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

May 1998

LAND MANAGEMENT SYSTEMS

Actions Needed in Completing the Automated Land and Mineral Record System Development

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GAO

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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 discusses the Bureau of Land Management's (BLM) efforts to complete the Automated Land and Mineral Record System (ALMRS)/Modernization. This project is intended to improve BLM's ability to record, maintain, and retrieve land description, ownership, and use information. At an estimated cost of about $594 million, it is the largest system development project BLM has ever undertaken.

In March 1997, we reported[1] that BLM had encountered problems that increased the risk of degraded system performance and capability. We also reported significant project management and technical risks and made recommendations to BLM to reduce them and strengthen the management of the project.

As a follow-on to that assignment, you asked that we assess BLM's actions to address the recommendations contained in our March 1997 report and identify the status of BLM's efforts to test, deploy, and implement ALMRS initial operating capability. To meet these objectives, we reviewed ALMRS project management, technical, and planning documents; observed testing at the ALMRS/Modernization pilot site offices in Santa Fe, Albuquerque, Farmington, and Taos, New Mexico; and discussed the project with prime contractor officials, contractor officials involved with testing, and BLM and Department of the Interior (DOI) officials. Our work was performed from July 28, 1997, through February 20, 1998 in accordance with generally accepted government auditing standards. Further details on our objectives, scope, and methodology are provided in appendix I. We requested comments on a draft of this report from the Director of the Bureau of Land Management. He provided us with written comments that are discussed in the "Agency Comments" section and reprinted in appendix II.

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

Results in Brief

BLM has not yet fully implemented our recommendations to mitigate risks and help ensure a successful transition and operating environment for ALMRS. Specifically, BLM does not have a security architecture and sound security plan, complete transition plans, and complete operations and maintenance plans for ALMRS. BLM has developed a draft configuration management plan and has been implementing a configuration management program. However, BLM has not developed a credible project schedule. These tools are essential to manage the remainder of the project, help ensure system availability and performance, and avoid security and operational problems.

During beta testing[2] of the ALMRS initial operating capability (IOC) and validation testing of converted data, BLM identified computer workstation configuration and software problems. The testing also surfaced operational concerns that had not been adequately addressed, such as how ALMRS will support public information needs and data exchanges between BLM and other organizations. BLM is revising its project plan and schedule to address these problems before entering the final testing and certification phase. BLM may not be able to maintain the modified schedule, however, because it (1) is being developed without analyzing human resource usage and task relationships for predeployment activities and (2) contains optimistic time frames for completing activities, leaving little time to deal with unanticipated problems that are likely to arise.

Finally, recent and potential future delays in implementing ALMRS place BLM at risk that existing systems supporting mission-critical business processes, which are to be replaced by ALMRS, will be subject to the Year 2000 computer problem. While BLM is planning to provide the upgrades necessary to allow for the continued use of these systems if ALMRS is not fully deployed by the year 2000, it has not yet completed the requisite assessment to determine how to do this.

Background

BLM's mission is to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations. It 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 subsurface mineral resources on 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

[2]Beta testing is testing of a prerelease version of software by selected cooperating users.

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, records of land ownership, mining claims, and oil and gas leases. According to BLM, most of the paper documents are deteriorating and becoming increasingly difficult to read.

During the energy boom in 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 improved efficiency for recording, maintaining, and retrieving land description, ownership, and use information and provide geographic information system (GIS)[3] 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 more efficiently record, maintain, and retrieve land description, ownership, and use information to support BLM, other federal programs, and interested parties. It is to do this by establishing a common information technology platform,[4] 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.

The ALMRS/Modernization consists of the ALMRS IOC, geographic coordinate database (GCDB),[5] and modernization of BLM's computer and telecommunications infrastructure and rehosting of selected management

[3]A geographic information system is computer technology designed to assemble, store, manipulate, and display 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).

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

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

and administrative systems.[6] 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. ALMRS IOC is to replace various manual and ad hoc automated BLM systems currently operating on older mainframe computers.
- GCDB[7] is the database that is to contain geographic coordinates and survey information for land parcels. 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 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 BLM.

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 years 1994 through 1996. The 12 administrative applications have been rehosted and are operational. According to BLM's latest estimates, the ALMRS/Modernization is expected to cost about $594 million through fiscal year 2002, about 47 percent more than the $403 million estimate provided to the Office of Management and Budget in 1993. According to the Assistant Director for Information Resources Management (IRM), the increase is largely due to costs that were not included in the original agreement with OMB, including almost $105 million for technology refreshment.

Concerned that BLM might deploy the system prematurely, the House and Senate appropriations committees in fiscal year 1996 directed BLM to (1) test, verify, and validate that ALMRS operates as specified and (2) certify

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

[7]GCDB is composed of information from the National Public Land Survey System that is the basis for defining the legal boundaries of all public land parcels.

to them that it performs accurately and effectively and provides the expected capabilities prior to deployment. BLM retained a contractor to conduct the independent verification and validation testing and an operational assessment, testing, and evaluation and expects to base its certification to the committees on these tests. In our March 1997 report,[8] we stated that BLM would 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.

BLM Has Not Fully Implemented Our Recommendations to Reduce Risks

As of February 20, 1998, BLM had not fully implemented the recommendations contained in our March 1997 report. BLM's efforts to develop a security plan and an architecture, transition plans, and operations and maintenance plans were incomplete. BLM had taken substantial action to establish a configuration management program, but it had not yet produced a credible project schedule. These management tools are essential to manage the remainder of the project, help ensure system availability and performance, and avoid security and operational problems.

Security Planning Is Incomplete

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 ALMRS/Modernization security plan should define the policies and procedures for operating and maintaining a secure environment. In our March 1997 report, we recommended that before deploying ALMRS IOC, BLM develop 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.

BLM has not yet developed a security architecture. It has developed a security plan, finalized some policies—such as those governing user access to ALMRS/Modernization components—and has been working to

[8]See footnote 1.

complete contingency plans for the state offices and their subordinate district and area offices. Also, in October 1997, BLM conducted a risk assessment for the planned deployment of ALMRS IOC to the New Mexico State Office. In January 1998, ALMRS IOC was certified for operation in New Mexico by the Department of the Interior's Information Technology Security Manager.

Our review of BLM's security plan and related documents shows that the plan is not based on a documented risk assessment of ALMRS and does not provide sufficient detail to manage the security of ALMRS and its databases. Because BLM has no documented risk assessment of the ALMRS, it has no basis for asserting that the system is secure or the plan adequately addresses the various vulnerabilities and risks attendant to a nationwide client-server system. Also, the risk assessment performed at the New Mexico State Office focused on policies, procedures, and conditions at that office but did not deal with the security of, or assess the vulnerabilities of and risks to, ALMRS.

Transition Plans Do Not Fully Address Key Issues

The process of deploying a major information system that people will use to do their jobs requires careful planning. Many of the 210 BLM offices nationwide that will receive ALMRS/Modernization—designed to automate many manual functions—have little or no experience implementing client-server systems.[9] The transition from automated capabilities provided by a centrally managed mainframe system[10] to a locally managed client-server environment requires 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. In our March 1997 report, we recommended that before deploying ALMRS IOC, BLM 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.

BLM's National Information Resources Management Center developed the ALMRS Transition/Deployment Plan, dated September 2, 1997, to be used as a guide for deploying the needed upgrades for the hardware and software and transitioning to the ALMRS/Modernization platform and ALMRS IOC.

[9]Distributed systems that split software tasks between client computers and server computers and allow clients and servers to work cooperatively on a network.

[10]A large computer that generally supports multiple users connected via terminals.

According to a senior program analyst for the ALMRS project, 4 of the 12 state offices have prepared transition plans for their operations and the offices under their jurisdictions. BLM provided a copy of the 4 state offices' plans.

Our review of the ALMRS Transition/Deployment Plan showed that while the plan generally addresses transition, its primary focus is on deployment activities. BLM notes that subsequent versions of the plan will provide more transition information to help each state office make use of ALMRS in the most effective and efficient way. The Assistant Director for IRM told us that the ALMRS Transition/Deployment Plan will be updated to incorporate the recent work of user advisory teams and lessons from final ALMRS testing. Our review of the 4 state offices' plans showed that only 1 of them identified and addressed transition issues, such as how the state and subordinate offices will deal with oil and gas, mining, and solid mineral business process changes resulting from the implementation of ALMRS. Unless BLM ensures that the revised plans adequately address transition issues, BLM faces increased risks of disruptions to its work processes and impairments to its ability to (1) conduct its land and mineral management business and (2) use ALMRS most effectively.

Overall Operations and Maintenance Plan Does Not Address Site Functions

Operations and maintenance of information systems based on a client-server architecture require a large number of highly skilled people. Unlike the centrally managed legacy mainframe systems that have been supporting BLM operations, the ALMRS/Modernization 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. In our March 1997 report, we recommended that before deploying ALMRS IOC, BLM develop operations and maintenance plans addressing the acquisition, management, and maintenance of managerial and technical support for the ALMRS/Modernization to help ensure successful operations.

BLM has developed a draft operations and maintenance plan for the National Information Resources Management Center. This plan describes the (1) routine operations and maintenance services that the National Information Resources Management Center will provide and (2) approach that will be used to provide management and technical guidance necessary for the operations and maintenance of ALMRS. The plan, however, does not address how BLM will provide for operations and maintenance functions at the major BLM sites that will be responsible for operating and maintaining

ALMRS on a daily basis. This is critical because BLM will be relying on ALMRS to conduct its business and maintain its official records. The Assistant Director for IRM stated that the state offices are being contacted to ascertain whether they need additional or more specific guidance to meet these responsibilities. Due to the many sites involved and the complexities of the systems, sites will need operations and maintenance plans that clearly describe how they are to fulfill their responsibilities and how these responsibilities will be handled when there are unexpected shortages of qualified staff.

Configuration Management Program Is Being Implemented

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 integrity throughout their life cycles. System modifications without the safeguards imposed by the discipline of configuration management could lead to undesirable consequences. For example, they could cause system failures, endanger system integrity, increase security risks, and degrade system performance. In our March 1997 report, we recommended that before deploying ALMRS IOC, BLM 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 systems not related to the ALMRS/Modernization, to ensure successful management and integrity of the ALMRS/Modernization.

Our review of the latest configuration management guidance and discussions with project officials show that BLM has taken action to establish a configuration management program. BLM has developed a draft configuration management plan and associated policies and procedures and has taken action to implement them. BLM's configuration manager estimated that implementation of the configuration management program is about 85 percent complete. Since BLM's plan is still in draft and actions are not fully completed, we have not yet reviewed the configuration management program.

ALMRS Project Schedule Risks Continue

In March 1997, we reported that in its latest schedule, BLM planned 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. We stated that BLM might not be able to maintain this

schedule because it continued to allow insufficient time between critical milestones to deal with problems that were likely to arise.[11] At that time, BLM's own project management plans cited concern that milestones were overly optimistic, listed them as a major risk, and stated that the short time frames were influenced by BLM's desire to begin deploying the system in fiscal year 1997. We recommended that BLM fully update the project schedule, including analyzing human resource usage and task relationships to establish reliable milestones and a critical path to complete the project.

Although a complete, current, and accurate project schedule is essential to adequately manage and control the hundreds of tasks remaining to complete the project, BLM has not linked available staff resources to those tasks in developing the ALMRS project schedule. BLM revised the project schedule again in September 1997 without implementing our recommendation and was not able to meet critical milestones. BLM is again revising its plans and milestones, but although it is planning to analyze human resource usage and task relationships in establishing milestones for deployment activities, it is not planning to do so for its schedule to complete, test, and certify ALMRS.

Table 1 shows the acceptance testing and deployment milestones BLM is anticipating pending formal revision of its plans and schedule. According to the anticipated milestones, initiation of deployment will be about 9 months behind the schedule in place at the time of our March 1997 report. This represents more than a 2-year delay from the schedule delivered to OMB when the project was approved in 1993.

Table 1: ALMRS IOC Final Testing and Deployment Milestones

	Milestones as of January 15, 1997	Milestones as of February 17, 1998
Complete acceptance testing	3rd quarter FY 1997	3rd quarter FY 1998
Begin deployment	4th quarter FY 1997	3rd quarter FY 1998

Status of the ALMRS/ Modernization Project

BLM expected to certify to the Appropriations Committees in December 1997 that ALMRS performs accurately and effectively and provides expected capabilities after completing beta testing in November 1997 and operational assessment test and evaluation (OAT&E) in December 1997.

[11]We also discussed this concern in our August 1995 report Land Management Systems: Progress and Risks in Developing BLM's Land and Mineral Record System (GAO/AIMD-95-180, Aug. 31, 1995).

However, this milestone was not met because numerous problems were encountered during beta testing that required correction before BLM could begin OAT&E. Also, shortly after beta testing, BLM discovered that data converted from its legacy systems for ALMRS were not reliable because of errors in the conversion software. Since then, BLM has been making corrections to resolve the software and other problems and revising final testing plans and milestones. Continuing delays in implementing ALMRS may place BLM at risk of losing information technology support for core business processes because of the imminent Year 2000 computer problem.

Problems Encountered During Beta Testing

The following problems emerged during the beta test of ALMRS.

- BLM encountered unexpected workstation failures and slowdowns caused by insufficient workstation memory and by problems discovered in two BLM-developed software applications that had not been sufficiently tested.
- BLM had not yet determined with sufficient certainty how BLM staff will use ALMRS and the expected workload that they will generate in performing their day-to-day duties. A realistic operational usage definition of ALMRS workstations is essential for the design and conduct of OAT&E.

After beta testing, BLM converted data from legacy systems in the New Mexico State Office's jurisdiction to the database management system used in the ALMRS/Modernization and expanded the sample size for testing and validating the data. BLM discovered that some of the data were being converted incorrectly. BLM identified 43 software errors that resulted in missing land descriptions, incorrect associations, incomplete conversions to designated data elements, and accurate conversions being written into error files. BLM estimated that some of these errors will take up to 4 months to correct.

According to the project comanager, BLM is analyzing the data conversion problems, performing further testing and validation, identifying those problems that must be corrected prior to performing OAT&E, and correcting the data conversion software. BLM also plans to reconvert and update the New Mexico database and analyze and validate the new database prior to deployment.

BLM Plans to Correct Problems

As a result of problems found during and after beta testing, BLM slipped its schedule to allow time to correct and revise its strategy and milestones for OAT&E and independent verification and validation. In conjunction with its

OAT&E and independent verification and validation contractor, BLM agreed that 12 conditions need to be satisfied before OAT&E can begin. The conditions include the

- completion of training manuals and aids for BLM-developed software components;
- establishment of data sharing procedures and a public room[12] plan;
- establishment of a national help desk;
- development of a maintenance plan that delineates necessary activities for maintaining the contractor- and BLM-developed software components of ALMRS IOC; and
- identification of automated access and training requirements for the Mineral Management Service, another part of the Department of the Interior that uses BLM land and mineral data.

At the end of our field work, most of the conditions had not been met and BLM had not made the requisite database corrections for OAT&E. BLM expected to conduct the OAT&E in March 1998, certify ALMRS IOC in April 1998, and deploy ALMRS IOC to the first state office jurisdiction in June 1998. However, the schedule estimates remain unreliable because BLM had not provided for unexpected problems or analyzed human resource usage and task relationships in establishing critical milestones in revising the project schedule, as we recommended in our March 1997 report.

Year 2000 Risks Are Appearing

The recent and potential future delays in the ALMRS/Modernization program introduce the risk that BLM will lose information technology support for its core business processes because of the looming Year 2000 problem. The Year 2000 problem is rooted in the way dates are recorded and computed in many computer systems. For the past several decades, systems have typically used two digits to represent the year, such as "98" representing 1998, in order to conserve electronic data storage and reduce operating costs. With this two-digit format, the year 2000 is indistinguishable from 1900, 2001 from 1901, and so on. As a result of this ambiguity, computer systems or application programs that use dates to perform calculations, comparisons, or sorting may generate incorrect results when working with years after 1999.

BLM has identified two legacy systems supporting its core business processes that are subject to the Year 2000 computer problem. These two

[12]BLM provides land and mineral records and reference information to the public in public rooms at selected offices.

mission-critical systems, the Case Recordation System and the Mining Claim Recordation System, are to be replaced with ALMRS IOC implementation. BLM presently uses these two systems to create and manage land and mineral case files. They capture and provide information on case type, customer, authorizations, and legal descriptions. Without these systems, BLM cannot create and record new cases, such as mining claims, or update case data. BLM's initial assessment of the two mission-critical systems shows that the older computer mainframes on which these systems run are date-dependent and may malfunction in the year 2000.

These two systems are to be replaced by ALMRS before the year 2000. However, the delays in implementing ALMRS introduce the risk that BLM will be forced to continue using these two systems beyond 2000. To mitigate this risk, BLM is considering upgrading the mainframes on which these two systems run. However, BLM has not yet completed an assessment to determine what this upgrading would entail or developed a contingency plan for key business processes to be supported by these systems in the event that ALMRS is not fully deployed by the year 2000. The BLM Year 2000 Program Coordinator expects the assessment of this and the resulting contingency plan to be completed in the near future, although we were told that no deadline has been established for these actions.

Conclusions

BLM has not fully implemented the recommendations we made in our March 1997 report. It has not yet completed essential plans for system security, transition, operations and maintenance, and configuration management, exacerbating risks that ALMRS/Modernization will not be successfully implemented and meet operational needs. BLM understands the importance of these essential tools and has been working to develop them. However, until our prior recommendations have been implemented and necessary plans have been completed, approved, and put into place, BLM will not be ready to deploy the system. Continuing delays with the ALMRS/Modernization and the looming Year 2000 computer problem place BLM at risk that core business processes will not be supported beyond January 1, 2000.

Recommendation

To reduce the risk that BLM will lose information technology support for core business processes, we recommend that the Director of the Bureau of Land Management (1) direct that the two mission-critical systems ALMRS is to replace be fully assessed to determine what actions are needed to

ensure the continued use of these systems after January 1, 2000, and (2) develop a contingency plan to take those actions in the event that ALMRS is not fully deployed by that time.

Agency Comments

In comments on a draft of this report, the BLM Director stated that he generally agrees with our observations and provided some updated information. BLM agreed with our recommendation to perform a full assessment of the two mission-critical systems to be replaced by ALMRS and develop a contingency plan to take the needed actions in the event that ALMRS is not fully deployed by the year 2000. BLM stated that it (1) has taken significant steps to implement the six recommendations in our March 1997 report and (2) will implement them before deploying the system. BLM also described some efforts that it believes are indicative of progress to date.

We are sending copies of this report to the Secretary of the Interior, the Director of the Bureau of Land Management, the 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, Civil Agencies Information
Systems

Contents

Abbreviations

ALMRS	Automated Land and Mineral Record System
BLM	Bureau of Land Management
DOI	Department of the Interior
GCDB	geographic coordinate database
GIS	geographic information system
IOC	initial operating capability
IRM	information resources management
OAT&E	operational assessment test and evaluation
OMB	Office of Management and Budget

Objectives, Scope, and Methodology

Our objectives were to assess BLM's actions to address the recommendations contained in our March 1997 report and identify the status of BLM's efforts to test, deploy, and implement ALMRS initial operating capability (IOC).

To review BLM's actions to address our recommendations (develop a credible project schedule, configuration management plan, security architecture and security plan, complete transition plans, and complete operations and maintenance plans), we reviewed the ALMRS Project Office's project management and scheduling procedures; BLM's National Configuration Management Board's draft configuration management plan; BLM information technology security plans, ALMRS application security plan, and other security documentation; BLM's Operations and Maintenance plan for the National IRM Center; and BLM's Version 2.0 Transition and Deployment Plan and site-specific transition/deployment plans for New Mexico, Idaho, Arizona, and Colorado. We compared revised project milestones with past milestones and remaining project risks. We also reviewed Carnegie Mellon University's Capability Maturity Model for Software and site readiness review results.

To ascertain BLM's efforts to test, deploy, and implement ALMRS IOC, we reviewed ALMRS/Modernization project documents, weekly activity reports and assessments by the independent verification and validation contractor, system integration meeting minutes, BLM's exit criteria for system certification, software problem reports, and project management schedules. We also reviewed BLM's submission to the Department of Interior's Year 2000 Master Plan and status reports on BLM's Year 2000 efforts. We attended the Department of the Interior's October 1997 quarterly review of the development project at the ALMRS/Modernization project office in Lakewood, Colorado, and observed alpha IV testing at the ALMRS/Modernization pilot site offices in Santa Fe, Albuquerque, Farmington, and Taos, New Mexico and beta testing at the ALMRS/Modernization pilot site offices in Santa Fe, Albuquerque, and Taos, New Mexico. We also reviewed the results of alpha IV and beta testing.

We discussed the project with prime contractor officials; contractor officials responsible for independent verification and validation and operational assessment testing and evaluation; a senior technical analyst and the Acting Chief Information Officer at the Department of the Interior; BLM's Assistant Director and Deputy Assistant Director for IRM, and BLM's ALMRS budget analyst. We further discussed the essential management plans with ALMRS project officials responsible for project management and

scheduling, configuration management, security, deployment, transition, and operations and maintenance planning; and discussed software development risks, performance problems, planned system capabilities, software problem reports, system testing, and technical complexity with project officials responsible for systems engineering, software development, and testing. We discussed BLM's Year 2000 efforts with the Bureau's Year 2000 Program Coordinator.

We performed our work at Interior's information resources management headquarters in Washington, D.C.; BLM headquarters in Washington, D.C.; the ALMRS/Modernization project office in Lakewood, Colorado; the prime contractor's office in Golden, Colorado; ALMRS pilot site offices in Santa Fe, Albuquerque, Farmington, and Taos, New Mexico; and the independent verification and validation contractor's office in the ALMRS/Modernization project office in Lakewood, Colorado.

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

APR 13 1998

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 status report on actions taken by the Bureau of Land Management (BLM) in completing the Automated Land and Mineral Record System (ALMRS). As one of the largest systems yet undertaken by a civilian agency, ALMRS has had many different critical junctures. Over the past several years, the General Accounting Office (GAO) has provided many important and timely observations to the BLM. The most recent report is no exception.

We have taken significant steps to implement the six recommendations in your March 1997, report. While some portions of your recommendations in that report are yet to be fully completed, I intend that all will be completed before deploying the system. We have also made a great deal of progress in developing the ALMRS software and planning for implementation since your last report. Some of the significant steps in our progress toward implementation of the ALMRS since that time include the following:

- We have completed both Alpha and Beta tests at the New Mexico pilot sites. The Beta tests clearly demonstrated the application software is mature, functions as planned, and is ready for testing in a full operational environment.
- Communications and hardware upgrades have been installed in New Mexico, Arizona, and Idaho and are in progress for Colorado, California, Montana, Nevada, and Wyoming.
- Technical training and the train-the-trainer sessions on use of the application have been completed for the staffs of New Mexico, Arizona, and Idaho.
- The Transition/Deployment Plan has been completed, one update of the plan has been issued, and a second update will be completed by the end of the month.
- Site Readiness Reviews have been completed for New Mexico, Arizona, Idaho, and Colorado with very positive results.
- The Configuration Management Plan has been completed and implemented.

See comment 1.

- The security review for ALMRS has been completed in New Mexico by the Department and the National IRM Center Security Manager has prepared assessments for the system security for Arizona, Idaho, and Colorado and is working with the states to implement the few remaining security activities.

See comment 2.

I am concerned that the discussion of costs in the current report does not accurately reflect the situation relative to funding requirements for the ALMRS/Modernization project. The total life cycle costs of the project are expected to be about $594 million through fiscal year 2002. The difference between this projection and the $403 estimate provided earlier to Office of Management and Budget (OMB) in 1993, is largely due to the costs excluded from the OMB estimate, specifically $105 million for technology refreshment, data communications circuits, facilities and utilities and continued training. Other costs were understated, including hardware and commercial off-the-shelf software maintenance. Subtracting these excluded and underestimated costs bring the BLM's projections to $413 million, or slightly higher than the original cost estimates.

See comment 1.

As stated in the report, there have been delays in getting the system ready for full field testing and subsequent deployment. However, these schedule adjustments reflect in a positive way the Bureau's commitment to (1) deploy a system that provides the functionality required to carry out the land and mineral programs of the Bureau, (2) ensure that the system has been fully tested in an operating environment prior to making the commitment to deploy the system to the rest of the Bureau, and (3) verify that the data has been properly converted.

We concur with your recommendation that we complete an assessment of the potential for any Year 2000 problems with the mission-critical systems, and that we develop a contingency plan that specifically addresses this issue. The contingency plan is expected to be completed by May 15, 1998.

Enclosed is a summary of our comments on specific portions of the draft report. We appreciate that the cutoff date for your field work was February 20, 1998, and that a number of concerns involved works in progress. Therefore, in the enclosed comments, we have attempted to point out where we feel the material in the report is based on incomplete information and have provided updated information that reflects our current situation. By providing critical input during the development of this very important automation effort, GAO's continued contribution has been very valuable and is appreciated.

Sincerely,

Pat Shea

Pat Shea
Director

Enclosure

See comment 3.

See comment 4.

See comment 5.

BLM'S RESPONSE TO GAO'S MARCH 1998 DRAFT REPORT ON ALMRS

Schedule

A critical path for the project schedule has been identified and the first iteration of resourcing against the schedule has been completed. Since the primary commitment of the Bureau of Land Management (BLM) is to deploy Automated Land and Mineral Record System (ALMRS) only after we have successfully completed the pilot effort in New Mexico, any schedule is naturally "at risk" until the pilot is completed and the determination is made that the system is ready to be deployed to the rest of the BLM. As schedules are adjusted in the future dependent on progress with the New Mexico pilot, we will go through additional iterations of resourcing to ensure that the Bureau has the capability to carry through with the plans for deployment. We appreciate the support that the General Accounting Office (GAO) staff has given us on placing the emphasis on completing a successful pilot rather than on meeting an artificially derived schedule.

Configuration Management

The Configuration Management Plan has been completed and an active configuration management program is now fully implemented. The BLM's Configuration Manager will be doing periodic consistency reviews to ensure that all offices continue to adhere to Configuration Management requirements.

Security Planning

The Department's Information Technology (IT) Security Manager has certified that ALMRS meets the Department's security requirements in New Mexico. The implementation of these security requirements in New Mexico will be used as a guide for achieving IT security for ALMRS in the remaining states. This model will be used by the National IRM Center Security Manager to certify, as a part of the site readiness reviews for each state, that the remaining states have implemented all security requirements prior to deployment of ALMRS to those sites. Security assessments were included in the site readiness reviews for Arizona, Idaho, and Colorado and actions were identified that must be implemented prior to deployment of ALMRS in those states. Additional security requirements will be implemented for ALMRS Release 2.

We agree that, even though all Departmental security requirements have been met for the currently identified level of security for Release 1, an up-to-date Risk Assessment for ALMRS would be useful. In addition, the BLM's Security Plan will be submitted to an independent party for review and suggestions for improvement. The review of the Security Plan and completion of the Risk Assessment and Contingency Plan will be completed by July 1, 1998.

Enclosure 1-1

See comment 6.

Transition Planning

After nearly five years of experience, the BLM is already well along on the transition from a centrally-managed mainframe system to a locally-managed client server environment. We have undertaken a number of initiatives to plan for the transition of business operations under the legacy systems to operations under ALMRS and detailed program guides will be available prior to the beginning of operations under ALMRS in New Mexico. All states have completed transition/deployment plans; the four plans provided to the GAO staff were those that had been updated and reviewed as a part of our site readiness reviews. The remaining eight state plans will be updated using the next update of the Bureau's Transition/Deployment Plan prior to the site readiness reviews for those states. We believe the combination of these initiatives in transition planning significantly reduces the risks of any disruptions to work processes or of potential impairments to our ability to conduct our land and mineral management business and positions the BLM to use ALMRS most effectively.

See comment 7.

Operations and Maintenance Planning

The Operations and Maintenance (O&M) Plan is completed and is being reviewed by the field offices. This document provides a single reference summarizing operations and maintenance policies and procedures and directing state, National Center and other IRM technical personnel to more detailed guidance found in Instruction or Information Memorandums, Standard Operating Procedures, and other IRM plans and policies. States will use this plan to update the O&M plans for their sites. Software maintenance will be included in the Operations and Maintenance Plan.

See comment 8.

Results of Beta Testing

The purpose of Beta testing is to discover any problems that might exist in a field operational environment that may not have been discovered in the lab testing. During the Beta testing we expected to discover problems and we confirmed things such as the amount of memory and paging space required for the system to function. The Beta testing did exactly what it was supposed to do and provided the essential information necessary to prepare for full field deployment.

See comment 1.

Operational Assessment Test & Evaluation (OAT&E) Walk Through

Mitretek conducted a two-day OAT&E "walk through" in New Mexico on March 25 and 26, 1998. The purpose of this walk through was to validate Mitretek's planned OAT&E process and data collection approach, including for testing purposes determining what a "normal" workload is. During this two-day validation, close to 300 work activities were attempted which resulted in approximately 400 hours of user testing. Users followed normal work activities rather than scripted testing as in the previous Alpha and Beta testing. System performance measures (CPU and network loading), system availability and recovery data, help desk and coaching concept, and the collection of data relative to activities, problems, and usability were evaluated.

Enclosure 1-2

While the OAT&E "walk through" was not intended as a formal test (formal OAT&E will be scheduled upon successful conversion of legacy data to ALMRS), the quality of the data collected was better than expected. The analysis identified only one significant application problem related to post conversion data cleanup. No problems were identified with the ALMRS application itself. The network remained stable and no "down time" related to ALMRS usage was experienced. Significantly, a high level of enthusiasm by ALMRS users was observed. In fact, many users requested that they be allowed to continue to use the system after the testing was concluded.

Enclosure 1-3

The following are GAO's comments on BLM's April 13, 1998, letter.

GAO Comments

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

2. In discussing BLM's comments, the Assistant Director for IRM told us that a primary reason for the increased estimated cost from $403 million to $594 million is that $105 million of technology refreshment costs were not included in the estimate provided to OMB. We revised the report to clarify this point. We also note that technology refreshment costs, as well as the other costs BLM mentioned, are properly a part of life-cycle costs and should have been included in the initially approved $403 million life-cycle estimate provided to OMB.

3. In BLM's comments on the ALMRS project schedule, it stated that GAO staff has supported placing emphasis on completing a successful pilot as opposed to meeting an artificially derived schedule. We agree that emphasis should be placed on successfully completing all testing, including the pilot test. Testing is an essential part of developing and deploying an efficient and effective system.

We also agree that BLM should not try to meet artificially derived milestones. A complete, current, and accurate schedule with tasks linked to available resources is an essential tool to manage and control a large-scale project. This is the primary reason why we have addressed the project schedule in this report and in our two prior reports on ALMRS.[1] The project schedule should have been based on tasks to be completed, resources associated with task completion, and a critical path with sufficient time allotted to deal with unanticipated problems. BLM has not done this.

4. BLM noted that the Configuration Management Plan and program were fully implemented about a month after we completed our fieldwork. As we note in the report, we did not assess the configuration management program during our review because the plan had not been completed and the program had not yet been fully implemented before the end of our fieldwork.

[1]Land Management Systems: Progress and Risks in Developing BLM's Land and Mineral Record System (GAO/AIMD-95-180, Aug. 31, 1995) and Land Management Systems: BLM Faces Risks in Completing the Automated Land and Mineral Record System (GAO/AIMD-97-42, March 19, 1997).

5. As we discuss in the report, the risk assessment performed at the New Mexico State Office focused on policies, procedures, and conditions at that office. The risk assessment did not deal with the security of, or assess the vulnerabilities of and risks to, ALMRS. In addition, until a full risk assessment of ALMRS is completed and documented, BLM has no basis for asserting that the system is secure or that the plan adequately addresses the vulnerabilities and risks attendant to a nationwide client-server system.

6. Our review of BLM's updated transition plans showed that only one of the four plans identified and addressed transition issues. As we discuss in the report, the transition from automated capabilities provided by centrally managed mainframe legacy systems to the locally-managed client server environment of ALMRS 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. Our concern is that with the complexity of ALMRS and the business process changes it will require, BLM needs to ensure that its transition plans provide the necessary guidance for successful transitions in its 210 state, district, and resource area offices.

7. Operations and maintenance plans are essential for operating and maintaining ALMRS on a daily basis. BLM noted that the states will update the operations and maintenance plans for their sites. In updating their plans, the state offices will need specific information that clearly describes how they are to fulfill their day-to-day responsibilities and how these responsibilities will be fulfilled when there are unexpected shortages of qualified staff.

8. We agree. Beta testing is testing of a prerelease version of software by selected cooperating users in order to uncover problems that were not discovered during laboratory testing. According to BLM, the beta test served that purpose. As we note in our report, these problems along with data conversion errors required correction before OAT&E could begin. Beta testing was conducted in November 1997 and OAT&E was scheduled to be completed in December 1997.

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