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

March 1997

LAND MANAGEMENT SYSTEMS

BLM Faces Risks in Completing the Automated Land and Mineral Record System

GAO/AIMD-97-42

GAO

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

Accounting and Information
Management Division

B-271929

March 19, 1997

The Honorable Ralph Regula
Chairman
The Honorable Sidney R. Yates
Ranking Minority Member
Subcommittee on Interior
and Related Agencies
Committee on Appropriations
House of Representatives

This report presents the results of our review of the Bureau of Land Management's (BLM) efforts to complete the development of the Automated Land and Mineral Record System/Modernization (ALMRS/Modernization). This project is intended to improve BLM's ability to record, maintain, and retrieve land description, ownership, and use information, and is the largest system development project ever undertaken by BLM or the Department of the Interior, of which BLM is a part. Currently, BLM and the prime contractor are approaching the final stages of software development and the beginning stages of operational testing.

In August 1995 we reported to you on BLM's progress and the potential problems in developing and implementing the ALMRS/Modernization.[1] At that time, we discussed the complexity of the effort and the likelihood that the project schedule could be delayed because BLM had planned insufficient time to accomplish certain steps and deal with unanticipated problems.

As a follow-up to that assignment, you asked that we ascertain (1) if risks remain that could seriously affect the performance, capability, or cost of ALMRS, (2) if BLM is operationally and managerially ready to deploy ALMRS in fiscal year 1997, (3) the latest cost estimates for ALMRS and reasons for any cost increases, (4) what Interior is doing to promote the use of ALMRS by its other bureaus, and (5) if other Interior bureaus are planning to use ALMRS for their land management needs. Details of our objectives, scope, and methodology are provided in appendix I.

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

Results in Brief

BLM has recently encountered problems with the ALMRS/Modernization development that increase the risk of degraded performance and capability, and these problems have already resulted in higher costs. During expanded testing of the ALMRS/Modernization, BLM discovered that the system performed some functions more slowly than expected and did not process all transactions correctly during tests using an operationally-sized database. BLM also recently suspended the development of an important reporting capability and substituted some standard reports which cost less and take less time to finish. BLM and the prime contractor have progressed in correcting these problems. Their correction efforts are continuing.

Although BLM is preparing to begin deploying ALMRS in fiscal year 1997 after development and testing are complete, it will not be ready to deploy ALMRS until it has completed essential management plans, policies, or procedures to help ensure a successful transition and operating environment. Still lacking are a configuration management plan and a system security plan and security architecture. Also, transition and operations and maintenance plans are incomplete. These tools are essential to help ensure system availability and performance and to avoid security and operational problems.

The modernization is now expected to cost about $537 million through fiscal year 2002 or about 33 percent above the $403 million estimate provided to the Office of Management and Budget in 1993. According to BLM's Assistant Director for Information Resources Management (IRM), some project costs were underestimated and some were not included in the original estimate. Project delays have also added to the increase. The Assistant Director also stated that the estimate could change as BLM refines its life-cycle cost model.

Interior established a working group of representatives from each of its bureaus to study the feasibility of using ALMRS to support each bureau's requirements. The preliminary study indicates that, with modification, ALMRS can be used to support the needs of all bureaus. The department has stated that it intends to use ALMRS to support the land title and record management responsibilities of all bureaus but is waiting for the successful completion of ALMRS and the results of the final study before issuing procedures on the use of ALMRS. In the interim, the Bureau of Indian Affairs (BIA) has already declared that it will use as much of ALMRS as it can to meet its needs.

Background

BLM's mission is to manage public lands and resources to best serve the needs of the American people. The Bureau manages approximately 264 million acres of public land in 28 states—about one-eighth of the land in the United States. It also manages the mineral estate underlying another 300 million acres of lands administered by other government agencies or owned by private interests. Public resources managed by BLM include rangelands, timber, minerals, watersheds, wildlife habitats, wilderness and recreation areas, and archaeological and historical resources. The Bureau has 210 state, district, and resource area offices that manage over 1 billion paper documents, including land surveys and surveyor notes, tract books, land patents, mining claims, oil and gas leases, and land and mineral case files. According to BLM, most of the paper documents are deteriorating and are becoming increasingly difficult to read.

During the early 1980s, BLM found that it could not handle the case processing workload associated with a peak in the number of applications for oil and gas leases. It recognized that to keep up with increased demand, it needed to automate its manual records and case processing activities. Thus, in the mid-1980s, the Bureau began planning to acquire an automated land and mineral case processing system. The scope and functionality of the planned system changed over the years, ranging from a system to automate paper documents and records and case processing activities to a system that would provide automated information systems and geographic information system (GIS)[2] capabilities.

In 1993, BLM decided on the scope and functionality of the ALMRS/Modernization. The bureau designated it a critical system for (1) automating land and mineral records and case processing activities and (2) providing information to support land and resource management activities. The ALMRS/Modernization is expected to provide an efficient means of recording, maintaining, and retrieving land description, ownership, and use information to support BLM, other federal programs, and interested parties. It does this by establishing a common information technology platform,[3] increasing public access to BLM records through the Internet, integrating multiple databases into a single geographically referenced database, shortening the time to complete case processing activities, and replacing costly manual records with automated ones.

[2]Geographic information system technology is the computer hardware and software that allow for the assembly, storage, manipulation, and display of geographically referenced data, i.e., data that are associated with specific places on earth, such as the geographic location of a lake or oil well.

[3]An automated information systems environment that consists of interoperable hardware, systems software, and communications.

The ALMRS/Modernization consists of the ALMRS initial operating capability (IOC), geographic coordinate database (GCDB),[4] and modernization of BLM's computer and telecommunications infrastructure and rehosting of selected management and administrative systems.[5] These components are described more fully below.

- The ALMRS IOC is the flagship of the ALMRS/Modernization. With new software and upgraded hardware, it is to provide (1) support for case processing activities, including leasing oil and gas reserves, recording valid mining claims, processing mineral patents, and granting rights-of-way for roads and power corridors and (2) information for land and resource management activities, including timber sales and grazing leases.
- GCDB is the database that will contain geographic coordinates and survey information for land parcels and provide the basic geographic data for a GIS. Other databases, such as those containing land and mineral records, are to be integrated with GCDB. ALMRS IOC will tie BLM's records and land and mineral resource data to the GCDB's legal descriptions of specific land parcels.
- The information technology modernization and rehost component consists of installing computer and telecommunications equipment and office automation applications, and converting selected management and administrative systems to a relational database system to be used throughout the Bureau.

Some elements of the ALMRS/Modernization, such as new computer and telecommunications equipment, e-mail and office automation, were installed at BLM offices from fiscal year 1994 through fiscal year 1996. Eleven of the 12 administrative applications to be rehosted are now operational.[6]

Concerned that BLM might deploy the system prematurely, the House and Senate appropriations committees directed BLM to test, verify, and validate that ALMRS operates as specified and certify to them that it performs accurately and effectively, and provides the expected capabilities prior to deployment. BLM retained a contractor to conduct the independent

[4]We previously reported significant cost overruns and milestone slippages on an earlier project to develop the GCDB. See Land Management Systems: Extensive Cost Increases and Delays in BLM's Major Data Base Project (GAO/IMTEC-91-55, Aug. 5, 1991).

[5]BLM has been converting selected management and administrative software from COBOL, a third-generation programming language that uses flat data files, to INFORMIX, a fourth-generation query language and relational database system.

[6]There were 13 administrative applications, however, BLM canceled the Fire Management System on January 21, 1997.

verification and validation testing. The Bureau expects to base its certification to the committees on the independent verification and validation testing and operational testing and evaluation.

Recent Management Changes

ALMRS/Modernization project management has undergone significant change in the past 6 months. The project manager and deputy project manager retired and were replaced with project comanagers. A technical director position was created to oversee the more technical aspects of the project and support project management decision-making. Finally, BLM created a new senior-level post, the Assistant Director for IRM, to oversee the bureau's IRM program. The former acting Director of the Department of the Interior's Office of Information Resources Management was selected for this position.

ALMRS/ Modernization Schedule Risks

ALMRS IOC software development was nearing completion when software problems were identified in the spring and summer of 1996. Correction of these problems has caused the project schedule to be delayed almost 1 year. According to the current project schedule, BLM plans to deploy ALMRS IOC in its Arizona, Idaho, and New Mexico offices by the end of fiscal year 1997 and complete the deployment to the remaining states in fiscal year 1998.

However, BLM may not be able to maintain this schedule. As we reported in August 1995, BLM continues to allow little time between critical milestones for ALMRS IOC and, therefore, there is insufficient time to deal with unknown problems that BLM acknowledges are likely to surface. In its January 29, 1997, Project Management Plan working draft, BLM expressed concern that the current milestones are overly optimistic and lists them as a major risk.[7] According to the plan, the short time frames are influenced by BLM's desire to begin deploying the system in fiscal year 1997.

In addition to being overly optimistic, the current project schedule has not been fully analyzed or updated. As a result, the project milestones may not be reliable. The milestones could slip if BLM fully analyzes the human resources usage and task relationships, and estimates the critical path for the project. A complete, current, and accurate project schedule is essential to adequately manage and control the hundreds of tasks that remain to complete the project.

[7]BLM defines a major risk as one which exceeds a 70-percent chance of occurring and would have a detrimental effect on the program.

Table 1 shows the current milestones for qualifications testing (functionality and integration), acceptance testing, and deployment. According to the current schedule, deployment will be about 15 months behind the schedule that was in place at the time of our last report. This represents an 18-month delay in deployment from the schedule delivered to OMB when the project was approved in 1993.

Table 1: ALMRS IOC Final Testing and Installation Milestones

	Milestones as of August 31, 1995	Milestones as of January 15, 1997
Complete qualifications testing	2nd quarter FY 1996	3rd quarter FY 1997
Complete acceptance testing	3rd quarter FY 1996	3rd quarter FY 1997
Begin deployment	3rd quarter FY 1996	4th quarter FY 1997

Recent Problems Threaten the Performance, Capability, and Cost of the ALMRS/ Modernization

The Bureau and the prime contractor recently reported correcting the remaining performance problems and have made progress in correcting software errors, but have not yet fully succeeded. BLM also recently suspended the software development and testing work for case information reporting—a flexible report-generating capability that has been identified as an important need to users—because completing the work to develop the capability would cost too much and take too much time. Correcting software problems has caused about a year in schedule delays which, according to BLM, will cost about $12 million.

Performance Problems and Software Errors Have Been Identified

ALMRS IOC software development was progressing relatively smoothly and nearing completion until the time of user evaluation testing at some of the New Mexico pilot site offices in May 1996. During this testing, BLM users observed and assessed whether ALMRS successfully performed various functions in field office environments. A number of problems were reported involving unacceptably slow system performance. Additional testing was performed throughout the summer using an operationally-sized database rather than the smaller test database used in earlier testing. The additional testing uncovered a large number of problems.

The severity of these problems was brought to the forefront at an August 1996 meeting to discuss the ALMRS/Modernization project. During the meeting, the prime contractor reported that there were 204 uncorrected

high-priority problems.[8] Also, BLM estimated that the overall performance of ALMRS IOC was about 20 times too slow to meet its needs. Since then, BLM and the prime contractor have been trying to correct these problems. As a result of the efforts, BLM and the prime contractor reported that as of February 3, 1997, uncorrected high-priority problems had been reduced to about 85. The prime contractor also reported on January 31, 1997, it had resolved the remaining system performance problems.

However, the true performance of ALMRS IOC will not be known until testing has been performed in an operational environment with realistic user loads and an operationally-sized database. According to BLM's plans, this will occur before full deployment, during capability demonstration assessment testing at four offices in New Mexico—a state expected to have one of the largest ALMRS workloads. This will be the opportunity for BLM users to test the functionality and performance of ALMRS IOC in an operational environment with true workloads before deployment.

In regard to this issue, the Acting Deputy Assistant Director for IRM stated that BLM is keenly aware of the need to deliver a responsive system. BLM is closely monitoring key performance indicators and pending software tests as refinements are made to the software. Also, the official added that performance at less than desired speeds will diminish expected work productivity increases, and lead to worker dissatisfaction with the system.

Some Capabilities May Be Deferred

While the ALMRS/Modernization is expected to provide the basic functionality needed by BLM to perform its mission, work has been deferred on a significant reporting capability. Case information reporting was to replace a number of standard reports and provide users with an ad hoc reporting capability—the ability to select information from databases and prepare reports they need—to help them accomplish their work. BLM users consider this capability an important part of the support to be provided by ALMRS IOC. From a software development standpoint, case information reporting is a complex software integration of multiple segments of the system.

Because of its complexity, the development of the case information reporting capability cost more and took more time than anticipated. According to the Acting Deputy Assistant Director for IRM, the former

[8]High-priority problems are defined as ones in which the software does not work, causing the computer system to crash; or discontinue operation or ones in which a critical function cannot be executed. Resolving these problems involves correcting the software or implementing acceptable procedures to work around the problems.

ALMRS/Modernization project manager canceled the task order for case information reporting in October 1996, believing that completing the development and testing would cost at least $1 million more than the estimated $1.5 million already spent and extend the project completion date. In lieu of case information reporting, BLM has been working to provide some standard reports and a rudimentary ad hoc reporting capability that it believes will provide needed information to meet minimal staff requirements.

In this regard, the Assistant Director for IRM said all mandatory reporting requirements will be met before deployment. In addition, the Acting Deputy Assistant Director for IRM stated that BLM intends to reactivate case information reporting to provide a more powerful and user friendly reporting capability. The official said he expects this reporting capability to be included in the first set of maintenance modifications after deployment.

Other capabilities could also be deferred if they cannot be successfully completed within the newly revised project schedule. A recent BLM task order for the contract included a provision that would allow it to defer any ALMRS IOC capability that cannot be successfully developed and tested on time.

The House and Senate Appropriations Committees-directed testing should provide information to the Committees on any remaining significant problems or loss of capabilities. Further, the testing should help BLM prevent deployment before performance and capability issues are satisfactorily resolved.

Costs May Increase Further

Significant cost risks remain in completing the ALMRS/Modernization project. BLM estimates that the cost of the milestone delays to correct software problems is about $1 million per month. The 1-year delay will cost about $12 million and any additional delay would also cost about $1 million a month.

Further, BLM recently identified other risks that could also increase costs. In its January 29, 1997, Project Management Plan working draft, BLM noted the following major risks:

- Telecommunications network traffic may be too high under a normal ALMRS IOC workload, especially in remote areas. If this occurs, BLM may have to acquire additional communications lines at a significant cost.
- Computer servers may not provide adequate performance for states with larger transaction volumes. If this occurs, BLM may have to (1) acquire more capable servers at a higher cost and (2) extend the project schedule, which would also increase costs.

According to the Acting Deputy Assistant Director for IRM, BLM has been considering opportunities to mitigate the risks of increased cost. In this regard, BLM has placed increased emphasis on enhancements to software design because it was determined to be the most cost effective method of increasing performance. The Acting Deputy Assistant Director said the results of these efforts have been effective thus far and testing indicates that further design changes will continue to return significant performance increases. Also, the Assistant Director for IRM told us that improved telecommunications capability is already planned and BLM expects to acquire more capable computer servers.

BLM Does Not Have Essential Management Controls Needed Before Deployment

The ALMRS project is approaching the end of software development and the beginning of final testing. Although BLM is preparing to begin deployment of the ALMRS/Modernization in July 1997, it does not yet have in place necessary management plans, policies, or procedures essential for operating and maintaining a nationwide system. BLM has worked on these plans, policies, and procedures; however, at present, they are not finished, approved, or ready to implement. BLM will not be ready to deploy ALMRS until it establishes a configuration management plan, policies, and procedures; system security plan and architecture; transition plan; and operations and maintenance plan. These management tools are needed before deployment to help avoid system failures, degradation of system performance, unauthorized access, system outages, and operational problems. The Bureau must also finish resolving preparedness issues at ALMRS sites to avoid problems in the future.

Configuration Management Plans, Policies, and Procedures Are Not Complete

Configuration management plans, policies, and procedures are a set of management controls over the composition of and changes to computer and network systems components and documentation, including software code documentation. Configuration management is essential to successfully manage complex information systems and ensure their integrity throughout their life cycles.

According to the Acting Deputy Assistant Director for IRM, BLM has a configuration management plan and the related policies and procedures to manage ALMRS/Modernization hardware and software; however, these plans have not been finalized and adopted. Also, the ALMRS/Modernization configuration management board—an organization responsible for managing the system configuration and changes—does not have the authority to control changes in non-ALMRS systems and components installed in state, district, and area offices. Unrestrained by bureau-wide configuration management control, these offices and the state-level configuration management boards could modify any local non-ALMRS system—primarily personal computers, networks, and applications—and perhaps adversely affect the ALMRS/Modernization.

System modifications without the safeguards imposed by the discipline of configuration management could lead to undesirable consequences, such as causing system failures, endangering system integrity, increasing security risks, and degrading system performance. Site-readiness reviews, conducted in 1996 at several state, district, and area offices show that more needs to be done to fully manage and control the ALMRS/Modernization configuration. For example, some BLM offices lack local configuration management plans or policies, use various versions of software, and use hardware that does not conform to BLM's standards for the ALMRS/Modernization.

On February 6, 1997, the Acting Deputy Assistant Director for IRM told us that the scope of the ALMRS/Modernization configuration management board responsibilities is being increased to include the remainder of BLM's information technology architecture that is networked to ALMRS. Subject to the guidance of the ALMRS/Modernization board, local configuration management boards in each BLM state office and center will control the implementation of any hardware or software.

BLM Has No Security Plan or Architecture

Security focuses on the ability to ensure the confidentiality, integrity, and availability of stored and processed data. Unsecured or poorly secured systems are highly vulnerable to external and internal attacks and unauthorized use. Security planning includes the identification of high-level security requirements, including mission, management, and technical security requirements; functional security requirements that cover users' security needs; data-sensitivity analysis to identify data requiring special protection; and a security architecture that describes the security controls and relationships among the various system components.

The security plan should define the policies and procedures for operating and maintaining a secure ALMRS/Modernization environment.

While BLM has had a security planning effort underway, and has finalized some policies, such as a security access policy for the ALMRS/Modernization, it has taken no steps to develop a security plan and architecture. In addition, BLM has yet to finalize other key security guidance for the ALMRS/Modernization, including

- a disaster recovery and contingency plan for the restoration of operations and data in the case of sabotage, natural disaster, or other operational disruption and
- a security test, evaluation, and certification plan to provide assurance that the system will protect information, as required by the security policy.

On February 6, 1997, the Acting Deputy Assistant Director for IRM told us that BLM is committed to following security requirements. He added that BLM is using risk assessment and contingency planning software to ensure a standard approach to security planning at all sites. While these efforts are commendable, they are not a substitute for a security plan and architecture.

Transition Planning Is Not Complete

BLM asked a contractor to help it develop a bureauwide plan for the deployment of and transition to ALMRS IOC. However, it is not clear to what extent this plan will address the transition issues related to the roles and responsibilities of BLM staff. Because the development of a transition plan not only requires detailed knowledge of the ALMRS IOC, but also a thorough understanding of BLM's culture, existing work processes, and the current operational environment, it is important that BLM personnel play key roles in the transition planning.

Many of the 210 BLM offices nationwide that will receive the ALMRS/Modernization system—designed to automate many manual functions—have little or no experience implementing sophisticated information systems. The process of deploying a major information system that people will use to do their jobs requires careful planning. The transition from automated capabilities provided by a centrally-managed mainframe system to a locally-managed integrated system will require changes in organizational roles, responsibilities, and interrelationships among the units and people using the system. A transition plan should

address these issues, and guide BLM in defining new operational procedures.

On February 6, 1997, the Acting Deputy Assistant Director for IRM told us that BLM has begun discussions to form a team to address the expected changes in work processes and the effect on local staff functions. In addition, BLM plans to (1) finish the preparation of a final central transition plan and (2) prepare guidance on completing final state plans as soon as experience has been garnered from the capability demonstration assessment testing at four offices in New Mexico.

Operations and Maintenance Plans Are Not Complete

Operations and maintenance of information systems based on a client-server architecture[9] require a large number of highly skilled people. Unlike the centrally-managed legacy mainframe systems that have been supporting BLM operations, the ALMRS/Modernization system will require management and technical support at each major BLM site. This support includes UNIX system managers, database administrators, user support and telecommunication specialists, and security officers.

Site-readiness reviews of state, district, and area offices indicate that BLM does not currently possess the managerial and technical capability to support the ALMRS/Modernization system. BLM recognizes the risks associated with operations and maintenance issues. In its January 29, 1997, Project Management Plan working draft, it notes significant risks associated with not being prepared to manage staffing and skills issues related to deployment, implementation, and operations and maintenance. While BLM recognizes the need to develop or acquire sufficient managerial and technical capability to operate and manage the ALMRS/Modernization, and has launched an ambitious training program, some of its offices are not yet prepared to operate and maintain the system.

On February 6, 1997, the Acting Deputy Assistant Director for IRM stated that each BLM site has been operating the base ALMRS/Modernization platform and network beginning as early as 1994. After a brief shakedown period, the staff at each site have proven capable of operating and maintaining the system. He said BLM has been providing extensive technical training and achieved industry certification of fourteen of its technical staff. As to other skills, the Acting Deputy told us implementation of the ALMRS IOC application will require database

[9]A distributed system that splits software tasks between client computers and server computers and allows clients and servers to be independently located on a network. Client systems typically request services of server systems.

administration skills which are still being acquired. The official said the sufficiency of numbers of qualified staff varies from site to site; however, state directors have committed to providing sufficient staffing prior to ALMRS implementation. Clearly, as noted in the discussions above, the operations and maintenance of ALMRS is an area that must be managed for BLM to achieve its objectives and the daily needs of its offices. Completion of an operations and maintenance plan would help to ensure that BLM can meet these needs and mitigate the risk described in its Project Management Plan working draft.

Estimated Cost of ALMRS Is Increasing

As of January 1997, BLM estimates that the ALMRS/Modernization project will cost about $537 million through 2002. This latest estimate is about $134 million over the initially-approved cost estimate of $403 million, an increase of about a third. According to BLM's Assistant Director for IRM, most of the cost increases are attributable to (1) the probable underestimation of costs in the original estimate, such as the cost of hardware and software maintenance and initial training, and (2) costs that were not included in the original estimate, such as the cost of technology refreshment, data communications line leases, facilities and utilities, continuing training, and operations and maintenance costs to be funded by BLM's program areas. In addition, project delays contributed to increased costs.

The original project estimate of $403 million provided to OMB in 1993 covered a 10-year period.[10] During this 10-year period, the ALMRS/Modernization was expected to be in operation for 6.5 years—mid-fiscal year 1996 through fiscal year 2002. The latest estimate, however, includes only 4.5 years of operation—mid-fiscal year 1998 through fiscal year 2002.

According to the ALMRS/Modernization project budget analyst, BLM told OMB that it believed it could develop and implement the ALMRS/Modernization for an estimated $403 million. However, this estimate was not based on a life-cycle cost model or sound cost estimating techniques. Therefore, this cost estimate was not reliable. In 1995, BLM tasked a contractor to develop a life-cycle cost model for the ALMRS/Modernization to accurately capture the past cost and estimate future costs. The prototype model was completed in April 1996. BLM has been working to input cost data into the database and examine the prototype model. The $537 million cost estimate

[10]The total was based on the estimate for fiscal year 1993 through fiscal year 2002 plus the funds that had been obligated in fiscal years 1991 and 1992.

was developed using a combination of the prototype model and other financial data. However, it appears that this estimate will also change as BLM continues to try to improve its ability to reliably estimate costs.

In this regard, the Assistant Director for IRM told us accurate project accounting is complicated because of the underestimations and omissions described above and other factors. Also, the Assistant Director said that BLM has contracted with the consultant, who worked with the bureau to develop the life-cycle cost model, to return in February 1997 to help refine the model. Finally, the official stated that further study and work on the life-cycle cost model will enable BLM to reasonably estimate cost allocations and more accurately project costs for 1998 and future years.

Interior Intends to Promote the Departmentwide Use of ALMRS

The Department of the Interior has stated that it intends to use ALMRS as the core system to support its land management responsibilities. ALMRS IOC was designed to automate an important part of those responsibilities—the creation and maintenance of land and mineral ownership and use records. As geographic capabilities and data are developed over time, the department expects ALMRS to provide the automated land ownership and use information to support all of its bureaus. The department stated that it will establish procedures for the use of ALMRS by all bureaus after (1) the software is developed and accepted by BLM and (2) BIA completes its study of the adaptability of ALMRS to other bureaus' requirements.

In 1993, the department established the Land Records Automation Work Group, composed of representatives from each of its bureaus. The group was charged with identifying the land title and record responsibilities of the bureaus and determining the feasibility of using ALMRS to support those responsibilities. The group found that, after BLM, BIA had the largest requirement for automating land titles and other land records. Under the auspices of the work group, BIA assessed whether ALMRS would satisfy the requirements of the bureaus and what modifications would be necessary to meet the requirements.

According to the report on its preliminary findings, BIA concluded that the ability of ALMRS to meet its land records management needs is quite positive, although modifications to ALMRS would be necessary.[11] The Bureau also noted that it is highly likely that ALMRS can be modified to meet the needs of the other bureaus, adding that more analyses are

[11] ALMRS/Modernization Commonality Assessment, performed by the Bureau of Indian Affairs for the Department of the Interior's Land Records Automation Work Group.

required to determine the extent of the modifications needed. In discussing these findings, BIA officials stated that the Bureau is planning to use ALMRS—or as much of it as possible—to meet its land title and records system requirements.

The Acting Deputy Assistant Director for IRM also noted that BLM assigned two technical specialists to assist the BIA in the planning stages of its land records project, in an effort to facilitate the adoption or adaptation of ALMRS.

Conclusions

BLM faces risks that threaten the performance and capability of the ALMRS/Modernization and resolving these may further increase costs. Several risks could also adversely affect the recently revised project milestones, including the deployment and completion dates, and the latest cost estimate. The Bureau has been endeavoring to correct the problems and mitigate these risks.

The absence of completed versions of essential plans, policies, and procedures on configuration management, system security, transition, and operations and maintenance adds additional risks. BLM understands the importance of these essential tools, and has been working to develop them. However, until these plans, policies and procedures have been completed, approved, and put into place, the Bureau will not be ready to deploy the system.

Recommendations

To reduce the risks and strengthen the management of the ALMRS/Modernization, we recommend that the Director, of the Bureau of Land Management:

- fully update the ALMRS/Modernization schedule, including analyzing human resources usage and task relationships to establish reliable milestones and a critical path to complete the project;
- disclose in BLM's certification to the House and Senate appropriations committees, information on (1) how well the system performs and (2) any automated capability that has been removed, suspended, or deferred to ensure that ALMRS IOC is not deployed with degraded performance or capability loss;
- establish a robust configuration management plan, and related policies and procedures for establishing a program focused on managing the components of and all changes to all BLM information systems, including

non-ALMRS/Modernization systems, to ensure successful management and integrity of the ALMRS/Modernization;

- establish a system security architecture and plan, including security policies and procedures; disaster and recovery plans; and security test, evaluation, and certification plans to reduce risks to the availability and integrity of stored and processed data;
- develop transition plans outlining the changes in organizational roles, responsibilities, and interrelationships among the units and people using the ALMRS/Modernization system to reduce the risk associated with those changes; and
- develop operations and maintenance plans addressing the acquisition, management, and maintenance of managerial and technical support for the ALMRS/Modernization system to help ensure successful operations.

Agency Comments

The Bureau of Land Management provided comments on a draft of this report. These comments are summarized below and reprinted in appendix II. BLM stated that it generally agrees with our observations and will implement all of our recommendations. In this regard, BLM said it has actions underway and fully intends to have the necessary plans, policies, and procedures in place by the time ALMRS IOC is ready to be deployed to the first state.

BLM's comments describe the accomplishments and progress it has made in the overall ALMRS/Modernization project. The Bureau said it is acting to mitigate the risks that threaten the success of the project and is working vigorously to ensure that ALMRS is developed and deployed as quickly as possible without compromising quality. According to BLM, the new project management team is taking a number of steps to increase the probability of successful project completion. Finally, the Bureau states that it is confident that the ALMRS software will meet its requirements and is optimistic that the software can be deployed close to the current schedule.

We are sending copies of this report to the Secretary of the Interior, Director of the Bureau of Land Management, Director of the Office of Management and Budget; and interested congressional committees. We will also make copies available to others upon request.

Should you or your staff have any questions concerning this report, please contact me at (202) 512-6253. I can also be reached by e-mail at

willemssenj.aimd@gao.gov. Major contributors to this report are listed in appendix III.

Joel C. Willemssen
Director, Information Resources Management

Contents

Abbreviations

ALMRS	Automated Land and Mineral Records System
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
COBOL	Common Business Oriented Language
GCDB	geographic coordinate data base
GIS	geographic information system
IOC	initial operating capability
IRM	information resources management
OMB	Office of Management and Budget

Objectives, Scope, and Methodology

Our objectives were to ascertain (1) if there are remaining risks that could seriously affect the performance, capability, or cost of ALMRS, (2) if BLM is operationally and managerially ready to deploy ALMRS in fiscal year 1997, (3) the latest cost estimate for ALMRS and reasons for any increases, (4) what the Department of the Interior is doing to promote the use of ALMRS by its other bureaus, and (5) if other bureaus are planning to use ALMRS for their land management needs.

To determine if there are any remaining performance, capability, and cost risks, we reviewed ALMRS/Modernization project documents, assessments by the independent verification and validation contractor, prime contractor weekly and monthly status reports, software problem reports, and project management schedules. We also attended quarterly Interior reviews of the development project at the ALMRS/Modernization project office in Lakewood, Colorado, and observed user evaluation testing at the ALMRS/Modernization pilot site offices in Santa Fe, Albuquerque, Farmington, and Taos, New Mexico.

We discussed the project with prime contractor officials; contractor officials involved with independent verification and validation testing, and operational assessment testing and evaluation; a senior technical analyst at Interior; and BLM's Assistant Director for IRM. We discussed software development risks, performance problems, planned system capabilities, software problem reports, system testing, technical complexity, costs associated with milestone delays, and project management and scheduling procedures with project officials responsible for systems engineering, software development, budgeting, and project management. We reviewed the results of user evaluation testing, and database design and sizing analyses. We compared revised project milestones with past milestones, including those discussed in our prior report,[1] and remaining project tasks.

Because of the delays in the ALMRS/Modernization schedule, we were unable to review the results of the formal qualifications testing, pilot sites capability demonstration assessments, stress testing, independent verification and validation testing, and operational assessment testing and evaluation, as they had not taken place before the end of our fieldwork.

To determine if BLM is operationally and managerially ready to deploy ALMRS/Modernization in fiscal year 1997, we reviewed draft configuration management, security, and transition plans, policies, and procedures, BLM's operations and maintenance strategic options document, Carnegie Mellon

[1]GAO/AIMD-95-180, Aug. 31, 1995.

University's Capability Maturity Model for Software, and minutes of BLM configuration management board meetings. We reviewed the results of BLM site-readiness reviews and BLM's revised testing and deployment schedules, and discussed them with ALMRS/Modernization project managers, the Interior senior technical analyst, and the independent verification and validation contractor.

To obtain the latest cost estimates for the ALMRS/Modernization and reasons for any increases, we reviewed and analyzed project estimates and compared them with estimates and categories in the original OMB-approved funding agreement. We compared BLM's current ALMRS/Modernization cost projections with estimates included in our prior report.[2] Budget estimates were collected from and discussed with BLM's Assistant Director for IRM and the ALMRS/Modernization project budget analyst. We did not independently verify the accuracy of the estimates.

To determine how Interior is promoting the use of ALMRS by other bureaus and whether other bureaus are planning to use ALMRS for their land management needs, we reviewed Interior's Land Automation Work Group meeting minutes, hearings report on BIA appropriations for fiscal year 1997 before the Subcommittee on Interior and Related Agencies, House Committee on Appropriations, and BIA's Commonality Assessment. We discussed the department's actions with its senior technical analyst and its former Acting Director, Office of Information Resources Management.

Our work was performed from April 15, 1996, through February 21, 1997, in accordance with generally accepted government auditing standards. We performed our work at Interior's information resources management headquarters in Washington, D.C.; the ALMRS/Modernization project office in Lakewood, Colorado; the prime contractor's office in Golden, Colorado; and independent verification and validation contractor's offices in McLean, Virginia and in the ALMRS/Modernization project office in Lakewood, Colorado.

[2]GAO/AIMD-95-180, Aug. 31, 1995.

Comments From the Bureau of Land Management

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Washington, D.C. 20240

February 21, 1997

Mr. Gene G. Dodaro
Assistant Comptroller General
U.S. General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Dodaro:

See comment 1.

Thank you for the opportunity to review and comment on your draft report on the Bureau of Land Management's (BLM) testing and deployment of the Automated Land and Mineral Record System (ALMRS). We recognize the validity of most of your observations and recommendations, particularly the need to complete critical management plans prior to deployment. Finalizing these plans is proceeding well, and we fully intend to have the necessary plans, policies, and procedures in place by the time the software is ready to be deployed to the first State. We address each of the report recommendations in the attachment.

See comment 2.

BLM has already made significant progress on the overall ALMRS/Modernization Project, and these accomplishments include:

- Deployment of approximately 6,000 workstations throughout the Bureau. Combined with the hardware that existed previously to deployment of the ALMRS/Modernization hardware, this provides a modern workstation for every BLM employee who needs one. We have implemented office automation throughout the BLM and provided a national wide area network. Electronic Mail (E-Mail) has been installed throughout the BLM and is connected to other Federal Governments and Interior agencies and the Internet.

- Training for more than 4,800 employees in such areas as operation and maintenance of the system or user applications of the system.

- Data improvements in land and minerals records. Trial runs of data conversion have been completed for 9 of the 12 jurisdictions, with an error rate of 2% to 7% on 65.5 million records. These results far exceeded expectations.

- Site readiness reviews have been completed in all States to ensure that the necessary staff with the right skills is available and that appropriate provisions have been made for such things as telecommunications, security, and contingency planning. Staff and senior BLM management are monitoring the States' implementation of the actions identified in the site readiness and staffing reviews. Follow up reviews will be conducted prior to deployment and will be part of the Deployment Plan.

- We have "rehosted" 11 administrative systems from the outdated minicomputer platform to the ALMRS/Modernization platform.

- Ongoing dialog has been initiated with the BLM headquarters and field office leadership to ensure that they understand the importance of successful deployment of ALMRS/Modernization and meaningful workload measures have been included in their performance reviews.

See comment 3.

The BLM is taking action to mitigate the risks that threaten the success of the project's last phase, the ALMRS software testing, hardware upgrades, and deployment. We recognize that the project is behind schedule, and the BLM is working vigorously to ensure that ALMRS is developed and deployed as quickly as possible without sacrificing or compromising quality. For example, we have included additional system testing to address performance issues that were discovered during test runs last summer. The current schedule is being reviewed and will probably be revised to allow refinements following the pilot site testing and deployment. However, any schedule changes must be taken in a way that minimizes cost increases.

See comment 4.

The original funding agreement was approximately $575 million. When the contract was awarded in 1993, the OMB funding agreement was reduced to $403 million, because the contractor's bid was considerably less than the Government's estimate. With the benefit of additional experience in managing the project, we now believe that hardware and off-the-shelf software maintenance costs, initial training, and ALMRS software maintenance costs were underestimated. We have also identified additional cost categories that probably were not included in the 1993 OMB funding agreement.

See comment 3.

The BLM did encounter performance problems during testing last summer. However, at our urging, the contractor has reported significant progress toward resolving the problems and we expect performance to meet our specifications.

There also is a valid concern for the risks associated with handling the amount of data that will flow over the network and be processed on the servers. We have already taken action to mitigate these risks by improving telecommunications through use of frame relay services which are being deployed in intrastate networks and by identifying hardware upgrades

required to support higher speed connections. In addition, enhancements to software applications will reduce the number of transactions across the network, resulting in a reduction in network traffic. Projected costs for network and server enhancements are included in our budget.

See comment 1.

The new project management team is in place, and they are taking a number of significant steps to increase the probability of successful project completion. Of particular note are their actions to align staffing and skills at both the National IRM Center (NIRMC) and in the field. The State Directors have committed to address identified deficiencies and to sufficiently staff for deployment and subsequent operations and maintenance.

In conclusion, the ALMRS/Modernization Project has enabled the BLM to change the way it does business, and has positioned us to make even greater strides in resource management and service delivery in the future. We are confident that the ALMRS software will meet BLM's requirements and are optimistic that the software can be deployed close to the current schedule. We appreciate the constructive counsel GAO has provided over the past 2 years and your continued support of the Project.

Sincerely,

DEPUTY

Director

Attachment

See comment 1.

BLM RESPONSE TO DRAFT RECOMMENDATIONS

RECOMMENDATION: Fully update the ALMRS/Modernization schedule, including analyzing human resources usage and task relationships to establish reliable milestones and a critical path to complete the project.

COMMENT: We agree.

The Project Plan has been developed and is being modified to include the human resource requirements such as staffing and training, a series of meaningful milestones, and identification of the critical path. The final Plan is to be completed by mid-March.

RECOMMENDATION: Disclose in BLM's certification to the House and Senate appropriations committees, information on (1) how well the system performs and (2) any automated capability that has been removed, suspended, or deferred to ensure that ALMRS IOC is not deployed with degraded performance or capability loss.

COMMENT: We agree.

RECOMMENDATION: Establish a robust configuration management plan, and related policies and procedures for establishing a program focused on managing the components of and all changes to all BLM information systems, including non-ALMRS/Modernization systems, to ensure successful management and integrity of the ALMRS/Modernization.

COMMENT: We agree.

The Configuration Management Plan and the related policies and procedures will be finalized by the end of March. The draft Plan, policies, and procedures have already been adopted by the National IRM Center and the states.

RECOMMENDATION: Establish a system security architecture and plan, including security policies and procedures; disaster and recovery plans; and security test, evaluation, and certification plans to reduce risks to the availability and integrity of stored and processed data.

COMMENT: We agree.

The security architecture and plan are under development and will be completed by the end of March. A template for a Contingency Plan is being developed for the field and is scheduled for completion by mid-April. State security evaluations have already been done as a part of the initial site readiness reviews. Follow-on security testing and evaluation will be conducted as part of the pre-deployment site readiness reviews. The Department has agreed to conduct the ALMRS security certification, and this will be done following successful pilot testing.

Attachment 1-1

See comment 1.

RECOMMENDATION: Develop transition plans outlining the changes related to the organizational roles, responsibilities among the units and people using the ALMRS/Modernization system to reduce the risk associated with implementing a system that will require changes in organizational roles, responsibilities, and interrelationships.

COMMENT: We Agree.

A preliminary Deployment Plan has been developed and is being refined and combined with the plans prepared by contractor and the states. The preliminary Deployment Plan will be expanded to address transition issues related to the changing roles and responsibilities of BLM staffs. The final Transition and Deployment Plan will be completed by April 30, 1997, and will be revised as necessary based on the experience gained during deployment to the pilot state.

RECOMMENDATION: Develop operations and maintenance plans addressing the acquisition, management, and maintenance of managerial and technical support for the ALMRS/Modernization system to help ensure successful operations.

COMMENT: We agree.

Development of Operations and Maintenance Plans is underway and will be completed prior to deployment.

Attachment 1-2

GAO Comments

The following are GAO's comments on BLM's February 21, 1997, letter.

1. This information is summarized in the "Agency Comments" section of the report.

2. The components and status of the ALMRS/Modernization are summarized in the "Background" section of the report. BLM's letter provides additional details that GAO believes are unnecessary to address the Subcommittee's questions or understand the findings, conclusions, and recommendations in the report.

3. BLM's actions to identify and mitigate risks are discussed in the "ALMRS/Modernization Schedule Risks" and "Recent Problems Threaten the Performance, Capability, and Cost of the ALMRS/Modernization" sections of the report.

4. The cost estimation difficulties are discussed in the "Estimated Cost of ALMRS Is Increasing" section of the report. BLM's letter states that the first estimate provided to OMB was $575 million. This estimate was reduced by BLM to $403 million after it awarded the contract to develop ALMRS. Since then, BLM has considered the $403 million estimate to be the official estimate.[1]

[1]GAO/AIMD-95-180, Aug. 31, 1995.

Major Contributors to This Report

Accounting and Information Management Division, Washington, D.C.

David G. Gill, Assistant Director
Mirko J. Dolak, Technical Assistant Director
Keith Rhodes, Technical Director
Marcia C. Washington, Senior Information Systems Analyst

Ordering Information

The first copy of each GAO report and testimony is free. Additional copies are $2 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary. VISA and MasterCard credit cards are accepted, also. Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:

U.S. General Accounting Office
P.O. Box 6015
Gaithersburg, MD 20884-6015

or visit:

Room 1100
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders may also be placed by calling (202) 512-6000 or by using fax number (301) 258-4066, or TDD (301) 413-0006.

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (202) 512-6000 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

For information on how to access GAO reports on the INTERNET, send an e-mail message with "info" in the body to:

info@www.gao.gov

or visit GAO's World Wide Web Home Page at:

http://www.gao.gov

PRINTED ON RECYCLED PAPER

United States
General Accounting Office
Washington, D.C. 20548-0001

Bulk Rate
Postage & Fees Paid
GAO
Permit No. G100

Official Business
Penalty for Private Use $300

Address Correction Requested