	SITE ATT	X
9	TRANSPORTED MANTLE	SUBSTRATUM	SITE ATT	X
10	ANNUAL AVERAGE PRECIPATATION	PRECIPITATION	SITE ATT	X
13	RAINFALL AMOUNT	PRECIPITATION	SITE ATT	X
14	PROB OF MAX RAINFALL INTENSITY	PRECIPITATION	SITE ATT	X
15	DROUGHT PROBABILITY	PRECIPITATION	SITE ATT	X
16	HYDROLOGIC REGIME	PRECIPITATION	SITE ATT	X
17	ANNUAL AVERAGE TEMP	TEMPERATURE REGIME	SITE ATT	X
18	AVG TEMP-WARMEST MONTH	TEMPERATURE REGIME	SITE ATT	X
19	AVG TEMP-COLDEST MONTH	TEMPERATURE REGIME	SITE ATT	X
21	WIND INTENSITY	AIR MOVEMENT	SITE ATT	X
23	STORMS, KIND AND FREQUENCY	AIR MOVEMENT	SITE ATT	X
24	OXIDATION-WEATHERING	CHEMICAL WEATHERING	PROCESS AT	X
25	CARBONATION WEATHERING	CHEMICAL WEATHERING	PROCESS AT	X
26	HYDRATION WEATHERING	CHEMICAL WEATHERING	PROCESS AT	X
27	HYDROLYSIS WEATHERING	CHEMICAL WEATHERING	PROCESS AT	X
28	SOLUTION WEATHERING	CHEMICAL WEATHERING	PROCESS AT	X
29	FROST WEDGING	MECHANICAL WEATHERIN	PROCESS AT	X
30	ROOT WEDGING	MECHANICAL WEATHERIN	PROCESS AT	X
31	GRANULAR DISINTEGRATION	MECHANICAL WEATHERIN	PROCESS AT	X
32	PODZOLIZATION	SOIL FORMING PROCESS	PROCESS AT	X
33	FERRALIZATION	SOIL FORMING PROCESS	PROCESS AT	X
34	LATERIZATION	SOIL FORMING PROCESS	PROCESS AT	X
35	CALCIFICATION	SOIL FORMING PROCESS	PROCESS AT	X
36	GLEYING	SOIL FORMING PROCESS	PROCESS AT	X
37	SALINIZATION	SOIL FORMING PROCESS	PROCESS AT	X
38	ALKALINIZATION	SOIL FORMING PROCESS	PROCESS AT	X
39	STREAM EROSION	EROSION+TRANSPORT	PROCESS AT	X
40	ICE EROSION	EROSION+TRANSPORT	PROCESS AT	X
41	WIND EROSION	EROSION+TRANSPORT	PROCESS AT	X
42	GRAVITY, MASS WASTAGE	EROSION+TRANSPORT	PROCESS AT	X
44	STREAM DEPOSITION	DEPOSITION	PROCESS AT	X
45	ICE DEPOSITION	DEPOSITION	PROCESS AT	X
46	WIND DEPOSITION	DEPOSITION	PROCESS AT	X
47	GRAVITY DEPOSITION	DEPOSITION	PROCESS AT	X
51	STREAM DEPOSITION		CNTRVSL	X
52	STREAM EROSION		CNTRVSL	X
54	HYDROLIC REGIONS		CNTRVSL	X
55	AVG ANNUAL TEMP		CNTRVSL	X

SUB-PROGRAM 1110 -- AIRFIELD PAVEMENTS
TECHNICAL SPECIALTY 8 -- EARTH SCIENCE

BAAPS

IMP. BAAP CODE	IMP. BAAP NAME
73	CLEARING SITE
74	GRUBBING SITE
75	STUMPING SITE
81	CONCRETE DEMOLITION
83	LUMBER DEMOLITION
94	CONCRETE REMOVAL/DISPOSAL
101	TOPSOIL STRIPPING
102	GRADING
103	FOOTINGS EXCAVATION
104	TRENCH AND BACKFILL OPERATIONS
121	LOOSEN-EARTHWORKS
122	EXCAVATE
123	LOAD
125	DUMP
145	PLACING-BITUM
207	PLACING CONCRETE
285	FURBISHING(LANDSCAPE-PLANTING-SEEDING)

PROGRAM -- OPER AND TRAIN FAC
SUB-PROGRAM 1170 -- TRAINING FACILITIES

BAAP NO.	BAAP NAME
10	SITE ACCESS/DELIVERY
11	RAILROAD ACCESS/DELIVERY
12	ROAD ACCESS/DELIVERY
13	WATER ACCESS/DELIVERY
14	AIR ACCESS/DELIVERY
15	PIPELINE DELIVERY
16	CONTINUOUS BELT DELIVERY
17	CABLEWAY ACCESS/DELIVERY
18	ELECTRICAL POWER DELIVERY

30 PRELIMINARY WORKS-PERM OR TEMP
- 31 ASPHALT OPERATIONS
- 32 CANTEEN OPERATION
- 33 CONCRETE OPERATIONS
- 34 AGGREGATE PRODUCTION
- 35 FIELD MAINT FAC OPERATION
- 36 FIELD TESTING LAB OPERATION
- 37 CRAFT SHOP OPERATION
- 38 FUEL STOR + DISP-TRUCKS ETC
- 39 FIELD LAUNDRY OPERATION
- 41 MEDICAL FACILITY OPERATION
- 42 MESS HALL OPERATION
- 43 OFFICES OPERATION
- 44 QUARTERS OPERATION
- 45 STORAGE YARD OPERATION
- 46 STORES-WAREHOUSES OPERATION
- 47 SURFACE DRAINAGE CONTROL
- 48 GROUND-WATER CONTROL

60 UTILITIES
- 61 COMPRESSED AIR PRODUCTION
- 62 ELECTRIC UTILITIES PROVISION
- 63 HEAT PROVISION
- 64 SOLID WASTE HANDLING
- 65 TOXIC LIQ/INDUST WASTE HANDLING
- 66 SEWAGE WORKS PROVISION
- 67 WATER WORKS PROVISION
- 68 AIR CONDITIONING PROVISION

70 SITE PREPARATION
- 71 EXPLORATION OF SITE
- 72 SURVEY LAYOUT OF SITE
- 73 CLEARING SITE
- 74 GRUBBING SITE
- 75 STUMPING SITE

80 DEMOLITION
- 81 CONCRETE DEMOLITION
- 82 STEEL DEMOLITION
- 83 LUMBER DEMOLITION
- 84 BRICK DEMOLITION

90 REMOVAL AND DISPOSAL
- 91 BRUSH REMOVAL/DISPOSAL
- 92 TREE REMOVAL/DISPOSAL
- 93 LUMBER REMOVAL/DISPOSAL
- 94 CONCRETE REMOVAL/DISPOSAL
- 95 STEEL REMOVAL/DISPOSAL

100 EXCAVATION
- 101 TOPSOIL STRIPPING
- 102 GRADING
- 103 FOOTINGS EXCAVATION

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   104     TRENCH AND BACKFILL OPERATIONS
120     EARTHWORKS AND BORROWING
   121     LOOSEN-EARTHWORKS
   122     EXCAVATE
   123     LOAD
   124     HAUL
   125     DUMP
   126     CONSOLIDATE/COMPACT SOIL
   127     TRIM AND FINISH
140     TUNNELING AND SUBSURFACE EXCVTN
   141     CUT
   142     DRILL
   143     LOOSEN
   144     LOAD
   145     HAUL
   146     DUMP
   147     DRAIN
   148     SUPPORT LINE
160     FOUNDATIONS(BLDGS AND ROADS)
   161     SUBGRADE CONSOLIDATION/COMPACTION
   162     BASE COURSE
   163     FOOTINGS
   164     PILES
   169     DRAINING
200     CONCRETE CONSTRUCTION
   201     RAW MATERIALS DELIVERY
   202     FORMING
   203     REINFORCING
   204     MIXING
   205     LOADING
   206     HAULING
   207     PLACING CONCRETE
   208     FINISHING CONCRETE
   209     CURING/SEALING
   211     STRIP AND CLEAN FORMS
   212     SAWING AND JOINT INSTALLATION
220     MASONRY CONSTRUCTION
   221     RAW MATERIALS DELIVERY
   222     MORTAR MIX
   223     SCAFFOLDING
   224     HOIST
   225     PLACE-MASONRY
   226     POINTING
   227     CLEANING
240     STEEL CONSTRUCTION
   241     RAW MATERIALS DELIVERY
   242     FABRICATION
   243     STRESS RELIEVING
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   244     MATERIAL HAULING
   245     ERECTION
   246     FASTENING
 260     LUMBER CONSTRUCTION
   261     RAW MATERIALS DELIVERY
   262     PEST/INSECT PROTECTION
   263     FASTENING
   264     FRAMING
   265     SHEATHING
 270     FINISHING OPERATIONS
   271     DOORS, WINDOWS
   272     ELECTRIC
   273     PLUMBING
   274     HEATING
   275     AIR CONDITIONING
   276     INSULATION
   277     SIDING
   278     ROOFING
   279     FLOORING
   281     WALL
   282     CEILING
   283     ORNAMENTATION
   284     PAINTING
   285     FURBISHING(LANDSCAPE-PLANTING-SEEDING)
   286     COMMUNICATIONS

FOR THIS SUBPROGRAM, IMPACTS ABC WILL BE PRINTED AT LEVEL 1
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SUB-PROGRAM 1170 -- TRAINING FACILITIES
TECHNICAL SPECIALTY 1 -- ECOLOGY

ATTRIBUTES

BAAP NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
71	B	C	C								C									C			C	C			B								
72	B	C	C								C								C	C	C		C	C			B	B	B					B	
73	A	B	A	B	B	B	A	B	A	A	B	A	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
74	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
75	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
80	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
81			C																																
84																																			
91	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
92	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
93	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
94	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
95	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
101	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
102				A		A	A																		A	A	A	A	A	A	A	A	A	A	
103																									A	A	A	A	A	A	A	A	A	A	
104	C	B	C		C	C	C		C	C	C	C	C							C				C	A	A	A	A	A	A	A	A	A	A	
121	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
122	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
123							C																		A	A	A	A	A	A	A	A	A	A	
124	B	C					C		C	B	B	C	B						C	C			C	C	A	A	A	A	A	A	A	A	A	A	
125	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
126	B	A	A	B	C	B	C		B	A	A	B	A		B	B		C	A	B			B	B	A	A	A	A	A	A	A	A	A	A	
127	C	C	C	C		C	C		C	C	C	B	B		B				C	C			C	C	A	A	A	A	A	A	A	A	A	A	
141		A				C			C	C	C	C	C						C						C	C	C	B	B	B	B	B	B	B	
142		A				C			C	C	C	C	C						C						C	C	C	B	B	B	B	B	B	B	
143		A		B		C			C	C	C	C	C						C						C	C	C	B	B	B	B	B	B	B	
144																									C	C	C	B	B	B	B	B	B	B	
145																									C	C	C	B	B	B	B	B	B	B	
146	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
147				A		A	A											A	A	A	A	A	A	A	C	C	C	A	A	A	A	A	A	A	
148																									C	C	C	B	B	B	B	B	B	B	
164																															B				
169				A		A	A											A	A	A	A	A	A	A				A	A	A	A	A	A	A	
201																												C	C	C	C	C	C	C	
202																												C	C	C	C	C	C	C	
203																												C	C	C	C	C	C	C	
204				A		A	A											A	A	A	A	A	A	A				A	A	A	A	A	A	A	

205																												C	C	C	C	C	C	C	
206																												C	C	C	C	C	C	C	
207																												C	C	C	C	C	C	C	
208																												C	C	C	C	C	C	C	
209																												C	C	C	C	C	C	C	
211				A		A	A										A	A	A	A		A	A					A	A	A	A	A	A	A	
212				C																								C	C	C	C	C	C	C	
227	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
262	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
284	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
285																	C	C	C	C	C	C	C												A

BAAP NO. 38 39 40

71			
72			
73	A	A	A
74	A	A	A
75	A	A	A
80			
81			A
84			A
91	A		
92	A		
93			
94			
95			
101	A	A	
102	A	A	
103			
104			
121			
122			
123			
124			
125			
126			
127			
141			
142			
143			
144			
145			
146	A	A	

147			
148			
164			
169			
201			
202			
203			
204			
205			
206			
207			
208			
209			
211			
212			
227	A		
262	A	A	A
284			
285		A	A

SUB-PROGRAM 1170 -- TRAINING FACILITIES
TECHNICAL SPECIALTY 1 -- ECOLOGY

ATTRIBUTES

IMP. ATTR. CODE	ATTR. NAME	SUB-PARAMETRIC NAME	PARAMETRIC NAME	TEXT CODE
1	LARGE MAMMALS	SPEC DIVERSITY FAUNA	ECOSYSTEM	X
2	SMALL MAMMALS	SPEC DIVERSITY FAUNA	ECOSYSTEM	X
3	BIRDS	SPEC DIVERSITY FAUNA	ECOSYSTEM	X
4	FISH	SPEC DIVERSITY FAUNA	ECOSYSTEM	X
5	REPTILES	SPEC DIVERSITY FAUNA	ECOSYSTEM	X
6	INSECTS	SPEC DIVERSITY FAUNA	ECOSYSTEM	X
7	OTHER FAUNA	SPEC DIVERSITY FAUNA	ECOSYSTEM	X
8	ENDANGERED SPECIES-FAUNA	SPEC DIVERSITY FAUNA	ECOSYSTEM	X
9	ANGIOSPERMS TREES	SPEC DIVERSITY FLORA	ECOSYSTEM	X
10	ANGIOSPERMS SHRUBS	SPEC DIVERSITY FLORA	ECOSYSTEM	X
11	ANGIOSPERMS HERBS	SPEC DIVERSITY FLORA	ECOSYSTEM	X
12	GYMNOSPERMS	SPEC DIVERSITY FLORA	ECOSYSTEM	X
13	LOWER VASCULAR	SPEC DIVERSITY FLORA	ECOSYSTEM	X
14	ALGAE	SPEC DIVERSITY FLORA	ECOSYSTEM	X
15	FUNGI	SPEC DIVERSITY FLORA	ECOSYSTEM	X

16	LICHENS	SPEC DIVERSITY FLORA	ECOSYSTEM	X
17	ENDANGERED SPECIES-FLORA	SPEC DIVERSITY FLORA	ECOSYSTEM	X
18	STRATIFICATION	SYSTEM STABILITY	ECOSYSTEM	X
19	CLIMAXNESS	SYSTEM STABILITY	ECOSYSTEM	X
20	TERRITORALITY	SYSTEM STABILITY	ECOSYSTEM	X
21	MIGRATION	SYSTEM STABILITY	ECOSYSTEM	X
22	SEASONALITY	SYSTEM STABILITY	ECOSYSTEM	X
23	REPRODUCTIVE BEHAVIOR	SYSTEM STABILITY	ECOSYSTEM	X
24	FEEDING ACTIVITIES	SYSTEM STABILITY	ECOSYSTEM	X
25	SMALL GAME, HUNTING	HUNTING	WILDLFE MT	X
26	WATERFOWL, HUNTING	HUNTING	WILDLFE MT	X
27	BIG GAME, HUNTING	HUNTING	WILDLFE MT	X
28	POND + RIVER, FISHING	FISHING	WILDLFE MT	X
29	COLD WATERS FISHING	FISHING	WILDLFE MT	X
30	LARGE LAKES, FISHING	FISHING	WILDLFE MT	X
31	COASTAL WATERS, FISHING	FISHING	WILDLFE MT	X
32	SHELLFISH, FISHING	FISHING	WILDLFE MT	X
33	DEEP SEA FISHING	FISHING	WILDLFE MT	X
34	HATCHERY ACTIVITIES, FISHING	FISHING	WILDLFE MT	X
35	UNDESIRABLE SPECIES	UNDES SPECIES	WILDLFE MT	X
38	IMPACTS ON GAME ANIMALS		CNTRVSL	X
39	ENCROACHMENT ON NATURAL HABITATS		CNTRVSL	X
40	RARE AND ENDANGERED SPECIES		CNTRVSL	X

SUB-PROGRAM 1170 -- TRAINING FACILITIES
TECHNICAL SPECIALTY 1 -- ECOLOGY

BAAPS

IMP. BAAP CODE	IMP. BAAP NAME
71	EXPLORATION OF SITE
72	SURVEY LAYOUT OF SITE
73	CLEARING SITE
74	GRUBBING SITE
75	STUMPING SITE
80	DEMOLITION
81	CONCRETE DEMOLITION
84	BRICK DEMOLITION
91	BRUSH REMOVAL/DISPOSAL
92	TREE REMOVAL/DISPOSAL
93	LUMBER REMOVAL/DISPOSAL

94	CONCRETE REMOVAL/DISPOSAL
95	STEEL REMOVAL/DISPOSAL
101	TOPSOIL STRIPPING
102	GRADING
103	FOOTINGS EXCAVATION
104	TRENCH AND BACKFILL OPERATIONS
121	LOOSEN-EARTHWORKS
122	EXCAVATE
123	LOAD
124	HAUL
125	DUMP
126	CONSOLIDATE/COMPACT SOIL
127	TRIM AND FINISH
141	CUT
142	DRILL
143	LOOSEN
144	LOAD
145	HAUL
146	DUMP
147	DRAIN
148	SUPPORT LINE
164	PILES
169	DRAINING
201	RAW MATERIALS DELIVERY
202	FORMING
203	REINFORCING
204	MIXING
205	LOADING
206	HAULING
207	PLACING CONCRETE
208	FINISHING CONCRETE
209	CURING/SEALING
211	STRIP AND CLEAN FORMS
212	SAWING AND JOINT INSTALLATION
227	CLEANING
262	PEST/INSECT PROTECTION
284	PAINTING
285	FURBISHING(LANDSCAPE-PLANTING-SEEDING)

SUB-PROGRAM 1170 -- TRAINING FACILITIES
TECHNICAL SPECIALTY 7 -- REGIONAL ECONOMICS

ATTRIBUTES

BAAP NO.	3	6	12	13	17	19	20	21	22	23	28	29	31	33	35	36	38	40	44	46	47	48	49	50	54	56	58	61	65	67	68	69	70	71	76
1170	C	C	B	A	A	C	A	B	A	C	A	C	B	A	B	B	C	B	B	A	B	B	B	B	C	A	C	A	A	C	A	B	A	C	A

BAAP NO.	77	79	81	83	84	86	88	92	96	125	130	131	132	133	138	139	140
1170	C	B	A	B	B	C	B	A	B	C	B	B	B	B	A	A	A

SUB-PROGRAM 1170 -- TRAINING FACILITIES
TECHNICAL SPECIALTY 7 -- REGIONAL ECONOMICS

ATTRIBUTES

IMP. ATTR. CODE	ATTR. NAME	SUB-PARAMETRIC NAME	PARAMETRIC NAME	TEXT CODE
3	POP-GROUP QTS-NON MIL BARRACKS	POP. RESIDNT + TRANS	POPULATION	X
6	6-13 YRS-ELEMENTARY SCHOOL	RES POP-BY AGE	POPULATION	X
12	MINING	OTHER. TO BE SPECIFI	POPULATION	X
13	CONTRACT CONSTRUCTION	EMP BY INDUS	EMP TOTAL	X
17	LUMBER + WOOD PRODUCTS	EMP BY INDUS	EMP TOTAL	X
19	CHEM. PETRO. RUBBER + MISC PLASTIC	EMP BY INDUS	EMP TOTAL	X
20	STONE. CLAY. GLASS. CONCRETE	EMP BY INDUS	EMP TOTAL	X
21	PRIMARY METAL INDUSTRIES	EMP BY INDUS	EMP TOTAL	X
22	FABRICATED METAL PRODUCTS	EMP BY INDUS	EMP TOTAL	X

23	MACHINERY, EXCEPT ELECTRICAL	EMP BY INDUS	EMP TOTAL	X
28	TRANSPORT COMM, ELECTRIC, GAS + SAN-SER	EMP BY INDUS	EMP TOTAL	X
29	WHOLESALE TRADE	EMP BY INDUS	EMP TOTAL	X
31	FINANCE, INSUR + REAL ESTATE	EMP BY INDUS	EMP TOTAL	X
33	HOTELS, ROOMING HOUSES + LODGING PLACES	EMP BY INDUS	EMP TOTAL	X
35	MISC BUSINESS SERVICES	EMP BY INDUS	EMP TOTAL	X
36	AUTO REPAIR, SERVICES, + GARAGES	EMP BY INDUS	EMP TOTAL	X
38	MEDICAL + OTHER HEALTH SERVICES	EMP BY INDUS	EMP TOTAL	X
40	OTHER SERVICES, N.E.C.	EMP BY INDUS	EMP TOTAL	X
44	GOVMT, LOCAL	EMP BY INDUS	EMP TOTAL	X
46	EMPLOYEES RESIDING LOCALLY	EMP BY RESIDENCE	EMP TOTAL	X
47	EMPLOYEES COMMUTING TO WORK	EMP BY RESIDENCE	EMP TOTAL	X
48	EMP DIST-MINORITY GROUP	EMP DIST-MINORITY GP	EMP TOTAL	X
49	EMPLOYED		LABOR FORCE	X
50	UNEMPLOYED		LABOR FORCE	X
54	OCCUPATION	SKILL	HUMAN CAP	X
56	WAGES + SALARY INCOME	INCOME OF POP	INCOME OUTPUT	X
58	INCOME DISTRIBUTION	INCOME OF POP	INCOME-OUTPUT	X
61	CONTRACT CONSTRUCTION	OUTPUT TOTAL	INCOME-OUTPUT	X
65	LUMBER AND WOOD PRODUCTS	OUTPUT TOTAL	INCOME-OUTPUT	X
67	CHEMICALS, PETROL, RUBBER + MISC PLASTIC	OUTPUT TOTAL	INCOME-OUTPUT	X
68	STONE, CLAY, GLASS + CONCRETE PRODUCTS	OUTPUT TOTAL	INCOME-OUTPUT	X
69	PRIMARY METAL INDUSTRIES	OUTPUT TOTAL	INCOME-OUTPUT	X
70	FABRICATED METAL PRODUCTS	OUTPUT TOTAL	INCOME-OUTPUT	X
71	MACHINERY, EXCEPT ELECTRICAL	OUTPUT TOTAL	INCOME-OUTPUT	X
76	TRANSPORTATION, COMM, ELECTRIC, GAS + SA	OUTPUT TOTAL	INCOME-OUTPUT	X
77	WHOLESALE TRADE	OUTPUT TOTAL	INCOME-OUTPUT	X
79	FINANCE, INSUR, AND REAL ESTATE	OUTPUT TOTAL	INCOME-OUTPUT	X
81	HOTELS, ROOMING HOUSES + OTHER LODGING P	OUTPUT TOTAL	INCOME-OUTPUT	X
83	MISC BUSINESS SERVICES	OUTPUT TOTAL	INCOME-OUTPUT	X
84	AUTO, REPAIR, SERVICE + GARAGES	OUTPUT TOTAL	INCOME-OUTPUT	X
86	MEDICAL AND OTHER HEALTH SERVICES	OUTPUT TOTAL	INCOME-OUTPUT	X
88	OTHER SERVICES N.E.C.	OUTPUT TOTAL	INCOME-OUTPUT	X
92	GOVMT, LOCAL	OUTPUT TOTAL	INCOME-OUTPUT	X
96	CONTRACT-CONST-PRIVATE	PRIV SECTOR ASSETS	ASSETS	X
125	PUBL FIN, TAXATION, MONETARY POLICIES	PUBLIC SECTOR ASSETS	ASSETS	X
130	ARCHEOLOGY SITES	OTHERS	ASSETS	X
131	HISTORICAL SITES	OTHERS	ASSETS	X
132	UNIQUE CITY SCAPES	OTHERS	ASSETS	X
133	UNIQUE LANDSCAPES	OTHERS	ASSETS	X
138	EMPLOYMENT TOTAL		CNTRVSL	X
139	UNEMPLOYMENT		CNTRVSL	X
140	INCOME OF POPULATION		CNTRVSL	X

SUB-PROGRAM 1170 -- TRAINING FACILITIES
TECHNICAL SPECIALTY 7 -- REGIONAL ECONOMICS

BAAPS

IMP. BAAP CODE	IMP. BAAP NAME
1170	TRAINING FACILITIES

APPENDIX C:

DATA ELEMENT DEFINITIONS

Function Code: A 2-digit numeric code identifying the type of Army activities, as developed by CERL personnel. Report file is EICS.

CODE	NAME
01	Construction
02	Operation, Maintenance, and Repair
03	Training
04	Mission Change
05	Real Estate
06	Procurement
07	Industrial
08	Research, Development, Test, and Evaluation
09	Administration and Support

Function Name: A 12-character alphanumerical abbreviation of function name. A verbalization of the function code C1. Report file is EICS.

Unique BAAP Code: A 5-digit numeric format which indicates the code for the unique BAAP name, developed by CERL personnel. Report file is EICS.

Unique BAAP Name: A 25-character alphanumeric abbreviated field containing the BAAP Name, as developed by CERL personnel. Report file is EICS.

A list of *Construction* BAAP's follows:

BAAP NO.	BAAP NAME
10	Site Access/Delivery
11	Railroad Access/Delivery
12	Road Access/Delivery
13	Water Access/Delivery
14	Air Access/Delivery
15	Pipeline Delivery
16	Continuous Belt Delivery
17	Carleway Access/Delivery
18	Electrical Power Delivery
30	Preliminary Works-Permanent or Temporary
31	Asphalt Plant Operation
32	Canteen Operation
33	Concrete Plant Operation
34	Aggregate Production
35	Field Maint Fac Operation
36	Field Testing Lab Operation
37	Craft Shop Operation
38	Fuel Storage + Disp-Trucks, etc
39	Field Laundry Operation
41	Medical Facility Operation
42	Mess Hall Operation

BAAP NO.	BAAP NAME
43	Offices Operation
44	Quarters Operation
45	Storage Yard Operation
46	Stores-Warehouses Operation
47	Surface Drainage
48	Ground-Water Control
60	Utilities
61	Compressed Air
62	Compressed Air Production
63	Heat Provision
64	Solid Waste Handling
65	Toxic Liq/Indust Waste Handling
66	Sewage Works
67	Sewage Works Provision
68	Air Conditioning Provision
70	Site Preparation
71	Exploration of Site
72	Survey Layout of Site
73	Clearing Site
74	Grubbing Site
75	Stumping Site
80	Demolition
81	Concrete Demolition
82	Steel Demolition
83	Lumber Demolition
84	Brick Demolition
90	Removal and Disposal
91	Brush Removal-Disposal
92	Tree Removal-Disposal
93	Lumber Removal-Disposal
94	Concrete Removal-Disposal
95	Steel Removal-Disposal
100	Excavation
101	Topsoil Stripping
102	Grading
103	Footings Excavation
104	Trench and Backfill Operations
105	Channeling
106	Dredging
120	Earthworks and Borrowing
121	Loosen-Earthworks
122	Cut-Earthworks
123	Load-Earthworks
124	Haul-Earthworks

BAAP NO.	BAAP NAME
125	Dump Earthworks
126	Consolidate-Compact-Earthworks
127	Trim-Earthworks
130	Quarrying and Stonework
131	Cut-Quarrying
132	Drill-Quarrying
133	Loosen-Quarrying
134	Load-Quarrying
135	Haul-Quarrying
136	Dump-Quarrying
140	Subsurface Excavation
141	Cut-Subsurface Excavation
142	Drill-Subsurface Excavation
143	Loosen-Subsurface Excavation
144	Load-Subsurface Excavation
145	Haul-Subsurface Excavation
146	Dump-Subsurface Excavation
147	Drain-Subsurface Excavation
148	Support Line-Subsurface Excavation
160	Foundations
161	Subgrade Prep-Foundations
162	Base-Foundations
163	Footings-Foundations
164	Piles-Foundations
165	Mat or Raft-Foundations
166	Caissons
167	Cofferdams-Foundations
168	Dewatering-Foundations
169	Drainage-Foundations
180	Bituminous Construction
181	Raw Materials Delivery-Bitum Construction
182	Mixing-Bitum Construction
183	Loading-Bitum Construction
184	Hauling-Bitum Construction
185	Placing-Bitum Construction
186	Finishing-Bitum Construction
187	Curing-Sealing-Bitum Construction
200	Concrete Construction
201	Raw Materials Delivery-Concrete Construction
202	Forming-Concrete Construction
203	Reinforcing-Concrete Construction
204	Mixing-Concrete Construction
205	Loading-Concrete Construction
206	Hauling-Concrete Construction
207	Placing-Concrete Construction

BAAP NO.	BAAP NAME
208	Finishing-Concrete Construction
209	Curing Sealing-Concrete Construction
211	Strip and Clean Forms
212	Sawing, etc. Joing Installation
220	Masonry Construction
221	Raw Materials Delivery-Masonry Construction
222	Mortar Mix
223	Scaffolding-Masonry Construction
224	Hoist-Masonry Construction
225	Place-Masonry Construction
226	Painting-Masonry Construction
227	Cleaning-Masonry Construction
240	Steel Construction
241	Raw Materials Delivery-Steel Construction
242	Fabrication-Steel Construction
243	Stress Relieving
244	Material Delivery-Steel Construction
245	Erection-Steel Construction
246	Fastening-Steel Construction
260	Lumber Construction
261	Raw Materials Delivery-Lumber Construction
262	Pest-Insect Protection-Lumber Construction
263	Fastening-Lumber Construction
264	Framing-Lumber Construction
265	Sheathing-Lumber Construction
270	Finishing Operations
271	Doors, Windows-Finishing
272	Electric-Finishing
273	Plumbing-Finishing
274	Heating-Finishing
275	Air Conditioning-Finishing
276	Insulation-Finishing
277	Siding-Finishing
278	Roofing-Finishing
279	Flooring-Finishing
281	Wall-Finishing
282	Ceiling-Finishing
283	Ornamentation-Finishing
284	Painting-Finishing
285	Furnishing (Landscape-Planting-Seeding)
286	Communication-Finishing

- The following three elements are associated with a given Unique BAAP Code or Name:

BAAP Impact Content (B IMP CONT): This 1-digit alphanumeric character contains the

detailed impact scale code for the impact of Army activities as specified by the Unique BAAP Code on the environment. Report File is EICS.

A - Definitely consider this factor as being potentially impacted by the BAAP.

B - Possible effect, requires consideration.
C - Consider in special cases.

BAAP Impact Attribute (B IMP ATTR): This 7-digit numeric field holds the code for the detailed attribute which is impacted by the given Army activity (specified by the Unique BAAP Code) at the scale given by the BAAP Impact content above. Report file is EICS.

BAAP Impacted Technical Specialty (B IMP TS): This 2-digit number indicates the technical specialty code to which the detailed attribute belongs. Report file is EICS.

TECH SPEC CODE	NAME
1	Ecology
2	Health Science
3	Air Quality
4	Surface Water
5	Ground Water
6	Sociology
7	Regional Economics
8	Earth Science
9	Land Use
10	Noise
11	Transportation

Note: Only a certain percentage of the detailed attributes are impacted by a given Army activity, as specified by the Unique BAAP Code on a given Technical Specialty.

• The following ten elements are associated with a given impact as specified by a given Unique BAAP Code:

BAAP Dollar Qualifier (BAAP DOLLAR): This 3-digit numeric field contains a value code which can be used to modify or qualify the impact of the BAAP depending on the amount of the Army activity involved.

BAAP Dollar Name (B DOL NAME): This 17-character alphanumeric field contains a verbalization of the BAAP dollar qualifier.

BAAP Location Qualifier (BAAP LOCAT): This 3-digit numeric field contains a code which can be used to modify or qualify the BAAP depending on the location of the Army activity involved.

BAAP Location Name (B LOC NAME): This 17-character alphanumeric field contains a verbalization of the BAAP Location Qualifier.

BAAP Time Qualifier (BAAP TIME): This 3-digit numeric field contains a value which can be used to qualify the BAAP, dependent on the time of the Army program.

BAAP Time Name (B TIME NAME): This 17-character alphanumeric field contains a verbalization of the BAAP Time Qualifier.

BAAP Season Qualifier (BAAP SEASON): This 3-digit numeric field contains a value which can be used to qualify the BAAP, dependent on the season of the year.

BAAP Season Name (B SEA NAME): This 17-character alphanumeric field contains a verbalization of the BAAP Season Qualifier.

BAAP Site Element (B SITE ELEM): This 3-digit numeric code can be used to qualify the BAAP, depending on conditions at the site of the Army program.

BAAP Site Name (B SITE NAME): This 17-character alphanumeric field contains an abbreviated verbalization of the BAAP Site Element.

- The following five elements are associated with a given Unique BAAP Code or Name:

Review Impact Content (IMP CONTENT): This 1-digit alphanumeric character contains the review-impact scale code for the impact of an Army activity as specified by the Unique BAAP Code on the environment. Report file is EICS.

A = definitely consider this factor as being potentially impacted by the BAAP.

B = Possible effect, requires consideration.

C = Consider in special cases.

Review BAAP Attribute Number (REV NO): This 5-digit numeric field holds the code for the review level attribute which is impacted by the given Army Activity which is specified by the Unique BAAP Code at the scale given by the Review Impact Content above. Report file is EICS.

Impacted Technical Specialty Number (ITS NO): This 4-digit numeric code indicates the technical specialty code to which the review level attribute number belongs. Report file is EICS.

TECH SPEC CODE	NAME
1	Ecology
2	Health Science
3	Air Quality
4	Surface Water
5	Ground Water
6	Sociology
7	Regional Economics
8	Earth Science
9	Land Use
10	Noise
11	Transportation

Note: Only a certain percentage of all the review-level attributes is impacted by a given Army activity (as specified by the Unique BAAP code) on a given technical specialty.

Alternative Methods of Accomplishment (METHODS): This 16-character alphanumeric field contains abbreviated terms indicating methods by which the BAAP could be accomplished. Report file is EICS.

Relative Cost of Alternative Methods of Accomplishment (REL COST): This 4-digit numeric field (9.99) contains a comparison of the relative costs of the alternative methods of accomplishment for that BAAP.

- The following definition of six elements applies to only the construction-functional area.

Program Code (PROG CODE): In this 5-digit number, the first two digits contain the functional area code; the final three digits contain the Army facility class codes as given in AR 415-28. Report file is EICS.[3]

Program Name (PROG NAME): This 25-digit, alphanumeric, abbreviated name indicates the Facility class name corresponding to the appropriate program code —C5. Report file is EICS.[4]

CODE	PROGRAM NAME
01100	OPER AND TRAIN FAC
01200	MAINT + PROD FAC
01300	RESEARCH, DEV + TEST FAC
01400	SUPPLY FACILITIES
01500	HOSP + MEDICAL FAC
01600	ADMINISTRATIVE FACILITIES
01700	HOUSING + COMMUNITY FAC
01800	UTILITIES AND GROUND IMPR

Sub-Program Code (S PROG CODE): In this 5-digit number, the first two digits contain the functional area code; the final three digits contain the category groups within each facility class. Report file is EICS.[5]

Sub-Programs Name (S PROG NAME): This 25-digit alphanumeric, abbreviated name indicates the category group's name with each facility class corresponding to the appropriate subprogram code —C8.

SUBPROG CODE	SUBPROG NAME
1110	AIRFIELD PAVEMENTS
1120	LIQ FUEL + DISP FAC
1130	COMM NAVIG AID, AIRFLD LGT
1140	LAND OPERATIONAL FAC
1150	WATERFRONT OPER FAC

[3] *Department of the Army Facility Classes and Construction Categories*, AR 415-28.
[4] *Department of the Army Facility Classes and Construction Categories.*
[5] *Department of the Army Facility Classes and Construction Categories.*

1160	HARBOR + COASTAL FAC
1170	TRAINING FACILITIES
1210	MAINTENANCE FACILITIES
1310	R AND D AND TEST BUILDINGS
1390	R + D + TEST NON BUILDINGS
1410	LIQ STOR-FUEL + NON-PROP
1420	AMMUNITION STORAGE
1430	COLD STORAGE
1440	STORAGE COVERED
1450	STORAGE OPEN
1510	HOSPITAL BUILDINGS
1520	DISPENSARY WITH BEDS
1530	LABORATORIES AND CLINICS
1540	DENTAL CLINICS
1550	DISPENSARIES
1610	ADMINISTRATIVE BUILDINGS
1620	ADMIN STRUCTURES UNDERGRND
1690	ADMIN-STRUCTURES-OTHER
1710	FAMILY HOUSING
1720	TROOP HOUSING
1730	COMMUNITY FAC-PERS INT
1740	COMM FAC, INTERIOR
1750	COMM FAC MORALE-WELF-REC
1810	ELECTRICITY
1820	HEAT
1830	SEWAGE AND WASTE
1840	WATER
1850	ROADS AND STREETS
1860	RAILROAD TRACKS
1870	GROUND IMPROVEMENT STRUCT
1880	FIRE AND OTHER ALARM SYS
1890	MISCELLANEOUS
1910	LAND
1920	OTHER RIGHTS
1930	IMPROVEMENTS

Report file is EICS.[6]

Sub-Sub Program Code (SS PROG CODE): In this 5-digit number, the first two digits contain the function-area code and the final three digits identify the basic category items within each category group within each facility class. Report file is EICS.[7]

Sub-Sub Program Name (SS PROG NAME): This 25-digit alphanumeric, abbreviated name indicates the basic category item within each category group with each facility class which corresponds to the appropriate sub-sub program Code-C11. Report file is EICS.[8]

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[6] *Department of the Army Facility Classes and Construction Categories*, AR 415-28.
[7] *Department of the Army Facility Classes and Construction Categories*.
[8] *Department of the Army Facility Classes and Construction Categories*.

BAAP Code: The same code as used in the Unique BAAP Code is used here to exclude BAAP's that do not apply to a particular subprogram or sub-sub program. It is a 5-digit numeric field.

BAAP Technical Specialty Code (BIS CODE): This technical specialty code is used to exclude technical specialties that do not apply to a particular sub-program or sub-sub program. It is a 5-digit numeric field.

- The following four elements are associated with a given sub-subprogram.

Sub-Sub Program Impact Content (SSP IMP CONT): This 1-digit alphanumeric character contains the detailed or review-level impact-scale code for the impact of an Army activity as specified by the sub-subprogram code on the environment.

A = definitely consider this factor as being potentially impacted by the BAAP.

B = Possible effect, requires consideration.

C = Consider in special cases.

Sub-Sub Program Impact Attribute (SSP IMP ATTR): This 3-digit numeric field holds the code for the detailed attribute which is impacted by the given Army activity specified by the sub-subprogram code at the scale given by the SSP IMP CONT above. Report file is EICS.

Sub-Sub Program Impacted Technical Specialty (SSP IMP TS): This 2-digit number indicates the technical specialty code to which the impacted, detailed, or review-level attribute belongs.

Sub-Sub Program Impacted Review No. (SSP DMP REV NO): This 2-digit numeric field holds the code for the review attribute which is impacted by the given Army activity specified by the sub-subprogram code at the scale given by the SSP IMP CONT above. Report file is EICS.

Note: There are no data present for the above four elements in the current version of the ECIS data base.

- The following ten elements are associated with a given impact as specified by a given sub-subprogram:

Sub-Sub-Program Dollar Qualifier (SSP DOLLAR): This 3-digit numeric field contains a value code which can be used to modify or qualify the impact of the sub-subprogram, depending on the extent of the Army activity.

Sub-Sub-Program Dollar Name (SSP DOL NAME): This 17-character alphanumeric field contains a verbalization of the sub-subprogram dollar qualifier.

Sub-Sub Program Location Qualifier (SSP LOCAT): This 3-digit numeric field contains a code which can be used to modify or qualify the sub-subprogram, depending on the location of the Army activity involved.

Sub-Sub-Program Location Name (SSP LOC NAME): This 17-character alphanumeric field contains a verbalization of the location qualifier.

Sub-Sub Program Time Qualifier (SSP TIME): This 3-digit numeric field contains a value which may be used to qualify the Sub-Subprogram Impact, dependent on the time of the Army activity.

Sub-Subprogram Time Name (SSP TIME NAME): This 17-character alphanumeric field sub-subprogram contains a verbalization of the Time Qualifier.

Sub-Subprogram Season Qualifier (SSP SEASON): This 3-digit numeric field contains a value which may be used to qualify the sub-subprogram impact, dependent on the season of the year.

Sub-Subprogram Season Name (SSP SEA NAME): This 17-character alphanumeric field contains a verbalization of the sub-subprogram season qualifier.

Sub-Subprogram Site Element (SSP SITE ELEM): This 3-digit numeric code can be used to qualify the sub-subprogram impact depending on conditions at the site of the Army activity.

- The following four elements are associated with a given sub-program code or name.

Sub-Program Impact Content (SP IMP CONT): This 1-digit alphanumeric character contains the detailed or review level impact scale code for the impact of an Army activity, as specified by the sub-program code on the environment.

A = Definitely consider this factor as being potentially impacted by the BAAP.

B = Possible effect, requires consideration.

C = Consider in special cases.

Sub-Program Impact Attribute (SP IMP ATTR): This 3-digit numeric field holds the code for the detailed attribute which is impacted by the given Army activity (specified by the sub-program code or name) at the scale given by the SP IMP CONT above. Report file is EICS.

Sub-Program Impacted Technical Specialty (SP IMP TS): This 2-digit number indicates the technical specialty code to which the detailed or review level attribute belongs.

Sub-Program Impacted Review No (SP IMP REV NO): This 2-digit numeric field holds the code for the review attribute which is impacted by the given Army activity (specified by the sub-program code or name) at the scale given by the SP IMP CONT above.

Note: Only a certain percentage of the detailed and review level attributes are impacted by a given Army activity (as specified by the sub-program code or name). At present only the technical specialty 08, Regional Economics, considers impacts at the sub-program level. In other words, the value of the element SP IMP TS is always eight.

- The following ten elements are associated with a given impact as specified by a given sub-program code:

Sub-Program Dollar Qualifier (SP DOLLAR): This 3-digit numeric field contains a value code which can be used to modify or qualify the impact of the sub-program, depending on the amount of the Army activity involved.

Sub-Program Dollar Name (SP DOL NAME): This 17-character alphanumeric field contains a verbalization of the sub-program Dollar Qualifier.

Sub-Program Location Qualifier (SP LOCAT): This 3-digit numeric field contains a code which can be used to modify or qualify the sub-program impact, depending on the location of the Army activity involved.

Sub-Program Location Name (SP LOC NAME): This 17-character alphanumeric field contains a verbalization of the sub-program Location Qualifier.

Sub-Program Time Qualifier (SP TIME): This 3-digit numeric field contains a value which may be used to qualify the sub-program Impact, dependent on the time of the Army activity.

Sub-Program Time Name (SP TIME NAME): This 17-character alphanumeric field contains a verbalization of the sub-program Time Qualifier.

Sub-Program Season Qualifier (SP SEASON): This 3-digit numeric field contains a value which can be used to qualify the sub-program Impact, dependent on the season of the year.

Sub-Program Season Name (SP SEA NAME): This 17-character alphanumeric field contains a verbalization of the sub-program Season Qualifier.

Sub-Program Site Element (SP SITE ELEM): This 3-digit numeric code can be used to qualify the sub-program Impact, depending on conditions at the site of the Army activity.

Sub-Program Site Name (SP SITE NAME): This 17-character alphanumeric field contains an abbreviated verbalization of the sub-program Site Element.

Program Impact Content (P IMP CONT): This 1-digit alphanumeric character contains the detailed or review-level scale-code for the impact of an Army activity, as specified by the program code on the environment.

A = Definitely consider this factor as being potentially impacted by the BAAP.

B = Possible effect, requires consideration.

C = Consider in special cases.

Program Impact Attribute (P IMP ATTR): This 3-digit numeric field holds the code for the detailed attribute which is impacted by the given Army activity (specified by the program code or name) at the scale given by P IMP CONT above. Report file is EICS.

Program Impacted Technical Specialty (P IMP TS): This 2-digit number indicates the technical specialty code to which the detailed or review level attribute belongs.

Program Impacted Review No. (P IMP REV NO): This 2-digit numeric field holds the code for the review attribute which is impacted by the given Army activity (specified by the program code or name) at the scale given by the P IMP CONT above.

Note: These are not data for the above four elements in the current version of the EICS data base; similarly, there are no data for the following ten elements.

• The following ten elements are associated with a given impact as specified by a given program code:

Program Dollar Qualifier (P DOLLAR): This 3-digit numeric field contains a value code which can be used to modify or qualify the impact of the program.

Program Dollar Name (P DOL NAME): This 17-digit-character alphanumeric field contains a verbalization of the program Dollar Qualifier.

Program Location Qualifier (P LOCAT): This 3-digit numeric field contains a code which can be made to modify or qualify the program impact, depending on the location of the Army activity involved.

Program Location Name (P LOC NAME): This 17-character alphanumeric field contains a verbalization of the program Location Qualifier.

Program Time Qualifier (P TIME): This 3-digit numeric field contains a value which can be used to qualify the BAAP, dependent on the time of the Army activity.

Program Time Name (P TIME NAME): This 17-character alphanumeric field program contains a verbalization of the Time Qualifier.

Program Season Qualifier (P SEASON): This 3-digit numeric field contains a value which can be used to qualify the program Impact, dependent on the season of the year.

Program Season Name (P SEA NAME): This 17-character alphanumeric field contains a verbalization of the program Season Qualifier.

Program Site Element (P SITE ELEM): This 3-digit numeric code can be used to qualify the program Impact, depending on conditions at the site of the Army activity.

Program Site Name (P SITE NAME): This 17-character alphanumeric field contains an abbreviated verbalization of the program Site Element.

Technical Specialty Code (TECH SPEC CODE): This 2-digit numeric code identifies the major categories of environmental attributes on which Army activities can have an effect. Report file is EICS.

TECH SPEC CODE	NAME
1	Ecology
2	Health Science
3	Air Quality
4	Surface Water
5	Ground Water
6	Sociology
7	Regional Economics
8	Earth Science
9	Land Use
10	Noise
11	Transportation

Technical Specialty Name (TECH SPEC NAME): This 18-character alphanumerical verbalization of the technical specialty code relates to the main categories of environmental attributes which can be affected by Army activities. Report file is EICS.

Attribute Code (ATTR CODE): This 5-digit numeric code identifies the detailed attributes under the technical specialties, as developed by CERL personnel. Report file is EICS.

Attribute Name (ATTR NAME): This 24-character alphanumeric abbreviation of the name of the detailed attribute is a verbalization of the Attribute Code. Report file is EICS.

Parametric Name: This 16-character alphanumeric abbreviation of a higher classification of attributes has the following classification levels:

Technician Specialty
  Parametric Name
    Sub-Parametric Name
      Attribute Name

Report file is EICS.

Sub Parametric Name (S PARAMETRIC NAME): This 20-character alphanumeric abbreviation of a higher classification of attributes has the following classification levels:

Technical Specialty
  Parametric Name
    Sub-Parametric Name
      Attribute Name

Report file is EICS.

Attribute Text (ATTR TEXT): This 5-digit numeric field contains the code for retrieving the text of the related attribute. The first two digits contain the technical specialty number and the remaining three digits contain the attribute number.

Review Attribute Code (REV ATTR CODE): This 5-digit numeric code identifies the review attributes under the technical specialties, as developed by CERL personnel. Report file is EICS.

Review Attribute Name (REV NAME): This is a 20-character alphanumeric abbreviation of the name of the review attribute, which is a verbalization of the attribute code. Report file is EICS.

Review Text (REV TEXT): This 5-digit numeric field contains the code for retrieving the text of the related review attribute. The first two digits contain the technical specialty number and the remaining three digits contain the attribute number.

APPENDIX D:

SAMPLE OUTPUT FROM INTERACTIVE RETRIEVAL

The following illustrates a complete session on an interactive terminal with immediate access to the EICS data base through System 2000. The last four pages are a separate output from the line-printer, as requested during the interactive session.

```
73/08/17. 08.22.23.
 HOUSTON/CDC KRONOS 2.00.
USER NUMBER:  TN593[redacted]
PASSWORD
[redacted]
TERMINAL:      42
RECOVER/SYSTEM: BATCH,45000
/CATLIST
          CATALOG OF TN593[redacted]   73/08/17. 08.23.15.


  FILE NAME(S)


 LDTEXT     SVTEXT     COPY       TARHWQJ    TBRHWQJ    TCRHWQJ    TDRHWQJ
 TERHWQJ    TFRHWQJ    LTPLI      BODA       BOLB       BODC       BODD
 TUR        MERCURY

        16 FILE(S)
/ATTACH(S2K=ABSFIL/UN=90443HV)
/STATUS,F
TTY   42
SYSTEM -  BATCH
FILE NAME:
STATUS -  IDLE


FILENAM  TYPE STAT    LENGTH  UNIT

S2K      *PM  0051     0.737 KPR.
OUTPUT   .LC  0025      TT14.

/S2K
 73/08/17. 08.25.10.*BEGIN SYSTEM 2000* RELEASE   2.23E
 ---
? USER,[redacted]:
 ---
? DATA BASE NAME IS DAPJCT:
 ASSIGNED DAPJCT              18     605            73/07/06. 08.03.34.
```

? *C600*

TECHNICAL SPECIALTIES
73/08/17.

CODE	T. S. NAME
***	
1	ECOLOGY
2	HEALTH SCIENCE
3	AIR QUALITY
4	SURFACE WATER
5	GROUNDWATER
6	SOCIOLOGY
7	REGIONAL ECONOMICS
8	EARTH SCIENCE
9	LAND USE
10	NOISE
11	TRANSPORTATION

? *C601*

DETAILED AND REVIEW ATTRIBUTE COUNT BY T.S.
73/08/17.

T.S. CODE	T.S. NAME	DETAILED ATTRI COUNT	REVIEW ATTRI COUNT
*** 1	ECOLOGY	38	8
2	HEALTH SCIENCE	53	16
3	AIR QUALITY	97	6
4	SURFACE WATER	78	13
5	GROUNDWATER	55	8
6	SOCIOLOGY	62	11
7	REGIONAL ECONOMICS	137	9
8	EARTH SCIENCE	54	12
9	LAND USE	52	8
10	NOISE	22	7
11	TRANSPORTATION	29	12

```
 ---
? *C602(10)
   10
   NOISE

?---

  *C603(10)
```

DETAILED ATTRIBUTES
73/08/17.

ATTR NO	PARAMETRIC NAME	SUBPARAMETRIC NAME	ATTRIBUTE NAME
***			
1	HEALTH ATT	PHYSIOLOGICAL MAINT	CARDIOVASCULAR SYSTEM
2	HEALTH ATT	PHYSIOLOGICAL MAINT	DIGESTIVE SYSTEM
3	HEALTH ATT	PHYSIOLOGICAL MAINT	OTHER SYSTEMS
6	HEALTH ATT	HEARING THRESHOLD	HEARING ACUITY
7	HEALTH ATT	HEARING THRESHOLD	AURAL DETECTION
8	HEALTH ATT	HEARING THRESHOLD	AURAL DISCRIMINATION
11	HEALTH ATT	SLEEP PERFORMANCE	CONTINUITY
12	HEALTH ATT	SLEEP PERFORMANCE	DURATION
13	HEALTH ATT	SLEEP PERFORMANCE	RECUPERATION
18	HUMAN ACT	TASK PERFORMANCE	MECHANICAL
19	HUMAN ACT	TASK PERFORMANCE	MENTAL
23	HUMAN ACT	COMMUNICATION	AURAL-FACE TO FACE
24	HUMAN ACT	COMMUNICATION	AURAL-TELEPHONE
25	HUMAN ACT	COMMUNICATION	VISUAL
26	HUMAN ACT	COMMUNICATION	TELEVISION
30	HUMAN ACT	ANNOYANCE + STRESS	ANNOYANCE AND STRESS
36	LAND USE	LAND USE INTEGRITY	PROPERTY DAMAGE
37	LAND USE	LAND USE INTEGRITY	PROPERTY VALUE
38	LAND USE	LAND USE INTEGRITY	LAND USE
45	CNTRVSL		DISRUPTION OF HUMAN ACTIVITY
46	CNTRVSL		PERMANENT DAMAGE TO HEALTH
47	CNTRVSL		PROPERTY VALUE DEPRECIATION

```
 ---
? *C754(10)
 CNT 117

?---

  REPORT FILE IS NOISE:
 ---
? *C654(10)
 ---
? REPORT FILE IS S2KRPT:
 ---
? *C770(10)
 CNT 90

?---

  *C670(10)

                BAAPS AND REVIEW IMPACTS
                        73/08/17.

      IMPACT    ATT #    BAAP #    BAAP NAME
***
   A                1        73    CLEARING SITE
   A                3
   A               10
   A               11
   A                1        74    GRUBBING SITE
   A                3
   A               10
   A               11
   A                1        75    STUMPING SITE
   A                3
   A               10
   A               11
   A                1        80    DEMOLITION
   A                2
   A                3
```

A	4		
A	10		
A	11		
A	12		
A	1	100	EXCAVATION
A	2		
A	3		
A	10		
A	11		
A	1	121	LOOSEN-EARTHWORKS
A	2		
A	3		
A	10		
A	11		
A	1	122	EXCAVATE
A	2		
A	3		
A	10		
A	11		
A	1	131	CUT
A	2		
A	3		
A	4		
A	10		
A	11		
A	12		
A	1	132	DRILL
A	2		
A	3		
A	4		
A	10		
A	11		
A	12		
A	1	133	LOOSEN
A	2		
A	3		
A	4		
A	1	141	CUT
A	2		
A	3		

A	10		
A	11		
A	1	142	DRILL
A	2		
A	3		
A	10		
A	11		
A	1	143	LOOSEN
A	2		
A	3		
A	10		
A	11		
A	1	144	LOAD
A	2		
A	3		
A	10		
A	11		
A	1	145	HAUL
A	2		
A	3		
A	10		
A	11		
A	1	164	PILES
A	2		
A	3		
A	10		
A	11		
A	1	242	FABRICATION
A	3		
A	10		
A	11		
A	1	246	FASTENING
A	3		
A	10		
A	11		

```
---
? EXIT:
          END SYSTEM 2000
SWCE  SY04  1588      13.928
/STATUS,F
TTY   42
SYSTEM -  BATCH
FILE NAME:
STATUS -  IDLE


FILENAM  TYPE STAT    LENGTH  UNIT

S2KRPT   .LC  0027     0.017 KPR.
S2K      *PR  0023     0.737 KPR.
INPUT    .LC  0013      TT31.
OUTPUT   .LC  0027      TT31.

/EDIT,S2KRPT
 BEGIN TEXT EDITING.
? LIST;10
                 BAAPS AND DETAIL IMPACTS (A)
                            73/08/17.

   IMPACT    ATT NO   BAAP   BAAP NAME
? SET;50
? LIST;5
   A            24
   A            45    100   EXCAVATION
   A            46
   A            45    121   LOOSEN-EARTHWORKS
   A            46
? END
 END TEXT EDITING.
$EDIT,S2KRPT.
/DISPOSE(S2KRPT=PR/UN=TI.593[redacted])
 ERROR IN FILE ARGUMENTS.
/DISPOSE(S2KRPT=PR/EI=TI.593[redacted])
$DISPOSE(S2KRPT=PR/EI=TI.593[redacted])
```

```
/CATLIST
          CATALOG OF TN593[redacted]   73/08/17. 09.40.10.

  FILE NAME(S)

 LDTEXT     SVTEXT     TARHWQJ    TBRHWQJ    TCRHWQJ    TDRHWQJ    TERHWQ
 TFRHWQJ    LTPLI      COPYRPT

        10 FILE(S)
/BYE

TN593[redacted]   LOG OFF.  09.40.23.
TN593[redacted]   SS       0.215 SEC.
```

BAAPS AND DETAIL IMPACTS (A)
73/08/17.

IMPACT	ATT NO	BAAP NO	BAAP NAME
**			
A	45	73	CLEARING SITE
A	46		
A	45	74	GRUBBING SITE
A	46		
A	45	75	STUMPING SITE
A	46		
A	45	80	DEMOLITION
A	46		
A	47		
A	1	81	CONCRETE DEMOLITION
A	1		
A	2		
A	2		
A	3		
A	3		
A	6		
A	6		
A	23		
A	24		
A	1	82	STEEL DEMOLITION
A	1		
A	2		
A	2		
A	3		
A	3		
A	6		
A	6		
A	23		
A	24		

A	1	86	BRICK DEMOLITION
A	1		
A	2		
A	2		
A	3		
A	3		
A	6		
A	6		
A	23		
A	24		
A	45	100	EXCAVATION
A	46		
A	45	121	LOOSEN-EARTHWORKS
A	46		
A	45	122	EXCAVATE
A	46		
A	1	131	CUT
A	1		
A	2		
A	2		
A	3		
A	3		
A	6		
A	6		
A	23		
A	24		
A	45		
A	46		
A	47		
A	1	132	DRILL
A	1		
A	2		
A	2		
A	3		
A	3		
A	6		

A	6		
A	23		
A	24		
A	45		
A	46		
A	47		
A	1	133	LOOSEN
A	1		
A	2		
A	2		
A	3		
A	3		
A	6		
A	6		
A	23		
A	24		
A	1	141	CUT
A	1		
A	2		
A	2		
A	3		
A	3		
A	6		
A	6		
A	23		
A	24		
A	45		
A	46		
A	1	142	DRILL
A	1		
A	2		
A	2		
A	3		
A	3		
A	6		
A	6		

A	23		
A	24		
A	45		
A	46		
A	45	143	LOOSEN
A	46		
A	45	144	LOAD
A	46		
A	45	145	HAUL
A	46		
A	45	164	PILES
A	46		
A	45	242	FABRICATION
A	46		
A	45	246	FASTENING
A	46		

APPENDIX E:

LIST OF STRINGS BY NUMBERS AND FUNCTIONS

The built-in retrieval commands are called strings and are listed here first in order of the string number assigned. They are also listed in five separate groups according to the type of information each string can retrieve:

a. Technical Specialties and Attributes
b. Programs and Subprograms
c. BAAP's, Alternative Methods of Accomplishment
d. Detailed BAAP Impacts
e. Review Level BAAP Impacts.

String #	How to Access	Description of Function of String
C600	*C600*	List all T.S. codes and T.S.
C602	*C602(01)	Print name of T.S. code.
C603	*C603(01)	Print detailed attribute numbers and name with parametric and sub-parametric names for a given T.S.
C604	*C604(01)	Print review attribute number and name for a given T.S.
C605	*C605*	Print list of existing program: code and name.
C606	*C606(1100)	Print sub-program code and name for a given program code.
C607	*C607*	Print a list of all programs and sub-program codes and names.
C608	*C608*	Print a list of existing program and sub-program codes and names, where there are impacts.
C650	*C650(02)	Print detailed-level impacts and BAAPs for a given T.S. for all impact contents.
C651	*C651(71,84,02)	Print detailed-level impacts and BAAPs for a given range of BAAPs and a given T.S. for all impact contents.
C652	*C652(71,84,02)	Print detailed-level impacts and BAAPs for a given range of BAAPs and a given T.S. for A impacts only.
C653	*C653(71,84,02)	Print detailed-level impacts and BAAPs for a given range of BAAPs and a given T.S. for A and B impacts only.
C654	*C654(02)	Print all detailed-level impacts and BAAPs for a given T.S. for A impacts only.
C655	*C655(02)	Print detailed-level impacts and BAAPs for a given T.S. for A and B impacts only.

Preceding page blank

C670	*C670(02)	Print review level impacts and BAAPs for a given T.S. for all impact contents.
C671	*C671(71,84,02)	Print review level impacts and BAAPs for a given range of BAAPs and a given T.S. for all Impact contents.
C700	*C700(10,20)	Print the number of items in C800.
C701	*C701(10,20)	Print the number of items in C801.
C703	*C703(01)	Print the number of items in C603.
C704	*C704(01)	Print the number of items in C604.
C705	*C705*	Coun the number of items in C805.
C706	*C706*	Print number of items in C806.
C750	*C750(02)	Print number of items in C650.
C751	*751(71,84,02)	Print number of items in C651.
C752	*C752(71,84,02)	Print number of items in C652.
C753	*C753(71,84,02)	Print number of items in C653.
C754	*C754(02)	Print number of items in C654.
C755	*C755(02)	Print number of items in C655.
C770	*C770(02)	Print number of items in C670.
C771	*C771(71,84,02)	Print number of items in C671.
C800	*C800(10,20)	Print the BAAP number and BAAP names with the alternate method of accomplishment. BAAP number span by the parameters.
C801	*C801(10,20)	Print the BAAP number and BAAP names, giving the BAAP number wanted.
C805	*C805*	Print the BAAP number and BAAP names with detailed impacts, attribute number and T.S. number.
C806	*C806*	Print the BAAP number and BAAP name with review impacts, attribute number, and T.S. number.

TECHNICAL SPECIALITIES AND ATTRIBUTES

String #	How to Access	Description of Function of String
C600	*C600*	List all T.S. codes and T.S. names.

C602	*C602(01)	Print name of T.S. code.
C603	*C603(01)	Print detailed attribute numbers and name with parametric and sub-parametric names for a given T.S.
C703	*C703(01)	Print count of number of items in C603.
C604	*C604(01)	Print review attribute number and name of a given T.S.
C704	*C704(01)	Print count of number of items in C604.

PROGRAMS AND SUBPROGRAMS

C605	*C605*	Print list of existing program codes and names.
C606	*C606(1100)	Print Sub-program code and name for a given program code.
C607	*C607*	Print a list of all programs and sub-program codes and names.
C608	*C608*	Print a list of *existing* programs and sub-program codes and names, where there are impacts.

BAAPS, ALTERNATE METHOD OF ACCOMPLISHMENT

C800	*C800(10,20)	Print the BAAP numbers and name with the alternate method of accomplishment, giving the BAAP number span wanted.
C700	*C700(10,20)	Print the count of the items in C800 giving the BAAP number span wanted.
C801	*C801(10,20)	Print the BAAP number and BAAP name giving the BAAP number wanted.
C701	*C701(10,20)	Print the count of the number of items in C801 giving the BAAP number wanted.

DETAILED BAAP IMPACTS

C805	*C805*	Print the BAAP number and BAAP names with the detailed impacts, attribute number and T.S. number for all T.S. (30 pages output).
C705	*C705*	Count the number of items to be printed in (805).
C650	*C650(02)	Print detailed level impacts and BAAPs for a given T.S. for *all* impact contents.
C750	*C750(02)	Print count of the number of items in C650.

C651	*C651(71,84,02)	Print detailed level impacts and BAAP number and names for a given range of BAAPs and a given T.S. for all impact contents. The first two parameters are the range of BAAP number and the third parameter is the T.S. code.
C751	*C751(71,84,02)	Print the count of the number of items in C651. Parameter code is same as in C651.
C652	*C652(71,84,02)	Print detailed level impacts and BAAP number and names for a given range of BAAPs and a given T.S. for "A" impacts only. The first two parameters are the range of BAAP code and the last is the T.S. code.
C752	*C752(71,84,02)	Print the count of the number of items in C652. Print the parameter order the same as C652.
C653	*C653(71,84,02)	Print detailed-level impacts and BAAP's number and names for a given range of BAAPS and a given T.S. for "A" and "B" impacts only. The first two parameters are the range of BAAP code and the last is the T.S. code.
C753	*C753(71,84,02)	Print the count of the number of items in C653.
C654	*C654(02)	Print all detailed level impacts and BAAP number and name for a given T.S. for "A" impacts only.
C754	*C754(02)	Print the count of the number of items in C654.
C655	*C655(02)	Print detailed level impacts and BAAP number and name for a given T.S. for A and B impacts only.
C755	*C755(02)	Print the count of the number of items in C655.

REVIEW LEVEL BAAP IMPACTS

C806	*C806*	Print the BAAP number and BAAP names with review impacts, attribute number, and T.S. number.
C706	*C706	Print count of the number of items in C806.
C670	*C670(02)	Print review-level impacts and BAAP's number and names for a given T.S. for all impact contents.
C770	*C770(02)	Print the count of the number of items in C670.
C671	*C671(71,84,02)	Print review level impacts and BAAP names and number for a given range of BAAPs and a given T.S. for all impact contents.
C771	*C771(71,84,02)	Print count of number of items in C671.

GLOSSARY

Access Module: The module of the System 2000 data-base management system that handles retrievals and updates of the data base.

BASIS 70: A retrieval software system developed by Battelle Laboratories, Columbus, OH.

CDC: Control Data Corporation, a manufacturer of computer mainframes and a supplier of computer services.

CELDS: Computerized Environmental Legislative Data System, a document-retrieval system developed at CERL for national and state environmental laws, standards, and regulations.

COBOL: Common Business-Oriented Language, a programming language designed for data-processing applications.

Command: One or more English words with a specific meaning and evoking specific actions by a data-base management system.

Control Module: The module in the System 2000 data-base management system that serves control functions.

Cybernet: A computer network with nationwide centers, operated [illegible] DC and using CDC 6000-series computers.

DA: Department of the Army.

Define Module: The module in the System 2000 data-base management system that handles the definition of the data base.

Disk (magnetic): A peripheral device which can store a large volume of digital data for repeated transfer to the main memory.

Data Base: A collection of information that can be used for more than one specific application.

DBMS: Data-Base Management System, a software package used to manage the retrieval, updating, and other housekeeping activities associated with a data base.

DMS: Data Management System, equivalent in meaning to DBMS.

Drum (magnetic): A peripheral device similar in function to a disk.

EICS: Environmental Impact Computer System, an automatic storage and retrieval system for environmental impact information.

FORTRAN: Formula Translation, a programming language developed for scientific applications.

GSA: General Services Administration, an agency of the Federal government that handles most of its contracts and procurement.

IBM: International Business Machine Corporation, one of the world's largest computer manufacturers.

IMS: Information Management System, a data-base management system developed by IBM for use with its 360- and 370-series computers.

Inquire: A data-base management system, developed by Infodata Systems, Inc., that is available to government users.

Kronos: An operating system for the CDC 6400-series computers that was designed for time-sharing operations.

Mass-Storage Device: Same as Random-Access Device.

Module: A self-contained portion of a large software package. Such a package can contain many modules, one of which is always in the main computer memory during the execution of any operations.

PLI: Procedural Language Interface, an interface with the data base for the retrieval and updating of information using a procedural language such as COBOL or FORTRAN.

Random-Access Device: Usually a magnetic disk or drum that can provide a large volume of fast, on-line storage in addition to the main core memory of the computer.

RAMIS: A data-base management system developed and marketed by Mathematica, Inc.

Re-Act: A data-management package created by Cybertech Data Systems and marketed by Boeing Computer Services, Inc.

SCOPE: Supervisory Control of Program Execution, an operating system for the CDC 6600-series computers that can handle more than one batch job at the same time.

String: With reference to System 2000, a string is a series of commands for retrievals, updates, and other functions that can be executed by referring to the string name or number.

System 2000 (System 2K): A data-base management system, developed by MRI Systems Corporation of Austin, TX, that is available on the Cybernet network.

Tape (magnetic): A peripheral device that can sequentially store a large volume of digital information.

UAIMS: A data-base management system developed and marketed by United Aircraft Research Laboratories.

UT-200 Terminal: A remote, batch terminal for access to the Cybernet network, available from CDC.

VSN: Visual Serial Number, a number used to identify a reel of magnetic tape.

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