Quarterly Technical Progress Report - Base Program on Energy Related Research

**Quarterly Report
February 1 - April 30, 1994**

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Work Performed Under Contract No.: DE-FC21-93MC30126

For
U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
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ACKNOWLEDGMENT

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1.0 OIL AND GAS

TASK 1.1

CROW™ Process Modeling

Reporting Period: February 1994 - April 1994

Principal Investigators: Lyle A. Johnson and Francis M. Carlson

Task Objectives: This task is to incorporate new physical relationships peculiar to the CROW™ process into the existing thermal simulator and to validate the simulator based on controlled laboratory simulations.

Quarter Objectives: The objectives for this quarter were to complete tests using the two-dimensional test apparatus and the relative permeability testing with the selected organic contaminants. Model verification using the results from the test simulations was to continue.

Accomplishments: Tests using nonaqueous phase liquid (NAPL) and dense nonaqueous phase liquid (DNAPL) were 95% completed. At higher flushing temperatures there were problems with failure of the Plexiglas sides of the reactor. The problem was mitigated by replacement of the sides with thin aluminum sheets.

Relative permeability testing was completed for the light nonaqueous phase liquid (LNAPL) and begun for the NAPL. Previous problems encountered in measuring small differential pressures across the test cell were solved by using an inclined water-filled manometer.

Model modification was initiated using the data from the LNAPL tests for history matching and verification.

Procedures: The primary steps being taken in this task are (1) model development, (2) physical simulations, and (3) model verification. Step 1 will be used initially to identify the parameters for step 2 and will also include the incorporation of new physical relationships determined during the conduct of step 2. Upon completion of step 1, the data from step 2 will be used to validate the model in step 3.

Three scenarios of organic contamination in an aquifer are being investigated: LNAPL contamination floating on groundwater at the top of an aquifer, DNAPL contamination at the bottom of an aquifer, and NAPL contamination that has a density nearly identical to water, resulting in a suspended phase within an aquifer.

To conduct the two-dimensional tests, a vessel was constructed out of 0.25-inch Plexiglas. The vessel is 3-feet long, 2-feet high and 2-inches thick. Slotted and screened pipes of varying lengths are installed at one end of the vessel from the top to simulate the injection well. Similar slotted and screened pipes are installed on the other end of the vessel from the bottom to simulate the extraction well. A throttle valve controls the extracted fluid flow rate. Testing of the NAPL and DNAPL conditions could not be completed because of failures with the Plexiglas sides of the reactor. This problem has been resolved by replacement of the sides with aluminum sheets.

For each test, the vessel is filled with both organic material and water saturated, fine-grained, uniform sand such as a 20-40 frac sand. This type of material has been chosen because it is similar to material found at a large number of contaminated sites. After the vessel is completely filled with sand and liquids, the vessel is sealed to establish a no-flow boundary condition, as used by the simulator.

The apparatus for measuring relative permeability consists of a test cell, an injection system, and a production collection system. The test cell consists of a cylindrical, stainless steel vessel that contains the packed, unconsolidated sand. The test cell is surrounded by guard heaters and insulated to produce isothermal conditions during the elevated temperature tests.

The fluid injection system consists of three positive displacement pumps for fluid or chemical injection, and an injected fluid heater. The positive displacement pumps are precalibrated to deliver the specified injection rates of organic material and water. The fluid heater has sufficient capacity to heat the injected fluids to the temperatures necessary for the experiments.

The collection system for the produced fluids includes a regulating valve to maintain back pressure on the system and a series of graduated collection vessels. The series of collection vessels permits the determination of individual component production rates versus time.

The entire reactor system is equipped with pressure gauges, pressure transmitters, and thermocouples to monitor the pressure and temperature of the system. All pressure transmitter and thermocouple signals are collected, analyzed, and stored by a data acquisition and control system. The guard heaters for the test cell are also controlled by this system. The problem of measuring the small differential pressures across the cell has been resolved by adding an inclined manometer to the system.

Organic samples to be used in the physical simulations have been combined with the mineral material to ensure that any interactions between the two have stabilized before the testing occurs. The minimum contact time before use of the material in a test is 1000 hours.

Activities Scheduled for Next Quarter: Data from the two-dimensional tests and the relative permeability testing will be compiled for the model verification effort. Relative permeability testing with the NAPL and DNAPL organic contaminants will be completed. Model verification using the results from the test simulations will continue.

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For Form EIA-459E

ACCOUNT STATUS REPORT

Month/Year
APRIL 1994

94 JUN 15 PM 12:28

Title : Base Program

Contract No : DE-FC21-93MC30126

Client : DOE

Contract Type : Cooperative Agreement

Account Value :

Proposal No :

Account No :

Description: Task 1.1

CROW Process Modeling

Essential Elements of Information	Yes	No	Customer Notified	Approved
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	93-1.1.2 Physical Simulations					
Task Mgr:	Johnson Jr, Lyle	93-1.1.3 Model Verification					
Sub Task Mgr:		93-1.1A Experimental Plan					
Proj Admin:		93-1.1B Progress Report					
		94-1.1.1 Model Documentation					
		94-1.1A Topical Report					
Contract Start	02/02/93						
Contract Complete	02/01/98						
Plan Approved	02/02/93						
Last Review							
Next Review							

PROGRAM HIGHLIGHTS

Budget vs Actual Table

	Feb 94	Mar 94	Apr 94
Budget	375983.66	375983.66	375983.66
Cost	226190.40	272898.35	308911.67
Variance	149793.26	103085.31	67071.99

F-Formal

I-Informal

Approved

Project Manager

Vice President

TASK 1.3

Development of a Portable Data Acquisition System and Coalbed Methane Simulator

Reporting Period: February 1994 - April 1994

Principal Investigators: Francis M. Carlson and Charles G. Mones

Task Objectives: The objectives of this task are to develop a self-contained, portable data acquisition system, to develop an in-house coalbed methane simulator, and to improve model physics to develop competitive advantage. Therefore, this task is divided into three relevant subtasks: 1.3.1 Development of Data Acquisition System, 1.3.2 Development of Coalbed Methane Simulator, and 1.3.3 Laboratory Work to Improve Model Physics and to Gain Competitive Advantage.

Quarter Objectives: The objective for the quarter for subtask 1.3.1 was to test the data acquisition system for its ability to remotely measure and analyze a helium response. Under 1.3.2, the objective was to add single-component sorption to one of the models for which we have the source code. There was no objective planned for subtask 1.3.3.

Accomplishments: Further testing of the data acquisition equipment took place this quarter. Under subtask 1.3.2, single-component sorption was not added to the model as planned this quarter because of other demands from other projects.

Procedures: The design of the data acquisition equipment includes the ability to quickly move onto a site and perform gas analyses for hydrocarbon gases, as well as helium and CO₂. Being able to measure helium allows the unit to be used for acquisition of tracer data, which typically is injected in an offset well and measured at the producer. The heart of the system is a small dual-column gas chromatograph manufactured by MTI Analytical Instruments. The particular model chosen requires a very small amount of power and runs on 12 volts DC.

Results: On March 28, a good opportunity became available to test the data acquisition unit in a field environment where helium tracer response would be independently determined by another laboratory. As far as operations go, the equipment functioned very well. The unit was able to be left unaccompanied for several days at a time and to take samples automatically and determine the chromatographic traces during this period. Two parts of the system, an infrared CO₂ analyzer and one of the Omega data loggers did not work as well as expected.

The infrared CO₂ analyzer seemed to be highly sensitive to temperature and is not recommended for future projects of this sort. One of the Omega data loggers came on intermittently and was not too reliable, at least when compared to the other Omega data logger. This may not be a serious problem, however, and the problem will be further investigated.

Activities Scheduled for Next Quarter: During the next quarter, the helium data acquired will be compared to companion samples analyzed by another laboratory to see how well the system has done. If time permits, single-component sorption will be added either to UTCOMP or Western Research Institute's (WRI) implicit model to test the stability of the model under sorption conditions.

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ACCOUNT STATUS REPORT

Month/Year
APRIL 1994

94 JUN 15 PM 12:28

Title	: Base Program	Description: Task 1.3 Portable Data Acquisition System and Coalbed Methane Simulator
Contract No	: DE-FC21-93MC30126	
Client	: DOE	
Contract Type	: Cooperative Agreement	
Account Value	:	
Proposal No	:	
Account No	:	

Essential Elements of Information	Yes	No	Customer Notified	Approved
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel	Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr: Smith, Verne	93-1.3.1 Data System Development					
Task Mgr: Carlson, Frank	Construction					
Sub Task Mgr:	Field Testing					
Proj Admin:	93-1.3.2 Simulator Development					
	Model Development					
	Validation Tests					
Contract Start: 02/02/93	93-1.3.3 Laboratory Work					
Contract Complete: 02/01/98	Quarterly Reports					
Plan Approved: 11/24/93	93-1.3A Report on Simulator Sys.					
Last Review						
Next Review						

PROGRAM HIGHLIGHTS

Budget vs Actual Table

	Feb 94	Mar 94	Apr 94
Budget	120562.90	130079.15	173418.93
Cost	3196.63	126442.96	140616.50
Variance	117366.27	3636.19	32802.43

F-Formal
I-Informal

Approved

Project Manager

Vice President

TASK 1.4

Tank Bottom Waste Processing Using the TaBoRR™ Process

Reporting Period: February 1994 - April 1994

Principal Investigators: Lyle Johnson, Robert Satchwell, and Vijay Sethi

Task Objectives: This task is to develop information relevant to the successful deployment of WRI's patented TaBoRR™ technology. Four subtasks have been identified, with the specific objectives to: (1) gather emission and effluent related information from a pilot-scale unit and perform nondestructive testing of process equipment for durability, (2) design, construct, and operate a process development unit (PDU) capable of processing 1 to 2 barrels/day of wastes, (3) perform numerical modeling and economic analysis for the prediction of process performance based on feedstock analysis, and (4) report all efforts.

Quarter Objectives: The objectives for this quarter were to initiate preparation of the facilities for the PDU, begin development of the experimental plan for testing of the PDU, and to continue monitoring of the development and construction of the pilot-scale unit.

Accomplishments: Preparation of the test facilities was initiated and will be completed early next quarter. The preliminary draft of the experimental plan has been developed for internal review.

Monitoring of the pilot-scale TaBoRR unit that is being developed under the JSR program has continued. When the unit is in operation, environmental and materials data will be collected.

Procedures: The primary subtasks being undertaken in this task are (1) collection of data from a pilot-scale unit, (2) construction and operation of a PDU unit, (3) numerical modeling and economic evaluation of the process, and (4) reporting. Subtask 1 is the collection of environmental and materials data from a pilot-scale unit being developed under a JSR program. These data will provide information critical to the permitting of the process and in construction of future TaBoRR units.

Subtask 2 will provide a PDU system in which the fate of some of the contaminants, such as sulfur, chlorides, and asphaltenes, can be determined. The fate of the contaminants directly impact the process performance and economics. The PDU will also provide a system to evaluate and develop the operating parameters for individual feedstocks and to evaluate materials of construction for the individual system components.

The development of numerical modeling in subtask 3 will provide the ability to predict the performance of the process based on feedstock analysis. Also, this effort will include the economic evaluation of the process based on data gathered from the first two subtasks and the numerical modeling. Reporting will be done under subtask 4.

Activities Scheduled for Next Quarter: The experimental plan for the task will be completed and submitted for approval. The preparation of the facilities for the PDU will be completed and the construction of the PDU system initiated if approval from the U.S. Department of Energy (DOE) is received. Monitoring of the development and operation of the pilot-scale unit will continue.

ACCOUNT STATUS/REPORT SERVICES

Month/Year
APRIL 1994

04 JUN 15 PM 12:28

Title : Base Program
Contract No : DE-FC21-93MC30126
Client : DOE
Contract Type : Cooperative Agreement
Account Value :
Proposal No :
Account No :

Description: Task 1.4
Investigation of Tank Bottom Waste Processing
Using the TaBoRR Process

Essential Elements of Information	Yes	No	Customer Notified	Appvd
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel
Proj Mgr: Smith, Verne
Task Mgr: Johnson Jr, Lyle
Sub Task Mgr:
Proj Admin:

Contract Dates
Contract Start: 02/02/93
Contract Complete: 02/01/98
Plan Approved: 03/29/94
Last Review:
Next Review:

PROGRAM HIGHLIGHTS

Budget vs Actual Table			
	Feb 94	Mar 94	Apr 94
Budget	0.00	0.00	0.00
Cost	18218.59	58536.23	63586.72
Variance	-18218.59	-58536.23	-63586.72

F-Formal
I-Informal

Approved

Project Manager
Vice President

2.0 ADVANCED SYSTEMS APPLICATIONS

TASK 2.1

Development and Optimization of a Process for the Production of a Premium Solid Fuel from Western U.S. Coals

Reporting Period: February 1994 - April 1994

Principal Investigator: Norm Merriam

Task Objectives: The long-term objective of this task is to develop a technically and economically feasible process for producing a low-sulfur, high-Btu, fuel from western coals. The objectives for 1993 were (1) to develop an economical method to control spontaneous combustion in pyrolyzed coal and (2) to demonstrate the removal of mercury from the coal by thermal treatment.

Quarter Objectives: Objectives for the first year of work on this task were achieved and reported in previous quarters. Work for the second year is scheduled for later in the year.

Accomplishments: The topical reports describing the test results (Merriam 1993; Merriam and Turner 1993) were approved by DOE in a previous quarter.

References:

Merriam, N.W., 1993, Removal of Mercury for Powder River Basin Coal by Low-Temperature Thermal Treatment. Laramie, WY, WRI Report to DOE, WRI-93-R021.

Merriam, N.W., and T.F. Turner, 1993, COMPCOALTM: A Profitable Process for Production of a Stable High-Btu Fuel from Powder Basin Coal. Laramie, WY, WRI Report to DOE, WRI-93-R008.

ACCOUNT STATUS REPORT

Month/Year
APRIL 1994

Title	:	Base Program
Contract No	:	DE-FC21-93MC30126
Client	:	DOE
Contract Type	:	Cooperative Agreement
Account Value	:	
Proposal No	:	
Account No	:	

Description: Task 2.1

Development and Optimization of a Process for the Production of a Premium Solid Fuel from Western U.S. Coals

Essential Elements of Information	Yes	No	Customer	
			Notifd'	Appvd'
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Veme	94-2.1 Premium Solid Fuel Research					
Task Mgr:	Merriam, Norman	94-2.1A Topical Report					
Sub Task Mgr:							
Proj Admin:							
Date							
Contract Start	02/02/93						
Contract Complete	02/01/98						
Plan Approved	02/02/93						
Last Review							
Next Review							

Sep 93
Dec 93
Mar 94
Jun 94
Sep 94

PROGRAM HIGHLIGHTS

	Budget vs Actual Table		
	Feb 94	Mar 94	Apr 94
Budget	97715.19	97715.19	97715.19
Cost	97715.84	97715.84	100009.55
Variance	-0.65	-0.65	-2294.36

F-Formal
I-Informal

Approved

Project Manager

Vice President

TASK 2.3

Optimization of the Recycle Oil Process for Eastern Oil Shale

Reporting Period: February 1994 - April 1994

Principal Investigator: Fred Turner

Task Objective: The objective of this task was to determine key processing parameters for production of oil from eastern oil shale using recycled oil extraction processes.

Quarter Objective: The objective this quarter was to complete the report on the findings of the preliminary study.

Accomplishments: The topical report was completed and submitted.

Procedures: Experiments were performed by loading 20 g of Sunbury shale and 20 g of tetralin into a tared reactor. The reactor was then attached to the head assembly which provides gas ports and a magnetically-driven stirring system. The nitrogen pressure in the reactor was cycled to 500 psig four times to remove traces of oxygen. The stirrer was typically set at 435 rpm. An experiment was started by lowering the reactor into a preheated laboratory sand bath. As the temperature in the reactor rose, the pressure was held constant by the release of gas through a back-pressure regulator into an evacuated gas collection system. At the end of the experiment (duration is typically 30 minutes), the reactor was removed from the sand bath and cooled by immersion in water. The reactor was weighed to determine the final weight of coal, tetralin, and products, and the weight of volatile products was calculated by difference. A Balston filter was used to trap produced oils. The majority of the volume in the gas collection system was in two 4800 cc containers. These were evacuated and weighed before an experiment and weighed again after the experiment. The difference is the sum of nitrogen charged and product gas less the gas and nitrogen in the connecting lines. Gas composition was determined using two gas chromatographs, one for hydrogen and the other for carbon oxides, hydrogen sulfide, and hydrocarbons. A calcium carbide precolumn converted water vapor to acetylene for analysis by flame ionization detection.

Results: Problems were encountered in determining the material balances. Accurate gas weights were not possible with the balance used. This balance was replaced with one of higher sensitivity.

Activities Scheduled for Next Quarter: In a previous quarter, the potential significance of this research effort was evaluated in relation to the opportunity to develop other capabilities that are in demand in industry. It was decided to request the discontinuation of this task, as well as task 1.2, and redirect these efforts to a new task (1.3). That request was approved by letter. Since the topical report on this effort has been submitted, no further work is planned on this task.

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ACCOUNT STATUS REPORT

Month/Year
APRIL 1994

94 JUN 15 PM 12:28

Title : Base Program
 Contract No : DE-FC21-93MC30126
 Client : DOE
 Contract Type : Cooperative Agreement
 Account Value :
 Proposal No :
 Account No :

Description: Task 2.3

Optimization of the Recycle Oil Process for Eastern Oil Shale

Essential Elements of Information	Yes	No	Customer Notified	Approved
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	93-2.3.7 Oil-Spent Shale Disengager					
Task Mgr:	Mones, Charles	93-2.3.8 Related Effects					
Sub Task Mgr:		93-2.3.9 Management and Reporting					
Proj Admin:		93-2.3A Experimental Plan					
		93-2.3B Topical Report					
Contract Start	Date						
Contract Complete	02/01/98						
Plan Approved	02/02/93						
Last Review							
Next Review							

PROGRAM HIGHLIGHTS

Request approved to redirect this effort to a new task.
 Topical report submitted.

Budget vs Actual Table

	Feb 94	Mar 94	Apr 94
Budget	253499.64	253499.64	253499.64
Cost	239967.34	119572.32	119765.61
Variance	13532.30	133927.32	133734.03

F-Formal
 I-Informal

Approved

Project Manager

Vice President

TASK 2.4

Process Support and Development

Reporting Period: February 1994 - April 1994

Principal Investigator: David Sheesley

Task Objective: The objective of this task is to obtain support leading to development of a COMPCOALTM pilot plant.

Quarter Objective: The objective for this quarter was to prepare the topical report of the results of this study.

Accomplishments: Follow-up contacts were made with parties showing an interest in the process. Work was initiated on the preparation of the topical report.

Procedures: The COMPCOAL process consists of four steps:

- Initial Drying
 - Partial Decarboxylation
 - Mild Pyrolysis
 - Stabilization
-

Results: The process reduces the weight of coal by about 40%, thus reducing transportation costs and improving coal marketability. Companion projects with this process have produced stabilized coal particles resistant to oxidation and readsorption of moisture.

Activities Scheduled for Next Quarter: Follow-up contacts will be made with parties showing an interest in the process. A topical report including the presentation materials will be completed.

Month/Year
APRIL 1994

Description: Task 2.4
Process Support and Development

ACTUAL VERSUS BUDGET \$

Month	Budget (\$)	Actual (\$)	Cost+ Obligations (\$)
Sep 93	146,200	146,200	146,200
Oct 93	146,200	152,100	146,200
Nov 93	146,200	152,200	146,200
Dec 93	146,200	152,200	146,200
Jan 94	146,200	152,200	146,200
Feb 94	146,200	152,200	146,200
Mar 94	146,200	152,200	146,200
Apr 94	146,200	152,200	146,200
May 94	146,200	152,200	146,200
Jun 94	146,200	152,200	146,200
Jul 94	146,200	152,200	146,200
Aug 94	146,200	152,200	146,200
Sep 94	146,200	152,200	146,200

[illegible]

Budget vs Actual Table

F-Formal
H-Informal

Approved

Project Manager
Vice President

TASK 2.5

Eastern Shale Oil Residue as an Asphalt Additive

Reporting Period: February 1994 - April 1994

Principal Investigator: Kenneth Thomas

Task Objectives: The objectives of this task are to determine whether an asphalt modifier produced from eastern shale is or is not beneficial to reduce age hardening and moisture damage susceptibility in asphalt concrete used in public roads.

Quarter Objectives: The objectives for this quarter were to begin preparation of a detailed work plan and initiate contacts for obtaining a stable modifier material.

Accomplishments: Preparation of the detailed experimental plan is nearly completed. The University of Kentucky Center for Applied Energy Research (CAER) was contacted for obtaining a stable eastern shale oil asphalt modifier.

Procedures: In previous studies, a very positive effect was demonstrated using Green River formation shale oil. Also, a modifier prepared from eastern shale oil showed a positive effect, but was too unstable to be useful. The oil to be used in this study is to be produced by CAER and is to be stabilized before it is tested as an asphalt modifier. CAER has indicated that a stabilized specification grade modifier may be available as early as June 1994, but more likely it will be July or August.

Activities Scheduled for Next Quarter: The primary activities planned for next quarter are to complete and submit the detailed experimental plan and to continue to monitor progress at CAER. In the event the modifier is received next quarter and the work plan is approved, the test sequence will start late in the quarter.

ACCOUNT STATUS REPORT

Month/Year
APRIL 1994

94 JUN 15 PM 12:27

Title	Base Program	Description: Task 2.5 Development of an Eastern Shale Oil Residue as an Asphalt Additive
Contract No	DE-FC21-93MC30126	
Client	DOE	
Contract Type	Cooperative Agreement	
Account Value		
Proposal No		
Account No		

Essential Elements of Information	Yes	No	Customer	
			Notified	Approved
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones											
		Planned	Actual	Progress	Scheduled	Delivered							
Proj Mgr:	Smith, Verne	<div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div>											
Task Mgr:	Thomas, Kenneth	<div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div>											
Sub Task Mgr:		<div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div>											
Proj Admin:		<div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div>											
	Date												
Contract Start	02/02/93												
Contract Complete	02/01/98												
Plan Approved	03/29/94												
Last Review													
Next Review													
		Sep 93	Dec 93	Mar 94	Jun 94	Sep 94							

PROGRAM HIGHLIGHTS

Budget vs Actual Table			
	Feb 94	Mar 94	Apr 94
Budget	0.00	0.00	3601.29
Cost	0.00	0.00	172.85
Variance	0.00	0.00	3428.44

F-Formal		Project Manager
I-Informal	Approved	Vice President

SUB-TASK STATUS REPORT

Month/Year
APRIL 1994

Title : Base Program
 Contract No : DE-FC21-93MC30126
 Client : DOE
 Contract Type : Cooperative Agreement
 Sub-Task Value :
 Proposal No :
 Sub-Task No :

Description: Task 3.1
 Solid Waste Management

Essential Elements of Information	Yes	No	Customer Notified	Approved
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones		Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	93-3.1A Topical Report						
Task Mgr:	Bland, Alan	94-3.1.1 Evaluation of CCT Ashes						
Sub Task Mgr:		94-3.1.2 Hydration Reactions						
Proj Admin:		94-3.1.3 Control of Hydration Reactions						
		95-3.1.4 Effect of Conditioning Media						
		95-3.1.5 Management and Reporting						
		95-3.1A Topical Report						
Contract Start	02/02/93							
Contract Complete	02/01/98							
Plan Approved	02/02/93							
Last Review								
Next Review								

PROGRAM HIGHLIGHTS

Budget vs Actual Table

	Feb 94	Mar 94	Apr 94
Budget	231457.94	288559.06	307119.93
Cost	271117.07	288559.55	307442.23
Variance	-39659.13	-0.49	-322.30

 F-Formal
 I-Informal

Approved

Project Manager

Vice President

TASK 3.2

Remediation of Contaminated Soils

Reporting Period: February 1994 - April 1994

Principal Investigators: Alan Bland and Terry Brown

Task Objective: The objective of this task is to develop physical, chemical, and thermal treatments to remediate inorganic and organic toxics from contaminated materials.

Quarter Objectives: The objectives for the quarter were to: (1) find a chemical composition of collectors and frothers that can separate and suspend in the liquid-phase hydrocarbon contaminants from a soil sample containing a high percentage of clays, (2) demonstrate that column flotation can be used to concentrate the hydrocarbon contaminant from the liquid phase into a collapsed froth, and (3) obtain materials and carbon balances for the scrubber system.

Accomplishments: The petroleum and mercury contaminated soils were acquired as "feedstock" for the remediation testing. The initial portion of the work relating to the petroleum contaminated soil has been completed. The chemistry of the collection and frothing system has not been optimized; however, preliminary results show that the flotation process separates hydrocarbons from the very fine soil fraction.

Procedures: The scrubber chemical optimization tests were conducted using 1-liter beakers. A high-speed laboratory mixer with an impact bar was used to simulate the action of an attrition scrubber. A typical test was conducted with 15 g of contaminated soil sample and 500 mL of solution containing the chemicals being evaluated. The solids settling from solution were dried and the carbon content was determined. The materials remaining in solution were flocculated using CaCl_2 . The resulting material was dried and carbon content determined. The carbon content of the settled solids and the dried flocculated materials were compared and the changes were used to evaluate the chemicals used in the process.

Frother tests were conducted using a 3-inch diameter by 26-inch long glass column. A cup was located at the bottom of the column to collect solids that settled during frothing. A stainless steel disc gas-sparger, 2 inches in diameter, was located near the column bottom. Wash water was pumped into the column at a point about halfway between the liquid surface and the column overflow (top of the column). The wash water rate was controlled to maintain a nearly constant liquid level in the column. Froth from the column overflow was collected by vacuum through an inverted funnel located at the top of the column. A flask was placed in the vacuum

line to trap the froth. The scrubber liquid containing the dispersed fine particles and petroleum materials was poured into the column and nitrogen was bubbled from the sparger through the liquid. Samples collected from these batch tests were evaluated for carbon content.

Results: A number of commercial surfactants and pH modifiers were evaluated as collectors and frothers. Combinations of various surfactants and pH modifiers were used at different reagent dosages. The most promising chemicals used showed about a 75% decrease in carbon content for the coarse solids. The carbon content of the fine solids was about 26% lower than the column feed after flotation. The collapsed froth taken from the column had an increase of about 54% in carbon content, compared to the column feed. These results provide an indication that froth flotation can provide a viable method for separating hydrocarbons from very fine soil particles. Materials and carbon balances for these initial tests closed within 95%.

Activities Scheduled for Next Quarter: The mercury contaminated soil will be characterized and preliminary testing will be conducted using various combinations of reagents that will be effective in remediating the soil. Efforts will continue to reduce turbulence in the column. A trip is planned to visit a pilot-scale column flotation unit that is operated by Dr. Glen Dobby, MinnovEX Technologies (Montreal, Canada).

ACCOUNT STATUS REPORT

Month/Year
APRIL 1994

Title : Base Program
Contract No : DE-FC21-93MC30126
Client : DOE
Contract Type : Cooperative Agreement
Account Value :
Proposal No :
Account No :

Description: Task 3.2
Remediation of Contaminated Soils

Essential Elements of Information	Yes	No	Customer Notified	Approved
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	93-3.2.2 Mercury Remediation					
Task Mgr:	Bland, Alan	93-3.2.3 Metal Remediation					
Sub Task Mgr:		93-3.2.4 Management and Reporting					
Proj Admin:		93-3.2A Topical Report					
		94-3.2.1 Characterization					
		94-3.2.2 Sample Requirements					
		94-3.2.3 Scrubbing/Flotation Tests					
		94-3.2.4 Process Testing					
		94-3.2.5 Management and Reporting					
		94-3.2A Topical Report					

PROGRAM HIGHLIGHTS

Budget vs Actual Table

	Feb 94	Mar 94	Apr 94
Budget	182916.61	159364.13	167320.23
Cost	146401.15	159364.82	168129.07
Variance	36515.46	-0.69	-808.84

F-Formal
I-Informal

Approved

Project Manager

Vice President

TASK 3.4

The Maxi-Acid™ Process: In Situ Amelioration of Acid Mine Drainage

Reporting Period: February 1994 - April 1994

Principal Investigators: Terry Brown and Alan Bland

Task Objective: The objective of this task is to develop a method for the in situ amelioration of acid mine drainage problems.

Quarter Objectives: The objectives for the quarter were to acquire and set up laboratory equipment and to initiate the development of the experimental plan.

Accomplishments: Most of the equipment has been purchased and set up. Testing of the system was initiated.

Activities Scheduled for Next Quarter: The work plan will be finalized and the laboratory investigations will be initiated.

SUB-TASK STATUS REPORT

Month/Year
APRIL 1994

Title : Base Program
 Contract No : DE-FC21-93MC30126
 Client : DOE
 Contract Type : Cooperative Agreement
 Sub-Task Value :
 Proposal No :
 Sub-Task No :

Description: Task 3.4
 Maxi-Acid Process: In Situ Amelioration of Acid Mine
 Drainage Problems

Essential Elements of Information	Yes	No	Customer Notified	Appvd
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	94-3.4.1 Laboratory Simulation					
Task Mgr:	Brown, Terry	95-3.4.2 Design and Modeling					
Sub Task Mgr:		95-3.4.3 Field Trials					
Proj Admin:		95-3.4.4 Management and Reporting					
		94-3.4A Experimental Plan					
		94-3.4B Topical Report					
Contract Start	Date 02/02/93						
Contract Complete	02/01/98						
Plan Approved	03/29/94						
Last Review							
Next Review							

PROGRAM HIGHLIGHTS

Budget vs Actual Table

	Feb 94	Mar 94	Apr 94
Budget	0.00	7620.74	9461.17
Cost	0.00	6520.73	15946.71
Variance	0.00	1100.01	-6485.54

F-Formal
 I-Informal

Approved

Project Manager

Vice President

TASK 3.5

Spill Test Facility Data Base

Reporting Period: February 1994 - April 1994

Principal Investigator: David Sheesley

Task Objectives: The overall objective of this task is to develop a data base for the Liquefied Gaseous Fuels Spill Test Facility (LGFSTF) Program that will provide information to the government and industry related to releases of fuels and chemicals. Specific objectives are to: (1) archive spill test results from the facility, (2) complete the data base on spill control technology documents and data, (3) archive and monitor literature references to selected real-world significant hazardous spill incidents, and (4) transfer this information to Clean Air Act Amendment participants of the U.S. Environmental Protection Agency (EPA) Research Program for the Development of Emergency Response Technologies and to others.

Quarter Objectives: No activities were scheduled for this quarter.

Activities Scheduled for Next Quarter: Information will be assembled and archived on spills, spill R&D, and LGFSTF technology demonstration data. Appropriate documentation will be prepared from test plans obtained from the spill test facility, including generation of a table for each data set that lists the scientific units associated with each data channel reported. A clearing house for spill test facility related data will be maintained. Citations will be accumulated for the bibliography. Additional searches covering the literature for plume dispersion and mitigation tests done on chemicals at the LGFSTF site will be made. Copies of reports that provide necessary documentation to data sets will be collected.

ACCOUNT STATUS REPORT

Month/Year
APRIL 1994

Title : Base Program
Contract No : DE-FC21-93MC30126
Client : DOE
Contract Type : Cooperative Agreement
Account Value :
Proposal No :
Account No :
Description: Task 3.5
Spill Test Facility Data Base

Essential Elements of Information	Yes	No	Customer Notified	Approved
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones		Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	94-3.5.1 Complete Data Sets						
Task Mgr:	Sheesley, David	94-3.5.2 Field Data Documentation						
Sub Task Mgr:		94-3.5.3 Implement STF Data Base 1						
Proj Admin:		94-3.5.4 Management and Reporting						
		94-3.5A Experimental Plan						
		94-3.5B Topical Report						
Contract Start	02/02/93							
Contract Complete	02/01/98							
Plan Approved	03/29/94							
Last Review								
Next Review								

4.0 APPLIED ENERGY SCIENCE

TASK 4.1

Heavy Oil/Plastics Co-Processing

Reporting Period: February 1994 - April 1994

Principal Investigator: Frank D. Guffey

Task Objective: The objective of this research is to evaluate the catalytic activity responsible for the decrease in thermal decomposition temperature observed when a mixture of plastic resin types are co-processed with heavy oil.

Quarter Objectives: The objectives for this quarter were to complete the experiments necessary to provide the data to establish the kinetics of the reaction and perform any additional thermal decomposition experiments needed to complete the study.

Accomplishments: The experiments to provide the data to determine the reaction kinetics were completed and the calculation of the kinetic constants performed. In addition, experiments were performed to gain insight into the effects of the heavy oil/plastics ratio on conversion of plastics to a distillate product. Analysis of the distillate products by gas chromatography/mass spectrometry (GC/MS) has been slowed because of problems with the GC/MS system.

Procedures: The experiments were performed in a batch reactor, as described in the experimental plan, using the appropriate masses of SAE 50 weight lubricating oil and mixed plastics. The plastics mixture is composed of high density polyethylene (HDPE), low density polyethylene (LDPE), polypropylene (PP), polystyrene (PS), and polyvinyl chloride (PVC) in concentrations that approximate their distribution in the municipal waste stream. In addition, a 0.75 g charge of polyvinyl chloride was added to the reactor after the desired experimental temperature was reached. Distillate samples were collected during the course of the experiment for mass balance, analysis, and to provide data for calculation of the kinetic parameters.

Results: A series of experiments have been conducted to demonstrate the effect of added PVC on lowering the temperature for decomposition of waste plastics. One experiment was conducted at 380°C (716°F) and PVC was not added to the reaction mixture when the reactor reached the processing temperature. A second experiment was conducted at 360°C (680°F) with the addition of 0.75 g of PVC when the reactor reached the reaction temperature. During the third experiment, which was conducted at 380°C (716°F), a charge of 0.75 g of PVC was added to the reaction

mixture when the reactor reached the reaction temperature. The results from these experiments are listed in Table 7, and include the percentage of distillate produced based on the total charge and the plastic conversion based expressed as a weight percentage.

Table 7. Comparison of Plastics Conversion at 380°C With and Without the Addition of Polyvinyl Chloride

	360°C With PVC	380°C Without PVC	380°C With PVC
Distillate Production (wt %)	5.5	10.0	14.0
Plastics Conversion (wt %)	20.1	19.8	27.9

At 360°C (680°F), with the addition of PVC, distillate production and plastics conversion were 5.5% and 20.1% respectively. The experiment conducted at 380°C (716°F) without the addition of PVC had distillate production of 10.0% and plastics conversion of 19.8%. The plastics conversion for these two experiments are comparable (approximately 20%) and shows a 20 degree (C) temperature increase in reaction temperature is required to accomplish the same level of plastics conversion without the addition of PVC. However, there is a significant increase in distillate production at 380°C (716°F). At 380°C (716°F), the addition of PVC to the reaction mixture increased the distillate production from 10% to 14% and increased the plastics conversion from 19.8% to 27.9%. These results demonstrate the effect noted when PVC is added to the reaction mixture of heavy oil and waste plastic. Addition of PVC promotes the thermal decomposition of waste plastics and increases the production of the distillate product.

A series of experiments were conducted at 360, 370, 380, and 390°C (680, 698, 716, 734°F) and the data collected during the experiments were fitted to the first order rate equation and the rate constants determined. The rate constants (k), constants of integration, the coefficients of determination (r^2), and the plastics conversion are listed in Table 8. The coefficients of determination range from 0.994 to 0.999 indicating a good fit of the data to the linear relationship of the first order rate equation. Both the reaction rate and the plastics conversion increase with increased reaction temperature as expected. The kinetic parameters determined for these experiments were used in the Arrhenius equation to estimate the apparent activation energy and the frequency factor.

The results from this calculation are listed in Table 9. The apparent activation energy was determined to be 52.3 kcal/mole and the frequency factor to be $2.12 \times 10^{15}/\text{min}$. The coefficient of determination (r^2) for the relationship was determined to be 0.990, indicating a good fit of the data to the linear relationship of the Arrhenius equation.

Table 8. First Order Rate Constants for Conversion to Distillate and Plastics Conversion

	360°C	370°C	380°C	390°C
k (g/min)	0.0009	0.0016	0.0028	0.0062
Constant	0.00	0.01	0.01	0.01
Coefficient of Determination, (r^2)	0.999	0.998	0.999	0.994
Plastics Conversion (wt %)	20.1	24.6	27.9	30.5

Table 9. The Apparent Activation Energy Using the Arrhenius Equation

Activation Energy (kcal/mole)	52.3
Frequency Factor (/min)	2.12×10^{15}
Coefficient of Determination, (r^2)	0.990

Activities Scheduled for Next Quarter: The GC/MS analyses will be completed and the report on this study will be prepared.

ACCOUNT STATUS REPORT

Month/Year
APRIL 1994

Title : Base Program
 Contract No : DE-FC21-93MC30126
 Client : DOE
 Contract Type : Cooperative Agreement
 Account Value :
 Proposal No :
 Account No :

Description: Task 4.1
 Heavy Oil/Plastics Co-Processing

Essential Elements of Information	Yes	No	Customer Notified	Approved
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones		Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	93-4.1.6 Data Evaluation and Report						
Task Mgr:	Thomas, Kenneth	93-4.1.8 Topical Report						
Sub Task Mgr:								
Proj Admin:								
Date								
Contract Start	02/02/93							
Contract Complete	02/01/98							
Plan Approved	02/02/93							
Last Review								
Next Review								

PROGRAM HIGHLIGHTS

Budget vs Actual Table

	Feb 94	Mar 94	Apr 94
Budget	113781.58	113781.58	113781.58
Cost	84469.20	92503.79	101373.85
Variance	29312.38	21277.79	12407.73

F-Formal
I-Informal

Approved

Project Manager

Vice President

TASK 4.2

Fossil Fuel and Hydrocarbon Conversion Using Hydrogen-Rich Plasmas

Reporting Period: February 1994 - April 1994

Principal Investigator: Francis Miknis

Task Objective: The objective of this task is to develop a novel and innovative, noncatalytic method for directly converting fossil fuel materials to hydrogen-rich fuels, while simultaneously reducing the heteroatom contents.

Quarter Objectives: None. Work was not scheduled to begin until the next quarter.

Procedures: Fossil fuel hydrocarbon materials will be irradiated in microwave-generated plasmas to produce improved hydrogen-rich liquid fuels. Initial experiments will be conducted with plasmas generated from hydrogen and methane. Solid, liquid, and gaseous products will be analyzed to determine the degrees of conversion and hydrogenation that have taken place. The starting hydrocarbon material will also be extracted with a suitable solvent to determine the amount of soluble, nonvolatile material that may be produced. Liquid products from selected experiments will be analyzed to determine the extent of hydrogenation and heteroatom removal that results from exposure to different plasmas under various conditions.

Activities Scheduled for Next Quarter: Plans for next quarter are to prepare and submit the experimental plan and to begin assembling the microwave-plasma reactor system.

Title	: Base Program	<div>94 JUN 15 PM 12:27</div> Description: Task 4.2 Fossil Fuel and Hydrocarbon Conversion Using Hydrogen-Rich Plasmas
Contract No	: DE-FC21-93MC30126	
Client	: DOE	
Contract Type	: Cooperative Agreement	
Account Value	:	
Proposal No	:	
Account No	:	

Essential Elements of Information	Yes	No	Customer	
			Notified	Approved
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones											
		<div> Planned Actual Progress Scheduled Delivered </div>											
Proj Mgr:	Smith, Verne	94-4.2 Hydrocarbon Conversion Res.											
Task Mgr:	Miknis, Francis	94-4.2A Experimental Plan											
Sub Task Mgr:		94-4.2B Topical Report											
Proj Admin:													
	Date												
Contract Start	02/02/93												
Contract Complete	02/01/98												
Plan Approved	03/29/94												
Last Review													
Next Review													
		Sep 93	Dec 93	Mar 94	Jun 94	Sep 94							

PROGRAM HIGHLIGHTS

	Budget vs Actual Table		
	Feb 94	Mar 94	Apr 94
Budget	0.00	0.00	0.00
Cost	0.00	0.00	58.11
Variance	0.00	0.00	-58.11

Approved _____ Project Manager
Vice President

6.0 REMEDIATION

TASK 6.1

North Site Remediation

Reporting Period: February 1994 - April 1994

Principal Investigator: Norm Merriam

Task Objectives: The objectives of this task are to evaluate and properly dispose of hazardous and nonhazardous materials, and to decontaminate and remove nonfunctional equipment at the North Site. These objectives are defined in five phases:

- I. Definition of Waste Streams
- II. Disposal of Hazardous Wastes
- III. Disposal of Nonhazardous Wastes
- IV. Sampling and Disposal of Buried Wastes
- V. Removal of Nonfunctional Equipment

Quarter Objectives: Objectives for the quarter were to complete and submit the final report on definition of the North Site waste streams (phase I); submit the plan for disposal of nonhazardous wastes (phase III); work on disposal of hazardous and nonhazardous North Site materials (phases II and III); prepare and submit the plan for sampling and disposal of the buried wastes (phase IV), and upon approval of that plan begin phase IV activities.

Accomplishments: Phase I: The final report on definition of the North Site waste streams was completed and submitted. Phase I is completed.

Phase II: Disposal of the hazardous North Site materials is about 30% completed. Shale oil that was contained in 70 stainless steel drums was transferred to steel drums. Special Resource Management (SRM) is currently packing hazardous materials for shipment at the end of May. Photographs were taken to document these activities.

Phase III: Disposal of the nonhazardous North Site materials is about 80% completed. Approximately 500 drums of coal, oil shale, and tar sand were moved off of the site. Oil shale, tar sand, and spent shale were taken by the Albany County Road and Bridge Department. In addition, 98 drums of oily dirt, insulation, tank bottom liner, and shredded tires were taken to the Chemical Waste Management landfill near Henderson, Colorado, and 12 drums of water were taken to the Laramie waste water treatment plant.

Phase IV: The plan for removal of buried cylinders and soil sampling was prepared and submitted for approval. The plan was reviewed and verbally approved, and phase IV was started. Suspected burial sites were surveyed by University of Wyoming Geology/Geophysics personnel using ground penetrating radar, a magnetometer, and a metal detector. Ten buried gas cylinders were located, along with one buried empty drum, and some sheet metal. The buried items were dug up, and the burial areas were resurveyed to confirm that all of the buried metal objects were removed. Soil sampling of various North Site locations was started. Photographs were taken to document these activities.

Procedures: Phase II: Preparation of the hazardous materials for disposal is being performed in conjunction with SRM. All environmental regulations and requirements are being followed. Profile information on each of the materials is being prepared by SRM with input from WRI. The profile information is then sent to the appropriate hazardous waste personnel who are currently in the process of packing the materials for shipment.

Phase IV: Buried gas cylinders were located using ground penetrating radar, a magnetometer, and a metal detector to survey suspected burial locations. Shallow-buried cylinders were removed using a hand shovel, and cylinders that were buried deeper were located using a back hoe and removed using a hand shovel.

ASTM and EPA documents were used as guidance in planning the phase IV soil sampling activities. A power auger is being used to collect the soil samples. Samples are being collected down to the bedrock, which for most locations at the North Site, is no more than 2 feet below the soil surface. Table 10 shows the phase IV sampling locations.

The analytical approach for phase IV was prepared with guidance from the Wyoming Department of Environmental Quality. Table 11 shows the recommended analytes for evaluating the phase IV soil samples. These were selected based on knowledge of materials that were buried, stored, or possibly leaked or spilled during storage or transfer at the various North Site locations.

Soil samples from areas suspected of containing metal contamination are being characterized for their total concentrations of the eight metals regulated under the Resource Conservation and Recovery Act (RCRA) (1984). The concentrations of the RCRA metals in the soil are being evaluated based on their toxicity characteristic regulatory levels (U.S. EPA 1990). The RCRA metals and their action levels are listed in Table 12.

The soil samples are being prepared for analysis of the RCRA metals by digesting them using SW846 Method 3050, Acid Digestion of Sediments, Sludges, and Soils, (U.S. EPA 1986). After digestion, the following methods are being used to analyze the digestates, depending on the specific analyte: SW846 Method 6010 for determination of barium, cadmium, chromium, lead, and silver; SW846 Method 7060 for determination of arsenic; SW846 Method 7471 for determination of mercury; and SW846 Method 7740 for determination of selenium (U.S. EPA 1986).

Table 10. Phase IV Sampling Locations

Sampling Locations	Possible Contamination
Southeast Burial Site (SBS)	Buried cylinders, mercury
Suspected Northeast Burial Site (NBS)	Unknown
Areas Under & Surrounding the Spent Oil Shale Pile (SO)	Metals- Cr, Pb, As Residual organic compounds
Old Septic Tank Leach Field (SL-1)	Metals
New Septic Tank Leach Field (SL-2)	Metals
Septic Tank Leach Field (Retort) (SL-3)	Metals
Storm Water Outfall (South) (SW-1)	Migration of contaminants from other North Site areas
Storm Water Outfall (North) (SW-2)	Migration of contaminants from other North Site areas
Automotive Shop Area (B-836)	Oils
Tar Sand Berm Area (TS)	Retort water (oil)
Drum Storage Area (DS)	Crude/heavy oils
Hazardous Waste Storage Area (HW)	Motor/waste oils Oil sludges Chlorinated solvents Nonchlorinated solvents
Old Pond (P)	Disposal or storage of materials in this area has not been documented. Migration of contaminants from other North Site areas
Flammable Storage Area (B-899)	Oil
Area Around the In Situ Processing Lab (B-852)	Oil shale oil/other oils
Area Around the Storage Tanks (ST)	Oil spills
Storage Building & Surrounding Area (B-850)	Mercury/lead-based paints Possibly oils
North Fence Area (NF)	Metals
Eastern Border of the North Site (B)	None

Table 11. Recommended Analytes for Evaluation of the Soil Samples Collected in Phase IV of the North Site Cleanup Project

Sampling Location	Recommended Analytes
Southeast Burial Site (SBS)	RCRA metals ^a
Suspected Northeast Burial Site (NBS)	RCRA metals; semivolatile organic compounds and volatile organic compounds, including those regulated by the toxicity characteristic
Areas Under & Surrounding the Spent Oil Shale Pile (SO)	RCRA metals; semivolatile organic compounds, including toxicity characteristic regulated compounds
Old Septic Tank Leach Field (SL-1)	RCRA metals
New Septic Tank Leach Field (SL-2)	RCRA metals
Septic Tank Leach Field (Retort) (SL-3)	RCRA metals
Storm Water Outfall (South) (SW-1)	RCRA metals; semivolatile organic compounds and volatile organic compounds, including those regulated by the toxicity characteristic
Storm Water Outfall (North) (SW-2)	RCRA metals; semivolatile organic compounds and volatile organic compounds, including those regulated by the toxicity characteristic

^a Metals regulated under the Resource Conservation and Recovery Act - arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver

Table 11. Recommended Analytes for Evaluation of the Soil Samples Collected in Phase IV of the North Site Cleanup Project (continued)

Sampling Location	Recommended Analytes
Automotive Shop Area (B-836)	RCRA metals ^a ; semivolatile organic compounds and volatile organic compounds, including those regulated by the toxicity characteristic
Tar Sand Berm Area (TS)	RCRA metals; semivolatile organic compounds and volatile organic compounds, including those regulated by the toxicity characteristic
Drum Storage Area (DS)	RCRA metals; semivolatile organic compounds and volatile organic compounds, including those regulated by the toxicity characteristic
Hazardous Waste Storage Area (HW)	RCRA metals; semivolatile organic compounds and volatile organic compounds, including those regulated by the toxicity characteristic
Old Pond (P)	RCRA metals; semivolatile organic compounds and volatile organic compounds, including those regulated by the toxicity characteristic

^a Metals regulated under the Resource Conservation and Recovery Act - arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver

Table 11. Recommended Analytes for Evaluation of the Soil Samples Collected in Phase IV of the North Site Cleanup Project (continued)

Sampling Location	Recommended Analytes
Flammable Storage Area (B-899)	RCRA metals ^a ; semivolatile organic compounds and volatile organic compounds, including those regulated by the toxicity characteristic
Area Around the In Situ Processing Lab (B-852)	RCRA metals; semivolatile organic compounds and volatile organic compounds, including those regulated by the toxicity characteristic
Area Around the Storage Tanks (ST)	RCRA metals; semivolatile organic compounds and volatile organic compounds, including those regulated by the toxicity characteristic
Storage Building & Surrounding Area (B-850)	RCRA metals; semivolatile organic compounds and volatile organic compounds, including those regulated by the toxicity characteristic
North Fence Area (NF)	RCRA metals
Eastern Border of the North Site (B)	RCRA metals; semivolatile organic compounds and volatile organic compounds, including those regulated by the toxicity characteristic

^a Metals regulated under the Resource Conservation and Recovery Act - arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver

Soil samples from areas suspected of containing contamination from semivolatile and volatile organic compounds are being characterized for the U.S. EPA Contract Laboratory Program (CLP) target list semivolatile and volatile organic compounds (Tables 13 and 14) in addition to those compounds regulated under the toxicity characteristic (Table 12). Analytical methods specified in the U.S. EPA CLP Statement of Work for Organic Analysis (U.S. EPA 1991) are being used to characterize the soil samples.

Results: Samples of the North Site soils are currently being collected and analyzed under Phase IV. However, no data have been received on the soils.

Activities Scheduled for Next Quarter: During the next quarter, phase II, III, and IV activities will be completed. The plan for phase V, which will involve removal of the oil storage tanks and oil shale retort(s) as well as groundwater sampling as requested by EPA, will be completed and submitted for approval. Phase V activities will be started after approval of the plan.

References:

Resource Conservation and Recovery Act, 1984, 3001(g), 42 U.S.C. 6921(g).

U.S. EPA, 1986, Method 3050: Acid Digestion of Sediments, Sludges, and Soils. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods (SW-846), Vol. 1A, 3rd Ed.

U.S. EPA, 1986, Method 6010: Inductively Coupled Plasma Atomic Emission Spectroscopy. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods (SW-846), Vol. 1A, 3rd Ed.

U.S. EPA, 1986, Method 7060: Arsenic (Atomic Absorption, Furnace Technique). Test Methods for Evaluating Solid Waste: Physical/ Chemical Methods (SW-846), Vol. 1A, 3rd Ed.

U.S. EPA, 1986, Method 7471: Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique). Test Methods for Evaluating Solid Waste: Physical/Chemical Methods (SW-846), Vol. 1A, 3rd Ed.

U.S. EPA, 1986, Method 7740: Selenium (Atomic Absorption, Furnace Technique). Test Methods for Evaluating Solid Waste: Physical/ Chemical Methods (SW-846), Vol. 1A, 3rd Ed.

U.S. EPA, 1990, Toxicity Characteristic Leaching Procedure (Method 1311). Federal Register, March 29, 55: 11798-11877.

U.S. EPA, 1991, Statement of Work for Organic Analysis. USEPA Contract Laboratory Program, Document Number OLM01.0, including revision OLM01.8.

Table 13. U.S. EPA CLP Target Compound List Semivolatile Organic Compounds

Semivolatile Compounds

Phenol
bis(2-Chloroethyl) ether
2-Chlorophenol
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,2-Dichlorobenzene
2-Methylphenol
2,2'-oxybis (1-Chloropropane)
4-Methylphenol
N-Nitroso-di-n-propylamine
Hexachloroethane
Nitrobenzene
Isophorone
2-Nitrophenol
2,4-Dimethylphenol
bis(2-Chloroethoxy)methane
2,4-Dichlorophenol
1,2,4-Trichlorobenzene
Naphthalene
4-Chloroaniline
Hexachlorobutadiene
4-Chloro-3-methylphenol
2-Methylnaphthalene
Hexachlorocyclopentadiene
2,4,6-Trichlorophenol
2-Chloronaphthalene
2-Nitroaniline
Dimethylphthalate
Acenaphthylene
2,6-Dinitrotoluene
3-Nitroaniline
Acenaphthene
2,4-Dinitrophenol
4-Nitrophenol

Table 13. U.S. EPA CLP Target Compound List Semivolatile Organic Compounds (continued)

Semivolatile Compounds

Dibenzofuran
 2,4-Dinitrotoluene
 Diethylphthalate
 4-Chlorophenyl-phenylether
 Fluorene
 4-Nitroaniline
 4,6-Dinitro-2-methylphenol
 N-nitrosodiphenylamine
 4-Bromophenyl-phenylether
 Hexachlorobenzene
 Pentachlorophenol
 Phenanthrene
 Anthracene
 Carbazole
 Di-n-butylphthalate
 Fluoranthene
 Pyrene
 Butylbenzylphthalate
 3,3'-Dichlorobenzidine
 Benzo(a)anthracene
 Chrysene
 bis(2-Ethylhexyl)phthalate
 Di-n-octylphthalate
 Benzo(b)fluoranthene
 Benzo(k)fluoranthene
 Benzo(a)pyrene
 Indeno(1,2,3-cd)pyrene
 Dibenz(a,h)anthracene
 Benzo(g,h,i)perylene

Table 14. U.S. EPA CLP Target Compound List Volatile Organic Compounds

Volatile Compounds
Chloromethane
Bromomethane
Vinyl Chloride
Chloroethane
Methylene Chloride
Acetone
Carbon Disulfide
1,1-Dichloroethene
1,1-Dichloroethane
1,2-Dichloroethene (total)
Chloroform
1,2-Dichloroethane
2-Butanone
1,1,1-Trichloroethane
Carbon Tetrachloride
Bromodichloromethane
1,2-Dichloropropane
cis-1,3-Dichloropropene
Trichloroethene
Dibromochloromethane
1,1,2-trichloroethane
Benzene
trans-1,3-Dichloropropene
Bromoform
4-Methyl-2-pentanone
2-Hexanone
Tetrachloroethene
Toluene
1,1,2,2-Tetrachloroethane
Chlorobenzene
Ethyl Benzene
Styrene
Xylenes (Total)

ACCOUNT STATUS REPORT

RECEIVED
ACQUISITION SERVICES

Month/Year
APRIL 1994

94 JUN 11 04 18 PM '94 Task 6.1

Title : Base Program
Contract No : DE-FC21-93MC30126
Client : DOE
Contract Type : Cooperative Agreement
Account Value :
Proposal No :
Account No :

North Site Remediation

Essential Elements of Information	Yes	No	Customer Notified	Appvd
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	Phase I Definition of Wastes					
Task Mgr:	Merriam, Norm	Phase II Disposal of Hazardous					
Sub Task Mgr:		Phase III Disposal of Nonhaz.					
Proj Admin:		Phase IV Soil & Buried Wastes					
		Phase V Nonfunctional Equipment					
Contract Start	02/02/93						
Contract Complete	02/01/98						
Plan Approved	09/30/93						
Last Review							
Next Review							

PROGRAM HIGHLIGHTS

Budget vs Actual Table

	Feb 94	Mar 94	Apr 94
Budget	340000.00	470000.00	610000.00
Cost	356905.20	418536.02	457425.59
Variance	-16905.20	51463.98	152574.41

F-Formal
I-Informal

Approved

Project Manager

Vice President

DISCLAIMER

Mention of specific brand names or models of equipment is for information only and does not imply endorsement of any particular brand.