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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

ENERGY AND MINERALS
DIVISION

B-202946

MAY 7, 1981

The Honorable James G. Watt
Secretary of the Interior



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Dear Mr. Secretary:

Subject: [Improvements Needed in Managing Federal
Coal Mapping Contracts] (EMD-81-38)

In a recent report, we identified various problems with the quality and usefulness of [Federal coal resource occurrence/coal development potential (CRO/CDP) maps] which we said could undermine the Department of the Interior's effort to resume new Federal coal leasing. ^{1/} While that report primarily concerned the impact of the maps on the coal program, this report points up shortcomings in contract management practices which were largely responsible for the poor quality maps and which, if not corrected, could also jeopardize other programs that rely on contracting. The shortcomings include

- questionable basis for awarding and amending contracts,
- vague contract provisions and lack of other guidance, and
- inadequate cost estimating and contract monitoring.

[The maps, which were intended to provide a basic source of coal resource data for Interior's land use planning system, were prepared under contracts awarded and managed by the U.S. Geological Survey (USGS). Between April 1977 and September 1979, 16 cost-plus-fixed-fee contracts were awarded for the purpose of mapping coal deposits in seven western States. Work under the contracts--all of which had the same basic contract provisions--was completed in January 1981 at a cost close to \$10 million.]

^{1/}"Mapping Problems May Undermine Plans For New Federal Coal Leasing," EMD-81-30, Dec. 12, 1980.

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In its October 1, 1980, response to our earlier report on mapping problems, Interior announced that it was terminating the CRO/CDP contract mapping program, and that it had "no plans to conduct any program along the lines of the CRO/CDP program for other leaseable minerals." Nevertheless, budgeting and staffing constraints--particularly under the new administration--may require USGS to supplement its in-house mapping capability through contracts so that needed maps are available to meet the Bureau of Land Management's anticipated planning and leasing schedules. In addition, USGS presently relies heavily on contracts to carry out its coal exploration and drilling programs. Thus, we believe early attention to USGS contracting practices should be included in your current effort to improve management of the Department.

QUESTIONABLE BASIS FOR AWARDING AND AMENDING CONTRACTS

Although Federal procurement regulations require agencies to award contracts on a competitive basis to the maximum practicable extent, USGS awarded 1 of the 16 mapping contracts on a sole-source basis without adequate justification. It also modified two other contracts to obtain additional maps outside the originally contracted area without attempting to obtain competition on the additional work. In addition, USGS officials orally requested 10 of the 16 contractors to make major changes in the scope of the contracts, which was the basis for later contract modifications resulting in significant cost increases.

In awarding a mapping contract for an area in Eastern Oklahoma, USGS solicited only one proposal--justifying this on the basis that the contractor was uniquely qualified due to specialized experience and proven ability to manage similar projects, and that no other company could perform the work. After this sole-source award, USGS invited the contractor to submit his proposal for furnishing maps for the area. In response, the contractor stated that he had identified a sole-source subcontractor with the expertise and capabilities to perform the work. The contractor submitted the subcontractor's technical proposal which was accepted by USGS. There was no adequate documentation to justify the noncompetitive award, nor any indication that USGS tried to locate other firms. In fact, another technically qualified firm had expressed interest to USGS in undertaking this same effort 6 months prior to the award but was not given the opportunity to submit a proposal.

USGS asked another contractor to include additional areas to be mapped in order to avoid year-end loss of funds. USGS estimated that this particular contract--for the Eastern Powder River Basin of Wyoming--would have between \$260,000 and \$280,000 remaining after the contractor completed the original work. Recognizing that they could not recommit prior year funds, and not wishing to lose these funds, USGS requested the contractor

to gather data for the additional area and later modified the contract to include it.

The contracting officer did not seek competition from other technically qualified sources for the effort, as required by the Federal Procurement Regulations. Also, he did not negotiate the additional costs, noting that the remaining funds would be sufficient to cover the additional work.

[USGS contract monitors and program officials were not trained adequately in contract administration and there were no written guidelines for them to follow.) Consequently, oral instructions were given to contractors which changed the scope of 10 of the 16 contracts. Sometimes the oral changes were the basis for later contract modifications, resulting in significant cost increases. For example:

- In one instance, USGS officials requested a contractor to complete additional maps outside the originally contracted area. USGS later modified the contract to include the additional work at a cost of \$73,479. By having the contractor obtain the data and become familiar with the area to be mapped, USGS in effect precluded competition for the additional work.
- USGS officials also orally requested another contractor to complete additional maps and to change certain mapping and other procedures. As a result, the contract was later modified for an additional \$390,000.
- In another case, USGS changed the boundary of an area to be mapped and also asked the contractor to map coal beds less than the previously contracted thickness of 5 feet--resulting in a later \$248,000 modification.

VAGUE CONTRACT PROVISIONS
AND LACK OF OTHER GUIDANCE

[The statement of work portions of the 16 contracts, all of which were basically the same, did not adequately describe (1) what data contractors were to use in preparing the maps, (2) how data was to be analyzed and interpreted, and (3) what procedures USGS was to follow in reviewing the resultant maps. As a result, contractors relied on oral instruction from USGS monitors who were not familiar with the areas being mapped to make important technical decisions and to attempt to resolve the confusion that occurred. Because of their inexperience and the lack of written guidelines either in the contracts or otherwise, the monitors sometimes were inconsistent in their decisions and quality control was largely left in the hands of

the contractors. Consequently, standards varied, delays occurred, and map quality suffered.

In addition, a program manual giving guidance on how the maps were to be prepared and reviewed was not published by USGS until May 1980--more than 2 years after the initial contract was issued and after work on all contracts was nearly completed. It was not published or used any earlier because USGS officials did not know what the maps should include or how the data should be presented. Interior itself provided little guidance to USGS, and Interior, USGS, and the Bureau of Land Management all had different understandings of the purpose and the ultimate use of the maps.

Use of data

The 16 contracts did not clearly spell out whether data available to the contractors was to be used and, if so, how it was to be used. For example, water, oil, and gas drill-hole logs--which varied in age and quality--were used by all contractors in varying degrees to identify, correlate, and measure coal deposits. But this often resulted in disputes between USGS field geologists and contractor personnel over their use and interpretations, and adequate procedures were not established by the contracts for resolving such disputes.

In addition, the contracts were not clear as to whether contractors should first screen the data presented. No provisions were included for establishing a cutoff point for the addition of new data, and no standards were provided as to either data quality or reliability. Moreover, the respective roles of the contractors and the contracting officer in making decisions about data were not clear, and no review standards were provided. For example, contractors were not given guidance as to how they should transfer outcrop and other surface information taken from different scale maps. While later contracts called for all outcrops to be traced and adjusted to modern topography, how this was supposed to be done was unclear.

Also, no precise steps were given on how USGS was to compile, organize, and provide its unpublished data to a contractor. Delays and cost overruns resulting from the slow, fragmented compilation of this data could have been avoided if clear steps had been specified in the contracts, and then followed, for obtaining information from USGS offices.

Moreover, provisions for safeguarding "unpublished" original USGS data were not clear. The type of data to be safeguarded, the level of effort called for to maintain its secrecy, and the length of time secrecy was to be maintained were not specified. For such data, the contracts prohibited other "uses," but uses was not defined. For example, geophysical

logs for holes drilled by USGS, not then publicly available, were given to contractors for use in preparing the maps. In transmitting the data to the contractors, USGS stated that use of the data for other than U.S. Government-contracted work was strictly prohibited. Whether other types of unpublished USGS data besides geophysical logs had to be protected prior to their publication by USGS was unclear, making it difficult for USGS to enforce the requirement.

Analysis and interpretation of data

After the data was gathered, the contractors were required to analyze it to determine which coal beds could be correlated and where coal development potential occurred. Again, the contracts did not state how the contractors were to do this. As a result, standards varied and map quality suffered.

The contracts were unclear as to how correlation diagrams--showing how the layers of coal and non-coal deposits relate to one another--were to be constructed, even though correlation diagrams are critical elements in developing an understanding of coal beds and their development potential.

In addition, the contracts stated that guidelines for preparing coal development potential maps--intended to show the development potential for specific deposits--were to be furnished by the Government based on information compiled and developed by the contractors. But a standard list of criteria was provided irrespective of location and degree of geological complexity of coal beds, and no clear instructions were given as to how development potential criteria were to be applied and how results of their application were to be presented.

In determining development potential and establishing the boundaries on the maps, contractors were required to label each 40-acre tract--the smallest legal subdivision for classifying coal land--with the highest development potential rating associated with each tract. For example, if only 5 acres in a tract were rated as high potential, then the entire 40 acres were upgraded to high potential even though portions of the tract might actually differ. Some USGS contract monitors, however, believed this practice to be unrealistic and misleading and, instead, required contractors to designate high development only when a majority of land in a 40-acre tract had high potential. Thus standards varied.

Finally, no provision was made for contractor personnel to do any field work, such as "spot-checking," to verify data, even though such verification had not been done by USGS and is a critical step in assuring accurate and reliable maps. After the contractors submitted the maps, USGS discovered that certain outcrop lines had often been erroneously reported, leading to inaccurate descriptions of the nature and extent of the coal.

Review procedures in approving maps

Work under the contracts was to be completed in four phases. After each phase USGS contract monitors were to approve that phase before work could begin on the next. Contract provisions, however, on the nature and scope of USGS reviews were vague and multiple and changing review procedures added time and expense to the work. Vague review provisions also added confusion to Government/contractor relations and precluded early mutual accommodation of different views.

In addition, responsibility for professional geological opinion was not assigned clearly under the contracts and standards for quality control and reliability were not provided. Some important parts of the contracts affecting costs were not worded carefully and contractors were uncertain as to their meaning. For example, work on a phase was not approved until completed, but contractors were not authorized to incur costs "in the performance of any work in a phase which has not been approved by the Government."

Early in the program, USGS monitors approved maps before they were made available to the public. Some of these monitors, however, did not know the geology of the area being mapped. As a result, their comments were usually editorial rather than technical, and quality control was left largely to the contractors. Yet, as mentioned above, USGS prohibited contractors from making field visits to resolve disputes on coal bed correlation or to measure depth of a coal bed in unlikely or unrealistic areas which would go unnoticed by inexperienced contract monitors.

Beginning in 1979, USGS required field geologists familiar with the area to review the maps. Review of some maps took up to 8 months. Contractors and USGS officials agreed that the additional review improved quality controls but at a considerable cost.

INADEQUATE COST ESTIMATING
AND CONTRACT MONITORING

None of the 16 contracts were completed within the original cost estimates. In fact, total costs increased more than 70 percent over the original contract estimates. These cost overruns were largely due to

- costs not properly estimated;
- USGS internal problems on direction of the program, causing delays; and
- frequent changes in the basic format of the maps.

Fourteen of the 16 contracts had cost increases ranging up to 199 percent. Work on five contracts was stopped after almost \$2.4 million had been spent but only a small portion of the maps (31 of 221) was completed. Three of these contracts for a total of 133 maps were stopped without the contractors completing any of the maps, because USGS had insufficient funds to pay the estimated cost of completing them (close to \$1 million more). Of the total cost increases over the original contract estimates (\$4,213,204), about 11 percent (\$459,792) was due to options exercised on contracts. The table on page 8 shows the cost increases which occurred.

Cost not properly estimated

USGS did not have detailed coal resource data available and thus did not know the cost of preparing CRO/CDP maps at the time of awarding the contracts. As a result, USGS did not prepare a cost or price analysis, as required by the Federal Procurement Regulations. Consequently, contractors started "buying in" at unrealistically low prices.

For example, USGS officials believed initially that the cost of mapping the Red Desert area of Wyoming would cost about \$300,000. When USGS issued a \$397,986 contract for this area, a USGS official evaluated the contractor's proposal and stated that it showed a good understanding of the work requirements because the contractor had performed a background study of the area's geology. Later, the contractor requested an increase of \$380,313 to fulfill the original requirements under the contract. The USGS contract monitor then stated that the contractor did not originally assess the work requirements properly, and terminated the contract because of insufficient funds.

USGS internal problems

The lack of direction and cooperation between USGS headquarters and field offices caused considerable time delays and added cost to the contracts. The Acting Chief, Conservation Division, wrote early in 1977 that the success of the project would largely depend on both the coordination and cooperation that could be developed between involved Division personnel, and he outlined the responsibility of each group. However, the memorandum was never fully implemented. For example, field offices were not instructed on how to assemble and provide timely data to the contractors.

Furthermore, confusion existed regarding the treatment of unpublished data collected by field geologists. Some field geologists immediately turned over uninterpreted, unorganized information to contractors; some refused to release any data until it was made publicly available, particularly industry-derived drill-hole logs, the confidentiality of which was maintained until USGS released all the data in a public report;

Initial and Final Contract
Amounts for CRO/CDP Maps

<u>Contract Area</u>	<u>Number of maps</u>	<u>Initial cost estimate</u>	<u>Final cost</u>	<u>Percent increase</u>	<u>Date awarded</u>
Hana-Carbon, WY	21	\$ 227,227	\$ 287,140	26	4/08/77
Yampa-Danforth, CO	46	313,205	872,252	178	6/28/77
Rawlins-Rock Springs- Kemmerer, WY	68	379,829	989,091	136	7/12/77
Northern Powder River Basin, MT	95	516,915	1,432,869	155	7/25/77
Knife River, ND	a/ 59	282,298	843,373	199	8/10/77
Wasatch-Bookcliffs, UT	39	202,100	300,229	48	9/09/77
Eastern Powder River Basin, WY	b/134	693,966	1,087,684	57	9/29/77
Northern San Juan Basin, NM	69	476,481	900,169	89	9/29/77
North Park-Lower White River, CO	c/ 29	236,640	256,629	8	9/27/78
Alton-Kanab, UT	09	100,900	116,286	15	9/27/78
Southern San Juan Basin, NW	d/ 56	491,007	829,165	69	9/27/78
Paonia-Somerset- Bookcliffs, CO & UT	e/ 48	282,200	394,522	40	9/27/78
Red Desert, WY	f/ 30	397,986	397,986		9/28/78
Dickinson-New England- Mott, ND	g/ 55	554,585	554,585		9/28/78
Henry Mountains, UT	12	127,629	188,192	47	9/29/78
Eastern Oklahoma	14	168,866	214,855	27	9/28/79
Total	784	\$5,451,823	\$9,665,027		

a/Sixteen of the 59 maps were completed by contractor because USGS had insufficient funds to fulfill the requirements under the contract.

b/Includes 114 maps under the original contract plus 20 additional maps that USGS requested outside the contract area. USGS modified the contract to include these additional maps.

c/Fifteen of the 29 maps were completed by contractor because USGS had insufficient funds to fulfill the requirements under the contract.

d/Includes 51 maps under the original contract plus five additional maps that USGS requested outside the contract area. USGS modified the contract to include the additional maps.

e/None of the 48 maps were completed by contractor because USGS had insufficient funds to fulfill the requirements under the contract.

f/USGS terminated contract with no maps completed by contractor. Contractor estimated that it would cost an additional \$380,313 (a 96-percent increase) to fulfill the original requirements under the contract.

g/USGS terminated contract with no maps completed by contractor. Contractor estimated that it would cost an additional \$524,412 (a 95-percent increase) to fulfill the original requirements under the contract.

and others released data only after being fully satisfied of the correctness of the interpretations. These divergent practices caused misunderstanding of the data by contractors, disagreements between contractors and USGS personnel on interpretations, costly delays in contract completions, and equally costly revisions of nearly completed maps.

For example, when USGS issued a contract to map 55 areas in North Dakota, information on only 21 drill holes was publicly available. But several months before the contract was awarded, a field geologist obtained 570 drill-hole logs from a coal company for a large portion of the area. The USGS field office, however, treated this data as proprietary, as agreed with the coal company and, consequently, refused to release the information in that form. When the contractor requested it directly from the company, the company indicated that the data had been released to USGS on a confidential basis and that no information would be made available because the contractor could not guarantee confidentiality. By the time USGS made the information publicly available, considerable work had already been done by the contractor and the new data required many changes in the maps, at an additional cost of \$524,412--a 95 percent increase over the original estimate. Because of limited funds, USGS terminated the contract with no maps completed. USGS could have avoided this problem had there been effective communications about the status and timing for public release of information before issuing the contract.

Four other contractors also did not receive relevant USGS data until they had done considerable work on the maps.

--The contractor for the Yampa-Danforth area in Colorado received data when the maps were ready to be made available to the public.

--A contractor for the North Park area in Colorado received data piece-meal from USGS throughout the mapping process and had to remap one area three times.

--Another contractor for the Southern San Juan Basin area in New Mexico received geologic data from USGS about 7 months after it initially requested the data.

--Still another contractor for the Northern Powder River Basin area in Montana received data from USGS 2 years after the contract was signed, requiring the contractor to redraw maps.

Two years after the program began, USGS finally clarified the issue of releasing unpublished data by requiring that all data gathered by USGS (except company confidential data) was to be released to the contractors upon request.

Format of maps changed frequently

Because USGS did not know what type of data and analyses was needed at the time of the awarding contracts, most contractors were asked to change the basic format of the maps several times, causing delays and higher costs. One contractor was asked to change the format three times--ultimately, back to the original format. As a measure to avoid confusion, USGS provided the contractors with a prototype map and requested them to follow this basic format. The prototype, however, was drafted by USGS in about 2 weeks, had technical errors, and often was not geologically relevant to other areas being mapped. This caused even more confusion. The prototype was ultimately remapped by another contractor at additional costs.

RECOMMENDATIONS

We recommend that the Secretary of the Interior require the Director, USGS, to take the following steps to improve its contract management practices:

- Train contracting personnel, including designated contract monitors, in contract administration prior to their appointment.
- Require personnel to organize, assemble, and manage available resource data before contracting for the same or related data in order to better gauge types of data and analyses actually needed.
- Devise specific contract provisions and other guidance to assure mutual understanding on contract requirements, and to minimize reliance on oral guidance when change orders are necessary.
- Assure that sufficient efforts are made to comply with Federal Procurement Regulations in securing competition on all contracts as well as major changes to contracts to the maximum practicable extent.
- Assure that contracts are properly monitored to preclude cost overruns and to assure effective contractor performance.
- Use fixed-price contracts rather than cost-plus-fixed-fee contracts whenever possible.

AGENCY COMMENTS

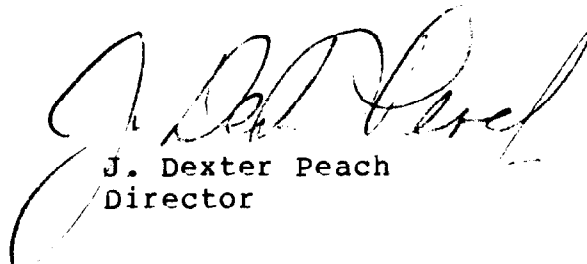
We discussed a draft of this report with the Chiefs of USGS' Procurement and Coal Management Offices, both of whom expressed agreement with our findings, conclusions and recommendations in the draft. They pointed out various improvements that have been made in contracting practices but that our report should help in making continued improvements.

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Section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of the report; a like statement to the House and Senate Committees on Appropriations should accompany the agency's first request for appropriations made more than 60 days after the date of the report.

Copies of this report will be sent to the above Committees as well as to the Director, Office of Management and Budget; the Chairman, House Interior and Insular Affairs Committee; the Chairman, Senate Energy and Natural Resources Committee; and other interested parties.

Sincerely yours,



J. Dexter Peach
Director