

Methane Recovery from Coalbeds Project

Monthly Progress Report

Contract Number DE-AC21-78MC08089

MARCH 1980

PREPARED FOR
UNITED STATES DEPARTMENT OF ENERGY
MORGANTOWN ENERGY TECHNOLOGY CENTER
MORGANTOWN, WEST VIRGINIA

BY

TRW

ENERGY SYSTEMS PLANNING DIVISION

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1. SUMMARY OF PROGRESS - MARCH 1980

This section of the report highlights the progress through March 1980 made by TRW Energy Systems Group on the Methane Recovery from Coalbeds Project (MRCP) under DOE Morgantown Energy Technology Center Contract No. DE-AC21-78MC08089. A discussion of the progress accomplished during this period is contained in Section 3.

1.1 PROGRESS DURING THE MONTH

Resource Engineering

- Continued coring Indiana Geological Survey well in the Illinois Basin
- Conducted computer assisted LANDSAT analysis in conjunction with 1979 Detailed Site Investigation
- Met with Northwest Exploration on the possibility of production testing of wells in the San Juan Basin later this year
- Negotiations for a Type III test with Adolph Coors in the Piceance Basin in Colorado are continuing
- Contacted by Navajo Nation requesting assistance for methane desorption analysis of coals cored by USGS.

Technology Test Projects

- Permit to plug and abandon the old well discovered during fracturing of Waynesburg College well was received from the State of Pennsylvania
- Drilling on the Oxy #9 horizontal borehole at the Occidental Research Corporation (ORC) project at V.P. No. 5 Mine was initiated. The conductor pipe was grouted in place and drilling is proceeding at the 100 foot point.
- Contract modifications for CY 1980 have been signed off with provision for incremental funding for ORC.

1.2 PROGRESS TO DATE

The following is a summary of the significant progress made by TRW Energy Systems Group under this contract since its inception.

ENGINEERING SUPPORT

Planning and Analysis

- Assisted in the preparation and publication of the FY 1979 and FY 1980 MRCP Project Plan Documents (PPD)
- Assisted in the preparation of the MRCP Technical Implementation Plan (TIP)
- Provided inputs and assistance for preparation and publication of Unconventional Gas Recovery Semi-Annual Reports for the periods ending September 1978, March 1979, and September 1979
- Provided MRCP inputs used in the preparation of exhibits for the International Petroleum Exposition and other meetings.

Technical Review of Proposals

- Supplied formal review and evaluation of four R&D proposals, three Technology Test Project proposals, and eleven Resource Engineering proposals.

Technology Transfer and Information Management

- Assisted in planning and conducting the 1978 and 1979 Methane Recovery from Coalbeds Symposia and in compilation of the Symposia Proceedings
- Prepared drafts of the MRCP Technology Transfer Plan and the Information Management Plan
- Authored or co-authored the following papers on Methane Recovery from Coalbeds:
 1. A. A. Lee, "The Delineation of Methane Resources in Unminable and Minable Coalbeds," presented at the Methane Recovery from Coalbeds Symposium, April 18 - 20, 1979, in Pittsburgh, Pennsylvania.
 2. H. H. Rieke, C. R. Skillern, C. T. Rightmire, and W. Overbey, "A Systems Approach to Large Scale Exploratory Drilling Ventures," presented at the Society of Professional Log Analysts' 20th Annual Logging Symposium June 3 - 6, 1979, in Tulsa, Oklahoma.

Technology Transfer and Information Management (Continued)

3. H. D. Shoemaker, A. Gillies, and C. L. Sturgill, "Generation of Mine Power from Methane Drainage," presented at the Coal Gasification Conference, July 31 - August 3, 1979 in Pittsburgh, Pennsylvania.
4. R. L. Wise and C. T. Rightmire, "Methane Recovery and Utilization from Coalbeds," presented at the 1979 Society of Petroleum Engineers Annual Technical Conference and Symposium, September 23 - 26, 1979, in Las Vegas, Nevada.
5. H. H. Rieke, C. T. Rightmire, and W. H. Fertl, "Evaluation of Gas-Bearing Coal Seams," presented at the 1979 Society of Petroleum Engineers Annual Technical Conference and Symposium, September 23 - 26, 1979, in Las Vegas, Nevada.
6. W. H. Fertl and H. H. Rieke, "Gamma Ray Spectral Evaluation Techniques Identify Fractured Shale Reservoirs and Source Rock Characteristics," presented at the 1979 Society of Petroleum Engineers Annual Technical Conference and Symposium, September 23 - 26, 1979, in Las Vegas, Nevada.
7. D. R. Watkins and H. D. Shoemaker, "Testing for Methane in Coal Seams," presented at the Energy Sources Technology Conference and Exhibition in New Orleans, Louisiana, February 3-7, 1980.
8. H. H. Rieke, F. G. Galliers, and S. A. Friedman, "Stratigraphic Relationship of Desmoinesian Coals in the Kiowa Syncline, Pittsburg County, Oklahoma," presented at the South-Central Section Meeting of the Geological Society of America, Wichita, Kansas, 3-4 March 1980.

R&D Surveillance

- Developed test plans for Phase I and II testing for the Maurer turbodrill
- Completed Phase I testing of the Maurer turbodrill
- Completed interim Phase II turbodrill testing in January 1980.

RESOURCE ENGINEERING

Planning and Analysis

- Assisted in the preparation and publication of the following:
 - Unminable Coal Drilling Project Plan
 - Resource Delineation Plan

- Assisted in the preparation and publication of the following basin reports:
 - Draft Illinois Basin Report
 - Draft Powder River Basin Report
- Participated in industry coordination meetings as follows:
 - Unmined Coal Project Organization
 - Resource Delineation Workshops
 - Desorption Methods and Standards
- Developed contractual agreements with companies for cooperative participation in 31 wells of the 33 planned for the 1978-1979 program.

<u>Basin</u>	<u>Tests Completed (to date)</u>	<u>Additional Projected (1979 Program)</u>
Arkoma	4	1
Green River	3	0
Illinois	4	1
Northern Appalachian	2	0
Piceance/Uinta	8	0
Powder River	3	0
San Juan	1	2
Southern Appalachian/ Warrior	1	0
Western Washington	1	0
TOTAL	27	4

University Subcontracts

- Negotiated and signed subcontracts with Pennsylvania State University, Virginia Polytechnic Institute, and the Colorado School of Mines to support the resource delineation effort.
 - Penn State is conducting activities in mine monitoring, mine simulation, and in-mine fracture observation
 - VPI & SU actively involved in basin analysis of coal-bearing regions of Southeastern United States
 - Colorado School of Mines Department of Geology has completed field work on a detailed geologic site investigation in the northern part of the San Juan Basin in the vicinity of Durango, Colorado.

Field Activities

- Reservoir assessment efforts have been directed to the following target areas:

Big Horn County, Montana	Posey County, Indiana
Clay County, Illinois	Powder River County, Montana
Fayette County, Alabama	Rio Blanco County, Colorado
Greene County, Pennsylvania	San Juan County, New Mexico
Haskell County, Oklahoma	Sublette County, Wyoming
LeFlore County, Oklahoma	Thurston County, Washington
Marion County, Illinois	Webster County, Kentucky
Pittsburg County, Oklahoma	

- Nine basins have been sampled by conventional and sidewall coring operations. Approximately 2,160 feet of conventional core and 96 sidewall cores were recovered since field operations began in April 1978. The total thickness of coalbeds encountered during conventional coring operations is approximately 560 feet; 131 coal samples have been collected for desorption analysis as have 21 samples of roof and floor rocks.
- The ranges of gas contents of coalbeds tested to date, by basin are:

<u>Basin</u>	<u>Gas Content (cu ft/ton)</u>
Illinois	23 - 48
Arkoma	73 - 270
Piceance	10 - 339
Warrior	17 - 104
Powder River	1 - 13
Green River	133 - 540
San Juan	16 - 73
Western Washington	34 - 91

TECHNOLOGY TEST PROJECTS

- Completed conceptual system designs for three candidate sites:

<u>Company</u>	<u>Types of Systems</u>	
	<u>Recovery</u>	<u>Utilization</u>
Ranger Fuels	Vertical wells	Pipeline injection
Eastern Associated	Gov gas	Mine shaft heating
Bethlehem Mines	Vertical wells.	Pipeline injection

- Prepared and published the Technology Test Project Evaluation Report which ranked 12 major proposed projects.

- Completed negotiations and signed a subcontract with Occidental Research Corporation (ORC) in cooperation with Island Creek Coal Company to develop a technique for recovery of methane from long horizontal holes drilled from within the mine and using the gas to produce LNG. Project is in progress and basic drilling techniques have been developed and validated.
- Completed the design and verification phase of the Occidental Research Corporation project. Five development holes were drilled. A technique verification hole (#6) was completed. Gas production is approximately 200 CFD per foot of horizontal hole. Occluded methane is 400 to 500 CF/Ton.
- Completed two exploratory boreholes into the thin #4 seam which overlies the mined #3 seam at the ORC site. Gas production approximates that from holes in the thicker seams.
- The implementation phase go-ahead for the ORC project has been initiated.
- Completed negotiations with Pennsylvania Energy Resources, Inc. (PERI) to develop and demonstrate a system for the recovery of methane from anthracite coal using a stimulated multiple completion wells and utilizing the gas by injection into a local pipeline. At the direction of METC, this project is being held in abeyance due to the current MRCP funding limitation.
- Completed negotiations and signed a subcontract with Waynesburg College to develop and demonstrate a system for the recovery of methane from bituminous coal and utilizing the gas by injection into a private pipeline.
- Additional progress on the Waynesburg College Methane Well includes:
 - a. Environmental Assessment completed
 - b. Coring program completed
 - c. Preliminary Well Drilling, Completion, and Stimulation Plan completed
 - d. Drilling permits and approval of alternate method of completion secured from the State of Pennsylvania
 - e. Well drilling completed
 - f. Ran a suite of logs oriented to determining coal seam characteristics
 - g. All casing set and cemented
 - h. Based upon log information, selectively perforated and incrementally stimulated with nitrogen foam and 20/40 sand proppant three zones containing coal seams with methane potential
 - i. Bailed and swabbed well and set downhole water pump and tubing preparatory to dewatering well.

2. INTRODUCTION

2.1 BACKGROUND

During the natural process of coal formation, methane, the principal constituent of natural gas, is generated and trapped in the coal seam as well as in the adjacent rock area. All coal deposits contain methane. The concentration of methane varies from seam to seam, and within the seam. Recent estimates of the methane reserves in coalbeds are reported to approximate 700 trillion cubic feet. Given current and conservatively projected economic and technological factors, the recovery of an estimated 300 trillion cubic feet of the resource appears feasible. Based on present consumption rate, this is equal to a 10- to 12-year supply of the commodity.

Because of its volatility, methane has been considered a menace and hazardous to mining operations. The U. S. Bureau of Mines and many mining companies, in the interest of safety, have developed techniques for draining methane from the coalbeds prior to the start of underground coal mining, and for diluting the methane with fresh air during underground coal mining operations to reduce the concentration of coal dust and methane in the mines, and thereby reduce the probability of mine explosions and fires. Presently, all drainage techniques conclude by venting the coal gas into the atmosphere. Approximately 250 million cubic feet of methane are vented daily in U. S. mining operations. The content of the methane in gas vented from virgin coal is comparable to the quality of natural gas recovered from gas reservoirs. The content of methane in gas vented from gob (working mine) areas varies from 25 to 90 percent, depending on the venting techniques used.

In order to curb the waste of methane contained in coalbeds, and to provide for its recovery and utilization, the Department of Energy has initiated the Methane Recovery from Coal Project (MRCP) and assigned lead responsibility to the Morgantown Energy Technology Center. Major project objectives include:

- Location and characterization of methane resources
- Development of improved, cost-effective methane recovery and utilization technology

- Development of methane conservation techniques and systems
- Development of methane recovery prediction and projection techniques (models for well productivity)
- Development of field tests for pilot systems
- Investigation of legal and institutional constraints
- Transfer of applicable technologies to private industry.

On March 24, 1978, TRW was awarded Contract No. DE-AC21-78MC08089 to implement the engineering and integration necessary to achieve these objectives.

2.2 SCOPE OF WORK

Objectives and Approaches

The primary objective of the TRW effort is to develop and demonstrate a set of conditions in which recovery and utilization of coalbed methane is clearly to the economic advantage of the relevant private sector interests and which minimizes the necessity for Federal involvement over an extended time period. The TRW approach is established to meet this objective and encompasses:

- Resource characterization to identify target sites with greatest potential
- Identification of R&D to improve recovery and utilization techniques
- Definition, selection, and implementation of systems application projects to verify technical and economic viability under a variety of field conditions
- Technology transfer sufficient to support extensive commercialization of coalbed methane
- Overall program integration to assure a coordinated effort.

Statement of Work

Work under the TRW Methane Recovery from Coalbeds Project (MRCP) is defined by three discrete tasks. For Calendar Year 1980, work under each task is delineated as follows:

Task 1 - Engineering Assistance to METC

Task Objective

Provide technical assistance to the Methane Recovery from Coalbeds Project.

Subtask Objectives

Subtask 1 - Project coordination and preparation and updating of MRCP planning inputs for Project Planning Documents, Project Technical Implementation Plans, and Project Strategy Plans.

Subtask 2 - Review and analyze MRCP-related technical proposals which are submitted to DOE/METC for resource delineation, technology development, and Technology Test Projects as directed by METC.

Subtask 3 - Project documentation including preparation of project reports and technology transfer activities.

Subtask 4 - Review and evaluate R&D and related activities associated with the Methane Recovery from Coalbeds Project, as directed by METC.

Task 2 - Resource Engineering

Task Objective

Provide technical assistance and subcontracting support for the resource delineation activities. The task objectives are threefold:

- To estimate more reliably the methane resources contained in the nation's coalbeds
- To estimate the recoverable resource
- To determine exploration and production technologies that allow extrapolation from test sites to larger resource areas.

Subtask Objectives

Subtask 1 - Provide overall resource delineation planning, field support, evaluation and analysis, and administration/monitoring support.

Subtask 2 - Provide subcontracting and administration/monitoring of selected university activities.

Subtask 3 - Provide subcontracting and administration/monitoring of data derived from field activities involving geological investigations, drilling, well testing, logging, fracturing, laboratory analysis, and evaluation of data.

Task 3 - Technology Test Projects

Task Objective

Provide to METC detailed design, development, analysis, initial implementation, evaluation, and reporting of technology test projects.

Subtask Objectives

Subtask 1 - Provide for the definition and implementation, analysis, and reporting of the technology test projects defined in the discussions of Task 3, Subtasks 2 and 4 of the basic proposal.

Subtask 2 - Continue implementation of the test to demonstrate the recovery of methane from multiple horizontal wells in an active mine and the utilization of the gas for the production of LNG or other purposes.

Subtask 3 - Deleted.

Subtask 4 - Continue implementation of the test to demonstrate the feasibility of recovering methane from multiple production zones in a single well and utilizing the gas in a local distribution system pipeline.

Subtask 5 - Reserved.

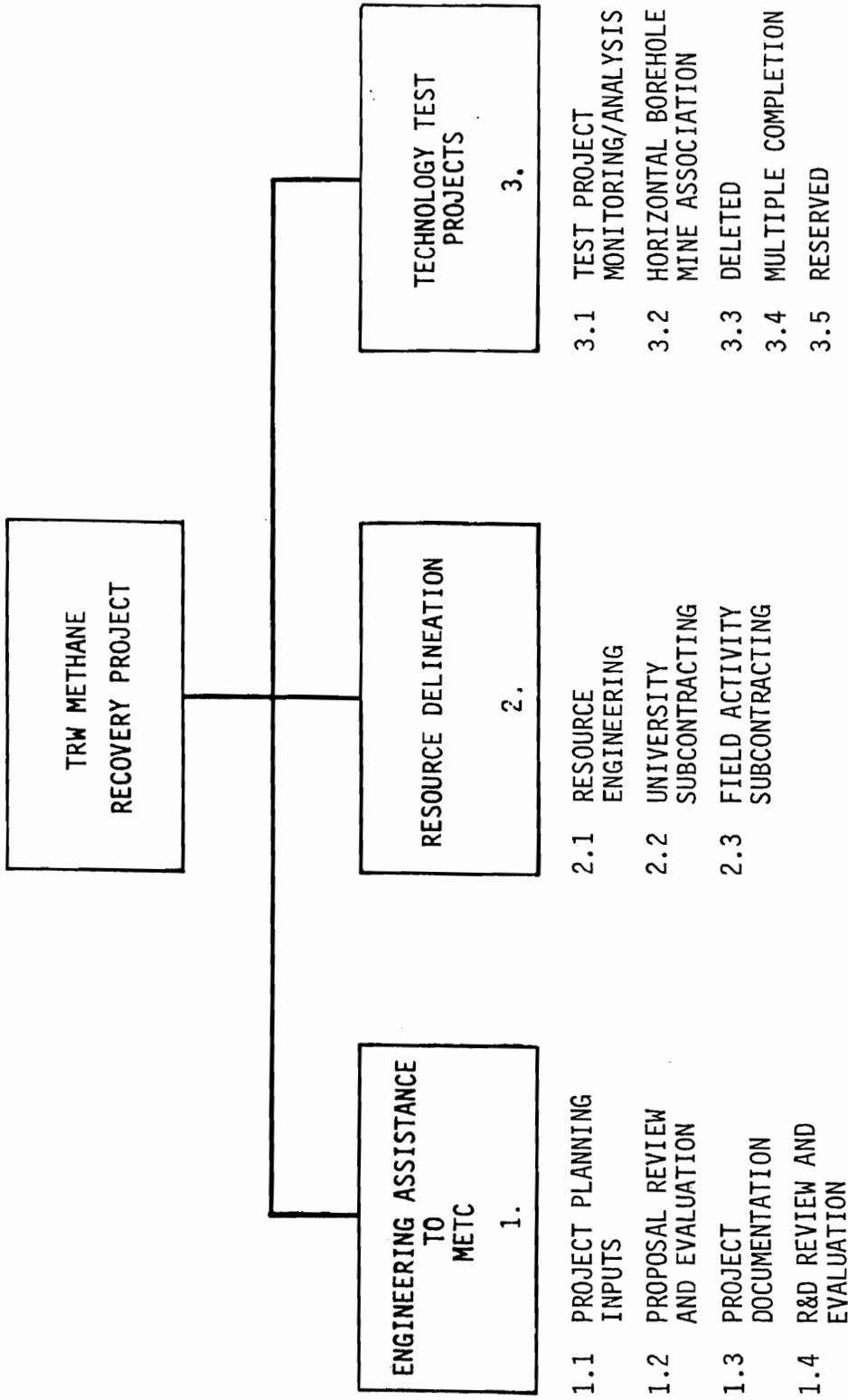


Figure 2-1. TRW MRCP Work Breakdown Structure (Revised 6/30/79)

3. DISCUSSION OF PROGRESS DURING MARCH 1980

The following items are brief discussions of progress during the month of March. Additional data and descriptions of field projects in progress and in firm planning are contained in Section 4; Appendix A contains data and descriptions of completed field projects.

3.1 ENGINEERING SUPPORT

- Assisted in review and evaluation of work proposed by Harris & Associates and GeoChem
- Completed inputs for the Advanced Drilling Technology Project Plan.

3.2 RESOURCE ENGINEERING

- Continued coring Indiana Geological Survey well in the Illinois Basin. Mechanical difficulties have delayed progress; however, completion is scheduled for April.
- Conducted computer assisted LANDSAT analysis in conjunction with 1979 Detailed Site Investigation
- Met with Northwest Exploration on the possibility of production testing wells in the San Juan Basin later in the year
- Negotiations for a Type III test with Adolph Coors in the Piceance Basin in Colorado are continuing with a meeting scheduled in early April
- Contacted by members of Navajo Tribe regarding assistance for methane desorption analysis of coals cored by USGS. A meeting is being arranged in the near future.
- Completed evaluation of a LLL proposal on fracture mechanics related to stimulation. A companion effort to show the relationship between currently funded fracture/stimulation efforts is near completion
- Presented paper at the South-Central Section Meeting of the Geological Society of America, Wichita, Kansas

3.3 TECHNOLOGY TEST PROJECTS

- After the Waynesburg College well stimulation, effort was devoted to determining what should be done relative to the 1903 well which erupted after fracturing the Waynesburg College methane well.

Permit to properly plug and abandon the 1903 well discovered during the fracturing of the upper zone of the Waynesburg College methane production well was received from the State of Pennsylvania.

Extremely wet weather has delayed setting the pump jack over the wellhead and beginning the reword of the old well.

- Following the refurbishment of the Acker drill at the Occidental (ORC) site, drilling has commenced on the Oxy #9 horizontal hole at the Island Creek Mine V.P. No. 5. Additional protective storage facilities and utilities to support the new drill location have been installed.

A new vertical vent hole has been drilled from the surface into a location which will be used to conduct gas to the surface for the drilling planned for this year. A new 5000 foot pipeline has been installed in the mine to connect this vent to the #9 hole.

4. FIELD ACTIVITIES

Each of the projects in the Engineering Support, Resource Engineering, and Technology Test areas having substantial field activities, planning for field activities, or analysis activities immediately following field activities are summarized in this section. Those projects with field activities completed are summarized in Attachment A of this report.

Project summary sheets are included for the following projects:

Engineering Support

Active R&D Projects

Maurer Turbodrill Testing

Resource Engineering

Field Operations in Progress

Indiana Geological Survey #2 - Illinois Basin

Field Operations in Firm Planning

Fuelco - San Juan Basin

Technology Test Projects

Occidental Research Corporation

Waynesburg College

Pennsylvania Energy Resources

ENGINEERING SUPPORT

Active R&D Projects

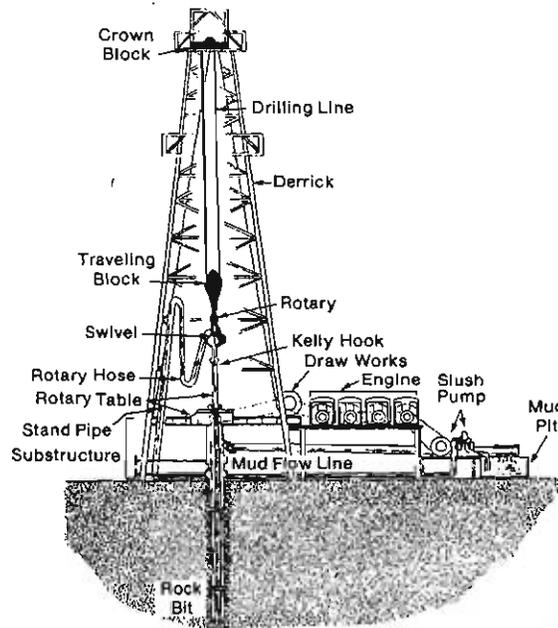
STATUS

Phase II Performance Tests

CO-OPERATING COMPANY
Maurer Engineering Inc.
Houston, Texas
TRW Mission Manufacturing
Houston, Texas
Gearhart-Owen Indus., Inc.
Fort Worth, Texas

CONTRACT(S)
DE-AC21-78MC08089

FIELD TEST PERIOD(S)
Performance
Phase I - February 1979
Field Tests
Phase II - December 1979
Directional Drilling Test
Phase III - Not Scheduled



OBJECTIVE

Determine performance and wear characteristics along with operational procedures required to apply the turbodrill to placing methane drainage boreholes in horizontal and/or steeply dipping coal seams.

FIELD ACTIVITY PROGRESS

- Maurer Engineering completed informal developmental testing at its Kor-King facility in Houston, Texas, on 28 December 1978. The tests utilized water as the working fluid. Design mods were made to the bearing pack based on the results of the tear-down inspection following each test.
- Formal Phase I testing began 20 February 1979. The test was prematurely terminated due to lower thrust bearing failure. A modification was made and testing resumed on 15 March.
- Performance testing was completed at TerraTek's Drilling Research Laboratory in Salt Lake City, Utah, on 10 and 11 April 1979. Sustained penetration rates in the range of 30 to 50 ft/hr were achieved.
- Drillability testing using the 7-3/4 inch motor was carried out at the Los Alamos Fenton Hill site. Average penetration rates of 20 ft/hr and above were observed.

OTHER TESTING

Turbodrill testing began 3 December. Twenty-three feet of hole were drilled before the turbodrill locked up. Upon disassembly and examination of the turbodrill, sand and mud were found along with damage to the lower thrust bearing.

ANALYSIS STATUS

Phase I data analysis is complete. TerraTek test data analysis is complete.
Phase I final report is in review at METC.

Maurer Turbodrill Testing

FIELD ACTIVITIES

Maurer Engineering performed five short-duration shakedown tests of the turbodrill. Baseline performance data were obtained. Teardown and inspection of the drill motor revealed design problems. Maurer Engineering instituted design modifications to the floating piston seal assembly in preparation for subsequent formal Phase I testing at TRW Mission Manufacturing. DOE/METC exercised the option to proceed into a modified testing project using the flow-through version of the bearing pack. When an adequate pressure seal is obtained, an abbreviated Phase I test may be run. At that point, the project will proceed directly into Phase III testing in a rugged field environment using the sealed bearing pack version.

Turbodrill testing began 3 December. Twenty-three feet of hole were drilled before the turbodrill locked up. Upon disassembly and examination of the turbodrill, sand and mud were found along with damage to the lower thrust bearing.

Phase II testing resumed the week of 21-25 January 1980. Bearing failures resulted in both turbodrills locking up. The tachometer did not produce discernible signals to indicate rotary speed downhole in the first test but indicated rotary speeds of 2400 to 2600 rpm in the second.

ANALYSIS ACTIVITIES

Preliminary baseline performance curves (at zero imposed bit-end pressure drops), have been determined from the shakedown tests and Phase I testing.

Preliminary indications of drilling rates to be expected at Gearhart-Owen were determined from the TerraTek data to aid in planning activities for Phase II testing.

Results of turbodrill teardown following resumed Phase II testing are:

- The lowest and uppermost radial roller bearings failed in the first motor: the outer races were cracked in both cases. The roller cage in the lowest radial bearing was bent and extruded in part between two rollers. Two rollers in that bearing were broken. Other parts of the uppermost radial bearing were intact.
- In the second motor, the lower thrust bearing failed because of excessive loading due to hydraulic downthrust of the turbine.

RESULTS

- The tachometer unit run at Fenton Hill operated satisfactorily by transmitting pressure pulses from 8800 feet downhole.
 - Redesign of the floating-piston assembly on the oil reservoir of the sealed bearing pack model.
 - Elimination of the pressure seal assembly and use of the seal leak-sleeve in the flow-through version of the bearing pack.
 - Analyses of the preliminary shakedown test data and Phase I data show characteristic torque, power, efficiency, and rotary speed relationships as expected. However, pressure drops through the drill appear to be considerably higher than expected.
 - Penetration rates achieved in relatively hard rock at TerraTek are encouraging in meeting the projected schedule at Gearhart-Owen.
-

RESOURCE ENGINEERING
Field Operations in Progress

STATUS

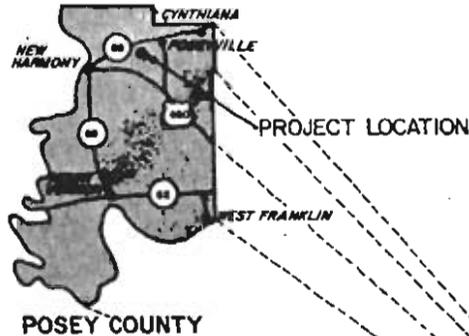
Field Operations in Progress

March 1980

CO-OPERATING COMPANY

Indiana Geological Survey
Bloomington, Indiana

Location: Sec. 26, T4S, R13W



CONTRACT(S)

FIELD TEST PERIOD(S)

Nov. 1979 - April 1980

OBJECTIVE

Provide gas content and desorption data from coals in the southeast part of the Illinois Basin in areas previously untested by MRCP.

FIELD ACTIVITY PROGRESS

- Drilling initiated
- Surface casing set
- The following coals have been intercepted:

Depth (ft)	Coal	Thickness (ft)
506.0	VII	3.0
562.0	Herrin	4.9
665.4	V	4.1
772.0	4a	2.2
827.0	4	2.5
906.5	IIIa	0.7

OTHER TESTING

- Desorption of coal samples
- Laboratory analyses of coal samples upon completion of desorption.

ANALYSIS STATUS

- Desorption in progress.

FIELD ACTIVITIES

- 20 December 1979 - At initial core point
21 December - Coal VII cored; sampled for desorption test.

Break for Holidays

- 8 January 1980 - Herrin coal cored; sampled for desorption test
24 January - Coal V cored; sampled for desorption test.
28 January - Mechanical and Hole problems delayed progress
19 February - Coal 4a cored; sampled for desorption
22 February - Coal 4 cored; sampled for desorption
26 February - Mechanical difficulties delayed progress
2 April - Coal IIIa cored, sampled for desorption
Mechanical difficulties delayed progress.

ANALYSIS ACTIVITIES

- Coal core desorption in progress.

RESULTS

RESOURCE ENGINEERING

Firm Planning

SAN JUAN BASIN
LA PLATA COUNTY, COLORADO

STATUS

Firm Planning

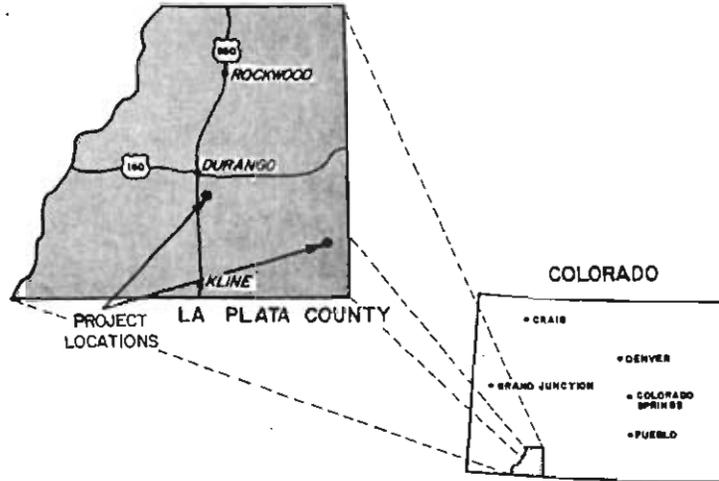
CO-OPERATING COMPANY
Fuel Resources Development
Co. (Fuelco)
Denver, Colorado
(303) 571-7703

Locations:

Either: D-21-34(SU)-9-N - Sec. 21, T34N, R9W
F-10-34(SU)-8-N - Sec. 10, T34N, R8W
F-21-34(SU)-7-N - Sec. 21, T34N, R7W

CONTRACT(S)

FIELD TEST PERIOD(S)



OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of the coal seams in the Ignacio Field Fruitland - Pictured Cliffs Formations, in the San Juan Basin. This effort will help determine the potential producibility of coal bed methane from this resource area.

FIELD ACTIVITY PROGRESS

Planned Tests

- Conventional Coring - Up to 120' in each well
- Drill Stem Testing - One DST in each well
- Sidewall Coring - Up to 50 cores in each well
- Geophysical Logging - Laterolog, Neutron Density, Sonic, Gamma, Caliper

OTHER TESTING

- Desorption of coal samples
- Lab analyses of coal samples

ANALYSIS STATUS

FIELD ACTIVITIES

ANALYSIS ACTIVITIES

RESULTS

TECHNOLOGY TEST PROJECTS

LONG HORIZONTAL HOLES, ACTIVE MINE TEST PROJECT
BUCHANAN COUNTY, VIRGINIA

STATUS.

Implementation Phase in Progress - Contracts Approved.

March 1980

CONTRACT(S)

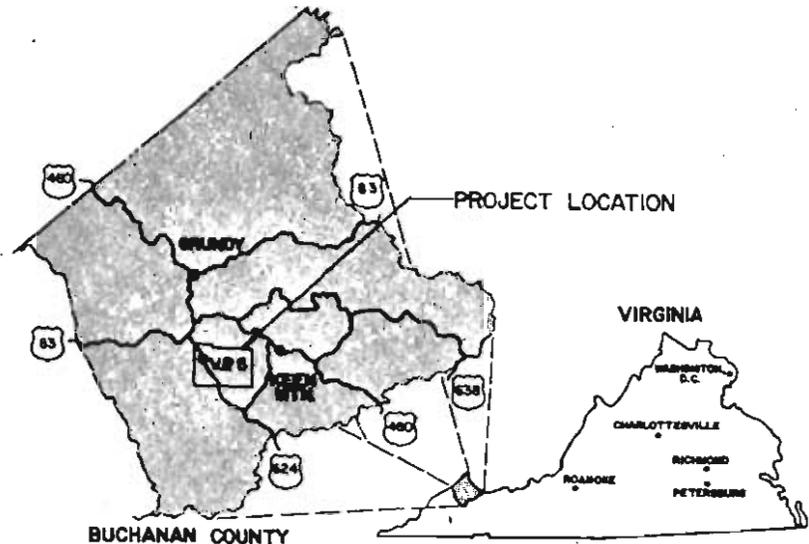
DE-AC21-78MC08089
Subcontract: H15730JJ96

Location: Island Creek Coal, Virginia Pocahontas Mine No. 5

CO-OPERATING COMPANY
Occidental Research Corp. (ORC)
Irvine, California with Island
Creek Coal Co., Lexington, KY

GENERAL SCHEDULE

Concept Phase - March 1978 to
August 1979
Design and - Sept. 1978 to
Verification October 1979
Phase
Implementation Nov. 1979 to
Phase - July 1981



OBJECTIVE

To develop a technique for recovery of methane from long horizontal holes drilled from within the mine and using the gas to produce LNG or in a similar application.

PROGRESS TO DATE

- Basic drilling techniques proven (multiple short and long-holes)
- Utilities in place
- Drilling of long-hole for validation completed
- In-mine piping for test site complete and extended
- Gas production approximately 705 MCFD from the four current holes (#4 through #8)
- Implementation phase has been initiated
- Technique for drilling through roof and along overriding seam for degasification was demonstrated.
- Surface vent hole installed for current drilling location.

RECOVERY SYSTEM SUMMARY

(5) 2000 ft horizontal holes drilled into longwall panel from mine. Use of a drill bit guidance system. Development of fail-safe piping system for in-mine use.

UTILIZATION SYSTEM SUMMARY

Pipeline to nearby mine site to small capacity developmental LNG or similar application if LNG not viable use. Alternate uses - Pipeline injection, minehead uses.

Long Horizontal Active Mine Test Project

DESIGN AND ANALYSIS ACTIVITIES

- Patent rights variation request by ORC is still under consideration by ORO. Contract was signed 17 September. Go-ahead by METC was given August 1979.
- Formal review of the project by TRW and DOE representatives was held 1 November.
- Preliminary utilization analyses show that at least two options are viable: coal drying and ventilation fan power. Other options, e.g. LNG, are still under study.
- Received DOE implementation phase approval. Executed contract modification.
- CY1980 contract was negotiated and approved.
- Implementing coal drying system as Oxy funded project. Other pipeline uses are in study.

FIELD ACTIVITIES

- Stopped drilling of first long-hole at 1550 feet due to high pressure and flow.
- Completed drilling on the second long-hole at 1730 feet. This part of the effort was for validation of techniques and to provide drilling baseline data. The hole will also be the first of five production holes. Gas production approximates 800 MCFD from the two long-holes and one 400 foot hole.
- Drilled exploratory holes (#7 and #8) into the #4 overriding seam. This unmined seam occasionally vents significant amounts of gas into the mining area (#3 seam) and some predrainage is desirable.
- Completed communication tests on Nos. 4, 5, and 6 holes with #6 in full operation
- Holes Nos. 4, 5, 6, 7, and 8 are currently being produced at 705 MCFD.
- Initiated drilling on #9 hole
- Installed vent to surface
- Added 5000 feet of vent lines.

SCHEDULE

Note: Overall schedule being revised for CY 1980.

MULTIPLE COMPLETION DEVELOPMENT TEST PROJECT
GREENE COUNTY, PENNSYLVANIA

STATUS

Design and Validation Phase in Progress

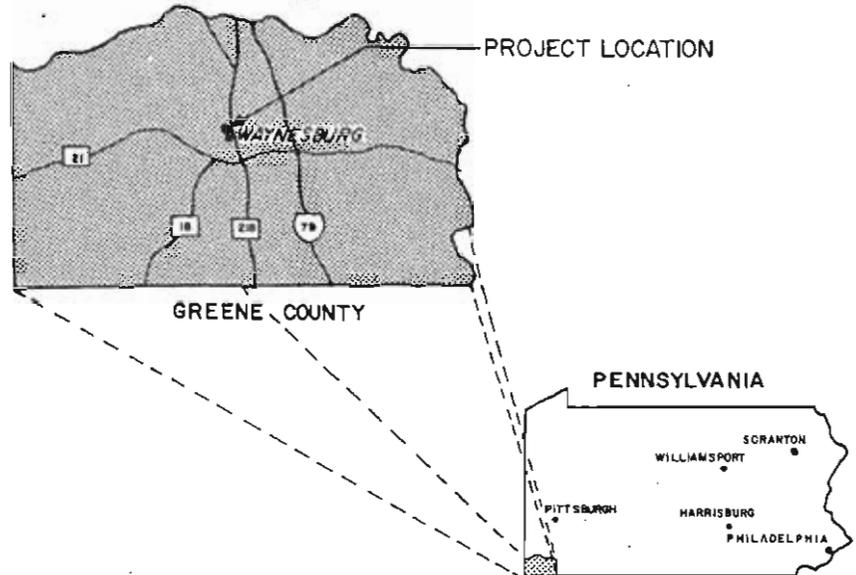
March 1980

CONTRACT(S)
DE-AC21-78MC08089
Subcontract: H12719JJ9S

CO-OPERATING COMPANY
Waynesburg College
Waynesburg, Pennsylvania

GENERAL SCHEDULE
Concept Phase - Mar 1978
to Aug 78
Design and Veri- Aug 1979
fication Phase Oct 1979
Implementation - Nov 1979
Phase Mar 1980

Location: Purman Run Tract on college campus North of Waynesburg



OBJECTIVE

To develop and demonstrate a multiple completion technique system considering a variable need for dewatering each zone and utilizing the recovered methane in a local distribution pipeline.

PROGRESS TO DATE

- Basic site and target coal seams identified
- Pipeline route and tie-in point identified
- Cost estimate complete
- Potential benefits estimated
- Subcontract negotiated and signed
- EA completed
- Completed drilling plan and preliminary geological work-up
- Permitting tasks complete
- Core drilling and core analysis activities are underway
- Well completion options are being evaluated
- Coring completed
- Production well drilled, cased, and cemented
- Logging program completed
- Perforated casing and nitrogen/foam fractured target seams.
- Installed down hole water pump, rods, tubing after bailing and swabbing

RECOVERY SYSTEM SUMMARY

Single well drilled into three seams overlain by the college facilities. Isolation and stimulation of individual zones planned. Multiple dewatering pumps considered in design.

UTILIZATION SYSTEM SUMMARY

Recovered gas to be utilized in college's distribution system. Estimates of production will satisfy 70 percent of peak demand.

Multiple Completion Development Test Project

DESIGN AND ANALYSIS ACTIVITIES

Design and verification phase completed; implementation phase in progress
 Environmental Assessment completed
 Drilling Plan completed
 Technique for coal stimulation evaluated in light of recent frac job conducted in Pennsylvania and other states
 Results of coal core analyses are indicated below:

Sample No.	Coal	Depth (ft)	Lost Gas cc/gm	Desorbed Gas cc/gm	Residual Gas cc/gm	Total Gas cc/gm	cf/ton
41	Waynesburg	149	0.06	1.58	1.15	2.8	90
42	"	153	0.02	1.07	1.06	2.2	70
43	Sewickley	371	0.07	2.66	2.01	4.7	150
44	"	486	0.05	1.88	2.63	4.6	147
45	Pittsburgh	489	0.08	2.15	1.89	4.1	131
46	"	491	0.15	2.82	2.60	5.6	180
J-L-1	(Rider)	483	0.10	2.75	1.33	4.2	134
155	Bakerstown	888	0.04	2.53	1.78	4.4	141
J-L-2	Upper Freeport	1085	?	1.48	2.12	3.6	115
47	Upper Kittanning	1187	0.12	3.07	1.64	4.8	154
156	(Predom. Shale)	1188	0.35	3.75	2.00	6.1	195
48	Middle Kittanning	1238	?	2.41	0.67	3.1	99
142	Clarion	1292	0.10	2.93	1.39	4.4	141

OPERATIONAL ACTIVITIES

Well Site survey completed
 Mud pit and access road constructed
 Coring contractor initiated coring on October 23
 Coring completed 18 December
 Production well drilled to TD 29 January and required geophysical logs run
 Well completion in progress. Down hole pump and tubing installed and electric power service installed.

SCHEDULE

MILESTONE/ACTIVITY	1979											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Phase I Report	▲											
Begin Coring										▲		
Complete Coring										▲		
Complete Well Design										▲		
Complete Drilling Operations											▲	
Complete Multiple Fracturing												▲
Start Pipeline Hookup Tests												▲
Phase II Design Report												▲

**ANTHRACITE COAL DRAINAGE TEST PROJECT
LUZERNE COUNTY, PENNSYLVANIA**

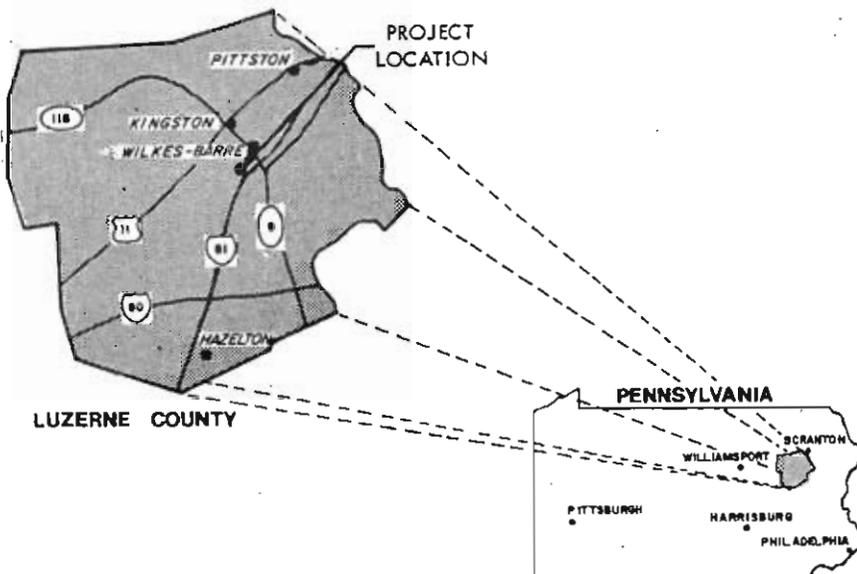
STATUS

Concept Phase Complete - Project deferred due to lack of DOE funding. As of 11/79

CONTRACT(S)

DE-AC21-78MC08089

Location Southwest of Wilkes-Barre on the Susquehanna



CO-OPERATING COMPANY

Pennsylvania Energy Resources, Inc. (PERI)
Wilkes-Barre, Pennsylvania

GENERAL SCHEDULE

Concept Phase - June 1976 to Aug 1978

Design and Verification } Indefinitely
Implementation } Deferred
Phase }

OBJECTIVE

To develop and demonstrate a system for the recovery of methane from anthracite coal using stimulated multiple, multiple completion wells and utilizing the gas by injection into a local pipeline.

PROGRESS TO DATE

- Experimental well drilled in 1976. Initial production was 85 MCFD before well was killed during hydraulic fracturing.
- Detail plan established for design and verification activities.
- Cost estimates completed for next phases.
- First draft of EA completed.

RECOVERY SYSTEM SUMMARY

(3) Multiple completion wells in Red Ash veins of Northern anthracite fields. Stimulation by gas, explosive or hydraulic fracturing.

UTILIZATION SYSTEM SUMMARY

Recovered gas to be utilized by injection into pipeline serving local area.

ANTHRACITE COAL DRAINAGE TEST PROJECT

DESIGN AND ANALYSIS ACTIVITIES

- Statement of Work has been structured to provide for one well to be drilled and tested during CY 1979. Completion will be delayed until CY 1980.

NOTE: The 1979 and 1980 work has been temporarily suspended at the direction of METC.

FIELD ACTIVITIES

- Site inspection conducted in mid-July
- Field trip for environmental planning conducted in August.

SCHEDULE

MILESTONE/ACTIVITY	1979											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Drilling Preparation - complete site selection - complete legal arrangements - complete well design					▲		▲					
Complete Initial Utilization System Design Prepare Maps Update Design Develop Procurement specifications Drill First Well Phase II Design Report	Project Indefinitely Deferred at DOE Direction											

5. SCHEDULES

Three types of schedules are shown in this section: the Master Schedule showing major project milestones, critical milestones for the next month, and major events scheduled for the following quarter.

5.1 MASTER SCHEDULE

The major milestones for the TRW MRCP for portions of CY 1979 and CY 1980 are shown in Figure 5-1.

5.2 PLANS FOR APRIL 1980

Engineering Support

- 15 April - Initiate draft MRCP Semi-Annual Report for the period ending March 31, 1980

Resource Engineering

- 3 April - Meet with Adolph Coors Company regarding Type III testing in Piceance Basin in Colorado
- 16 April - Meet with Navajo Nation regarding assistance for methane desorption analysis of coals
- 17 April - Complete field testing of Indiana Geological Survey well in Posey County, Indiana
- 17 April - Deliver Draft Western Washington Basin Report to DOE/METC for review
- 20 April - Deliver Draft Arkoma Basin Report to DOE/METC for review
- 25 April - Deliver Draft San Juan Basin Report to DOE/METC
- 28-29 April - Present paper at the 1980 Symposium on the Geology of Rocky Mountain Coal
- 30 April - Deliver Draft Green River Basin Report to DOE/METC.

Technology Test Projects

- 4 April - Complete contract mod for CY 1980 ORC effort
- 14 April - Install Jensen Jack and begin dewatering operations at Waynesburg College methane production well

MASTER PROJECT SCHEDULE

MILESTONES/ACTIVITIES	1979					1980									
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
PROJECT PLANNING ANALYSIS & SUPPORT															
- Project Plan (PPD)															
- Information Management Plan															
- Technology Transfer Plan															
- Semi-Annual Report															
- Turbodrill Testing															
RESOURCE ENGINEERING															
- Field Tests (Number Completed)															
- Field Site Geological Investigation															
- Basin Reports (Number Completed)															
TECHNOLOGY TEST PROJECTS															
- Horizontal Holes, In-Mine Drainage															
- Multiple Completion															
- Anthracite Coal															

Technology Test Projects (Continued)

- 30 April - Clean and plug 1903 well discovered during frac frac job at Waynesburg College
- 30 April - Install wellhead and surface equipment at Waynesburg College production well
- 30 April - Project review at ORC mine site
- 30 April - ORC paper presentation at Kentucky Industrial Coal Association

5.3 PLANS FOR MAY, JUNE, AND JULY 1980

Resource Engineering

- May-June - Establish cooperative agreements for coring, logging, and testing in areas of primary interest during CY 1980
- Mid-May - Deliver final Draft Arkoma and Western Washington Basin Reports to DOE/METC
- Late May - Present two papers at the UGR Symposium
- June - Conduct Type I Testing in two Fuelco wells in northern San Juan Basin

Technology Test Projects

- Early May - Waynesburg College methane well hookup to gas line
- Early May - Begin dewatering and methane production of Waynesburg College methane well
- Late May - ORC project review at Pittsburgh, Pennsylvania
- Late May - Participate in UGR/MRCP Symposium - 3 papers
- Late June - Review of ORC project at Irvine, California
- Late June - Industry inspection of UK drainage facilities
- Late June - National Coal Association meeting in Washington, D.C.

6. DELIVERABLE STATUS

The deliverables for the TRW effort are specified in Article III of the Contract. The status of each of the deliverables follows.

Reference: Article III, 1 Reports

<u>Paragraphs and Description</u>	<u>Delivery Date</u>	<u>Completion Status</u>
a. Monthly Progress Reports	Within 10 days after each month of contract performance.	PERIODIC
b. Monthly Financial Reports	Within 10 days after calendar month of performance.	PERIODIC
c. Contractor's Reports on Government-owned Capital Equipment	With each voucher.	AS APPLICABLE
d. Annual Reports	Within 15 days after annual period of contract.	CY 1978 - COMPLETED FEBRUARY 1979
e. Phase Reports	Within 10 days after completion of each phase of the work.	COMPLETED - DECEMBER 1978
f. Draft Final Report	Within 54 months after effective date of the contract.	WHEN APPLICABLE
g. Final Report	Within 30 days of DOE approval or recommended change of Draft.	WHEN APPLICABLE
h. Post Contract Reports	Semiannually after completion of the contract, if work continues at contractor's expense.	WHEN APPLICABLE

Reference: Appendix A, 1.2 Deliverables, 1.2.1 Phase I.

<u>Paragraphs and Description</u>	<u>Delivery Date</u>	<u>Completion Status</u>
a. Plan for Readily Available Central Data Base Information System.	A Phase I deliverable. Exact due date not specified.	COMPLETED - NOVEMBER 1979
b. Plan for Delineation of the Coalbed Methane Resource.	A Phase I deliverable. Exact due date not specified.	COMPLETED - FEBRUARY 1979
c. A preliminary & System Design d. for site developed for the first project.	A Phase I deliverable. Exact due date not specified.	COMPLETED - NOVEMBER 1978
e. A Program Plan	A Phase I deliverable.	FY 1980 ANNUAL UPDATE COMPLETED DECEMBER 1979
f. A List and Ranking of Potential Resource Contractors.	A Phase I deliverable. Exact due date not specified.	COMPLETED - MARCH 1979
g. A complete Technology Transfer Plan	A Phase I deliverable. Exact due date not specified.	COMPLETED - NOVEMBER 1979
h. An updated Cost Estimate for Phase I Options	A Phase I deliverable. Exact due date not specified.	COMPLETED - JULY 1978
i. An updated Cost Estimate for Phase II Options	A Phase I deliverable. Exact due date not specified	COMPLETED - DECEMBER 1978
j. Oral Presentation to TPO MERC at completion Phase I.	A Phase I deliverable.	COMPLETED - NOVEMBER 1978

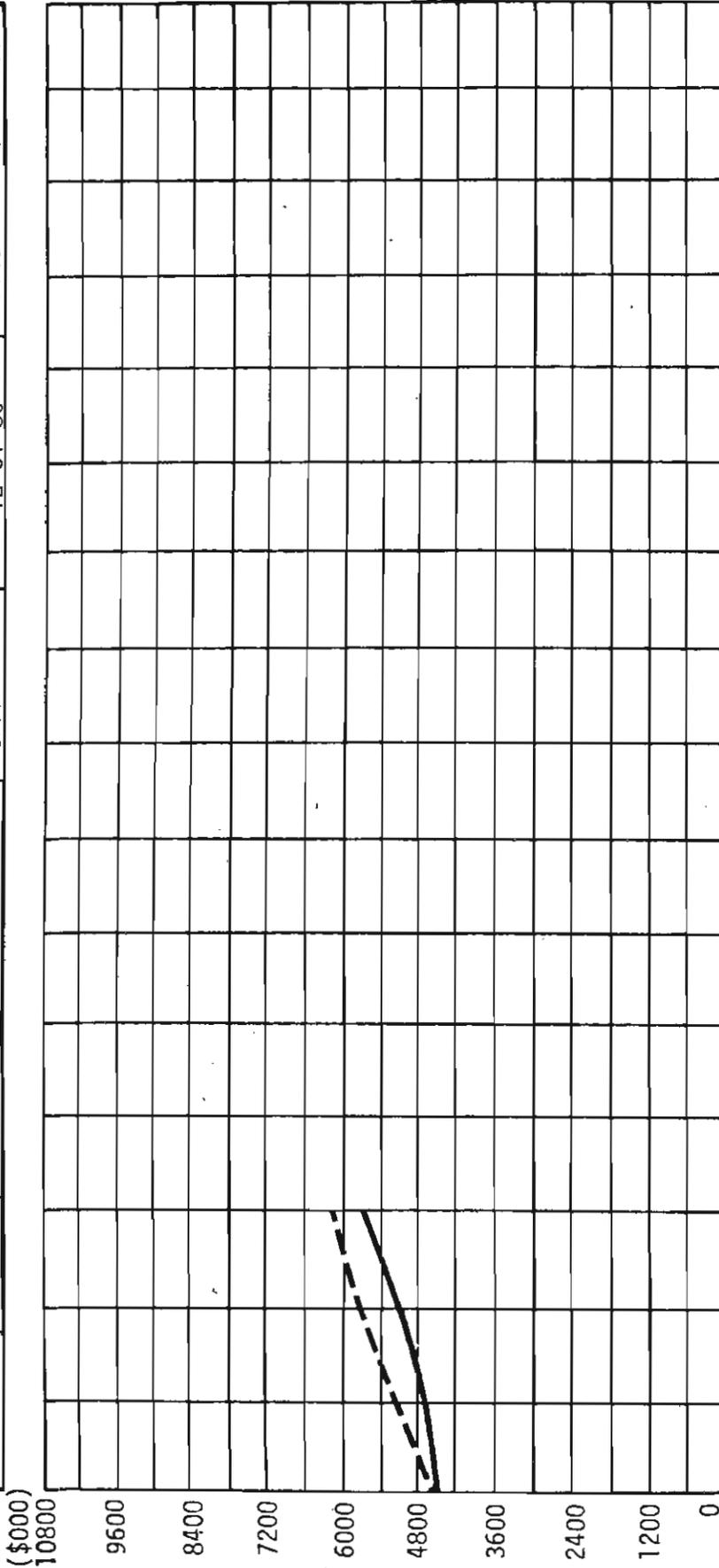
Reference: Contract Modifications Covering CY 1979 Effort (TBS)

<u>Paragraphs and Description</u>	<u>Delivery Date</u>	<u>Completion Status</u>
a. Well Test Reports	90 days after tests.	REQUIRED: <u>26</u> DELIVERED: <u>15</u> PAST DUE: <u>0</u>
b. Basin Reports	Approximately 6 week intervals starting in June	REQUIRED: <u>6</u> DELIVERED: <u>2</u> PAST DUE: <u>0</u>
c. Detailed Site Investigation Report	November 1979	FIELD ACTIVITIES COMPLETE - REPORT IN WORK
d. Phase II Design Report	30 days after completion of design.	REQUIRED: <u>2</u> DELIVERED: <u>0</u> IN WORK: <u>2</u>

7. EXPENDITURE STATUS

The expenditure plan and actual costs through the current reporting month are shown in Figure 7-1.

CONTRACT SUMMARY REPORT		CONTRACT TITLE		CUSTOMER	PERIOD ENDING
Methane Recovery From Coalbeds		DE-AC21-78MC08089		DOE	3-28-80
SALES NUMBER	CONTRACT NUMBER	CONTRACT TYPE	CONTRACT PERIOD	CONTRACT VALUE (\$ 000)	TOTAL
97141	78MC08089	CPFF	FROM: 2-12-77 TO: 12-31-80	COST FEE %	6145 451 7.3 6597



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PLAN	5166	5645	6145									
ACTUAL	4601	5137	5575									
VARIANCE	565	508	570									
COMMIT.	959	610	701									

DEVELOPMENTS/PROBLEMS THIS REVIEW PERIOD: This report reflects cost only. The actual cost for the month of March is \$438K. Budget reflects provisional cost increase of \$500K to continue performance thru April 1, 1980. High commitment includes \$200K to Occidental Petroleum Technology Test.

PROJECT MANAGER: A. Gillies
OPERATIONS MANAGER: R. L. Robertson

Figure 7-1. Expenditure Schedule

ATTACHMENT A

RESOURCE ENGINEERING

Field Operations Complete

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<u>Basin</u>	<u>Page</u>
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PICEANCE	F-1
GREEN RIVER	G-1
SAN JUAN	H-1
POWDER RIVER	I-1
WESTERN WASHINGTON	L-1

NORTHERN APPALACHIAN BASIN

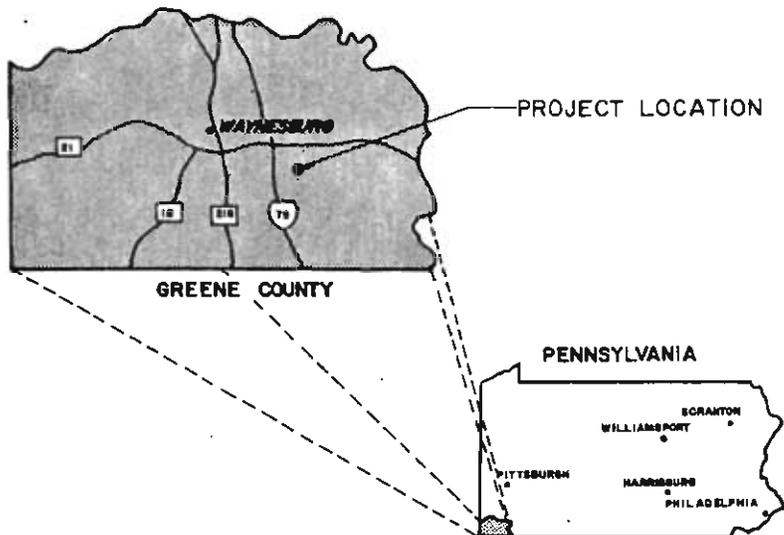
STATUS Complete

July 1979

CO-OPERATING COMPANY
Kinloch Development
Company

Location: #1 Murdoch Well; Whiteley Township, Greene County,
Pennsylvania ~1 mi. North of Fordyce along
Frosty Run.

CONTRACT(S)



FIELD TEST PERIOD(S)
April 3 - June 23, 1978

OBJECTIVE To test the effect of stimulation on the producibility of methane from
Pennsylvanian coalbeds.

FIELD ACTIVITY PROGRESS

- Drilling completed.
- Borehole geophysical logging - Neutron, compensated, density, induction - Completed.
- Sidewall coring - Completed.
- Perforation and pre-frac flow testing - Completed.
- Stimulation - Kiel process hydraulic fracturing - Completed.
- Post-frac injection testing - Completed.
- Gas and water production testing - Recommended but not carried out.

OTHER TESTING

- Desorption of sidewall core samples - Completed.

ANALYSIS STATUS

- All testing and analysis of tests completed.

FIELD ACTIVITIES

- April 3-7 - Drill to TD 1608 feet.
- April 8 - Log and sidewall core well.
- May 5 - Cement in 5-1/2 inch casing to TD.
- May 25 - Perforate 4 selected coalbeds.
- May 25-26 - Run casing-collar log and perforating record and cement band logs.
- June 7 - Complete pre-frac injection tests.
- June 7 - Stimulate well - Kiel frac process.
- June 23 - Final injection test.

ANALYSIS ACTIVITIES

- Desorption of sidewall core samples show that gas in content of coal seams ranges from 33.3 to 425.6 ft³/ton with the higher values from samples of the lower perforated coals.
- Pre-frac water injection test through acidized perms indicated permeabilities of 0.5 to 1.0 md depending on tested zone.
- Three stage frac at 3800 - 3900 psi (well above design) introduced 1533 bbl containing 18,480 lb 80-100 mesh and 15,750 lb 20-40 mesh sand.

RESULTS

- After frac, well flowed ~80 bbl water per day with show of gas.
- Sucker rod pump installed and produced water and gas. No water or gas monitoring equipment was installed so no quantitative measure of fluid production could be made.

WARRIOR BASIN

STATUS

Testing Complete - Analysis in progress

February 1980

CO-OPERATING COMPANY

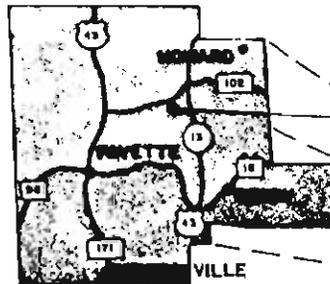
Grace Petroleum Corp.

Location: Davis Chapel Field, Sec. 34, T14S, R11W
Well No. 1 - Grimsley 35-15

CONTRACT(S)

FIELD TEST PERIOD(S)

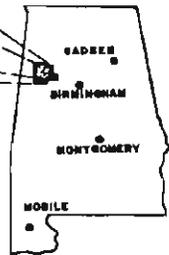
July 6-23, 1979



PROJECT LOCATION

FAYETTE COUNTY

ALABAMA



OBJECTIVE To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of several coal seams in the Pottsville Formation. This effort will help determine the potential productivity of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 551 feet.

Tests Performed

Conventional Coring

- 80 feet of core. Coal at 593-597, 1100-1102, 1675-1676, 1879-1882.

Logging

- Geophysical borehole logs - Dual induction (DISF), Formation density, compensated neutron, microlog and borehole compensated sonic log.

OTHER TESTING

- Desorption of coal samples.
- Laboratory analyses of coal samples.

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

- July 6 - Spud date
- July 9 - Core point reached
- July 11 - Cored Blue Creek seam, logged hole
- July 13 - Cored unnamed "H" seam
- July 15 - Logged hole
- July 16 - Cored Roosa seam
- July 17 - Cored Tidemore "B" seam
- July 23 - Final logging
- July 23 - Cemented production casing.

ANALYSIS ACTIVITIES

- Coal core desorption complete.

RESULTS

<u>Lithology</u>	<u>Sample Depth (ft)</u>	<u>Total Gas (cc)</u>	<u>Sample Wt (gm)</u>	<u>Total Gas Per Unit (cc/gm) (ft³/ton)</u>	
Coal	593	4950	1789	2.8	89.6
Coal	1102	2131	657	3.2	102.4
Coal	1675	650	1198	0.5	16.0
Coal	1880	2445	1113	2.2	70.4

ILLINOIS BASIN

STATUS

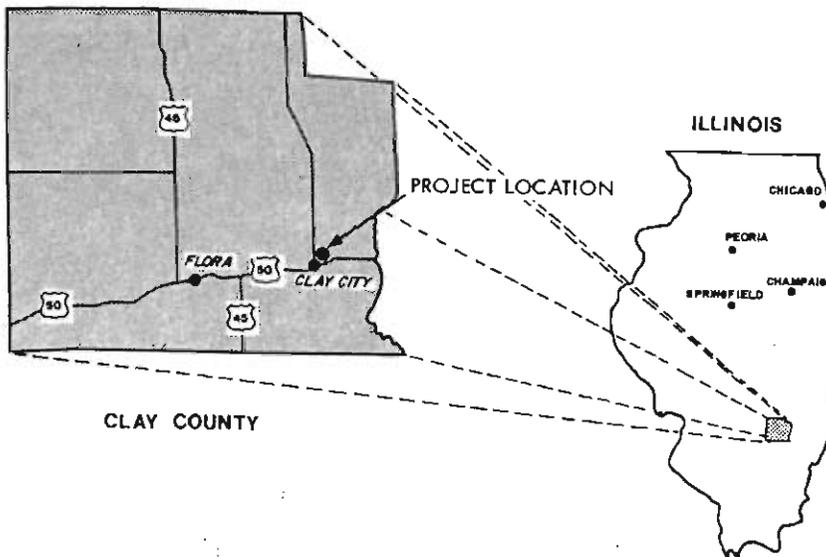
Testing Complete/Analysis in Progress

August 1979

CO-OPERATING COMPANY

Hagen Oil Company
Clay City, Illinois

Locations Henderson #2 Well, Elevation 451 feet,
Section 19, Township 3N Range 8E



CONTRACT(S)

DE-AC21-78MC08089

FIELD TEST PERIOD(S)

25 October to
28 October 1978

OBJECTIVE To determine the methane content and reservoir properties of numerous coal horizons within the Illinois Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 990 feet.

Tests Performed

- | | |
|---------------------|---|
| Conventional coring | ● 194 feet of core. Coal at 994-997, 1035-1037, 1077-1078, 1089-1091, and 1352-1352.5 feet. |
| Drill stem tests | ● Tests at 1342-1354, 1071-1083, and 1026-1038 feet. |
| Logging | ● Induction-laterolog, porosity, density, sonic, fracture identification. |
| Sidewall cores | ● Very little coal recovered. |

OTHER TESTING

Desorption complete.

ANALYSIS STATUS

In progress.

FIELD ACTIVITIES

- October 25
 - Coring with 30 foot barrel. Rates of 10 to 30 feet/hour.
 - Intervals 990-1020, 1023-1053, 1053-1067, 1067-1097, 1330-1360, 1400-1430, and 1480-1510 feet (TD).
 - Coal samples collected and placed in desorption canisters.
- October 27
 - Start drill stem tests in Seelyville coal - 1342-1354 feet.
- October 28
 - DST in Briar Hill (No. 5A), 1071-1083 feet.
 - DST in Herrin (No. 6) - misrun due to plugged tool.
 - Ran logs (induction, porosity, density, sonic, and fracture identification).
 - Attempts at sidewall coring aborted due to zero return - no charge for attempts.

Service Contractors: Christensen - Conventional coring
 Lynes - DST
 Schlumberger - Logging sidewall cores

ANALYSIS ACTIVITIES

- Desorption complete
- DST analysis completed, shut in pressures in Seelyville 479 to 466 psig; in Briar Hill 239 to 176 psig. No significant flows.
- Sidewall core desorption preliminary data - the gas content of the Danville (No. 7) coal was estimated by this technique to be 27.7 cubic feet/ton.
- Proximate/Ultimate Analysis complete.
- Porosity/Permeability of coal analyses complete; porosity is estimated to be between 3 and 7 percent; permeability is less than 0.1 md.

RESULTS

Conventional Core Desorption Results

<u>Depth of Sample</u>	<u>Lithology</u>	<u>Gas Content (Ft³/Ton)</u>
994	Coal	42
995	Coal } Danville (No. 7)	38
1035	Coal	29
1036	Coal } Herrin (No. 6)	35
1034	Shale (roof rock)	10
1077	Coal - Briar Hill (No. 5A)	32
1090	Coal - Harrisburg (No. 5)	38
1352	Coal - Seelyville	48

STATUS

Field and Laboratory Activities Completed/Evaluation in Progress November 1979

CO-OPERATING COMPANY

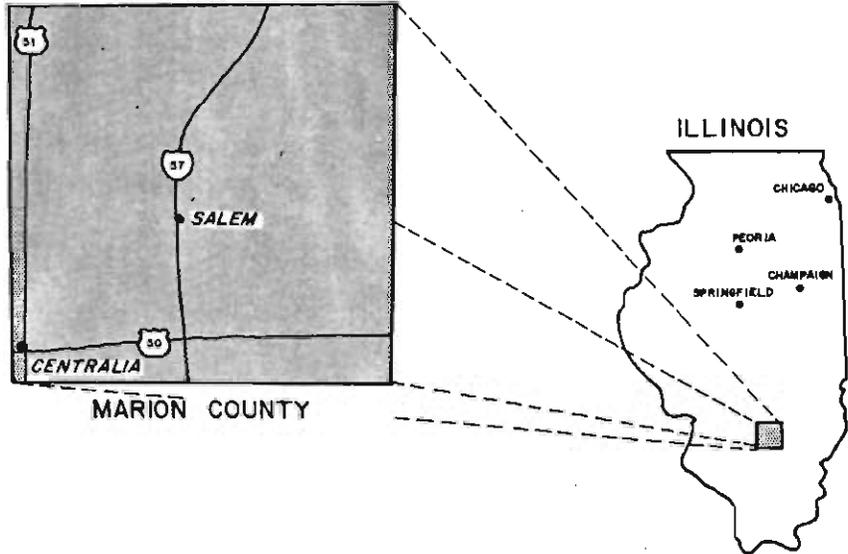
GeoWest Inc.
Billings, Montana
(406) 252-0070

Location: Confidential - Marion County, Illinois

CONTRACT(S)

FIELD TEST PERIOD(S)

May 12-17, 1979



OBJECTIVE

To determine coal thickness and gas content and some reservoir characteristics of these coals.

FIELD ACTIVITY PROGRESS

- Drilling and coring completed
- Borehole geophysical logging - electric, gamma-ray, gamma-gamma density, and caliper - completed.
- Drill stem test aborted because of hole sloughing.

OTHER TESTING

Desorption of coal samples
Laboratory analyses of coal samples

ANALYSIS STATUS

Evaluation in progress.

FIELD ACTIVITIES

12 May - Location selection

13 May - Site preparation

14-16 May - Drill and core coal seams encountered:

<u>Seam</u>	<u>Depth (feet)</u>	<u>Thickness (feet)</u>
Illinois No. 7	663.7	2.8
No. 6	698.0	5.1 (Upper part of seam drilled through)
No. 4	727.0	0.9
No. 5	732.4	4.0

16 May - Borehole geophysical logs run - Electric, gamma-ray, gamma-gamma density, and caliper.

17 May - Plug hole.

ANALYSIS ACTIVITIES

- Coal desorption complete.
- Porosity/Permeability and bulk density determination of roof and floor rock samples complete.
- Proximate/Ulimate analyses complete.

RESULTS

- Desorption of core

<u>Depth of Sample</u>	<u>Unit</u>	<u>Gas Content (Ft³/ton)</u>
664.8	Danville No. 7 coal	25.2
698.0	Herrin No. 6 coal	35.4
727.0	Briar Hill No. 5A coal	22.6
735.7	Harrisburg No. 5 coal	29.0
733.4	Harrisburg No. 5 coal	29.0
732.4	Harrisburg No. 5 coal	25.6

STATUS

Field Activities Complete/Analyses in Progress

March 1980

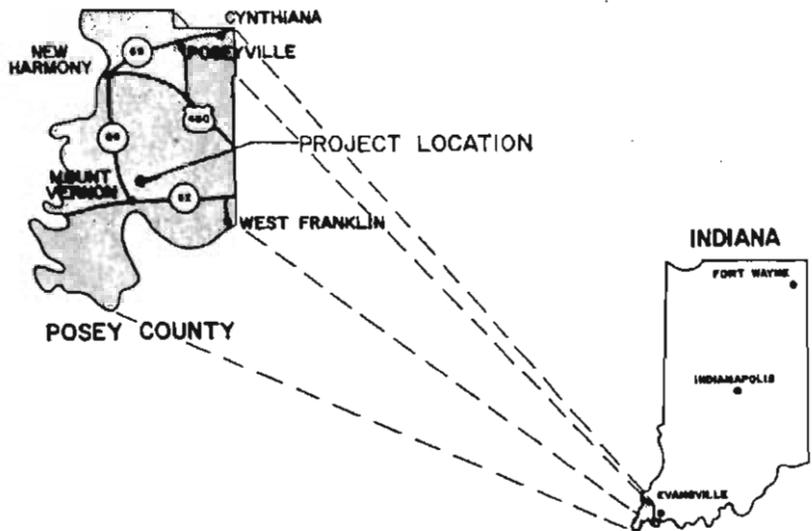
CO-OPERATING COMPANY
Indiana Geological Survey
Bloomington, Indiana
(812) 337-2862

Location: Sec. 33, T6S, R13W

CONTRACT(S)

FIELD TEST PERIOD(S)

Oct. 16 - Nov. 15, 1979



OBJECTIVE

Provide gas content and desorption data from coals in the southeast part of the Illinois Basin in areas previously untested by MRCP. Two wells in Posey County, Indiana, will be cored and logged.

FIELD ACTIVITY PROGRESS

- Field operations complete
- Desorption samples taken from the following coals:

Depth (ft)	Coal	Thickness (ft)
467.7	VII	2.0
517.5	Herrin	3.7
614.9	V	3.5
728.5	IVa	2.2
786.7	IV	1.3
879.0	III (Upper Split)	1.7
889.0	III (Lower Split)	5.0

- Borehole Geophysical logs run: Gamma-ray, SP, Resistivity

OTHER TESTING

- Laboratory analyses of coal samples on completion of desorption.

ANALYSIS STATUS

Desorption in progress.

FIELD ACTIVITIES

16 October	- At initial core point
18 October	- Coal VII cored, sampled for desorption test
23 October	- Herrin Coal member cored, sampled for desorption test
25 October	- Coal V cored, sampled for desorption test
31 October	- Coal IVa cored, sampled for desorption test.
1 November	- Coal IV cored, sampled for desorption test.
14 November	- Coal III (Upper Split) cored, sampled for desorption test.
14 November	- Coal III (Lower Split) cored, sampled for desorption test.
14 November	- Geophysical logs run.
15 November	- Hole plugged.

ANALYSIS ACTIVITIES

- Coal core desorption in progress.
- Residual gas determination and proximate/ultimate analyses planned for completion in April.

RESULTS

Preliminary Gas Desorption as of March 10, 1980:

COAL	DEPTH	DESORBED GAS cc/gm	RESIDUAL GAS	TOTAL GAS PER UNIT cc/gm	ft ³ /ton
VII	467	Desorption in progress			
Herrin	518	0.0*	0.5	?	?
V	616	0.4	0.4	0.8	26
4a	728	1.4	Analysis not complete		
4	787	1.5	Analysis not complete		
3	889	Desorption in progress			

cannister
leaked

STATUS

Field Operations Completed

March 1980

CO-OPERATING COMPANY

R. W. Beeson Oil Producer
Evansville, Indiana

Location: 1475' FSL, 925' FWL, 4 L 24

CONTRACT(S)

FIELD TEST PERIOD(S)

January 18-22, 1980

OBJECTIVE

To test the methane content of coals in this attractive, deep part of the Illinois Basin from which no specific gas content data is available.

FIELD ACTIVITY PROGRESS

- Field activity complete
- Coal cored as follows:

<u>Depth (ft)</u>	<u>Coal</u>	<u>Thickness (ft)</u>
1200.0	No. 13	5.7
1304.7	No. 9	5.0

- Geophysical logs run: Resistivity, Gamma Ray, Density, Neutron, SP, Sonic, and Caliper
- DST performed in each coal horizon: Formations were very tight -- permeability very low.

OTHER TESTING

- Desorption of coal core samples
- Lab analysis of coal, roof, and floor rocks.

ANALYSIS STATUS

- Desorption complete. Sample sent to USBM for remaining gas and proximate analysis
- Mechanical properties analysis complete.

FIELD ACTIVITIES

- 18 January 1980 - Site preparation, rig up, spud well
- 19 January - Core #1 - No. 14 coal not encountered
- 20 January - Core #2 - No. 13 coal sampled for desorption testing
- Cores #3 and #4 - No. 11 coal missing from section
- 21 January - Core #5 - No. 9 coal sampled for desorption testing
- TD @ 1324 feet
- Geophysical logs run
- DST initiated
- 22 January - DST completed
- Hole plugged.

ANALYSIS ACTIVITIES

- Desorption complete, sample sent to USBM for remaining gas and proximate analysis
- Roof and floor rock property testing in progress
- Coal log computer analysis complete
- Mechanical properties analysis complete.

RESULTS

Corehole desorption results from conventional cores:

Coal Seam	Depth (ft)	Lost Gas (cc/gm)	Desorbed Gas (cc/gm)	Remaining Gas (cc/gm)	Total Gas Per Unit (cc/gm) (ft ³ /ton)
#13	1200.0	0.03	0.59		
#13	1203.7	0.02	0.75		
#9	1305.2	0.04	0.61		
#9	1308.3	0.03	0.54		

ARKOMA BASIN

STATUS

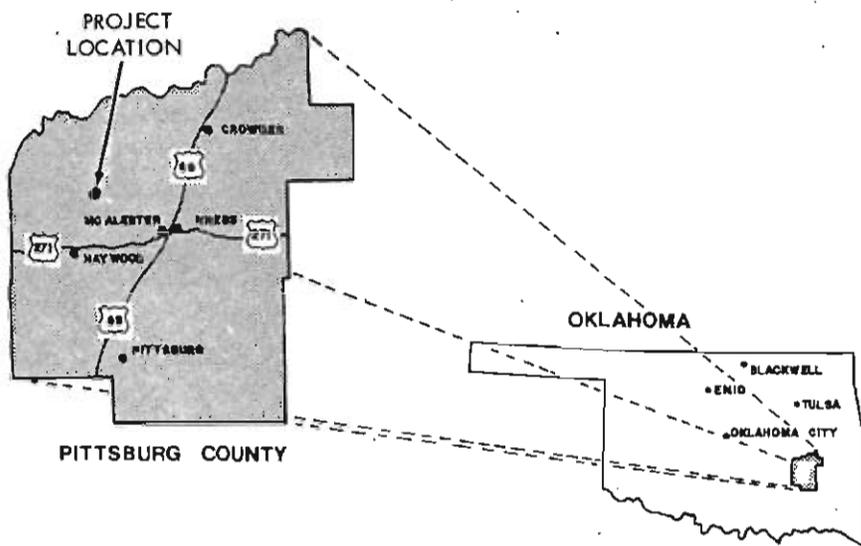
Testing Complete - Analysis in Progress

CO-OPERATING COMPANY
Arkla Exploration Co.
Shreveport, Louisiana

CONTRACT(S)
DE-AC21-78MC08089

FIELD TEST PERIOD(S)
9 October to
11 October 1978

Locations Brown Well #1-2, Elevation 755 feet
Section 2, Township 6N, Range 13E



OBJECTIVE To determine the methane content and reservoir properties of the Lower Hartshorne Seam in the Arkoma Basin as part of the effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing on this well was done during original drilling to 3150 feet.
- Tests Performed
 - Sidewall coring ● 36 cores obtained from 48 shots, 1820.0 to 2715.5 feet.
 - Drill stem tests ● Tested interval 2700 to 2740 feet. Pressure 716 psig, final flow 9.6 bbls/day.
 - Test interval 2127-2130 cancelled to eliminate risk of sticking pipe.

OTHER TESTING

Desorption of core samples by Geochem.
Logging by Arkla (Induction Later log, neutron density, and sonic).

ANALYSIS STATUS

Desorption completed.
DST indicates permeability of 4.5 md average, no formation damage.
Radius of investigation, 206 feet.

FIELD ACTIVITIES
 October 8 - Drilling reached 3150 feet, logging completed.
 October 9 - Sidewall cores taken.

<u>Interval</u>	<u>Shots</u>	<u>Cores Recovered</u>
1833.0 - 1834.0	2	2
1903.0 - 1906.0	4	3
2124.0 - 2131.0	20	17
2703.0 - 2732.0	22	18

October 10 - Circulated preparatory to drill stem tests at 2700 to 2740 feet.
 - After reaching bottom with DST tools, pipe tally showed improper test depth.

October 11 - DST tools repositioned and test conducted.

October 12 - Preparing for DST at 2127 to 2130 feet.

October 13 - DST cancelled by Arkla due to risk of sticking pipe below packer to bottom of the hole.
 - Testing completed.

Service

Contractors - Geochem - Sidewall cores, desorption
 Johnston - DST
 Schlumberger - Arkla logs

ANALYSIS ACTIVITIES

- Coal indicated on logs at depths shown above.
- DST results as calculated by Johnston using Horner method.

Flow	9.0 bbl/day, water
Pressure	Initial shut-in 716 psig, Final shut-in 710 psig
Permeability	4.5 md, average
Well Bore Damage	None
Radius of Investigation	- 206 feet
- Desorption in progress.

RESULTS

- Results from Geochem of sidewall cores:

<u>Interval</u>	<u>Lithology</u>	<u>Gas Content in Place (ft³/ton)</u>
1903-1905	Coal	130.9
2125-2130	Coal	211.2
2728-2733	Coal	72.6

STATUS

Pre-frac Field Operations Completed

March 1980

CO-OPERATING COMPANY

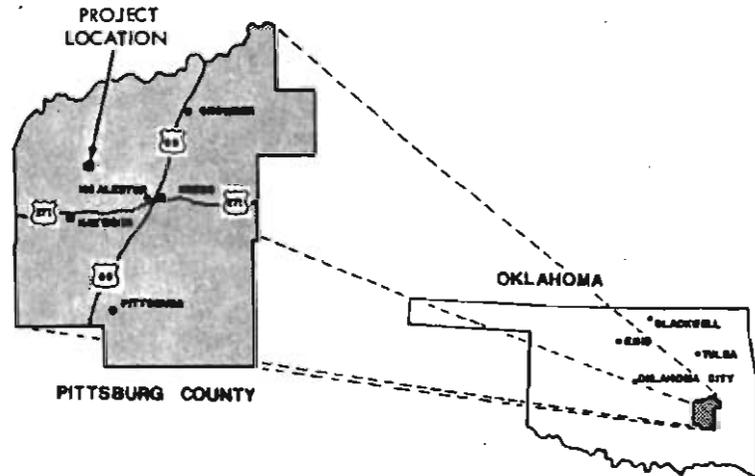
Mustang Production Co.
1100 East First National
Center
Oklahoma City, OK

Location: Barringer No. 1-11, Pittsburg County, OK
Sec. 11, T4N, R15E

CONTRACT(S)

FIELD TEST PERIOD(S)

July 4 - July 26, 1979



OBJECTIVE

To determine coal thickness and gas content and selected reservoir characteristics of these coals.

FIELD ACTIVITY PROGRESS

- Drilling and coring completed
- Borehole geophysical logging - electric, gamma-ray, spectralog, compensated density, and caliper - completed.

OTHER TESTING

Computer analysis of the coal seams for relative rank, thickness, moisture, mineral content, and ash content; desorption of coal samples; laboratory analyses of coal samples.

ANALYSIS STATUS

Desorption complete

FIELD ACTIVITIES

- July 11 - Coal horizon - Middle Booch, projected to be within the interval 3650 to 3662 ft.
 Core size - 3" core, using PVC plastic liner for the inner barrel.
 Interval cored - 3650' to 3662' - 12 feet, "air" coring
 Core recovered - 10.45' of core; 11" of which was coal
 Core loss - 1.55', attributed to core lifter slippage.
 Percent recovery - 87.1 percent.
- July 16 - Coal horizon - Upper Hartshorne, projected within the interval 4435 to 4458 ft.
 Core size - 3" core, using PVC plastic liner for the inner barrel
 Interval cored - 4435' to 4458' = 23 feet, "air" coring
 Core recovered - 0 feet
 Core loss - 23.00', attributed to the failure of the core lifter to react.
 Percent recovery - 0 percent.
- July 17 - Coal horizon - Lower Hartshorne, projected to be within the interval 4500 to 4593 feet.
 Core size - 3" core, using PVC plastic liner for the inner barrel
 Interval cored - 4580' to 4593' = 13.0 feet, "air" coring
 Core recovered - 5.5' of core; shale w/sandstone partings
 Core loss - 7.5' of core attributed to failure of the core lifter.
 Percent recovery - 41.3 percent.

ANALYSIS ACTIVITIES

- Design of fracture treatment is underway. A detailed proposed testing program was prepared, was reviewed by project participants and approved.
- Pre-frac and post-frac testing programs were prepared.
- Field operations were begun on February 11 and were terminated on February 13. Several attempts were made to swage out the collapsed casing at 1710 feet and 1744 feet downhole. The casing could not be repaired to accept the required packer unit for subsequent well completion operations. As a result, the Barringer well was abandoned as a viable prospect for type III testing.

RESULTS

Corehole Desorption Results from Conventional Cores

Lithology	Sample Depth	Sample Weight (gm)	Desorped Gas cc/gm	Residual Gas cc/gm	Total Gas cc/gm	Per ₃ Unit ft ³ /ton
Coal	3650-3651	1257	6.48	1.2	7.6	243.2

STATUS Field Operations Completed

February 1980

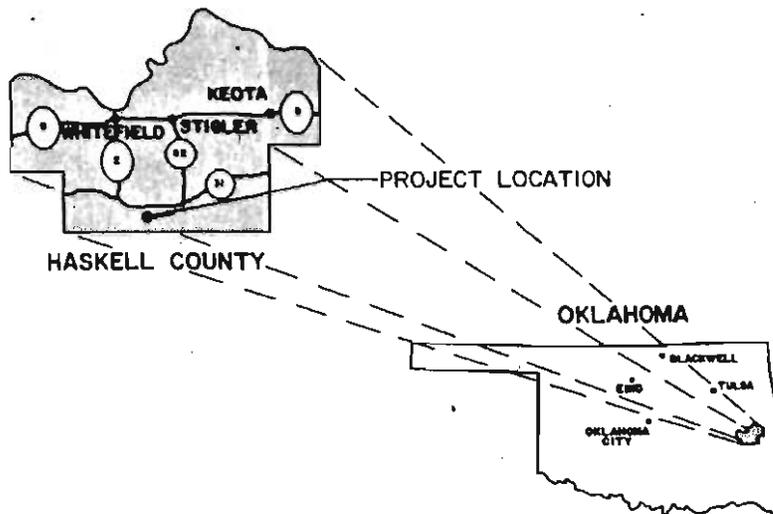
CO-OPERATING COMPANY
Mustang Production Company

Location: Day Well 1-14, Haskell County, Oklahoma
Sec. 14, T7N, R20E

CONTRACT(S)

FIELD TEST PERIOD(S)

July 4-26, 1979



OBJECTIVE To determine coal thickness and gas content and some reservoir characteristics of these coals

FIELD ACTIVITY PROGRESS

- Drilling and coring completed
- Borehole geophysical logging - electric, gamma-ray, spectralog, compensated density and neutron, and caliper - Completed.
- Being considered for type III testing.

OTHER TESTING

- Computer analysis of the coal seams for relative rank, thickness, moisture, mineral content, gas content and ash content.

ANALYSIS STATUS

In progress.

FIELD ACTIVITIES

- July 7
- Coal horizon - Upper Booch, projected to be within the interval 1615 to 1643 f
Core size - 3 1/2" core, using the standard steel inner barrel liner.
Interval cored - 1615 to 1643 feet - 28 feet, "air-mist"
Core recovered - 25.30" of core
Core loss - 2.70 feet of core caused by slippage of the core lifter
Percent recovery - 90.4 percent, all shale.
- July 21
- Core horizon - Hartshorne Undivided, projected within the interval 2585 to 2613 f
Core size - 3" core, using PVC plastic liner for the inner barrel
Interval cored - 2585 to 2613 feet - 28 feet, "air mist"
Core recovered - 18.45 feet of core, shale with sandstone partings
Core loss - 9.55 feet of core; 6 feet of which is believed to be coal and
3.55 feet of which is believed to be bottom rock. Coal core
loss attributed to air jetting of a soft and friable material.
Loss of bottom rock attributed to core lifter failure.
Percent recovery - 65 percent.

ANALYSIS ACTIVITIES

- Computer analyses of the well logs in progress.

RESULTS

STATUS

Field Operations Completed

March 1980

CO-OPERATING COMPANY

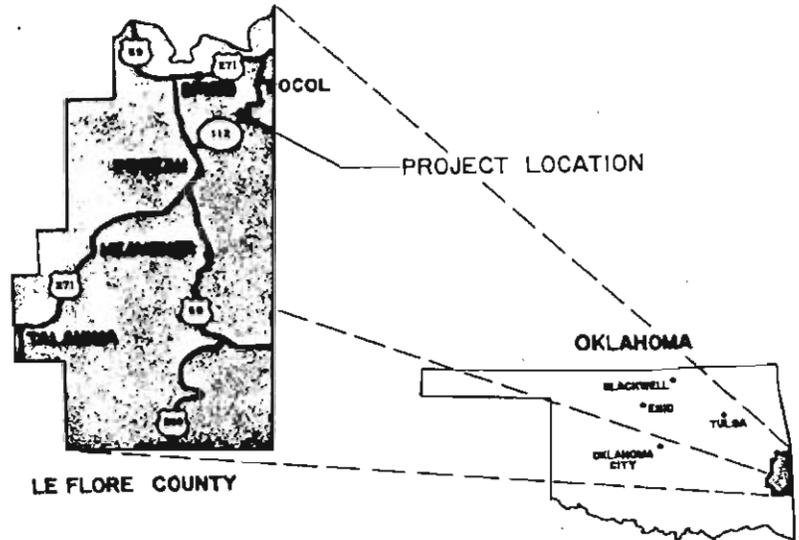
U.S. Bureau of Reclamation
Amarillo, Texas

Location: Well #DH-A17. Section 14, T8N, R26E
SW $\frac{1}{4}$ of NW $\frac{1}{4}$

CONTRACT(S)

FIELD TEST PERIOD(S)

September 6-14, 1979



OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of the Hartshorne Formation. This effort will help determine the potential productivity of coalbed methane from the eastern Arkoma Basin.

FIELD ACTIVITY PROGRESS

Testing was performed during the original drilling at:

Tests Performed

- | | |
|---------------------|--|
| Conventional Coring | ● 10 ft of core. Coal at 191.6 - 194.5 feet. |
| Logging | ● Borehole geophysical logs run - SP, gamma-ray, caliper, and density. |

OTHER TESTING

- Desorption of coal sample
- Laboratory analysis of coal sample to be completed in future.

ANALYSIS STATUS

- Desorption complete.

FIELD ACTIVITIES

- September 6 - Spud date, began coring from surface to TD
- September 11 - Recovered 2.9 feet of coal (Lower Hartshorne seam)
- September 13 - Reached TD, USGS logged hole

ANALYSIS ACTIVITIES

- Coal desorption complete.

RESULTS Corehole desorption results from conventional cores:

Lithology	Sample Depth (ft)	Total Gas (cc)	Sample Wt (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Total Gas Per Unit (cc/gm) (ft ³ /ton)	
Coal	191.6-192.6	12,739*	1363	8.5	0.9	9.4	300.8

*Includes lost and residual gas

PICEANCE BASIN

STATUS

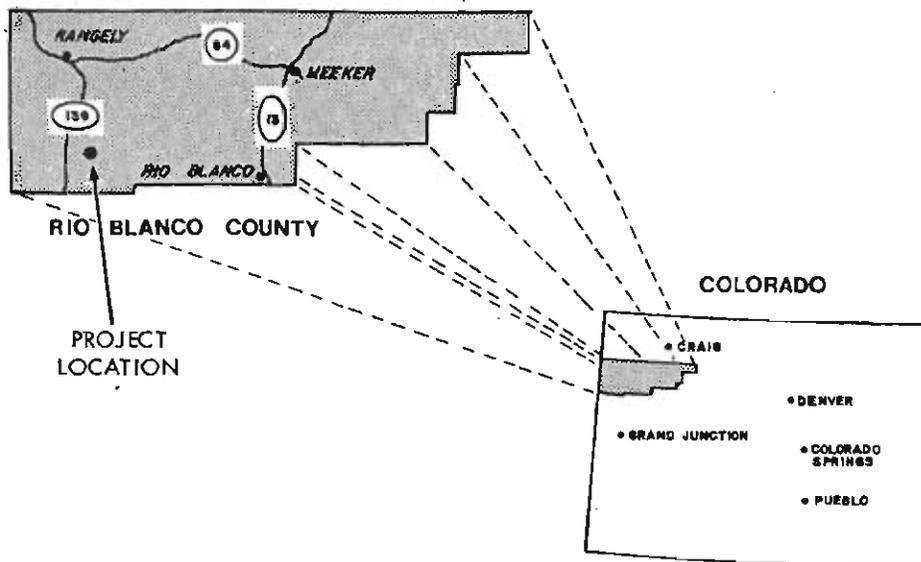
Testing Complete/Analysis in Progress

February 1980

CO-OPERATING COMPANY

Fuel Resources Development
Company
Denver, Colorado

Location: Cathedral 0-28-3-101-S - Sec. 28, T3S, R101W



CONTRACT(S)

FIELD TEST PERIOD(S)

September 9-10, 1978

OBJECTIVE To determine the methane content and reservoir properties of coal seams within the Lower Mesaverde Formation sediments in the Piceance Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 7894 feet.

Tests Performed

Results/Comments

Conventional coring

- 142 feet of core, coal samples taken at 1584-1586 and 1603-1604 feet.

Logging

- Compensated neutron-formation density, dual induction-laterolog.

OTHER TESTING

Coal core desorption
Proximate/ultimate analysis

ANALYSIS STATUS

Desorption of cores completed.

FIELD ACTIVITIES

- September 7 • Spudded in bedrock
- September 9 • Began coring, cored 90 feet
- September 10 • Cored 52 feet
- September 11 • Began logging by Schlumberger
- September 12 • Rigged down Schlumberger and rigged up casing crew
- September 13 • Released rig

ANALYSIS ACTIVITIES

- Desorption of two coal samples complete
- Laboratory analysis (proximate/ultimate, heating value, sulfur forms) completed

RESULTS

- Desorption data from conventional cores;

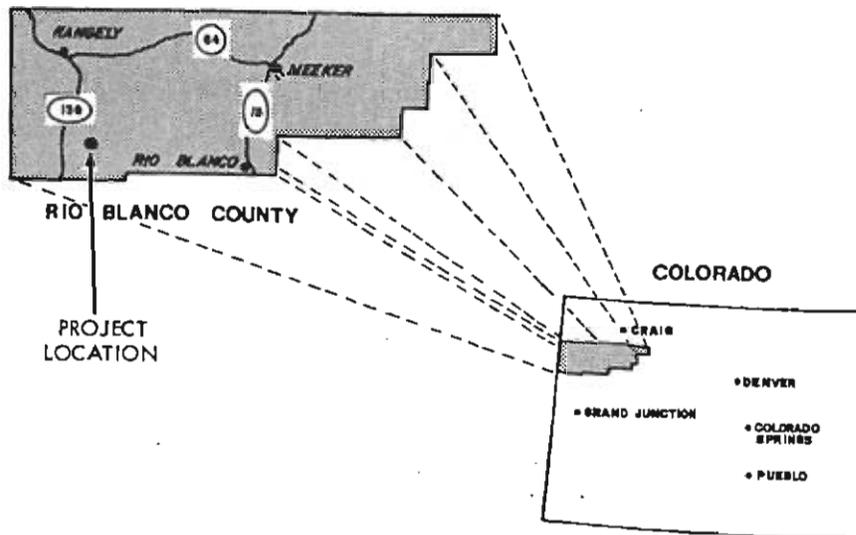
Sample Depth (Ft)	Total Gas (CC)	Sample Wt. (gm)	Total Gas Per Unit	
			(cc/gm)	(Ft ³ /Ton)
1585	898	1584	.6	19.2
1603	364	144	2.5	80.9

STATUS Testing Complete
No Further Activity

July 1979

CO-OPERATING COMPANY
Twin Arrow Drilling Co.
Rangely, Colorado

Locations C&K Well #1-13, Elevation 6910 feet.
Section 13, Township 3S, Range 101W



CONTRACT(S)
DE-AC21-78MC08089

FIELD TEST PERIOD(S)
3 October to
7 October 1978

OBJECTIVE To determine the gas permeability, flow rate and producibility of several coal seams of the Mesaverde Formation in the Piceance Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS	Results/Comments
Well in process of being abandoned by Twin Arrow. Plug set at about 1050 feet to isolate coal seams prior to initial testing.	
Zones tested. 573-581, 627-665, 726-736, 801-810.	
<u>Testing Sequence, all zones</u>	<u>Results/Comments</u>
Pressure and flow tests	No pressure, no flow
Squeeze cemented	1050 to 320 feet
Cement Bond Log	100 - 883 feet
Perforated	1 shot per foot
Acid treated	7.5% HF
Swabbed	Dry
Pressure and flow tests	No pressure, no flow
Fracture and flow test	Not performed due to no gas shows.

OTHER TESTING
Logs available from original drilling effort.
Induction, electric compensated density.

ANALYSIS STATUS
No further site specific analysis activity.

FIELD ACTIVITIES

- October 3. Swabbing attempted while awaiting bridge plug, unable to swab dry. Shut in.
- October 4. Bridge plug set at 1050 feet and hole swabbed dry. Hole continues to make water at 2.5 bbl/hr. Pressure and flow are negligible.
- October 5. Hole cemented from top of existing cement (-1050 feet) to 320 feet.
- October 6. Cement Bond log run. Perforated 5 zones at 1 shot/ft.
- October 7. Treated all zones with 7.5% MF. Total acid - 500 gal. Swabbed dry and pressure tested. Shut-in pressure zero. No flow observed through 1/8 inch orifice. Operations terminated.
- Service Contractors - Halliburton - Bridge plug, cementing, acidizing
Schlumberger - Bond log, perforating
Wellx - Original logs

ANALYSIS ACTIVITIES

In this area the Mesaverde is divided into upper and lower. Upper is brown and yellowish gray massive sandstone and gray shale with principal coalbeds near base. Lower is light gray and brown massive sandstone, gray shale and some coal. Based on Twin Arrow logs coal is present at 573-581, 627-633, 661-665, 726-736, 801-810. Other coal in thinner, deeper seams and in washed out hole areas at 1278-1282, 1494-1496, 1864-1870, 2116-2119, and 2148-2154. These zones to be tested in another well.

While no shows are now evident, original well tool pusher recalls show at 320 feet. It is possible that a bridge sealed off small sand from perforations.

RESULTS

No gas show in coals. Drilling site is on mesa with valley floor lower than intervals tested. It is possible any original gas in place was lost to the atmosphere.

See site AC in same locale.

PICEANCE BASIN
RIO BLANCO COUNTY, COLORADO

Site FAC

STATUS Testing Complete/Analysis in Progress

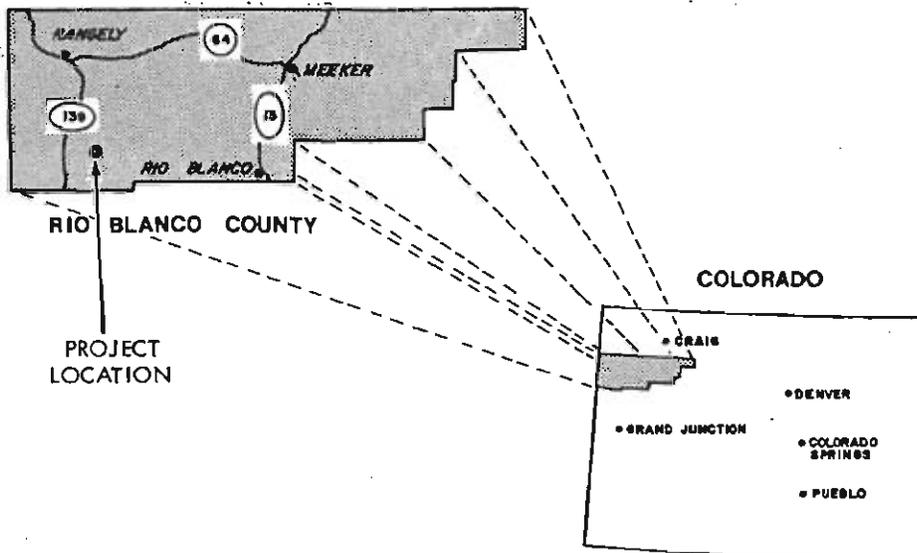
August 1979

CO-OPERATING COMPANY
Twin Arrow Drilling Company
Rangely, Colorado

Location: C&K Well #4-14 - Sec. 14, T3S, R101W

CONTRACT(S)

FIELD TEST PERIOD(S)
November - December
1978



OBJECTIVE To determine the content and reservoir properties of multiple coal seams of the Mesaverde Formation in the Piceance Basin as part of an effort to delineate the potential from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during original drilling at 6931 feet.

Tests Performed

Results/Comments

Conventional coring

- 150 feet of core. Coal at 685.2-685.6, 698.1-698.45, 770.9-771.6, 772.5-773.8, 759.2-760.0, 801.9-802.6, 804.4-805.0, 809.4-809.7, 986.5-987.3

OTHER TESTING

Desorption in progress
No logs run due to lost hole; logs run on #4-14X at same location.

ANALYSIS STATUS

Preliminary desorption data available.

FIELD ACTIVITIES		
November 18	●	First truck loads of rig equipment moved to site
November 20-24	●	Rigging up
November 25	●	Spud date, shaft pilot bearing froze
November 26	●	Repairs
November 27	●	Repair Kelly bushings, drill surface
November 30	●	Trip in for core #1
December 1	●	Trip in for core #2, core #3, core #4
December 2	●	Trip out for core #4, reaming, drilling
December 3	●	Repairs
December 4	●	Coring for CER
December 5	●	Coring for CER
December 8	●	Fish in hole
December 11	●	Fishing completed
December 14-28	●	Tried to whipstock out of plugged hole. Hole abandoned on December 28, 1979

ANALYSIS ACTIVITIES

- Desorption in progress
- No well testing was performed because the hole was lost

RESULTS

- Preliminary desorption results

<u>Depth of Sample</u>	<u>Lithology</u>	<u>Gas₃ Content (Ft³/Ton)</u>
685.2-685.6	Coal	151.4
698.1-698.45	Carb Shale/Coal	130.3
770.9-771.6	Carb Shale/Coal	33.1
759.2-760.0	Coal	156.2
772.3-773.6	Carb Siltstone	126.1
801.9-802.6	Coal	107.7
804.5-805.0	Carb Shale	136.6
809.3-809.7	Coal	339.2
986.5-987.3	Coal	111.0

STATUS

Field Operation completed

March 1980

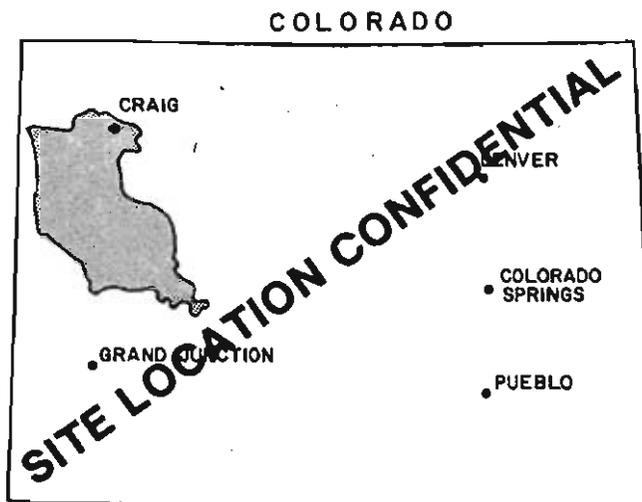
CO-OPERATING COMPANY

Confidential Well #2

CONTRACT(S)

FIELD TEST PERIOD(S)

June 11-20, 1979



OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of three coal seams. This effort will help determine the potential productivity of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 5463 feet.

Tests Performed

Results/Comments

Conventional Coring

- 43 feet of core. Coal at 1324.7 - 1325.9, 1325.9 - 1327.1, 1330.65 - 1338.8, 1351.2 - 1352.1

Logging

- Borehole geophysical logs run - electric, gamma-ray, gamma-gamma density, and caliper.

OTHER TESTING

- Desorption of coal samples
- Laboratory analysis of coal samples to be completed.

ANALYSIS STATUS

- Desorption in work - initial indications of low gas content

FIELD ACTIVITIES

- 16 June - Pilot hole logged
 17 June - Spud date for core hole
 19 June - Core point reached

<u>Seam</u>	<u>Depth (ft)</u>	<u>Thickness (ft)</u>
"E"	1324.7	2.4
"D"	1330.6	8.2
"C"	1351.2	0.9

20 June - Borehole geophysical logs run - electric, gamma-ray, gamma-gamma density and caliper

- Demobilization

ANALYSIS ACTIVITIES

- Coal core desorption in progress
- Laboratory analysis of coal samples (proximate/ultimate, heating value, sulfur form) to be conducted on completion of desorption.

RESULTS Desorption data from conventional cores:

<u>Lithology</u>	<u>Sample Depth (ft)</u>	<u>Total Gas (cc)</u>	<u>Sample Wt (gm)</u>	<u>Total Gas Per Unit (cc/gm) (ft³/ton)</u>	
Coal	1324.68-1325.85	2530	1558	1.9	60.8
Coal	1330.65-1331.65	2923	1599	1.9	60.8
Coal	1333.3 -1334.3	2675	1614	1.7	54.4
Coal	1335.8 -1336.8	2310	1651	1.5	48.0
Coal	1351.1 -1352.1	2148	1453	1.5	48.0

STATUS

Field Operations Completed

March 1980

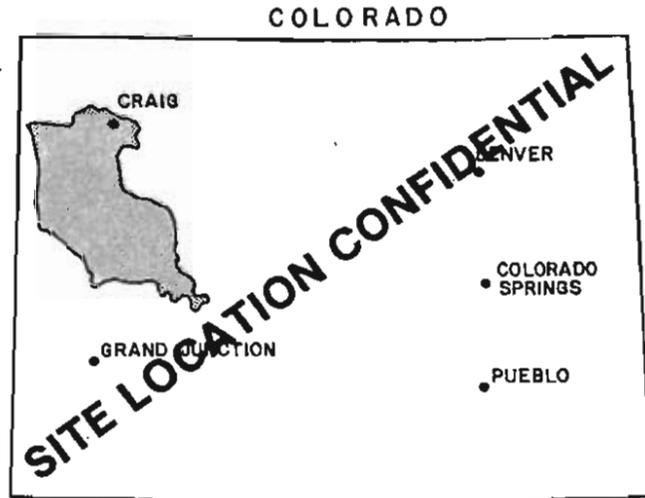
CO-OPERATING COMPANY

Confidential Well #3

CONTRACT(S)

FIELD TEST PERIOD(S)

June 26 - July 1, 1979



OBJECTIVE To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of six coal seams. This effort will help determine the potential productivity of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 5344 feet.

Tests Performed

Conventional Coring

- 79 feet of core. Coal at 741.75-748.18, 758.71-761.01, 764.92-770.0, 770.0-772.5, 794.65-796.8, 797.5-801.5, 805.6-810.97. Eight samples placed in canisters for desorption.

Logging

- Borehole geophysical logs run - Electric, Gamma-Ray, Gamma-Gamma, and Caliper

OTHER TESTING

- Desorption of coal samples.
- Laboratory analysis of coal samples to be completed.

ANALYSIS STATUS

- Desorption in progress - Initial indications of low gas content.

FIELD ACTIVITIES

- June 29 - Spud date, surface casing set.
 June 30 Core point reached (depth 740.0 feet)
 June 30-July 1 - Cored six coal seams.

<u>Seam</u>	<u>Depth (ft)</u>	<u>Thickness (ft)</u>
"F"	741.75-748.18	6.43
"E"	758.71-761.01	2.30
"D"	764.92-772.5	7.58
"C"	794.65-796.8	2.15
"B"	797.5 -801.5	4.0
"A"	805.6 -810.97	5.37

- July 2 - Borehole geophysical logs run - electric, gamma-ray, gamma-gamma density and caliper.

ANALYSIS ACTIVITIES

- Coal core desorption in progress.
- Laboratory analysis of coal samples (proximate/ultimate, equilibrium moisture) to be conducted following completion of desorption.

RESULTS Desorption data from conventional cores:

<u>Lithology</u>	<u>Sample Depth (ft)</u>	<u>Total Gas (cc)</u>	<u>Sample Wt (gm)</u>	<u>Total Gas Per Unit (cc/gm) (ft³/ton)</u>	
Coal	741.25-742.25	318	1678	0.2	6.4*
Coal	744.25-745.25	3610	1820	2.0	64.0
Coal	758.72-759.72	2838	1596	1.9	60.8
Coal	764.87-765.87	3810	1731	2.2	70.4
Coal	771.50-772.50	3705	1622	2.3	73.6
Coal	795.40-796.40	3168	1646	2.0	64.0
Coal	797.45-798.45	2910	1620	1.8	57.6
Coal	808.60-809.30	1850	1665	1.1	35.2

*Possible canister leak

STATUS

Field operations completed.

March 1980

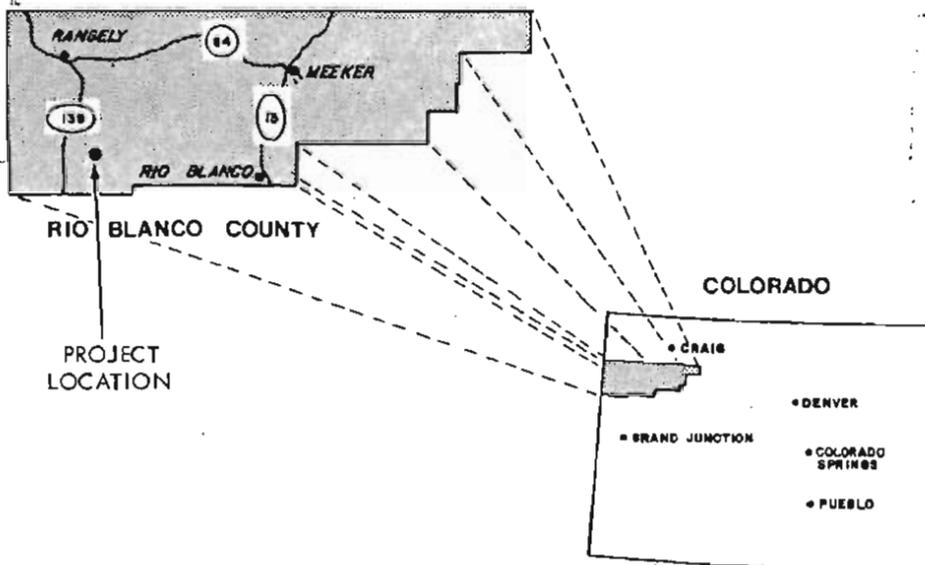
CO-OPERATING COMPANY
Fuel Resources Development
Co. (Fuelco)
Denver, Colorado
(303) 571-7707

Location: D-26-3-101-S Section 26, T3S R 101W

CONTRACT(S)

FIELD TEST PERIOD(S)

12 - 17 August 1979



OBJECTIVE

To determine the quantity and quality of coal and the methane content of the coal in the Mesaverde Formation on the west side of the Piceance Basin.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 7387 feet.

Tests Performed

Conventional coring

- 96 feet of core. Coal at 1148.9 - 1151.9, 1154.0 - 1159.0, 1183.2 - 1185.7, 1205.7 - 1206.5, 1209.1 - 1217.8, 1223.0 - 1225.0

Logging

- Borehole geophysical logs run - electric, gamma-ray, compensated density, and caliper.

OTHER TESTING

- Desorption of coal samples
- Laboratory analyses of coal samples, roof rock and floor rock.

ANALYSIS STATUS

- Desorption in progress - initial indications of low gas content.

FIELD ACTIVITIES

- 13 August - Spud date for core hole
 14 August - Core point reached, began coring operations

<u>Seam</u>	<u>Depth (ft)</u>	<u>Thickness (ft)</u>
"C"	1148.9 - 1151.9	3.0
"C"	1154.0 - 1159.0	5.0
"B"	1183.2 - 1185.7	2.5
"A"	1205.7 - 1206.5	0.8
"A"	1209.1 - 1217.8	8.7
Unnamed	1223.0 - 1225.0	2.0

- 15 August - Completed coring, demobilization

ANALYSIS ACTIVITIES

- Coal desorption in progress
- Laboratory analysis of coal (proximate/ultimate, heating value, sulfur form) in progress
- Laboratory analysis of roof rock (Triaxial Compressive Strength w/elastic properties, Permeability, Porosity and Natural bulk density) in progress
- Laboratory analysis of floor rock (Uniaxial Compressive Strength, Permeability, Porosity and Natural bulk density) in progress.

RESULTS

Desorption Data from Conventional Cores

<u>Lithology</u>	<u>Sample Depth (ft)</u>	<u>Total Gas (cc)</u>	<u>Sample Wt (gm)</u>	<u>Total Gas Per Unit (cc/gm) (ft³/ton)</u>	
Coal	1211.6-1212.4	1039	1312	0.8	25.6
Coal	1209.5-1210.5	712	1498	0.5	16.0
Coal	1223.0-1224.0	655	1249	0.6	19.2

STATUS

Field operation complete

December 1979

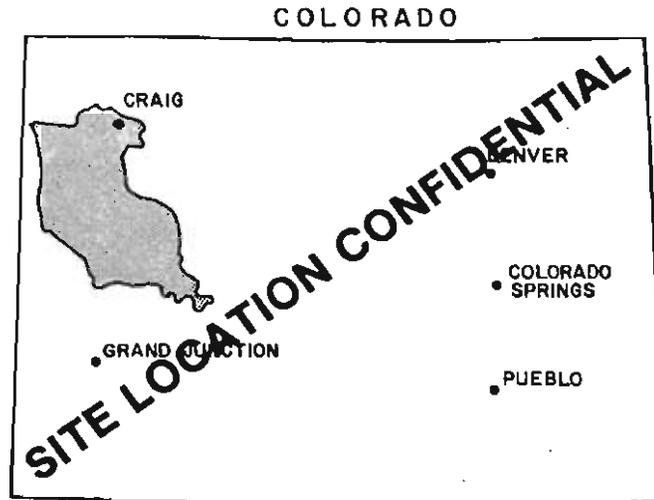
CO-OPERATING COMPANY

Confidential Well #4

CONTRACT(S)

FIELD TEST PERIOD(S)

23 - 31 August 1979



OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of two coal seams. This effort will help determine the potential productivity of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 5877 feet.

<u>Tests Performed</u>	<u>Results/Comments</u>
Conventional coring	● 45 feet of core. Coal at 879.15 - 882.48 ft, 904.3 - 912.0
Logging	● Borehole geophysical logs run - electric, gamma-ray, gamma-gamma density, and caliper

OTHER TESTING

- Desorption of coal samples
- Laboratory analysis of coal samples to be completed in future.

ANALYSIS STATUS

- Desorption in progress - initial indications of low gas content.

FIELD ACTIVITIES

- 26 August - Pilot hole logged, twin core hole spudded.
- 28 August - Core point reached (depth 870 feet), began coring two coal seams.
- | <u>Seam</u> | <u>Depth (ft)</u> | <u>Thickness (ft)</u> |
|-------------|-------------------|-----------------------|
| "C" | 879.15 - 882.48 | 3.3 |
| "B" | 904.3 - 912.0 | 7.7 |
- 28 August - Completed coring, demobilization

ANALYSIS ACTIVITIES

- Coal desorption in progress
- Laboratory analysis of coal planned.

RESULTS

Coal desorption results from conventional cores:

<u>Lithology</u>	<u>Sample Depth (ft)</u>	<u>Total Gas (cc)</u>	<u>Sample Wt (gm)</u>	<u>Total Gas Per Unit* (cc/gm) (ft³/ton)</u>	
Coal	911.0-911.8	27	1527	0.01	0.3
Interburden Siltstone	904.3-905.3	105	1756	0.06	1.9
Coal	879.15-880.15	248	1483	0.17	5.4

*Does not include lost gas.

STATUS

Field Operation Completed

February 1980

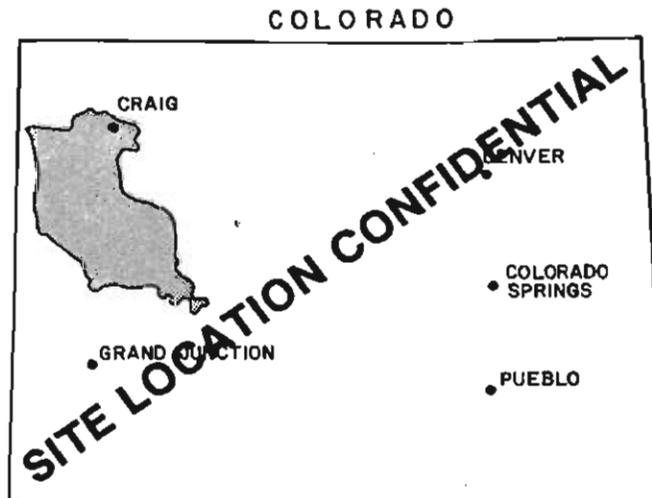
CO-OPERATING COMPANY

Confidential Well #5

CONTRACT(S)

FIELD TEST PERIOD(S)

August 23 - 31, 1979



OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of two coal seams. This effort will help determine the potential productivity of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 5562.2 feet.

Tests Performed

Conventional Coring

- 28.9 feet of core. Coal at 1187.46 - 1190.96 ft, 1198.35 - 1206.75 ft.

Logging

- Borehole geophysical logs run - electric, gamma ray, gamma-gamma density, and caliper.

OTHER TESTING

- Desorption of coal samples
- Laboratory analysis of coal samples to be completed in future.

ANALYSIS STATUS

- Desorption in progress - initial indications of low gas content.

FIELD ACTIVITIES

- August 25 - Pilot hole logged, twin core hole spudded.
 August 29 - Core point reached (depth 1180 feet), began coring two coal seams.

<u>Seam</u>	<u>Depth (ft)</u>	<u>Thickness (ft)</u>
"E"	1187.46 - 1190.96	3.5
"D"	1198.35 - 1206.75	8.4

- August 30 - Completed coring, demobilization.

ANALYSIS ACTIVITIES

- Coal desorption in progress
- Laboratory analysis of coal samples planned.

RESULTS

Coal desorption results from conventional cores:

<u>Lithology</u>	<u>Sample Depth (ft)</u>	<u>Total Gas (cc)</u>	<u>Sample Wt (gm)</u>	<u>Total Gas Per Unit*</u> (cc/gm) (ft ³ /ton)	
S1 Floor Rock	1190.96-1191.82	75	2783	0.03	1.0
Coal	1205.05-1206.05	1812	2018	0.9	28.8

*Does not include lost gas.

GREEN RIVER BASIN

Type I Testing Complete

February 1980

CO-OPERATING COMPANY

Energy Reserves Group

CONTRACT(S)

DE-AC21-78MC08089

GRI-5011-321-0101

FIELD TEST PERIOD(S)

Nov. 1978 - Dec. 1979

OBJECTIVE To determine the methane content and reservoir properties of several coal seams within the Mesaverde Formation in the Green River Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 6540 feet.

Tests Performed

Results/Comments

Conventional coring

- 139 feet of core, coal at 3652-3652.6, 3674.7 to 3676.1, 3923 to 3924.1, 3937 to 3937.2, 3947.9 to 3948.2, 4649 to 4659.8, 4660.8 to 4661, 4704.4 to 4706 feet.

Logging

- Compensated neutron, caliper, natural gamma, bore hole compensated sonic, dual induction

Sidewall coring

- 26 cores obtained
- Sample depth 3683-4988 feet

Drill stem tests

- Interval tested 3700-3800, 4634-4714 feet

OTHER TESTING

Coal core desorption

Proximate/ultimate analysis

Coal structural/strength testing at Colorado School of Mines

ANALYSIS STATUS

Desorption in progress.

Produced gas sample analysis: 48.8% CH₄, 31.7% N₂, 18.1% CO₂, and 1% ethane.

FIELD ACTIVITIES

- November 6, 1978 ● Spud date
- November 16 ● Began coring at 3642 feet, 30 foot core barrel
- November 17, 18 ● Cored 3642 - 3702 feet
- November 19, 20 ● Drill stem test #1, 3700 - 3800 feet
- November 22, 28, 29 ● Cored 3923 - 3953, 4649 - 4679, 4679 - 4709 feet
- November 29 ● Drill stem test #2, 4634 - 4714 feet
- December 2 ● Ran Schlumberger log for sidewall core points

Refer to type III testing report for frac and post-frac activities.

ANALYSIS ACTIVITIES

- Laboratory analysis (Proximate/ultimate, heating value, sulfur forms)
- Conventional core desorption continuing
- Drill stem test results complete
- Sidewall core desorption results:

<u>Depth</u>	<u>Lithology</u>	<u>Gas in Place (Ft³/ton)</u>
4984	Coal	144.0
4982	Very carbonaceous shale	89.9
4980	Coal w/shale	157.4
4978	Coal	157.7
4976	Coal	142.0
4872	Coal	178.5
4868	Coal	157.4
4864	Coal	209.9
4986	Coal	132.8
4814	Coal	189.6
4720	Coal	136.0
4666	Coal	178.5

RESULTS Preliminary Summary - On-going desorption of conventional core samples for Green River Site AA as of January 26, 1979.

- From 13 samples, the gas content ranged from a low of 7 SCF/ton to a high of 340 SCF/ton. Most of the samples had gas content in the range of 220 to 340 SCF/ton.

STATUS

Type III Pre-frac testing complete/Post-frac testing in progress

February 1980

CO-OPERATING COMPANY

Energy Reserves Group

CONTRACT(S)

DE-AC21-78MC08089
GRI-5011-321-0101

FIELD TEST PERIOD(S)

December 1979 - Present

OBJECTIVE

Complete well in one coal interval, frac and conduct long-term production testing to determine the methane content and reservoir properties of several coal seams within the Mesaverde Formation in the Green River Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

See initial test series performed during the original drilling at 6540 feet in Type I report.

Tests Performed

Results/Comments

Initial post-frac flow

● Producing 3-10 mcf gas/day, 3-4 bbl water/day

Present post-frac flow

- Producing less than 1 mcf gas/day
- Water total production during November 1979 was 138.7 bbl
- Still lack 128.5 bbl of load to recover.

OTHER TESTING

Coal structural/strength testing at Colorado School of Mines

ANALYSIS STATUS

Post-frac well clean-up continuing

Produced gas sample analysis: 48.8% CH₄, 31.7% N₂, 18.1% CO₂ and 1% ethane.

FIELD ACTIVITIES

See initial field activities - Type I report

- | | |
|---------------|--|
| June 22, 1979 | ● Well completion began |
| June 27 | ● Injectivity-pressure fall-off testing |
| July 5 | ● Halliburton frac (guar gel hydraulic with nitrogen assist) |
| July 27 | ● Post-frac clean-up underway. |
| September 9 | ● Water production -- 6.5 bb./day |
| October 24 | ● Production rates (2-3 bbl/day water, 6 Mcf/day gas) |
| November 17 | ● Producing 5 bbl water/day, less than 0.5 Mcf/day gas |

ANALYSIS ACTIVITIES

See initial series - Type I report

RESULTS

See initial results - November 1978

- Bottomhole pressure determined from pressure fall-off test is 2080 psi; average effective radial permeability is 1.6 md
- Continue post-frac flow testing until either rates fall off completely or all injected frac fluids are produced back.

STATUS Testing Complete/Analysis in Progress

August 1979

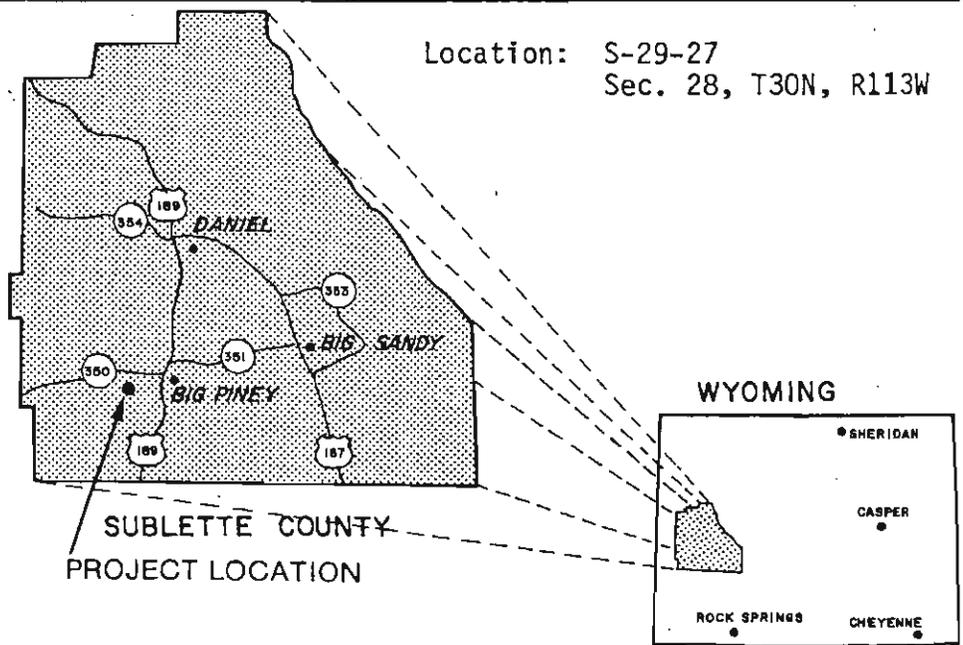
CO-OPERATING COMPANY
 Belco Petroleum Corp.
 Lakewood, Colorado

Location: S-29-27
 Sec. 28, T30N, R113W

CONTRACT(S)

FIELD TEST PERIOD(S)

2 January to
 14 January 1979



OBJECTIVE To determine the methane content and reservoir properties of numerous coal horizons within the Mesaverde Formation in the Green River Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 7298 feet.

Tests Performed

Results/Comments

Conventional Coring

- 90 feet of core. Coal at 3479.1-3481.4, 3494.8-3496.5, 3526.6-3528.2 feet

Logging

- Borehole compensated sonic/gama ray dual induction - SFL
- Compensated neutron/formation density Caliper

Sidewall coring

- 18 cores obtained
- Sample depths: 3498' - 3500'
- 3484' - 3487'
- 3438' - 3440'

OTHER TESTING

Coal core desorption
 Proximate/ultimate analysis

ANALYSIS STATUS

- Analysis by gas chromatograph complete
- Desorption in progress

- FIELD ACTIVITIES
- January 2 ● Spud date
 - January 11 ● Started coring at 3450 feet, 30 foot core barrel
 - Intervals 3450-3540.9, 3480.6-3510.9
 - Coal samples collected and placed in desorption canisters
 - January 12 ● Cored interval 3510.9-3540.9
 - Coal samples collected and placed in desorption canisters
 - January 13 ● Sidewall cores taken
 - Ran logs
 - Drill stem testing canceled at the request of Belco due to inclement weather and potential hole problems
 - Completion of testing

Service

- Contractors:
- Geochem - Desorption
 - Christensen - Conventional coring
 - Schlumberger - Logging and sidewall cores

ANALYSIS ACTIVITIES

- Laboratory analysis (proximate/ultimate, heating value, sulfur forms)
- Desorption in progress for conventional cores
- Sidewall core desorption complete

RESULTS

- Conventional core desorption data through May 11, 1979

<u>Sample Depth Range (ft)</u>	<u>Lithology</u>	<u>Range of Total Gas (ft³/ton)</u>
3479.1 - 3495.7	Coal (5 spls)	384 - 480
3506.0 - 3519.3	Carb. Shale (2 spls)	28 - 172
3525.1 - 3526.7	Coal (2 spls)	407 - 443

- Sidewall core desorption data by Geochem - March 11, 1979

<u>Sample Depth Range (ft)</u>	<u>Lithology</u>	<u>Range of Total Gas (ft³/ton)</u>
3438.5	Coal (1 spl)	214
3440.0 - 3485.5	Carb. Shale (3 spls)	98 - 212
3498.0 - 3499.5	Coal (3 spls)	215 - 350

SAN JUAN BASIN

SAN JUAN BASIN
SAN JUAN COUNTY, NEW MEXICO

Site HAA

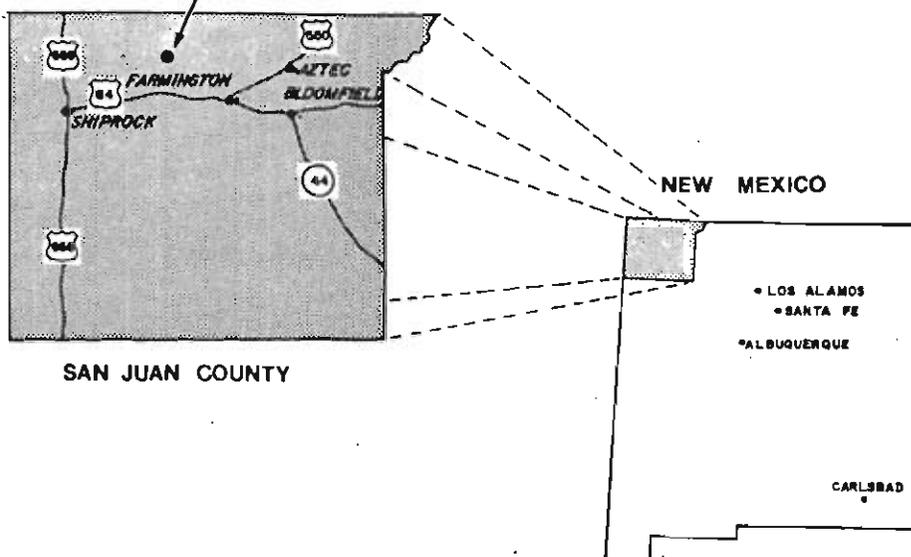
STATUS Testing and Analysis Complete
No Further Activity

February 1980

CO-OPERATING COMPANY
Western Coal Company
Albuquerque, New Mexico
(505) 842-1023

Location SE 1/4, Sec. 22, T30N, R15W

PROJECT LOCATION



CONTRACT(S)

FIELD TEST PERIOD(S)
16-17 June 1978

OBJECTIVE To determine the methane content and reservoir properties of coal seams within the Fruitland Formation in the San Juan Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing on this well was done during original coring at 393.5 feet

Tests Performed

Results/Comments

Conventional coring

- 43.5 ft. of core cut between 370 and 413.5 ft. encountering cumulative coal thickness of 12.2 feet.

OTHER TESTING

Coal core desorption
Proximate/ultimate analysis

ANALYSIS STATUS

Desorption and analyses completed.

FIELD ACTIVITIES

16-17 June - Participate in coring activities, core description, sample collection, and initial desorption

Coal Cored

<u>Core No.</u>	<u>Coal Interval</u>	<u>Seam Thickness (Ft)</u>
3	387.3-387.8	0.5
4&5	395.5-403.7	8.2
5	404.0-407.5	3.5

ANALYSIS ACTIVITIES

- Desorption of two coal samples completed.
- Laboratory analyses (proximate/ultimate, heating value, sulfur forms) completed.

RESULTS

- Desorption Data and Lab Data (as received)

<u>Depth (ft)</u>	<u>Gas Content (Total) cc/gm</u>	<u>Coal Rank</u>	<u>Heating Value (Btu/lb)</u>	<u>Moisture Content (%)</u>	<u>Volatile Matter (%)</u>	<u>Fixed C (%)</u>	<u>Ash (%)</u>
398.2-398.8	2.3	Hvaa	12293	4.7	38.2	49.3	7.7
398.8-399.4	.5	Hvab	12543	4.2	37.1	52.6	6.1

POWDER RIVER BASIN

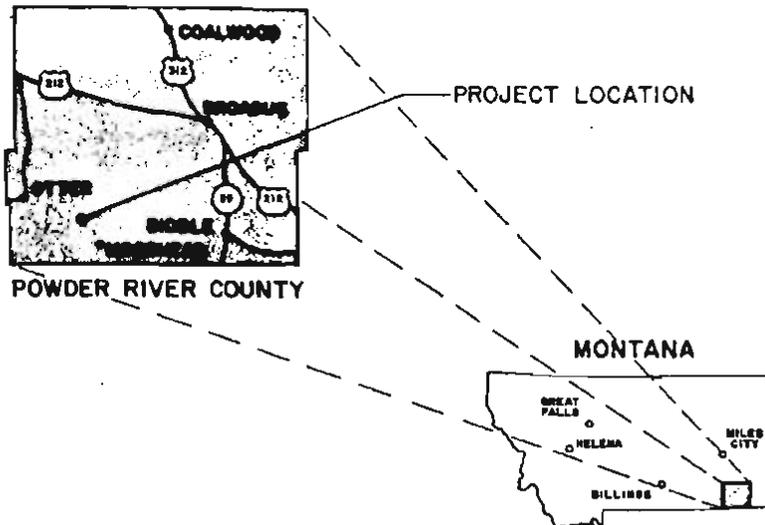
STATUS

Field operations completed.

October 1979

CO-OPERATING COMPANY
U.S. Geological Survey
Coal Branch
Denver, Colorado

Location: 1400' FSL, 2900' FSL
Sec. 22, T8S, R47E



CONTRACT(S)

FIELD TEST PERIOD(S)

28 - 31 August 1979

OBJECTIVE

To determine the methane content and some reservoir properties of the Anderson and Canyon A&B (Dietz) coalbeds in the Fort Union Formation.

FIELD ACTIVITY PROGRESS

- Drilling and coring completed.
Conventional coring started at 236.5 feet
Anderson seam top at 243.2 feet; seam 52.6 feet thick
Canyon A-B (Dietz) seam top at 377.0 feet; seam 24.5 feet thick.
- Borehole geophysical logs run - gamma ray, density, S.P., and resistivity.

OTHER TESTING

- Desorption of coal samples
- Laboratory analysis of coal samples and roof and floor rock to be completed.

ANALYSIS STATUS

- Desorption in progress.

FIELD ACTIVITIES

- August 29 - Drill to core point, 236.5 feet, and core Anderson seam from 243.5 to 305.1 feet
- August 30 - Waiting on repairs to water truck
- August 31 - Drill to second core point, ~367 feet, and core the Dietz (Canyon A&B) seam from 377.0 to 401.5 feet.
- Log hole.

ANALYSIS ACTIVITIES

- Coal core desorption in progress:

<u>Seam</u>	<u>Depth (ft)</u>
Anderson	247.5
	266.0
	291.0
Dietz	377.6
	385.0
	400.5

- Laboratory analysis of coal samples to be conducted upon completion of desorption (proximate/ultimate, equilibrium, moisture).

RESULTS

Coal desorption results as of October 23 from conventional cores:

<u>Lithology</u>	<u>Sample Depth (ft)</u>	<u>Total Gas (cc)</u>	<u>Sample Weight (gm)</u>	<u>Total Gas Per Unit (cc/gm) (ft³/ton)</u>	
Coal	247.5	74	1600	0.04	1.3
Coal	266.0	63	1652	0.04	1.3
Coal	291.0	54	1710	0.03	0.9
Coal	377.6	140	1603	0.08	2.6
Coal	385.0	72	1710	0.04	1.3
Coal	400.5	141	1637	0.08	2.6

STATUS

Field Operations Complete

February 1980

CO-OPERATING COMPANY

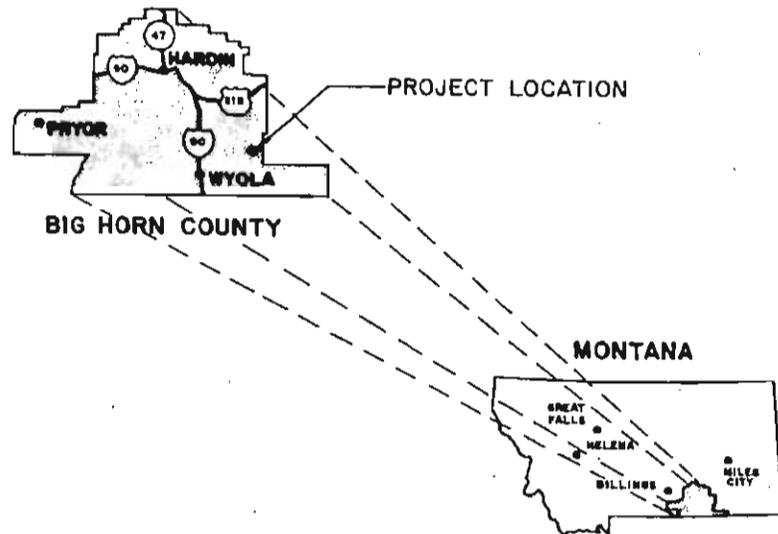
Montana Bureau of Mines
and Geology

Location: Site I: Well No. US-7735, Section 5,
T7S, R40E, 60 ft FNL, 1700 ft FEL

CONTRACT(S)

FIELD TEST PERIOD(S)

September 6-9, 1979



OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of the coal seams in the Powder River Basin. This effort will help determine the potential producibility of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

Testing was performed during the original drilling at:

Tests Performed

- | | |
|---------------------|---|
| Conventional Coring | ● 114.6 feet of core. Coal at 121 - 145.5, 347 - 352.5, 390.3 - 402.8, 620 - 673.5 feet |
| Logging | ● Gamma-gamma density, SP, resistivity log, Gamma-ray |
| Drill Stem Testing | ● Plugged tool, limited results, formation pressure is 51 psig |

OTHER TESTING

- Desorption of coal samples
- Physical properties analysis of overburden, interburden, and underburden

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

- September 6 - Began coring at 115 feet, recovered 45.2 ft of coal from eight coring runs, stopped coring at 403 feet.
- September 7 - Coring continued, recovered 48.5 feet of coal, total of six cores, stopped coring at 658.5 feet.
- September 8 - Coring completed, depth of 676.5 feet, recovered 5.0 feet of coal from one core.
- September 9 - Drill stem test of the Wall bed, plugged tool, limited results, formation pressure 51 psig.

ANALYSIS ACTIVITIES

- Coal desorption in progress
- Laboratory analysis of coal, overburden, interburden, and underburden in progress.

RESULTS

Coal desorption results as of November 2 from conventional cores:

Lithology	Sample Depth (ft)	Total Gas (cc)	Sample Weight (gm)	Total Gas Per Unit*	
				(cc/gm)	(ft ³ /ton)
Coal	121.0-122.0	107	1310	0.08	2.6
Coal	134.0-135.0	89	1349	0.07	2.2
Coal	144.0-145.0	96	857	0.11	3.5
Coal	348.2-349.2	41	913	0.04	1.3
Coal	390.3-391.3	28	886	0.03	0.9
Coal	400.5-401.7	30	1091	0.03	1.0
Coal	620.5-622.5	48	1208	0.04	1.3
Coal	630.8-631.9	114	852	0.13	4.2
Coal	656.3-657.6	68	963	0.07	2.2
Coal	672.1-673.5	123	1004	0.12	3.8

*Does not include lost gas.

STATUS

Field Operations Complete

November 1979

CO-OPERATING COMPANY

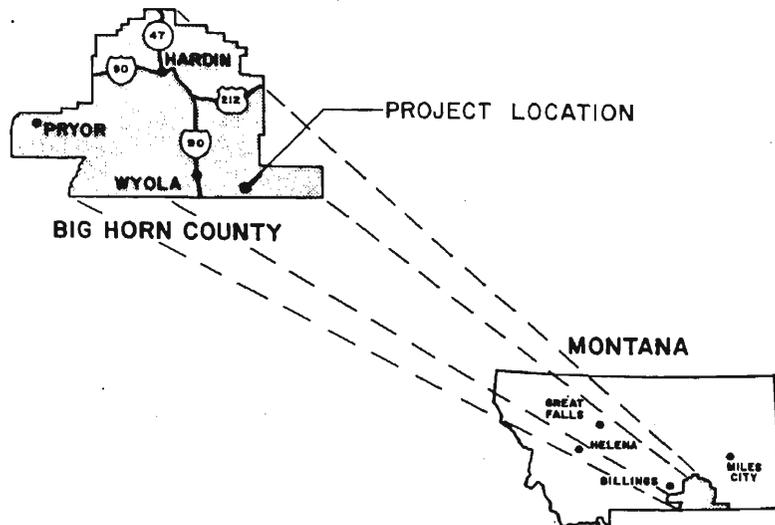
Montana Bureau of
Mines & Geology

Location: Site II: Well No. US-7746, Section 7,
T9S, R40E, 290 ft FNL, 1800 ft FWL

CONTRACT(S)

FIELD TEST PERIOD(S)

September 10-12, 1979



OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of the coal seams in the Powder River Basin. This effort will help determine the potential producibility of coalbed methane from this resource.

FIELD ACTIVITY PROGRESS

Testing was performed during the original drilling at:

Tests Performed

Conventional Coring

- 157 feet of core. Coal at 154.7-169.4, 171.1-172.7, 172.9-173.3, 173.5-174.5, 424.0-503.4, 538.8-603.0, 742.7-762.2, 762.5-769.7

Logging

- Gamma-gamma density, SP, Resistivity log, Gamma-ray

OTHER TESTING

- Desorption of coal samples
- Physical properties analysis of overburden, interburden, and underburden

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

- September 10 - Coring began at 154.5 ft, recovered 19.8 ft of coal.
- September 11 - Coring continued, recovered 79.4 ft of coal.
- September 12 - Coring completed, recovered 41.7 ft of coal with shale parting. Coring stopped at a depth of 772.5 feet.

ANALYSIS ACTIVITIES

- Coal desorption in progress
- Laboratory analysis of coal, overburden, interburden, and underburden.

RESULTS

Coal desorption results as of November 2 from conventional cores:

<u>Lithology</u>	<u>Sample Depth (ft)</u>	<u>Total Gas (cc)</u>	<u>Sample Weight (gm)</u>	<u>Total Gas Per Unit*</u>	
				<u>(cc/gm)</u>	<u>(ft³/ton)</u>
Coal	168.0-169.4	39	1016	0.04	1.3
Shale + Coal	172.0-174.0	44	877	0.05	1.6
Coal	448.6-449.7	83	861	0.10	3.2
Coal	455.9-457.2	75	1032	0.07	2.2
Coal	478.8-480.0	59	872	0.07	2.2
Coal	491.2-492.4	35	943	0.04	1.3
Coal	501.4-503.4	30	1234	0.02	0.6
Coal	601.5-603.0	206	1051	0.20	6.4
Coal	754.8-756.3	272	1094	0.25	8.0
Coal	768.2-769.7	473	1159	0.41	13.1

*Does not include lost gas

WESTERN WASHINGTON

STATUS

Field Operations Complete/Analyses in Progress

March 1980

CO-OPERATING COMPANY

Sandia/Lawrence Livermore
Labs

Location: Sec. 21, T15N, R1W
Thurston County, Washington

CONTRACT(S)

FIELD TEST PERIOD(S)

Oct. 29 - Nov. 7, 1979

OBJECTIVE

To provide gas content and desorption data on coal from the "Big Dirty,"
coalbed, Thurston County, Washington

FIELD ACTIVITY PROGRESS

- Field operations complete.
- Desorption samples were taken from the "Big Dirty" Coalbed at the intervals listed below:

<u>Sample #</u>	<u>Depth (ft)</u>
1	602.8 - 603.8
2	610.0 - 611.0
3	617.9 - 618.9
4	623.2 - 623.9

OTHER TESTING

- Rock property testing of roof and floor rock samples
- Proximate/ultimate analyses of coal samples upon completion of desorption.

ANALYSIS STATUS

- Desorption continuing.

FIELD ACTIVITIES

- 29 October - Coring initiated at 403 feet
- 6 November - "Big Dirty" coalbed intercepted at 601.9 feet; desorption samples 1-3 taken
- 7 November - Continued coring of "Big Dirty" coalbed zone; desorption sample 4 taken.

ANALYSIS ACTIVITIES

- Coal core desorption in progress.

RESULTS

Corehole desorption results from conventional cores:

Lithology	Sample No.	Sample Depth (ft)	Total Gas (cc)	Total Gas Per Unit*	
				(cc/gm)	(ft ³ /ton)
Coal	1	602.8 - 603.8	1469	2.3	74.7
Coal	2	610.0 - 611.0	1674	2.3	72.3
Coal	3	617.9 - 618.9	593	0.7	22.5
Coal	4	623.2 - 623.9	241	0.6	19.8

*Does not include lost gas.