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Management of Pit 9 - Highlights of Accomplishments and Lessons Learned to Date

Introduction

The Pit 9 project is a U. S. Department of Energy prototype full scale demonstration to retrieve and treat buried mixed transuranic waste. The project is being conducted as an Interim Action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The project is being managed by the DOE-Idaho Environmental Restoration Program, in conjunction with the Environmental Protection Agency Region 10 and the state of Idaho, under the Idaho National Engineering Laboratory Federal Facility Agreement and Consent Order.

Pit 9 is located in the northeast corner of the Subsurface Disposal Area (SDA) of the Radioactive Waste Management Complex (RWMC) at the Idaho National Engineering Laboratory (INEL). The Pit 9 project was conceived out of the need to determine capabilities to cost effectively retrieve and treat buried radioactive and radioactive mixed waste, and obtain characterization and contaminant migration data for buried waste at the INEL. Waste was disposed in Pit 9 from November 1967 to June 1969. Pit 9, at about 380 feet by 125 feet, represents approximately one acre of surface area of the 88 acre SDA. The pit contains approximately 350,000 ft^3 of soil beneath and between the buried waste and about 250,000 ft^3 of overburden soil. The average depth of the pit from soil surface to bedrock is approximately 17.5 feet. Approximately 110,000 ft^3 of transuranic (TRU) contaminated mixed wastes from Rocky Flats and approximately 40,000 ft^3 of low level and mixed wastes from the INEL were buried in Pit 9 during this period. Pit 9 is estimated to contain over 30,000 gallons of organics (over 30% of the total organic inventory in the SDA) and approximately 66 pounds of TRU radionuclides (between 3% and 4% of the total TRU inventory in the SDA). Pit 9 was selected as a demonstration site because it was one of the last disposal pits at the INEL to receive Rocky Flats waste, disposal records are better for Pit 9 than for disposal pits and trenches from earlier points in time, and the wastes in Pit 9 are representative of the wastes disposed in the SDA. Pit 9 is also a relatively small area located away from other disposal pits and trenches, which makes it suitable for access and facility construction without disturbing other buried waste.

Procurement Approach

A decision was made early in the project to contract with the private sector to allow them an opportunity to demonstrate their capabilities. DOE received much interest from private sector firms requesting they be allowed an opportunity to demonstrate their capabilities. The private sector indicated they could retrieve and treat wastes faster, cheaper, and better than could be done using the traditional approach of DOE owned facilities and the Management and Operations (M&O) Contractor performing the work. They also indicated the retrieval and treatment of buried mixed wastes could be accomplished using existing off-the-shelf technologies, with no need for additional research and development.

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The INEL Management and Operations contractor was tasked with subcontracting the effort, administering the subcontract, and providing limited oversight to assure operations are conducted in a manner which is protective of the environment and safe for workers and the public while accomplishing technical objectives. The Pit 9 project strategy consists of a three phased approach, including a proof-of-process (POP) test (Phase I), a limited production test (LPT) (Phase II), and full scale operations (Phase III). Technical review hold and decision points were included at the conclusion of the POP and LPT phases. In order to be allowed to proceed to the LPT and full scale remediation phases, the subcontractor was required to successfully complete first the POP and then the LPT phase.

Based on interest expressed by private industry, a fixed-unit-price contracting approach was selected. Under this approach, the selected subcontractor would be reimbursed for material treated to specifications, with up-front capitalization of facilities being the responsibility of the subcontractor, and risks of success being borne by the subcontractor rather than DOE. In the event the subcontractor failed to pass either the POP or the LPT phases, all costs incurred were the responsibility of the subcontractor, and DOE would have no further obligation. As a service type contract, the subcontractor is responsible for all design, construction, permits/licenses, operation, and decontamination and ultimate disposition of the facilities necessary to accomplish the scope.

A Request for Proposal (RFP) was issued November 19, 1991, to qualified respondents to Commerce Business Daily (CBD) advertisements and any other prospective firms. The RFP included a phased submittal of technical and price proposals, with an evaluation of technical proposals occurring first, followed by requesting price proposals from the most qualified offerer(s). The best combination of technical and price would be selected to proceed. Three teams responded to the RFP and submitted technical proposals. The Source Evaluation Board (SEB) concluded that two of the proposing teams were essentially equivalent, but significant reservations existed with the maturity of technologies, including integration, for the intended application. The third proposer was dropped from further consideration. As a result of the SEB process, the scope of the POP phase was expanded from a paper study and limited laboratory demonstration to both proposing teams conducting a pilot scale demonstration of critical aspects of their treatment system.

Following the completion of the POP test phase by both subcontractors, the Request for Price Proposal (RFPP) was issued December 7, 1993, in accordance with the original RFP. Although the RFPP was issued December 7, planning for this phase by the M&O was incomplete and continued into early calendar year 1994, resulting in extensions to proposal due dates and an overall schedule slip of over three months. Proposals were received from the two teams in April, 1994. Best and Final offers were received from the proposers in July, 1994. A letter subcontract was implemented August 26, 1994, with a full subcontract award announced by the Secretary of Energy on October 19, 1994.
During the period between the issuing of the original RFP and the request for price proposal, the project approach evolved as a result of establishing a regulatory framework through an approved

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Record of Decision, a learning process occurring, and project management changes in both the M&O and DOE organizations. This also resulted in slight changes in project strategy, with a more conservative approach to specifying requirements. The original project philosophy was to apply minimal DOE order requirements, tailor contract terms and conditions rather than use standard M&O boilerplate, and rely heavily on federal and state law and industry standards. As the project evolved, more of the standard DOE and M&O requirements were specified, and the subcontract began to look more like a standard M&O contract. This departure from the original project philosophy was partially in response to a fear by the M&O contractor of opening themselves up to liability under the M&O Contractor Accountability Rules. Because the Pit 9 facility would be constructed and operated on DOE property, DOE is also the regulator for OSHA and nuclear operations.

The original vision of not providing reimbursement to the subcontractor until material was treated was also modified to allow upfront progress and milestone payments to offset the cost of money considerations. This change in approach is estimated to have reduced the subcontract price between 10% and 20%. In order to keep the risk of performance on the subcontractor, a corporate guarantee of performance was required as a condition of the contract, which required the subcontractor to reimburse the DOE all progress and milestone payments made to date in the event they failed the LPT phase.

Since DOE is purchasing a service and the subcontractor owns the design, the subject of control of subcontractor documentation and data has been challenging. The subcontractors desired all designs, test plans/procedures, test data, and other documentation generated under or as a result of their subcontract to be controlled as proprietary or company confidential information, and subsequently stamped all documentation as proprietary and company confidential. The specifics of what was truly sensitive and required special handling were not worked out between the M&O and the subcontractors prior to initiating the POP testing and some early design and safety anlysis report work. This resulted in confusion and delays in providing test and design information to DOE, EPA, and IDHW. All documentation and data was handled as proprietary and company confidential or procurement sensitive as a precaution until the issue was resolved. Much of this was later determined to be government property or public information under the subcontracts. This same issue carried over into the award of the Pit 9 LPT/RA subcontract as well. Future efforts should consider this issue and obtain resolution early in the procurement process.

Early in the Pit 9 project, an initial project cost estimate was prepared based on indications from private sector firms. This initial cost estimate of $28 million for retrieval and treatment of Pit 9 waste did not include costs of facility design, construction, characterization, some operations and maintenance, research and development, or profit, and assumed a 50,000 ft^3 volume requiring treatment. The M&O contractor prepared three subsequent project cost estimates of $50 million, $120 million, and $160 million in 1992 and 1993, which included improvements on the initial estimate, but still did not include any allowance for profit or offsite developmental test facilities.

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These later estimates were based on treating 150,000 ft^3. DOE also had an independent project cost estimate prepared in 1993 as a means of validating M&O estimates. The DOE independent estimate and M&O estimates were evaluated and appropriate corrections were made to project planning and baseline documents. A $179 million fixed price subcontract for remediation of Pit 9 was signed in October 1994 with Lockheed Environmental Services and Technologies (LESAT). This subcontract incorporated progress and milestone payments, unit rates for removal/handling of material not requiring treatment, unit rates for treating up to 250,000 ft^3 of material, and a final payment upon completion of decontamination and removal of the Pit 9 facilities at the conclusion of the project. Maintaining the subcontract price with no increases is critical to the success of the project, and DOE-Idaho is committed to assure this happens. It is estimated that adequate contingencies are built into the current subcontract price.

Headquarters Procurement and Funding Approvals and Commitments

The magnitude of the Pit 9 procurement required a number of approvals at Headquarters be obtained both for award of the subcontract and for commitment of the government to a multi-year funding profile. The Secretary of Energy instituted a requirement on February 5, 1993 that all procurements of $25 million and above required her personal approval; which on September 3, 1993 was subsequently delegated to the Deputy and Under Secretaries based on program reporting relationships. For the Office of Environmental Management, the Under Secretary was the approving official. On July 8, 1994, the Office of Northwestern Area Programs (EM-44) submitted a request for approval through the Office of Clearance and Support (HR-522) to the Under Secretary and received approval to proceed with the procurement on September 7, 1994. This concluded the approval process for the procurement, but not the commitment of funds necessary to award the subcontract.

The approved project cost baseline for Pit 9 was almost $90 million below the required level based on the final subcontract price. On October 4, 1994, the Acting Deputy Assistant Secretary for Environmental Restoration provided commitment of funding, at the direction of the Assistant Secretary for Environmental Management. Although Headquarters had committed to the funding profile for Pit 9, the source of the additional funding for the project had not yet been identified. The immediate funding need was for fiscal year 1995, where an additional $39 million was required for design, long lead material procurement and construction. These funds were raised from the environmental restoration programs at each of the operations offices and program support at headquarters. The fiscal year 1996 shortfall of $18 million was remedied through an agreement with the Office of Environmental Restoration (EM-40), the Office of Waste Management (EM-30) and the Office of Facility Transition and Management (EM-60) that the needed funds would be provided from the DOE Idaho site allotments from those offices. The transfer of funding authority was to be documented in an amendment to the fiscal year 1996 budget submitted to Congress. In the event that the amendment did not reach Congress in time, a reprogramming action would have to be undertaken. The fiscal year 1997 shortfall of $32 million was obtained during the Internal

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Review Budget process partially as new money into the program and from other site programs at DOE Idaho.

The use of fixed price contracting provides the benefit of knowing how much a project will cost at its beginning and a way to benchmark scope changes and potential cost increases. It also requires a fixed period of performance which encourages the contractor to complete the job and move to the next; any delay on the contractors part costs the contractor money in terms of time, materials, and inflation. The use of fixed price contracting conversely limits program managers ability to speed up or slow down projects in order to accommodate increases and decreases in available funding levels. This eventuality causes priority setting and shifting of program funds from one project to the other, depending upon contract vehicle and procurement obligations.

The large price tag and short duration associated with the Pit 9 fixed price subcontract also presented some unusual problems. Since the bid was so much higher than the estimated cost, discussions between headquarters and the field were held on ways of altering the subcontract arrangement in order to be able to afford the project. Fixed price contracting on such a large project was new to many who did not completely understand that stretching out the fixed price contract could only be done through renegotiation of the contract. This would subsequently increase the overall cost of the subcontract and the administrative costs to DOE and the prime contractor. Because this was not a desirable option, the supplemental funding was found.

As the project proceeded in the face of severe budget reductions throughout the Department, a significant amount of discussion was focused on questioning the wisdom of continuing the project. Fixed price contracting is also accompanied by high termination costs, should the government decide that the project should be canceled or postponed following contract award. The contractor will have had to make significant construction material and equipment purchases and subcontracting commitments for required services early in the contract. Upon termination, the subcontractor would have to be reimbursed for these items, which could lead to the government paying for a significant portion of the original contract price with no benefit gained.

Under the fixed price contract, the various payment schemes (i.e., progress payments, milestone payments, and unit processing payments) and invoicing delays may cause the subcontractor to accrue work in one fiscal year but not be reimbursed until the following fiscal year. In the case of Pit 9, the subcontractor uses corporate funds to finance early work, with payment at the completion of required tasks. Thus, since this is a multi-year subcontract, the appearance of a significant uncosted balance will be a distortion of actual work accrued since a large amount of work could be performed without the government being invoiced. Although these funds have been legally obligated but not paid, there must be a commitment from headquarters to protect these balances since the work has been performed and the government has a legal obligation to pay for those services. To prevent this problem in the future, cash flow and management plans need to be agreed

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upon early in the process in order to properly time task completions and payments, and accommodate government accounting and invoicing methods.

Proof-of-Process Test Phase

As a result of the questions raised by the SEB on the maturity of proposed technologies, an expanded POP test phase was initiated through letter subcontracts on November 12, 1992. The purpose of the expanded POP was to demonstrate the viability of the proposed technologies for the Pit 9 application in order to support a decision to proceed to the LPT phase. Scopes of Work (SOW) for both teams were negotiated, and the work was performed under one year, fixed price contracts of $8 million each, payable only upon successfully meeting pass/fail criteria established in the SOW. Due to the dollar value of the POP subcontracts and the fact that they were not competitively bid, Defense Contract Audit Agency (DCAA) audits were required. This had not been planned for, and delays in preparation by the M&O and subcontractors resulted in impacts to subcontract finalization and the need to obtain additional approvals for obligation of funds and extension of periods of performance.

The POP tests included the assembly and operation of pilot scale equipment and systems. Test plans were developed by the subcontractors and approved by the M&O contractor. Existing subcontractor facilities and equipment were utilized where available and supplemented by new facilities and equipment where necessary. The tests required the processing of simulated mixed TRU wastes spiked with hazardous contaminants and surrogates for radionuclides, and the development of correlation coefficients for all surrogates used. The M&O contractor was to provide premixed sludges with surrogates and hazardous constituents pre-spiked, however due to hazardous waste management considerations, the addition of the hazardous and radioisotope surrogates was accomplished at the subcontractors' facilities. POP test reports were submitted by both teams December 22, 1993. An evaluation of POP test results was completed by the M&O contractor in March 1994. The evaluation of POP test results was conducted in parallel with the RFPP process, and contributed to slipping the subcontractor selection process.

There is a critical balance between keeping a level playing field during a competitive procurement situation and assuring adequate planning and coordination so the necessary information is obtained. It is imperative that the true needs of the test effort are well defined upfront, and include both technical and regulatory considerations. It is also important to maintain adequate involvement of regulatory agencies through these processes. The state of Idaho and Environmental Protection Agency were provided minimal opportunity for input to defining technical and regulatory requirements/standards to be demonstrated during the POP phase. As a result, there were a number of questions remaining after the POP test phase which could have been answered with little or no modification to the test trains had these needs been known. The M&O and subcontractors were sensitive to sharing information on subcontractor processes/approaches with the agencies

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during the proposal preparation phase, however sharing the information with the agencies was key to the overall success of the project.

Lessons learned during the POP test phase will be factored into the test planning for the limited production testing. The approach to some test design and objectives will be modified to assure the necessary technical and regulatory information is obtained to support the decision process for proceeding beyond the LTP phase. The LPT phase will be performed following completion of construction of the full scale Pit 9 facility. The LPT is intended to demonstrate that all integrated systems will function as proposed and demonstrate the reliability of the systems prior to proceeding to the full scale remediation phase. The LPT will first require successful demonstration using surrogates for Americium and Plutonium and hazardous contaminants prior to proceeding with processing a limited quantity of actual Pit 9 waste. In the event the system cannot achieve the treatment standards established in the ROD and subcontract, the subcontractor must remove the facility from the site and reimburse the DOE all progress and milestone payments made to date.

Integration of the CERCLA and DOE Processes

As a CERCLA Interim Action, the Pit 9 project is a team effort between the three Government agencies (DOE, EPA, IDHW), the INEL M&O Contractor (LITCO), and LESAT. The agencies jointly developed the Pit 9 ROD, signed in October 1993, which established the regulatory requirements and treatment standards for the project. The Pit 9 ROD established decision points at the conclusion of the POP and LPT phases and identified contingencies in the event goals are not achieved. In the event it is determined at the conclusion of either POP or LPT that objectives established in the ROD cannot be achieved, or it is not cost effective to proceed with the interim action, the project will be terminated and addressed under the INEL TRU-Contaminated Pits and Trenches decision. Through the CERCLA process, a $50 million estimate to retrieve and treat Pit 9 waste was presented to the public in the Pit 9 Revised Proposed Plan and ROD. As a result of the significant increase in cost between the 1992 estimate and the actual subcontract, an Explanation of Significant Differences from the ROD was prepared and issued in February 1995.

The development of the Pit 9 ROD resulted in the application of some innovative approaches to establishing treatment standards. The Pit 9 interim action is not a risk driven cleanup, however the TRU contaminants are potential risk drivers at the SDA and are the focus of this demonstration. A treatment level of 10 nanoCuries per gram (nCi/g) transuranic content was established as the only radioactive waste treatment standard for material to be returned to Pit 9. This standard was established using risk and human health based standards. Modeling demonstrated that the 10 nCi/g TRU concentration limit would be protective of groundwater (e.g., would not exceed drinking water standard of 15 picocuries per liter gross alpha) and other pathways, provided pit closure requirements detailed in the ROD were followed. Pit 9 contains contaminants which under current regulations would be Resource Conservation and Recovery Act (RCRA) listed wastes. These listed wastes, which are treated and returned to the pit, are delisted through the ROD. The

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delisting levels, calculated using the Environmental Protection Agency Composite Model for Landfills (EPACML), are health based levels determined based on site specific conditions. It must also be demonstrated that treated material to be returned to the pit does not exhibit a characteristic.

DOE has structured the Pit 9 project to obtain information which will support future treatment and remedial decisions across the DOE complex. The project has been coordinated between EM-30, 40 and 50 organizations at Headquarters and at the INEL. The demonstration of the Pit 9 technologies could eliminate the need for other small scale demonstrations of similar technologies for retrieval and treatment of mixed wastes. The remote retrieval and treatment technologies employed on the Pit 9 project are potentially applicable to retrieving and treating tons of radioactive, hazardous, and mixed wastes buried and stored at the INEL and across the DOE complex.

DOE has imposed RCRA LDR concentration limits as the hazardous waste treatment standards under the Pit 9 contract, which are more stringent than the treatment standards established in the Pit 9 ROD. This was done to demonstrate the ability of the subcontractor's treatment process to achieve current regulatory standards, which will provide DOE useful information for application to other EM-30 and EM-40 projects. In the event the subcontractor cannot meet the contractual treatment levels, DOE has an option to give contractual relief provided the ROD requirements are still met. The Pit 9 project will also provide INEL specific characterization data (e.g., container integrity, contaminant migration, soil moisture, waste characterization) to reduce uncertainties in future CERCLA remedial decisions for the remaining buried waste at the SDA.

Headquarters program managers worked with DOE-ID early in the process to delegate safety functions to the field, so that procedural review delays would not cause the subcontractor to miss key project milestones. On July 6, 1994, the Assistant Secretary delegated approval authority to the DOE-ID Operations Office Manager, for the Category 2 Safety Analysis Report (SAR) and Technical Safety Requirements (TSR) required by DOE Order 5480.23 and .22 for the Pit 9 project. Subsequently, on August 8, 1994, the Assistant Secretary signed a blanket delegation of authority allowing that Operational Readiness Reviews and Startup authority would receive the same delegation of approval level as previously delegated Safety Analysis Reports. These delegations placed the responsibility for construction and operations safety rightfully at the field, with personnel who are closest to the project.

Establishing a good fit between DOE requirements/needs and CERCLA requirements/needs has at times been difficult. CERCLA requires continuous substantial onsite physical remedial activity within 15 months of the ROD signature. In the case of Pit 9, this was within 3 months of the issuance of the Pit 9 subcontract, with design being at about a 30% (Title I) stage. The SAR requirements of DOE orders were also difficult to implement, since an adequate safety analysis requires design information. Preliminary Safety Analysis Reports (PSAR) are generally approved by DOE following completion of the design and prior to initiation of construction. Due to the

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aggressive Pit 9 project schedule, it was necessary to take advantage of options identified in DOE Order 5480.23 to allow construction and procurement to proceed prior to PSAR approval, justified in part since it is not DOE funds at risk under the fixed price contract. DOE and the agencies agreed to compress regulatory review and comment resolution periods for subcontractor documents from the standard 45 days to 30 days to accommodate the aggressive schedule.

The Pit 9 project assured National Environmental Policy Act (NEPA) values were adequately incorporated into CERCLA documentation prior to the change in DOE policy recognizing NEPA/CERCLA equivalence. An Environmental Assessment (the Pit 9 CERCLA Revised Proposed Plan and Supplements) was submitted to Headquarters in April, 1993, and a Finding of No Significant Impact was signed July 29, 1993. This approval process was accomplished in an expedited fashion through close coordination between the field and Headquarters program and oversight organizations and the state of Idaho and Shoshone Bannock Tribes.

In keeping with a private sector approach, a large effort has been required to keep DOE, EPA, IDHW and the M&O contractor organizations from trying to design the subcontractor's processes and facilities. In order to keep the liability and responsibility for success on the subcontractor, the focus of involvement by DOE, the M&O, and the regulatory agencies is to assure the applicable and relevant and appropriate requirements specified in the ROD, and other contract requirements are being complied with. The reviews concentrate on aspects which affect worker and public health and safety and the environment, and comments provided to the subcontractors identify issues and reference requirements but do not provide direction. Under this private sector approach, approval of subcontractor activities by DOE and the agencies has been limited to the SAR and TSRs, facility startup (ORR and Agency Prefinal Inspection), decisions to proceed beyond POP and LPT test phases, and product (treated material) acceptance.

Conclusions

The fundamental concepts employed under the Pit 9 project are sound. Purchasing treatment services rather than traditional DOE owned/contractor operated facilities appears to be a cost effective approach. Utilization of a phased work scope with decision points provides a structured approach for DOE to evaluate progress and discontinue in the event desired results are not obtained, yet provides the subcontractor with a clear definition of scope provided they perform successfully. The use of fixed price contracting for first of a kind projects with many unknowns results in proposers incorporating large contingencies to minimize corporate financial risk; cost plus fixed fee contracts with appropriate incentives could result in a more cost effective approach.

The Pit 9 approach to requirements definition could be further refined to realize greater cost savings and efficiencies. Efforts to eliminate DOE requirements which are redundant to state or federal law, are adequately addressed by industry standards, or add no real value could result in significant savings on both CERCLA and non-CERCLA projects. More attention should be given

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to validating the need for and appropriateness of terms and conditions and standard contract boilerplate prior to issuing the request for proposal. This could reduce or eliminate the types of problems Pit 9 has experienced during the procurement process and since subcontract award.

Aggressive schedules on the Pit 9 project were defined in the Pit 9 contract and specified in the request for proposal. These fixed milestones and resultant delays in subcontract award are believed to have contributed to project cost increases. The need for specifying aggressive schedules for contract performance should be weighed against the cost, and where not required, cost savings could be realized by allowing subcontractors some flexibility.

Advanced planning and coordination is extremely important on large projects such as Pit 9. Requirements definition, development of the procurement strategy, identification of contract terms and conditions, adequate planning on labor considerations, ownership of data/patent rights, and early and continued coordination with all necessary individuals and organizations are examples of areas that are necessary for the success of the project. Although the Pit 9 project has successfully completed the procurement process, improvements in planning and coordination in all of these areas could have resulted in a number of efficiencies.

Consideration should be given to the use of direct federal contracts for large scale, multi-year environmental restoration projects such as Pit 9. Benefits would include a cost reduction of approximately 5% by eliminating the M&O administrative layer between the federal project manager and the contractor performing the remediation; and subsequently, communications, direction, and performance evaluation would be directly between the two organizations. Although the decision to pursue the traditional approach of subcontracting through the M&O was made early in the Pit 9 project, significant progress has been made in reducing M&O program management costs, and shortening reporting and communication channels.

The M&O organizations bring depth in the technical and health and safety disciplines but also add time and introduce inefficiencies due to additional layers of management. By contracting the work through the M&O organization, clear definition of roles and responsibilities of the M&O versus the subcontractor becomes important to the success and smooth operation of the project. The direct contracting approach would require more federal procurement and project management time and expertise, but would yield more direct project control, potential cost savings, and better performance evaluation. The direct contracting approach would also provide the EPA and IDHW a more direct line of communication to the subcontractor performing the work.

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