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FORMATION MANAGEMENT
& TECHNOLOGY DIVISION

September 27, 1983

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Mr. Dallas L. Peck
Director, U.S. Geological Survey
National Center
Reston, Virginia 22092

Dear Mr. Peck:

Subject: Opportunities to Improve Geological Survey's Automatic Data Processing (ADP) Information Resources Management (GAO/IMTEC-83-8)

We have reviewed the Geological Survey's ADP information resource management and conclude that it needs to be improved. ADP planning, currently performed in each operating division, would be more effective if performed agencywide. Top management needs to establish a long-range ADP strategy for such planning and to better manage software resources within the divisions.

OBJECTIVES, SCOPE, AND METHODOLOGY

Our objective was to assess the adequacy and effectiveness of the Survey's information resources management as it relates to ADP planning and operations. We did our work at the Survey Headquarters in Reston and its regional office in Denver. We collected data on ADP planning, software development and management, data base management, and computer capacity planning. We interviewed senior officials responsible for establishing ADP management policy in the Geologic, National Mapping, Water Resources, Administrative, and Information Systems Divisions. We also interviewed the principal division managers directly responsible for managing ADP resources. We supplemented our interviews by analyzing contracts, records, reports, and other information related to the Survey's management of its ADP resources. We performed our work in accordance with generally accepted government audit standards.

The officials we interviewed stated that it is the Survey's policy to encourage the extensive use of microcomputers to support managerial and research functions. The Survey has already invested more than $3 million in several hundred microcomputers. While we did not examine management issues related to microcomputer use in the Survey, the potential problems of widespread use of such devices are discussed in our recent report to the Director, Office of Management and Budget, "Small Computers in the Federal Government: Management is Needed to

Realize Potential and Prevent Problems (GAO/AFMD-83-36)," March 8, 1983.

We did not perform a comprehensive or statistically projectable analysis of software development projects at the Survey, but we did gather detailed information on two projects--National Mapping Division's Internal Management System (IMS) and the Commitment Accounting System (CAS). Both are important to the Survey's organizational units. We believe the problems within these projects are likely to occur in other projects.

AGENCYWIDE ADP PLANNING PROCESS SHOULD BE ESTABLISHED

The Survey, which spends about $90 million annually for ADP support, has not identified ADP planning requirements agencywide or a strategy for meeting them. Consequently, attempts at such planning have been sporadic, fragmented, and incomplete. The Survey's five divisions are responsible for deciding how to satisfy their own ADP requirements as well as managing their own resources, such as hardware, software, and telecommunications. If top management did more to address these requirements agencywide, management of ADP resources would be improved. This, in turn, would make the Survey's overall information resources management more effective in terms of cost and operations.

Previous agencywide planning incomplete and discontinued

Agencywide ADP planning has not been conducted for several years and even then it was not comprehensive enough. The Survey's ADP plan, published in January 1979, represented only independent divisional planning efforts at that time. It was fragmented, and several sections were incomplete. For example, in the section on long-range ADP goals, four of the nine division subsections contained no narrative and were labeled "reserved for future use." More importantly, because the plan was only a compilation of individual divisions' submissions, it did not provide the direction needed for effective overall management of ADP resources.

Another plan was prepared in 1980, but it was not published. The Deputy Assistant Director for Information Systems told us that the Survey did not publish it because the Department of the Interior's Office of the Assistant Secretary for Information Resources Management did not require it. He said that, since the Survey divisions are primarily responsible for ADP planning, the plan submitted to the Department was merely for the Department's benefit, and that he saw no need to continue compiling it. Considering the Survey's expenditure of

$90 million annually for ADP and the impact of ADP resources on meeting program objectives, we contend that the Survey needs an agencywide planning process.

Agencywide planning would make day-to-day management more effective

Agencywide ADP requirements planning would document (1) the information an agency needed to be collected and produced, (2) who is to use the information, and (3) how accurate and timely the information needs to be. User organizations should participate in this process by translating mission statements into work processes and information flows that are independent of specific manual and automated information systems. The resulting statements of functional requirements should then be collected and synthesized at the Survey level. This analysis should provide a baseline for evaluating ADP support requirements on a broad basis and allow management to formulate a general strategy for meeting them.

The Information Systems Division (ISD), for example, is charged with providing central mainframe computer services and other support services to the four divisions on a cost reimbursable basis; yet the divisions have wide discretion in using ISD's services. On the basis of their case-by-case analyses, the divisions have chosen to acquire dedicated mini-computers rather than use ISD's mainframe computers. Such choices provide little basis for evaluating agencywide needs. Meanwhile, ISD continues to acquire more mainframe computers with little direction on how they will be used. The cost of operating ISD is about $20 million annually.

An internal task force reported in June 1981 that the Survey had not established an effective process for ADP policy development and long-term planning. As a result, the Survey established the Information Systems Council to develop specific policies for an information systems planning process. As of July 1983, policy and guidance had been drafted but not completed and published.

The Deputy Assistant Director for Information Systems told us that the Survey had discontinued its efforts to develop a policy requiring agencywide planning because (1) the Information Systems Council had decided to concentrate on specific problems, such as the ongoing and anticipated changes in mainframe utilization and (2) ISD is participating in an agencywide mid-range planning effort which will cover a 1- to 5-year timeframe. He also said that the effectiveness of the Survey's division-level ADP planning is assured through the interaction between ISD and senior division representatives at Information Systems Council meetings.

The Assistant Director for Information Systems stated that he did not consider long-range ADP planning practical for the Survey due to the decentralized nature of program planning and the constantly changing internal and technological environment. He also said that, while decentralized ADP planning had resulted in cheaper solutions for the divisions, he was not sure they were the most cost-effective for the Survey overall.

Clearly stated, long-range ADP goals and the strategy for achieving them are fundamental to effective ADP management, and agencywide ADP planning is necessary to achieve this objective. The benefits of a continuous ADP planning process are described in our publication "Questions Designed to Aid Managers and Auditors in Assessing the ADP Planning Process," September 30, 1982. In our view the fact that the Department of the Interior does not require a formal plan does not relieve the Survey from the responsibility of preparing one. The Survey should rethink its position on ADP planning. Changing conditions do not preclude the agencywide ADP requirements planning that is needed. Such planning can be accomplished without unwarranted imposition on division management's planning prerogatives, and we believe it will reduce costs in the long run.

MANAGEMENT OF SOFTWARE DEVELOPMENT COULD BE IMPROVED

Major software development projects have floundered for several years and have experienced significant management problems. The Survey could improve its management of software resources and software development projects by establishing agencywide software management policies and coordinating critical software management functions.

Software management functions generally follow the life-cycle of a software system. The life-cycle stages coincide with the basic processes of defining system or data base requirements, approving the development project, designing and programming the software, and implementing and maintaining the system. Life-cycle management is a formal process that structures these management functions so they are effectively carried out at appropriate levels of the organization. Although the details of life-cycle management process can vary somewhat, its implementation could correct identified deficiencies inherent in software projects. For example, this management process could minimize such problems as prolonged and protracted development schedules, cost overruns, and failure to meet design goals. To help remedy the costly and significant problems in software development projects, we have developed a framework of principles and procedures for managing systems development. This framework is outlined in our report "Government-wide Guidelines and Management Assistance Center Needed to Improve ADP Systems Development (AFMD-81-28)," February 20, 1981.

The programming divisions are responsible for managing and developing software. This work is often performed by managers and scientific personnel whose ADP skills have not been sharpened by traditional ADP career experience, and the Survey does not have a life-cycle software management policy to guide their performance. Although the Information Systems Council initiated a project to establish this policy in 1982, as of July 1983 the policy had not been formalized. ISD, however, is now drafting policy for system life-cycle management for the Interior Department's consideration, and the Survey plans to adopt it. The Survey needs to use the principles of systems life-cycle management even in the absence of any Interior Department requirements.

Major software development projects ineffective

Two major software development projects--IMS and CAS--have significant management and design problems that a formal life-cycle management process can minimize.

IMS

The National Mapping Division initiated this effort in 1978 to provide a system for reporting employee time, scheduling projects, and allocating resources. A commercially available project management software system package that division management had identified was to be used. The project was expanded in 1978 because the software required to support the commercial package was more complex than anticipated at the time the project was initiated. Despite the project's complexity, the National Mapping Division did not determine the feasibility of IMS, overall costs and benefits, or functional requirements, all of which are important aspects of the life-cycle software management process. As a result, National Mapping Division management was not in a position to evaluate the risks associated with the project, establish system performance criteria for the contractor, or establish other needed management controls over its development.

IMS completion has slipped over 4 years beyond the original target date of October 1978. Although IMS produced performance and status reports, as of July 1983 the project scheduling portion was operational only on a limited test basis. As a result, IMS still does not meet major design objectives, despite an estimated cost of close to $3 million. The Chief, Program Management Branch, Eastern Mapping Center, who has overall responsibility for developing the system, said that the software package continues to be modified to make it more efficient and to meet acceptable computer operating cost criteria. The project manager told us that operating costs remain high and could exceed $1 million annually.

CAS

In May 1978 the Survey's management planning committee determined that CAS was needed to improve the Survey's accounting system. An internal study in February 1979 concluded that the financial management system's month-end reports did not reflect a Survey manager's true financial position because of extensive time lags between the submission of a requisition (a commitment) and the issuance of a contract or purchase order (an obligation). In May 1981 the Director decided to implement CAS agencywide. A deadline of May 1982 was established for implementing a prototype system within the Water Resources Division that could be extended to other divisions shortly thereafter.

CAS is over 1 year behind schedule, and has encountered many problems. Operational problems began shortly before September 1982. These included

--an insufficient number of telecommunications lines,

--inability of the testing division to use terminals,

--unavailability of the data base management system for extended times, and

--recurring damage to system files.

More problems surfaced as initial testing continued--inadequate capability for backup and recovery of files, lack of an efficient method to update CAS with financial management system transactions, and problems affecting data entry.

In November 1982, the Director established a top management committee to deal with these problems and assure that CAS became fully operational during fiscal year 1983. This top management attention resulted in many positive actions, including the development of a formal project plan.

CAS is being redesigned while it is being tested, to provide batch input capability. This redesign was needed because on-line usage of computer time and resources made response time slow and data entry tedious. The concurrent process of redesign and testing may result in costly changes to computer programs previously written.

CAS was justified on the basis that it would provide a more efficient financial management system, reduce the proliferation of "cuff" record systems, and save about $3 million annually. The Survey has about 400 separate and distinct cost centers, and a large number of them have developed their own systems for tracking funds. Some of these systems are automated, highly

sophisticated, and designed for unique local requirements. Cost centers within Water Resources and Geologic Divisions are planning to maintain their own independent financial systems even when CAS becomes fully operational. If these systems are not eliminated, most of the expected $3 million annual savings will not be realized.

We believe that an effective life-cycle management policy would have alleviated many of these problems. The Survey should give priority to establishing such a policy to emphasize (1) setting standards for activities to be carried out by division managers, (2) providing for adequate technical assistance in defining system requirements, and (3) establishing the coordination of complex and multidivisional projects.

RECOMMENDATIONS

We recommend that the Director:

--Establish a continuous, integrated, agencywide ADP planning process which will update the requirements plan no less than annually.

--Assign a high priority to developing system life-cycle management policies for software projects agencywide.

--Require software development projects to follow the principles of a system life-cycle management process.

We are sending copies of this report to the Secretary of the Interior and the Office of the Inspector General. Copies will also be available to other interested parties upon request.

Sincerely yours,

Walter L. Anderson
Senior Associate Director