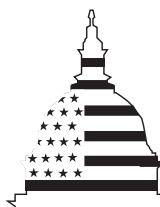United States General Accounting Office

GAO

Report to the Chairman and Ranking Minority Member, Subcommittee on Interior and Related Agencies, Committee on Appropriations, House of Representatives

February 2001

LAND MANAGEMENT SYSTEMS

BLM's Actions to Improve Information Technology Management

GAO

Accountability ★ Integrity ★ Reliability

Contents

Abbreviations

ALMRS	Automated Land and Mineral Record System
BLM	Bureau of Land Management
CIO	chief information officer
CMM	Capability Maturity Model
IOC	Initial Operating Capability
IRM	information resources management
IT	information technology
ITIB	Information Technology Investment Board
ITIM	Information Technology Investment Management
NILS	National Integrated Land System
NIRMC	National Information Resources Management Center
OMB	Office of Management and Budget
SEI	Software Engineering Institute

United States General Accounting Office
Washington, D.C. 20548

February 27, 2001

The Honorable Joe Skeen
Chairman
The Honorable Norman D. Dicks
Ranking Minority Member
Subcommittee on Interior
 and Related Agencies
Committee on Appropriations
House of Representatives

This report presents the status of actions taken by the Bureau of Land
Management (BLM) to strengthen its information technology (IT)
investment management and acquisition capabilities. The bureau has been
taking these actions to address recommendations we made when we
reported that the Automated Land and Mineral Record System (ALMRS)
Initial Operating Capability (IOC)—the major software component of
BLM's ALMRS/Modernization—failed to meet BLM's business needs and
was not deployable.[1] We made the recommendations to help BLM reduce
the risks that future IT efforts would fail.

At your request, we reviewed BLM's actions to implement our
recommendations and improve its management of IT. Accordingly, our
objectives were to determine whether BLM (1) has adequately assessed
ALMRS IOC and other alternatives to meet its business needs, (2) has
adequately strengthened its investment management practices, (3) is using
sound system acquisition processes, (4) has integrated its investment
management and systems acquisition improvement projects and developed
an overall plan and schedule for completing this integrated improvement
work, and (5) is planning to undertake any sizable systems acquisition or
development efforts before strengthening its information technology
program. Our objectives, scope, and methodology are presented in
appendix I. We performed our work from February 2000 through
December 2000 in accordance with generally accepted government

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[1]*Land Management Systems: Major Software Development Does Not Meet BLM's Business
Needs* (GAO/T-AIMD-99-102, March 4, 1999) and *Land Management Systems: Status of
BLM's Actions to Improve Information Technology Management* (GAO/AIMD-00-67,
February 24, 2000).

GAO-01-282 BLM's Information Technology Improvements

auditing standards. We requested comments on a draft of this report from the Department of the Interior. The Acting Assistant Secretary for Lands and Minerals provided us with written comments that are discussed in the "Agency Comments" section and reprinted in appendix II.

Results in Brief

Since 1999, BLM has been working to implement our recommendations to determine the usefulness of ALMRS IOC and assess and strengthen its IT investment management and acquisition capabilities. Although the bureau has not yet finished these efforts, it has begun to apply improved management strategies for selecting IT investments, develop processes and practices for controlling and evaluating investments, and build a more mature systems acquisition capability.

BLM performed a preliminary analysis of ALMRS IOC to determine whether all or part of the software could be used to meet the bureau's business needs. As we reported last year, BLM's chief information officer (CIO) plans to perform a final analysis of ALMRS IOC after the development of an enterprise architecture.[2] However, the enterprise architecture is not yet complete, and therefore the final analysis of ALMRS software has not yet been conducted.

BLM is continuing to address our recommendations to strengthen its investment management processes and practices and its systems acquisition capabilities. The bureau is developing an IT investment management program, an enterprise architecture, and IT acquisition practices to help avoid future problems and failures similar to ALMRS IOC. The bureau is also beginning to address our recommendation to integrate all these improvement projects. Senior BLM officials told us that, as a result of our follow-up work, the bureau plans additional corrective actions, including revising its IT capital asset plan, strategic information resources management (IRM) plan, IRM process improvement plan, and IT investment management process.

However, before completing and institutionalizing new investment control processes, the bureau has begun moving forward with an IT acquisition. As a result, BLM's efforts may be subject to many of the same project

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[2]An enterprise architecture is the explicit description of the current and desired relationships between business and management processes and information technology. BLM refers to its enterprise architecture as the bureau architecture.

management and management oversight risks that adversely affected the ALMRS/Modernization. We are therefore recommending that BLM establish procedures to ensure that the acquisition project and associated risks are properly managed and controlled.

Background

BLM's mission is to sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations. The bureau is responsible for approximately 264 million acres of public land in 28 states and public resources, including rangelands, timber, minerals, watersheds, wildlife habitats, wilderness and recreation areas, and archeological and historical resources. It also manages the subsurface mineral resources underlying another 300 million acres of land administered by other government agencies or owned by private interests. The bureau has 189 offices that maintain over 1 billion paper documents, including land surveys and surveyor notes, records of land ownership, mining claims, and oil and gas leases. According to BLM, most of the paper documents are deteriorating and are becoming increasingly difficult to read.

In the mid-1980s BLM began planning to acquire a land and mineral case processing system to keep up with its increasing workload and automate its manual records and case processing activities. By 1993, BLM decided on the scope and functionality of the project, called the ALMRS/Modernization. The project consisted of three major components: the ALMRS IOC, a geographic information system,[3] and the modernization of BLM's computer and telecommunications infrastructure and rehost of selected management and administrative systems. ALMRS IOC—the flagship of the ALMRS/Modernization—was to provide the capability to more efficiently record, maintain, and retrieve land description, ownership, and use information to support BLM, other federal programs, and interested parties.

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[3]A geographic information system is computer technology designed to assemble, store, manipulate, and display geographically referenced data, such as the location of a lake, oil well, or wildlife habitat.

Since 1995 we have issued several reports and made numerous recommendations to address the problems and risks that threatened the successful development and deployment of the ALMRS/Modernization.[4] In October 1998 an operational assessment test and evaluation showed that ALMRS IOC was not ready to be deployed because it did not meet BLM's business needs. The bureau subsequently stopped the ALMRS project. At the time the project was terminated, BLM estimated that from 1983 through 1998 it had obligated about $411 million for the ALMRS/Modernization project, of which over $67 million was spent to develop ALMRS IOC software.

In 1999, we testified on the long-standing project weaknesses at BLM that threatened the ALMRS/Modernization and increased the risks that future efforts would result in a similar outcome.[5] We recommended that BLM assess the usefulness of ALMRS IOC and other alternatives to meeting the bureau's business needs, and strengthen its investment management processes and systems acquisition capabilities. In February 2000, we reported that BLM was in the early stages of addressing our recommendations, and we further recommended that BLM develop a plan to integrate all these corrective actions and establish a schedule for completing them.[6]

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[4]*Land Management Systems: Progress and Risks in Developing BLM's Land and Mineral Record System* (GAO/AIMD-95-180, August 31, 1995), *Land Management Systems: BLM Faces Risks in Completing the Automated Land and Mineral Record System* (GAO/AIMD-97-42, March 19, 1997), *Land Management Systems: Information on BLM's Automated Land and Mineral Record System Release 2 Project* (GAO/AIMD-97-109R, June 6, 1997), *Land Management Systems: Actions Needed in Completing the Automated Land and Mineral Record System Development* (GAO/AIMD-98-107, May 15, 1998), and *Land Management Systems: Major Software Development Does Not Meet BLM's Business Needs* (GAO/AIMD-99-135, April 30, 1999).

[5]*Land Management Systems: Major Software Development Does Not Meet BLM's Business Needs* (GAO/T-AIMD-99-102, March 4, 1999).

[6]*Land Management Systems: Status of BLM's Actions to Improve Information Technology Management* (GAO/AIMD-00-67, February 24, 2000).

Preliminary ALMRS IOC Analysis Completed; Final Analysis Is Still Planned

Because of the enormous investment made in ALMRS IOC and the failure of the software to meet BLM's needs, we recommended that the Secretary of the Interior ensure that BLM thoroughly analyze the ALMRS IOC software to determine whether it could be cost beneficially modified to meet the bureau's needs. We pointed out that this analysis should be part of an overall effort to identify and assess all alternatives, including (1) modifying the ALMRS IOC software, (2) modifying existing land and recordation systems, (3) acquiring commercial, off-the-shelf software, or (4) developing new systems. We also stated that the alternatives analysis should clearly identify the risks, costs, and benefits of each alternative and should be performed after BLM is assured that it has verified its current business requirements.

In February 2000, we reported that BLM had prepared a preliminary report on its technical and functional analysis of ALMRS IOC, and concluded that ALMRS IOC was not operationally ready for deployment because it did not meet the bureau's business needs.[7] This conclusion was based on the determination that ALMRS IOC (1) was difficult to use and labor-intensive, (2) was poorly integrated into BLM's business processes, (3) was too slow, and (4) would be difficult and costly to maintain and operate. The bureau stated that although some of these problems could be solved, ALMRS IOC could not be repaired without a major technical effort and significant costs. At that time, BLM's CIO told us that the bureau planned to complete its analysis of ALMRS IOC and other alternatives after it established the bureau architecture and its business needs were known. The CIO noted that establishing an architecture is a necessary precursor to completing the analysis of ALMRS IOC and other alternatives because the architecture would document the bureau's business processes and information needs. As part of its final analysis, BLM planned to determine whether parts of ALMRS IOC could be useful for future IT efforts.

BLM developed an initial version of the bureau architecture in early 2000. It has also used non-software portions of ALMRS IOC, such as system specifications and documentation, to support other, ongoing information systems efforts. BLM's CIO told us that the bureau does not plan to complete a final analysis of ALMRS IOC and other alternatives until it finishes additional work to complete the bureau architecture. The bureau expects to complete its work on the architecture by the end of 2003.

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[7]GAO/AIMD-00-67, February 24, 2000.

Corrective Actions to Strengthen BLM's Investment Management Practices Continue

The absence of adequate investment management processes and practices at BLM was a significant factor contributing to the failure of ALMRS IOC. To reduce the risk that future IT efforts would fail and to help establish disciplined investment management as required by the Clinger-Cohen Act,[8] we recommended that the Secretary of the Interior ensure that BLM assess and strengthen its investment management practices to help avoid future problems. Sound investment management practices include (1) developing a capital asset plan, (2) developing strategic plans, (3) establishing an investment management board, (4) developing and implementing investment selection, control, and evaluation processes, (5) assessing staff skills, and (6) developing an information technology architecture to help properly manage new and ongoing IT projects.

IT Capital Asset Planning Is Under Way, but Not Yet Finished

The Clinger-Cohen Act requires agencies to use capital planning to guide the acquisition and management of IT, and the Office of Management and Budget (OMB) has issued guidance to assist agencies in developing a disciplined capital planning process.[9] OMB's guidance describes the key elements of an agency capital asset plan, including a statement of the relevant agency strategic plans, an analysis of existing systems and planned acquisitions, a gap analysis that identifies the agency objectives that cannot be met with existing IT assets, and justification for new spending.

BLM approved an IT capital asset plan, dated October 25, 1999, which outlines capital planning procedures for major IT acquisitions. The plan specifies the relationship between BLM's IT assets and the program performance goals identified in its strategic business plan. However, the plan is not yet complete, in that it does not include an analysis of the IT assets already owned by the agency and assets being acquired, an analysis of the gap between actual and planned performance, or justification for new acquisitions proposed for funding, as recommended by OMB guidance. According to BLM's Deputy CIO, the bureau expects to revise and restructure its capital asset plan now that an initial version of the bureau

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[8]The Clinger-Cohen Act of 1996 seeks to maximize the return on investments in information systems by requiring agencies to institute sound capital investment decision-making. Under the act, agencies must design and implement a process for maximizing the value and assessing and managing the risks of IT acquisitions.

[9]Office of Management and Budget, *Capital Programming Guide,* Version 1.0, Supplement to OMB Circular A-11, July 1997.

architecture has been developed. The Deputy CIO added that BLM is planning to incorporate OMB's recommended analyses and justifications in its revised plan. The analyses and justifications should help to guide the acquisition and management of BLM's IT assets and investments. BLM expects to finish revising the capital asset plan by the end of fiscal 2001.

Improvements to BLM's Strategic IRM Plan Are Under Way, but Not Yet Complete

The Clinger-Cohen Act requires agencies to ensure that IT is acquired and information resources are managed in a manner consistent with the Paperwork Reduction Act of 1995. The Paperwork Reduction Act requires agencies to develop and maintain a strategic IRM plan that integrates IT investment processes with their processes for making budget, financial, and program management decisions. OMB has issued guidance to assist agencies in developing strategic IRM plans that are consistent with the requirements of the Paperwork Reduction Act.[10]

BLM is revising its 1997–2002 strategic IRM plan, dated March 12, 1998. Our review of a draft of BLM's 2001–2005 strategic IRM plan showed that the draft plan includes a section on organizational effectiveness. The plan also shows how BLM's IRM goals relate to, and support, bureauwide goals and objectives. However, the plan is not yet complete in that it does not describe how IRM activities will help accomplish BLM's mission, nor does it ensure that IRM decisions are integrated with decisions on organizational planning, budget, procurement, financial management, human resources management, and programs, both of which are recommended by OMB in its strategic planning guidance. BLM's Deputy CIO told us that the bureau is revising its draft strategic IRM plan now that an initial version of the bureau architecture has been developed. According the Deputy CIO, the revised strategic IRM plan will be completed by the end of fiscal year 2001 and will include the information recommended by OMB. Inclusion of the information recommended by OMB should help ensure that BLM's strategic IRM plan will support IT investment management at the bureau.

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[10]Office of Management and Budget Circular A-130, *Management of Federal Information Resources,* November 30, 2000.

Information Technology Investment Board Has Been Established and Its Role Is Evolving

The Clinger-Cohen Act requires agencies to manage IT investments by using processes and information to ensure that IT projects are implemented at acceptable costs and within reasonable and expected time frames, and are contributing to tangible and observable improvements in mission performance. OMB's and our joint guidance identifies attributes that are critical for achieving successful investment management practices, including senior management attention to those practices. [11] Senior managers should have the authority to make key business and funding decisions on IT projects and use a disciplined and structured management forum for making key IT investment decisions with the authority to approve, cancel, or delay projects, mitigate risks, and validate expected returns. This guidance also describes key phases that should be part of a mature IT investment management process that provides for the continual selection, control, and evaluation of information technology investments.

BLM has established an Information Technology Investment Board (ITIB) composed of senior-level program, IRM, and financial managers, with a charter that clearly defines the board's roles, responsibilities, and functions. For example, the charter specifies that the board is responsible for decisions regarding the initiation, development, implementation, and evaluation of major IT investments. The charter also outlines the functions of the board, including (1) developing an information technology architecture, (2) selecting IT investments, (3) managing and controlling IT activities, and (4) evaluating IT investments after implementation. On August 24, 2000, BLM revised the ITIB charter to help further improve the bureau's selection, control, and evaluation processes. The charter revisions included (1) adding project life-cycle costs as selection assessment criteria, (2) adding progress reports on key project milestones and expenditures as part of the ITIB's management and control processes, and (3) plans to better align the schedule of ITIB meetings and activities with the bureau's budget cycle.

Since its creation in 1998, BLM's ITIB has approved 17 projects for funding based on criteria it established to select IT projects. These criteria include evaluating whether projects (1) support BLM's core business functions, (2) address work processes that have been simplified or redesigned to

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[11] *Evaluating Information Technology Investments: A Practical Guide,* Version 1.0, Office of Information and Regulatory Affairs, Information Policy and Technology Branch, Office of Management and Budget, November 1, 1995. This guide was prepared cooperatively by OMB and us.

reduce cost and improve effectiveness, (3) demonstrate a projected return on investment that is equal to or better than alternative uses of available resources, (4) are consistent with the bureau architecture, and (5) include a risk reduction strategy.

While these actions represent improvements, BLM has not yet established criteria and processes to properly control and evaluate IT investments. For example, the ITIB reviews ongoing projects at major project milestones or when additional funding is needed, while our guidance recommends and best practices suggest that in the control phase, information should be continually collected, updated, and provided to decisionmakers so they can identify projects that are at risk and act early to mitigate those risks or terminate the project. The ITIB also has not yet developed criteria for the evaluation phase that would measure actual versus projected performance and identify benefits that were achieved by an IT investment. Without identifying control and evaluation criteria and implementing such processes, BLM does not yet have in place all the elements necessary to properly manage its IT investments. BLM's CIO told us that the ITIB has worked to first establish and implement processes to select IT projects and establish selection criteria, including whether a project adequately supports the bureau's architecture. Now that those processes and criteria are in place, the board is beginning to focus on establishing processes to control ongoing IT projects. For example, the bureau is currently developing a tracking system to help ensure that the ITIB can review and control approved projects.

The ITIB also has not yet incorporated the bureau's strategic planning, capital planning, or budget cycle as part of the project selection, control, or evaluation criteria. For example, the ITIB charter does not recognize the bureau's strategic or annual performance plans as part of its selection, control, or evaluation processes. In addition, although the charter indicates that the ITIB will use BLM's capital asset plan or strategic plan as guidance in identifying the bureau's business needs, the charter focuses only on the bureau's architecture to identify those needs. BLM's CIO told us that the ITIB's charge, as identified in the board's charter, will be revised and updated as the bureau's investment management processes mature. BLM plans to include strategic and capital planning criteria as part of its selection, control, and evaluation cycle, and also plans to coordinate the cycle as part of its budget planning process.

Investment Management Processes Are Being Documented, but Efforts Are Not Yet Complete

BLM has drafted a document that is intended to describe the bureau's IT investment management process and provide the bureau with consistent and documented policies and procedures for managing information technology investments. The draft document, dated November 28, 2000, describes roles and responsibilities for investment management, provides detailed, project-oriented policies and processes for each phase of the selection, control, and evaluation process, and provides guidance for developing a business case for an IT project.

The draft document focuses primarily on the management of individual projects. The document lacks policies and procedures for managing all of BLM's IT systems and projects as a comprehensive portfolio that would help ensure that the bureau meets its goals and carries out its mission. For example, the document focuses on the requirements for managers, sponsors, and proponents of planned and ongoing projects to manage projects throughout the selection, control, and evaluation processes. It does not yet provide comprehensive and strategic policies and procedures for senior managers and decisionmakers that take into account the budget cycle, strategic goals and objectives, capital planning, and bureau architecture with BLM's management of its IT investments. BLM's CIO told us that the draft investment management document is evolving to describe a more comprehensive, portfolio-based approach to managing IT investments. The CIO said the bureau plans to identify its portfolio of investments and plans to begin more comprehensive reviews of those investments as part of the annual budget cycle.

BLM's IRM Organization and Staffing Assessment Has Been Completed

The Clinger-Cohen Act requires agency CIOs to assess staff IRM knowledge and skills. BLM has assessed its IT staffing and skills needs and restructured its national IRM organization based on that assessment. BLM's national IRM organization consists of its IRM headquarters in Washington, D.C., and National IRM Center (NIRMC) in Denver. In October 1999, BLM's CIO tasked a team of field managers and technical, program, and personnel specialists with assessing NIRMC, including its staffing and skill levels, mission and functions, and organizational structure. The team issued its final report in January 2000. Subsequently, in April 2000, a team of field managers and IRM specialists completed an assessment of BLM's headquarters-based IRM organization. Based on recommendations made by the assessment teams and validated by a BLM management team, the bureau made significant changes to its IRM organization.

According to the Director of BLM, implementing these recommendations has resulted in a new role for NIRMC, a reduction in force, and the reassignment of key IT functions to the headquarters IRM office. For example, before the reorganization, BLM's systems operations, systems engineering, and IRM management functions were located at NIRMC. Now, NIRMC's new role includes responsibilities for systems operations and systems engineering. The IRM management functions have been moved to BLM's headquarters offices in Washington, D.C., and restructured to include an investment management group and a policy and records group. A systems coordination group was also created to ensure adherence with system life-cycle management principles. In addition, two key positions were added to BLM's IRM organization—a lead information technology architect and a systems development manager. According to BLM's CIO, the reorganization and new technical positions will better enable the IRM organization to meet the information technology needs of the bureau. BLM's new organization took effect on July 2, 2000.

Work to Develop BLM's Bureau Architecture Continues

The Clinger-Cohen Act requires agency CIOs to develop, maintain, and facilitate the implementation of a sound and integrated information technology architecture.[12] The architecture should be an integrated framework for evolving or maintaining existing IT and acquiring new technology to achieve the agency's strategic and IRM goals and better support its business needs. According to OMB, to develop an enterprise architecture, agencies should identify and document business processes,[13] information flows and relationships, applications, data descriptions and relationships, and the agency's technology infrastructure. In addition, OMB

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[12]An information technology architecture, also referred to as an enterprise architecture, provides a comprehensive blueprint that systematically details the breadth and depth of an organization's mission-based mode of operation. An enterprise architecture provides details first in logical terms, such as defining business functions, providing high-level descriptions of information systems and their interrelationships, and specifying information flows; and second in technical terms such as specifying hardware, software, data, communications, security, and performance characteristics.

[13]Enterprise architectures should contain a business process component that describes the core business processes supporting the organization's mission. The business process component of the architecture must be developed by senior program managers in conjunction with IT managers.

recommends that agencies include a technical reference model[14] and standards profile as part of an architecture.[15]

BLM has developed an initial bureau architecture, which contains guiding principles and descriptions of some of BLM processes, data, and applications, and six strategic initiatives to improve the architecture and support its future development. As part of this effort, BLM also developed the first volume of a technical reference model that contains principles and recommended best practices for selecting and deploying system and network hardware and software. In addition, the bureau has developed a plan to broaden and further develop the bureau architecture over the next 3 years, because the architecture is not yet complete: It lacks a complete and accurate inventory of all of BLM's application software, data, business processes, and network and system hardware and software. For example, major components of the initial bureau architecture are limited to the 13 information systems that are managed by NIRMC.

BLM's acting lead architect told us that BLM is planning to complete a comprehensive analysis that will extend and validate the scope of the current bureau architecture for software applications and for systems and network hardware and software in all state offices. In addition, many tasks that are essential to the development of an architecture have yet to be completed by BLM. For example, BLM has not yet finished the business process analyses, data architecture and standards, and systems and network hardware and software standards as recommended by OMB. BLM's multiyear architecture plan includes these tasks, and shows that the bureau plans to complete them by the end of 2003.

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[14]A technical reference model identifies and describes the information services used throughout the agency, such as database, communications, and intranet services.

[15]Office of Management and Budget Circular A-130, *Management of Federal Information Resources,* November 30, 2000.

Corrective Actions to Strengthen Systems Acquisition Processes Are Continuing

As stated in our March 4, 1999, testimony, BLM did not have key management controls in place for the ALMRS IOC project to help ensure that the project would result in a system that would meet BLM's business needs.[16] Accordingly, we recommended that the Secretary of the Interior ensure that BLM obtain an independent assessment of its systems acquisition capabilities and ensure that it use sound systems acquisition processes.

BLM subsequently obtained an independent, high-level assessment of its systems acquisition capabilities, based on the Software Engineering Institute's (SEI) Software and Software Acquisition Capability Maturity Models (CMM)[SM] criteria.[17] BLM's software acquisition processes were found to be immature—level 1. According to SEI, the characteristics of a level 1 organization include (1) lack of a stable environment for developing and maintaining software, (2) overcommitment of staff and resources, and (3) abandonment of planned procedures when executing projects. Research by SEI has shown that defined and repeatable processes for managing software acquisition are critical to an organization's ability to consistently deliver high-quality information systems on time and within budget. The critical management process areas that SEI deems necessary for an organization to reach CMM level 2[18] include (1) software acquisition planning, (2) solicitation, (3) requirements development and management, (4) project management, (5) contract tracking and oversight, (6) evaluation, and (7) transition to support.

BLM is taking action to address weaknesses in its systems acquisition processes. For example, it has drafted a process improvement plan that includes improvement activities for all of the 13 key process areas included in both software and software acquisition CMMs—including the critical management processes required to reach CMM level 2 (listed above). According to the plan, the bureau will define activities for each key process area, define methods, policies, and procedures, obtain tools to support and

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[16]*Land Management Systems: Major Software Development Does Not Meet BLM's Business Needs* (GAO/T-AIMD-99-102, March 4, 1999).

[17]Capability Maturity Model[SM] is the service trademark of Carnegie Mellon University, and CMM® is registered with the U.S. Patent and Trademark Office.

[18]Level 2 organizations are defined as having basic project management processes to track cost, schedule, and functionality, with the necessary process discipline in place to repeat earlier successes on projects with similar applications.

automate the activities in each key process area, and provide training. BLM plans to complete these efforts in February 2002. The plan indicates that about 6 months will be devoted to using the improved processes and demonstrating the attainment of CMM level 2 capabilities.

BLM is also sponsoring a 6-week project-management training program to further strengthen its system acquisition capabilities. The training program consists of six courses, including software risk management, software quality management, and project scheduling and cost control. Thirty-one BLM staff completed the program in calendar year 2000, and BLM's CIO anticipates that many more BLM staff, including some not in the IT organization, will complete this training in 2001. BLM's CIO also told us that the bureau is committed to training as many BLM staff as necessary to support the successful management of new projects throughout the agency.

An Integrated Plan and Schedule Are Being Developed for BLM's Investment Management and Systems Acquisition Improvement Projects

To help ensure that BLM's improvement actions will succeed, we recommended that the Secretary of the Interior direct BLM to develop a comprehensive and integrated information technology investment management program by integrating the bureau's projects to strengthen its investment management and systems acquisition processes and practices. We also recommended that BLM establish an overall project plan, schedule, and milestones for these actions. We have developed a methodology and guidance, called Information Technology Investment Management (ITIM), to assist agencies in analyzing IT investment management processes and determining the maturity of those processes.[19] ITIM is structured using a maturity framework similar to SEI's CMM, and includes a roadmap that agencies can use for improving their IT investment management processes.

To address our recommendations, the bureau is using a contractor to assist in integrating its investment management improvement projects and has drafted an IRM process improvement plan. The draft plan, issued on October 10, 2000, is intended to be the primary planning document for BLM's IRM process improvement effort and is considered by the bureau to be a document that will be developed incrementally. The plan contains strategic goals for BLM's process improvement effort, describes the organizations responsible for carrying out the effort, contains an improvement agenda with guiding principles and a process improvement

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[19] *Information Technology Investment Management: A Framework for Assessing and Improving Process Maturity*, Exposure Draft, Version 1 (GAO/AIMD-10.1.23, May 2000).

roadmap, discusses risks and BLM's planned responses, and shows high-level criteria for the success of the effort. The plan focuses on eight improvement areas, including BLM's information technology architecture, investment management, project management, and data management.

However, the draft plan does not yet integrate these individual projects and identify the interdependencies among the planned improvement areas. For example, BLM's plans to improve its information technology architecture and its data management are described separately. Although these efforts are dependent upon each other, the draft plan does not address the relationships and management of the interdependencies between the two improvement efforts. As a result, BLM does not yet have a complete plan that shows the relationships and interdependencies of the projects aimed at strengthening its IRM program.

BLM's draft process improvement plan also contains a high-level schedule with milestones for completing its improvement work. The plan outlines four major objectives to be accomplished within 18 months: (1) defining an information technology architecture, (2) establishing stable investment management processes and practices to attain level 2 of our ITIM framework, (3) establishing project management and software acquisition best practices to attain CMM level 2, and (4) establishing policies and procedures to identify business-critical data sets, measure and improve data quality, reduce data duplication, and promote reuse of commonly used data.

However, the schedule does not contain the detailed tasks and interdependencies necessary to ensure that all of BLM's planned process improvement work could be completed on schedule. For example, the schedule includes a task to "define policies and procedures" to help improve the bureau's investment management processes. But the schedule does not include any of the lower level tasks that would identify exactly which policies and procedures would be defined, or the time and resources necessary to carry out the tasks. In addition, the schedule does not include interdependencies between this task and other related tasks such as "defining project management policies and procedures" or "piloting improved processes." These details and interdependencies are necessary to establish milestones and a critical path to help ensure a reliable schedule. According to BLM's CIO, the bureau will continue its planning efforts and further define all of its improvement projects and integrate them.

System Acquisition Is Beginning Before Investment Management Processes and Practices Are Strengthened

Because of the IT investment management and systems acquisition problems identified during the ALMRS/Modernization, we recommended that BLM not undertake any sizable systems acquisition or development efforts until the assessments we recommended were completed and corrective actions taken.

At the time of our February 2000 report, BLM had temporarily suspended all major systems acquisition and development projects. However, the bureau continued work on several ongoing systems maintenance projects as well as planning for a major system called the National Integrated Land System (NILS). NILS is a joint project with the United States Forest Service to develop a common data model and tools in a geographic information system environment for managing cadastral[20] and land record data. NILS consists of four modules called GeoCommunicator, Survey Management, Measurement Management, and Parcel Management[21] and is estimated to cost about $16.7 million through project completion. Each module is being planned as a separate project. We reported in February 2000 that, according to BLM's CIO, planning for NILS would continue but development would not begin until after the bureau architecture was sufficiently complete and its business needs documented.

Since that time, BLM has completed the initial bureau architecture and issued an interim architectural policy for bureauwide IT projects which is intended to guide and constrain new project development until development and implementation of the bureau architecture is sufficiently complete. In addition, BLM has begun work on the first of the four NILS modules—GeoCommunicator—estimated to cost about $1.9 million.[22] BLM plans to use GeoCommunicator to establish an Internet web site using its current information systems to facilitate data sharing and collaborative work among BLM staff.

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[20]Cadastral data document the legal boundaries, ownership, extent, and value of real property.

[21]Survey Management will consist of data collection software packages that will support the capture of land survey data directly into a geographic information system database format; Measurement Management will allow users to create a control network for survey data including the Public Land Survey System with the use of online measurement adjustment programs; Parcel Management will provide a process for managing land records and data stored in a database model.

[22]On January 29, 2001, the NILS project manager informed us that BLM is updating the cost estimate and expects the cost of this module to be significantly reduced.

Although the GeoCommunicator project is a small part of the NILS effort, we determined whether sufficient controls are in place to properly guide and manage the project. BLM's initial bureau architecture and interim policy provide adequate architectural guidance for the NILS GeoCommunicator module. However, the bureau's investment management processes are not yet sufficient to properly track and assess the progress of the GeoCommunicator project. For example, the bureau is only now beginning to identify and implement the investment processes and criteria necessary to control approved projects. By moving forward with development of the GeoCommunicator module before strengthening its investment management processes and practices, the bureau is increasing the risk that the project may not adequately meet its needs or be delivered as planned.

In addition, BLM has not assessed the potential risk and impact of the workload that GeoCommunicator may have on BLM's current computing environment. GeoCommunicator users will be able to view, download, and store land data in graphic formats, which would necessitate BLM having adequate computing capacity to support new hardware and communications requirements resulting from new uses of BLM land data. In addition, GeoCommunicator will facilitate the downloading of land record data from external sources into BLM's databases. BLM users could then combine external data with BLM's own data, with few controls over the use or quality of external data, and without timeliness standards for the external data. Without an understanding of the impact of GeoCommunicator on BLM's systems and data, BLM has no assurance that the project will produce expected results and meet the bureau's needs.

Conclusions

BLM continues taking corrective actions to implement the recommendations we made in 1999 and 2000. While these actions are not yet complete, the changes made thus far should help to improve the acquisition and management of IT investments. The bureau has begun to improve the selection and management of its IT investments and develop more mature systems development and acquisition capabilities. The bureau is also developing a plan and schedule to integrate its improvement actions, developing plans and actions to properly control ongoing and evaluate completed IT projects, and establishing an enterprise architecture. However, more needs to be done to fully address our recommendations. BLM recognizes this and said it will continue to work diligently on these areas.

BLM has also taken steps to acquire a component of a major information system before completing improvement actions to its investment control processes. Without sufficient management controls in place, BLM is increasing the risk that this new system effort will fail to meet the bureau's needs or will not be delivered as planned.

Recommendations

We recommend that the Secretary of the Interior direct BLM to take the following actions to help mitigate risks associated with moving forward with the GeoCommunicator acquisition:

- Adopt procedures to ensure proper management and control over the GeoCommunicator project. The procedures should include (1) consistent project monitoring by senior managers to ensure that cost and schedule are being controlled, benefits are being accomplished, risks are being managed, and strategic bureau needs are being met and (2) comparison of interim results against project estimates through each stage to ensure that the project is progressing as expected and to indicate when actions should be taken as problems arise, including modifying, canceling, continuing, or accelerating the project.
- Determine the additional workload and other impacts that implementing the GeoCommunicator module will have on BLM's current computing environment. This assessment should be completed as quickly as possible and evaluated by the ITIB immediately upon its completion.

Agency Comments

In commenting on a draft of this report, the Acting Assistant Secretary for Land and Minerals Management stated that the Department of the Interior concurs with our findings and recommendations. The department reported that BLM has been endeavoring to improve IT management, recognizes that there are areas that need further improvement, and will continue to work diligently in those areas. The key corrective actions include (1) filling several important positions in the next 6 months, (2) continuing the efforts to complete its IT investment management processes, (3) instituting a review of NILS to more accurately identify the risks, mitigation measures, and advisability of continuing with the projects as currently planned, and (4) applying new control and assessment criteria to the GeoCommunicator project. The department's comments are reprinted in their entirety as appendix II.

GAO-01-282 BLM's Information Technology Improvements

We are sending copies of this report to Senator Conrad Burns, Chairman, and Senator Robert C. Byrd, Ranking Member, Subcommittee on Interior and Related Agencies, Senate Committee on Appropriations. We are also sending copies of this report to Mitchell E. Daniels, Jr., Director, Office of Management and Budget; Gale A. Norton, Secretary of the Interior; and Nina Rose Hatfield, Acting Director, Bureau of Land Management. Copies will also be made available to others upon request and will be available on our home page at *http://www.gao.gov.*

Should you or your staff have any questions concerning this report, please contact me at (202) 512-6240, or David G. Gill, Assistant Director, at (202) 512-6250. We can also be reached by e-mail at *koontzl@gao.gov* and *gilld@gao.gov,* respectively. Major contributors to this report are listed in appendix III.

Linda D Koontz

Linda D. Koontz
Director, Information Management Issues

Objectives, Scope, and Methodology

As requested by the Subcommittee on Interior and Related Agencies, Committee on Appropriations, House of Representatives, our objectives were to determine whether BLM (1) has adequately assessed the usability of the ALMRS IOC software and other alternatives to meet its business needs, (2) has adequately strengthened its investment management practices, (3) is using sound systems acquisition processes, (4) has integrated all of its investment management and systems acquisition improvement projects and developed an overall plan and schedule for completing this integrated work, and (5) is planning to undertake any sizable systems acquisition or development efforts prior to strengthening its information technology program.

To meet our first objective, we reviewed BLM's technical and functional analysis of ALMRS IOC as well as supporting documentation and reports. We also interviewed bureau officials to determine BLM's plans to conduct further analyses.

To meet our second objective, we reviewed BLM's draft IT management plans, including its capital asset and strategic IRM plans, and compared the plans to OMB's and our guidance for developing such plans. To assess the composition and actions of BLM's ITIB, we compared the board's charter to our investment management guidance, attended ITIB meetings at BLM, and reviewed the results of the ITIB meetings to determine the extent to which BLM has implemented a sound investment management process. We also reviewed BLM's draft investment management process document and compared the bureau's draft process to our information technology investment management guidance. We reviewed the bureau's IRM reorganization and staffing assessment, and compared it with the Clinger-Cohen Act's requirement that agency CIOs assess the extent to which personnel meet the agencies' organizational IRM requirements. To assess BLM's architecture, we analyzed the bureau's architectural models and data, and the methodology used to develop the architecture, and compared them to OMB's guidance for developing and documenting enterprise architectures. We interviewed BLM officials, including the CIO and Deputy CIO, acting lead architect, and NILS project manager to identify BLM's planned and ongoing actions to strengthen its investment management processes.

To address our third objective, we analyzed BLM's plan to strengthen its investment management capabilities and compared the plan to the SEI's Software and Software Acquisition CMM criteria. We also interviewed

bureau officials to determine what actions BLM has taken and plans to take to strengthen its systems acquisition capabilities.

To address our fourth objective, we analyzed BLM's integrated plan and schedule for managing all of its investment management and systems acquisition improvement projects to determine whether the plan fully integrated these projects and to assess the reliability of the schedule. We also interviewed bureau officials to determine BLM's plans for further integrating these projects and establishing a reliable project schedule.

To address our final objective, we analyzed NILS and GeoCommunicator project plans and documents, and interviewed project and contractor officials. We also compared the project's progress to BLM's progress in developing and implementing IT investment management controls to determine whether the current controls are sufficient to properly track and control the GeoCommunicator project.

We performed our work at BLM and Department of the Interior headquarters in Washington, D.C., and BLM's National Information Resources Management Center headquarters in Denver. We performed our work from February 2000 through December 2000 in accordance with generally accepted government auditing standards.

Comments From the Department of the Interior

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

FEB - 5 2001

Mr. Joel C. Willemssen
Managing Director, Information
 Technology Issues
United States General Accounting Office
Washington, D.C. 20548

Dear Mr. Willemssen:

Thank you for the opportunity to respond to the draft report entitled, "LAND
MANAGEMENT SYSTEMS: BLM's Actions to Improve Information Technology
Management" (GAO-01-282). The Bureau of Land Management (BLM) concurs with
the findings of this report and with the two recommendations contained in the report. As
the report indicates, the BLM has been actively working to improve the management of
its information technology (IT). We recognize that there are areas that need further
improvement and will continue to work diligently in those areas. Details on progress
made and our comments to the recommendations are enclosed.

The BLM appreciates the advice and critical assessment the GAO has given to our IT
investment management program. The BLM is well aware of our responsibility to
properly manage this investment and future acquisitions, and we will endeavor to
improve our processes to reap the greatest benefit possible.

If you have any further questions, please contact Tim Foley, Senior Program Analyst at
(202) 452-5022 or Jean Fend, Audit Liaison Officer at (202) 452-5153.

Sincerely,

Piet deWitt

Piet deWitt
Acting Assistant Secretary, Land
 and Minerals Management

Enclosure

LAND MANAGEMENT SYSTEMS
BLM's Actions to Improve Information Technology Management
Draft Report GAO-01-282

The Bureau of Land Management (BLM) concurs with the findings of this report and
with the two recommendations contained in the report. As the report indicates, the BLM
has been actively working to improve the management of its information technology (IT).
We recognize that there are areas that need further improvement and will continue to
work diligently in those areas.

Recommendation 1: Adopt procedures to ensure proper management and control over
the GeoCommunicator project. The procedures should include (1) consistent project
monitoring by senior managers to ensure that cost and schedule are being controlled,
benefits are being accomplished, risks are being managed, and strategic bureau needs are
being met and (2) comparison of interim results against project estimates through each
stage to ensure that the project is progressing as expected and to indicate when actions
should be taken as problems arise, including modifying, canceling, continuing, or
accelerating the project.

Recommendation 2: Determine the additional workload and other impacts that
implementing the GeoCommunicator module will have on BLM's current computing
environment. This assessment should be completed as quickly as possible and evaluated
by the ITIB immediately upon its completion.

Response: The BLM has recently completed filling its key IT management positions.
Within the next six months we expect to fill several important supporting staff positions
to address investment control and configuration management. This will complete the
staffing of the recent organizational realignment designed to place an emphasis on
management controls for planning, acquisition and implementation of our IT assets in
accordance with the established best practices that the GAO has advocated.

The report correctly points out that the BLM's Information Technology Investment Board
(ITIB) has, to date, focused on improving its process for applying improved and consistent
selection criteria to projects and acquisitions. This has been a conscious decision in order
to meet pressing short term needs. However, the ITIB recognized the need for oversight
of the control and evaluation phases of its investments as well as the need to consider its
entire IT portfolio as an investment entity and has restricted consideration of new
investments to limited projects that address only immediate needs. The BLM Chief
Information Officer (CIO) has, through his management improvement plan and
organizational realignment, begun the steps to develop criteria, processes and staff support

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to enable the ITIB to fulfill its full range of responsibilities. The development and implementation of a detailed plan to establish the basis for project selection and design decisions is recognized as central to our improvement efforts and is underway.

The National Integrated Land System (NILS) and related modules were reviewed by an independent contractor as part of a task to assess the BLM's progress toward improving its project management process. The contractor's report is in accord with the conclusions in the GAO report, *"BLM has also taken steps to acquire a component of a major system before completing improvement actions to its investment control process. Without sufficient controls in place, BLM is increasing risk that this new system effort will fail to meet the bureau's needs or will not be delivered as planned."* Although, the BLM recognized there was some risk in proceeding with these projects, it was, at the time, considered a controlled and acceptable risk. In light of GAO's continuing concern and those concerns raised by the independent contractor, the BLM CIO has initiated a review by the BLM's Lead Architect of the systems and contract vehicles in place. This review will more accurately identify risks of proceeding with these projects, identify risk mitigation measures and report on the advisability of continuing the projects as currently planned.

The recommendations regarding the need for increased management control over the GeoCommunicator project and an assessment of the impact on the organization and IT resources when implemented are accepted. The GeoCommunicator project will be the first project to which the new control and assessment criteria will be applied. The recent transfer of management responsibility for this project to the Assistant Director for that program area will ensure that user requirements are fully addressed. The BLM CIO, however, has not dismissed his responsibility to ensure that proper IT engineering practices are followed and projected impacts are considered. The results of the review by the Lead Architect addressed in the preceding paragraph will be reported to the ITIB at its March 2001 meeting. It is recognized that followup on engineering assessments may be necessary. A test plan had been developed for GeoCommunicator which is designed to establish the effects of the application on the BLM's computing environment. A copy of this test plan as well as the requirements traceability matrix will be provided to the GAO separately.

The Responsible official for both recommendations is the BLM's Assistant Director for Information Resources Management.

GAO Contact and Staff Acknowledgments

GAO Contact

David G. Gill, (202) 512-6250

Acknowledgments

In addition to the individual named above, Elizabeth A. Roach, E. Randolph Tekeley, and Eric D. Winter made key contributions to this report.

Related GAO Products

Land Management Systems: Status of BLM's Actions to Improve Information Technology Management (GAO/AIMD-00-67, February 24, 2000).

Land Management Systems: Major Software Development Does Not Meet BLM's Business Needs (GAO/AIMD-99-135, April 30, 1999).

Land Management Systems: Major Software Development Does Not Meet BLM's Business Needs (GAO/T-AIMD-99-102, March 4, 1999).

Land Management Systems: Actions Needed in Completing the Automated Land and Mineral Record System Development (GAO/AIMD-98-107, May 15, 1998).

Land Management Systems: Information on BLM's Automated Land and Mineral Record System Release 2 Project (GAO/AIMD-97-109R, June 6, 1997).

Land Management Systems: BLM Faces Risks in Completing the Automated Land and Mineral Record System (GAO/AIMD-97-42, March 19, 1997).

Land Management Systems: Progress and Risks in Developing BLM's Land and Mineral Record System (GAO/AIMD-95-180, August 31, 1995).

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