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Fax: (918) 699-2005
E-mail: htiedema@npto.doe.gov

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CONTENTS

- 1-4 Crosscutting
- 5-7 Diagnostic and Imaging Systems
- 8 Environmental, Safety and Health
- 8-12 Field Demonstration
- 13-14 Oil Field Production and Operation
- 14 Computer Software
- 18 Order form

CATEGORY: CROSSCUTTING

PUB ID DOE/PC/91008-0300 **ORDER #** 6046

TITLE *Native American Initiative Short Course Management Plan, Topical Report, January 1997, 4 pp .*

PUB DATE 4/27/1999

CONTRACTOR BDM-Oklahoma, Inc.

A training program is outlined for members of Native American tribes with an interest in working in the oil and gas industry. Also, the program will assist tribes whose lands have oil and gas resources to become more familiar with the industry and technology necessary to develop their resources. The proposed program will contribute to meeting the goals of the U.S. Department of Energy's (DOE) Domestic Oil and Gas Initiative to help Native American tribes become more self-sufficient in developing and managing their resources through training in cost-effective, improved technologies for hydrocarbon production that will meet environmental regulations.

PUB ID DOE/PC/91008-0133 **ORDER #** 6081

TITLE *Reservoir Characteristics, Production Characteristics, and Research Needs for Fluvial/Alluvial Reservoirs in the United States, Topical Report, 300 pp. Class 5 Rpt.*

PUB DATE 4/28/1999

CONTRACTOR BDM-Oklahoma, Inc.

The Department of Energy's (DOE's) Oil Recovery Field Demonstration Program was initiated in 1992 to maximize the economically and environmentally sound recovery of oil from known domestic reservoirs and to preserve access to this resource. Cost-shared field demonstration projects are being initiated in geologically defined reservoir classes which have been prioritized by their potential for incremental recovery and their risk of abandonment. This document defines the characteristics of the fifth geological reservoir class in the series, fluvial/alluvial reservoirs. The reservoirs of Class 5 include deposits of alluvial fans, braided streams, and meandering streams. Deposit morphologies vary as a complex function of climate and tectonics and are characterized by a high degree of heterogeneity to fluid flow as a result of extreme variations in water energy as the deposits formed.

PUB ID DOE/PC/91008-0140 **ORDER #** 6054
TITLE *Native American Training Program in Petroleum Technology*, Topical Report, April 1995, 31 pp.
PUB DATE 4/27/1999

CONTRACTOR BDM-Oklahoma, Inc.

This report outlines a comprehensive training program for members of Native American tribes whose lands have oil and gas resources. The program has two components: short courses and internships. Programs are proposed for: (1) adult tribe representatives who are responsible for managing tribal mineral holdings, setting policy, or who work in the oil and gas industry; (2) graduate and undergraduate college students who are tribal members and are studying in the appropriate fields; and (3) high school and middle school teachers, and science teachers. Materials and program models already have been developed for some components of the projects. The plan is a coordinated, comprehensive effort to use existing resources to accomplish its goals. Partnerships will be established with the tribes, the BIA, tribal organizations, other government agencies, and the private sector to implement the program.

PUB ID DOE/PC/91008-0172 **ORDER #** 6055
TITLE *Field Laboratory in the Osage Reservation-- Determination of the Status of Oil and Gas Operations: Task 1. Development of Survey Procedures and Protocols*, Status Report, September 1995, 45 pp.
PUB DATE 4/27/1999

CONTRACTOR BDM-Oklahoma, Inc.

Procedures and protocols were developed for the determination of the status of oil, gas, and other mineral operations on the Osage Mineral Reservation Estate. The strategy for surveying Osage County, Oklahoma, was developed and then tested in the field. Two Osage Tribal Council members and two Native American college students (who are members of the Osage Tribe) were trained in the field as a test of the procedures and protocols developed in Task 1. Active and inactive surface mining operations, industrial sites, and hydrocarbon-producing fields were located on maps of the county, which was divided into four more or less equal areas for future investigation. Field testing of the procedures, protocols, and training was successful. No significant damage was found at petroleum production operations in a relatively new production operation and in a mature waterflood operation.

PUB ID DOE/PC/91008-0151 **ORDER #** 3180
TITLE *Crude Oil Analysis Database*, September 1995, 114 pp.
PUB DATE 2/1/1999

CONTRACTOR BDM-Oklahoma, Inc.

The Department of Energy (DOE) has one of the largest and most complete collections of information on crude oil composition that is available to the public. The computer program that manages this database of crude oil analysis has recently been rewritten to allow easier access to this information. This report describes how the new system can be accessed and how information contained in the Crude Oil Analysis Data Bank can be obtained.

PUB ID DOE/PC/91008-0042 **ORDER #** 4167
TITLE *Data Preparation Guidelines*, Final Report, March 1997, 95 pp.
PUB DATE 3/11/1999

CONTRACTOR BDM-Oklahoma, Inc.

The objective of this manual is to present guidelines and procedures for the preparation of new data for the Tertiary Oil Recovery Information System (TORIS) database. TORIS is an analytical system. It uses an extensive field- and reservoir-level database to evaluate the technical and economic recovery potential of specific crude oil reservoirs. NPC's 1984 evaluation of the EOR resource focused on the recovery potential of immobile or waterflood residual oil only. In 1988, the system's capabilities were expanded to include evaluation of the potential unrecovered mobil oil (UMO) in Texas, Oklahoma, and New Mexico. The system is being enlarged (beginning in 1993) to consider the recovery potential of extended primary and advanced secondary (ASR) operations in unswept portions of the reservoir in a manner consistent with the NPC's EOR methodology. Currently, ASR and EOR analyses include such techniques as infill drilling, polymer waterflood, profile modification, miscible CO₂ flooding, alkaline and surfactant/polymer flooding, steamflooding, and in-situ combustion.

PUB ID DOE/PC/91008-0209 **ORDER #** 6057
TITLE *94-A13 Native American Initiative Short Course Management Plan*, Topical Report, December 1995, 12 pp.
PUB DATE 4/27/1999

CONTRACTOR BDM-Oklahoma, Inc.

The training schedule offered four courses per year and included those courses identified by the tribes in a survey. The program, outlined for members of Native American Tribes whose lands have oil and gas resources, was for adult tribal representatives who are responsible for managing tribal mineral holdings or setting policy or who work in the oil and gas industry. The course content was developed by BDM-Oklahoma and sent in the Spring of 1995 to 26 tribal agencies identified through previous contact with the DOE. Participating tribes were the Creek, Pueblo, Cherokee, St. Regis Mohawk, Northern Arapaho, and Ute Mountain Ute.

PUB ID DOE/PC/91008-0268 **ORDER #** 6059

TITLE *Plan for Management of Mineral Assets on Native Tribal Lands and for Formation of a Fully Integrated Natural Gas and Oil Exploration and Production Company, Vertical Integration Plan*, Topical Report, August 1996, 76 pp.

PUB DATE 4/27/1999

CONTRACTOR BDM-Oklahoma, Inc.

This report describes a plan for Native American tribes to assume responsibility for and operation of tribal mineral resources using the Osage Tribe as an example. Under this plan, the tribal council select and employ a qualified Director to assume responsibility for management of their mineral reservations. The procurement process should begin with an application for contracting to the Bureau of Indian Affairs. Under this plan, the Director will develop strategies to increase income by money management and increasing exploitation of natural gas, oil, and other minerals.

PUB ID DOE/PC/91008-0252 **ORDER #** 6052

TITLE *Field Laboratory in the Osage Reservation--Determination of Status of Oil and Gas Operations*, Status Report, May 1996, 3 pp.

PUB DATE 4/27/1999

CONTRACTOR BDM-Oklahoma, Inc.

Microsoft EXCEL and Lotus 1-2-3 spreadsheets have been programmed to perform calculations as reservoir data is entered. These programs were developed by BDM-Oklahoma, Inc. personnel for use in the Field Laboratory in the Osage Reservation project. This spreadsheet will also assist Native American Tribe members in evaluation of the petroleum resource on the Osage Mineral Estate, Osage County, Oklahoma and independent operators to evaluate petroleum reservoirs on and off of the Osage Mineral Estate.

PUB ID DOE/PC/91008-0336 **ORDER #** 6050

TITLE *Native Tribes Training Initiative & Outreach: Field Demonstrations in High Priority Reservoirs (Native American Workshop on Petroleum Energy August 11-12, 1997, Santa Fe, NM)*, Topical Report, October 1997, 144 pp.

PUB DATE 4/27/1999

CONTRACTOR BDM-Oklahoma, Inc.

Twenty-seven Native American tribal members, council members, and other interested parties gathered in Santa Fe, New Mexico, to attend the Native American Workshop on Petroleum Energy on August 11 and 12, 1997, sponsored by the U.S. Department of Energy (DOE) and presented by BDM-Oklahoma, Inc, staff. Tribes represented at the workshop included the Jicarilla Apache, Pueblo of Acoma and Ute. Representatives of the Environmental Protection Agency (USEPA), Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), and Minerals Management Service (MMS) also attended. BDM-Oklahoma developed and organized the Native American Workshop on Petroleum Energy to help meet the goals of the DOE's Domestic Gas and Oil Initiative to help Native American tribes become more self-sufficient in developing and managing petroleum resources.

PUB ID DOE/PC/91008-0347 **ORDER #** 6049

TITLE *Protocol for Appraisal of Petroleum-Producing Properties on Native American Lands*, Topical Report, February 1998, 180 pp.

PUB DATE 4/27/1999

CONTRACTOR BDM-Oklahoma, Inc.

Petroleum is currently produced on Native American Tribal Lands and has been produced on some of these lands for approximately 100 years. As these properties are abandoned at a production level that is considered the economic limit by the operator, Native American Tribes are considering this an opportunity to assume operator status to keep the properties producing, often without consideration of the liabilities left by the former operators. The purpose of this report is to provide protocols for the appraisal of petroleum-producing properties and examples of some environmental flags that may indicate potential liabilities remaining on the property left unaddressed by previous operators. It provides a basis to make the decision to assume operations or to pursue remediation and/or closure of the liabilities of previous operators.

PUB ID DOE/PC/91008-0291 **ORDER #** 6048**TITLE** *Native American Conference on Petroleum Energy (November 16-17, 1996, Bartlesville, Oklahoma)*, Topical Report, November 1996, 118 pp.**PUB DATE** 4/27/1999**CONTRACTOR** BDM-Oklahoma, Inc.

Thirty-three Native American tribal members, council members, and other interested parties gathered in Bartlesville, Oklahoma, to attend the Native American Conference on Petroleum Energy on October 16 and 17 1996, sponsored by the U.S. Department of Energy (DOE). Tribes represented at the workshop included the Cherokee, Chickasaw, Hopi, Jicarilla Apache, Osage, Seminole, and Ute. Representatives of the Bureau of Indian Affairs (BIA), the Bureau of Land Management (BLM), and the Minerals Management Service (MMS) also attended. BDM-Oklahoma developed and organized the Native American Conference on Petroleum Energy to help meet the goals of the DOE's Domestic Gas and Oil Initiative to help Native American Tribes become more self-sufficient in developing and managing petroleum resources.

PUB ID DOE/PC/91008-0360 **ORDER #** 3177**TITLE** *5-Year Final Technical Progress Report*, Final Report, November 1998, 565 pp.**PUB DATE** 2/1/1999**CONTRACTOR** BDM-Oklahoma, Inc.

This final report presents the research, development, and demonstration results, accomplishments, and recommendations for future research that derived from activities performed at the Bartlesville, Oklahoma, facility and by subcontractors during the Period from January 1, 1994 through November 7, 1998. BDM-Oklahoma was also committed to accomplishing the following three objectives: (1) preserving oil and gas research capability as a national resource; (2) providing for expanded access to the results of oil and gas research and development through effective technology transfer; and (3) managing the federally owned facilities in Bartlesville, Oklahoma, toward the goal of site closure in November 1998.

PUB ID DOE/PC/91008-0278 **ORDER #** 6051**TITLE** *Mineral Resource Information System for Field Lab in the Osage Mineral Reserve Estate*, Topical Report, September 1996, 162 pp.**PUB DATE** 4/27/1999

The Osage Mineral Reservation Estate is located in Osage County, Oklahoma. Minerals on the Estate are owned by members of the Osage Tribe who are shareholders in the Estate. The Estate is administered by the Osage Agency, Branch of Minerals, operated by the U.S. Bureau of Indian Affairs (BIA). Oil, natural gas, casinghead gas, and other minerals (sand, gravel, limestone, and dolomite) are exploited by lessors. Operators may obtain from the Branch of Minerals and the Osage Mineral Estate Tribal Council leases to explore and exploit oil, gas, oil and gas, and other minerals on the Estate. Operators pay a royalty on all minerals exploited and sold from the Estate. A mineral Resource Information system was developed for this project to evaluate the remaining hydrocarbon resources located on the Estate. Microsoft Excel spreadsheets of operators, leases, and production were designed for use in conjunction with an evaluation spreadsheet for estimating the remaining hydrocarbons on the Estate.

PUB ID DOE/BC/14847-1 **ORDER #** 6709**TITLE** *National Geoscience Data Repository System, Phase III: Implementation and Operation of the Repository*, Progress Report, January-March, 1999, 9 pp.**PUB DATE** 5/14/1999**CONTRACTOR** American Geological Institute

The NGDRS steering committee met at Chevron's office on March 2, 1999 in Houston, Texas to review and discuss issues of data transfer and the future of the Stapleton prospect for establishment of a national core repository. Company representatives reaffirmed their commitment in principal to the NGDRS project. Given the downturn in oil prices and final results from the due diligence of the Stapleton property, AGI has decided to forego pursuing acquisition and build-out of the Stapleton Airport property. The major petroleum companies indicated that raising the \$10-12 million endowment would be difficult in the current climate. The completion of the due diligence of the property also revealed major concerns about the environmental liability associated with the property, which would require indemnification of the AGI by the City of Denver. Given these complicating results, AGI officially terminated efforts regarding the Stapleton property effective March 31, 1999. Several steering committee members put forth a proposal that the companies make their nonproprietary holdings public and list them in the NGDRS GeoTrek metadata catalog. Most of these holdings are at C&M Storage in Schulemburg, Texas. The companies are discussing methods to allow for public access to these data with C&M.

CATEGORY: DIAGNOSTIC AND IMAGING SYSTEMS

PUB ID DOE/PC/91008-0262 **ORDER #** 6125

TITLE *Applications of Geophysical and Geological Techniques to Identify Areas for Detailed Exploration in Black Mesa Basin, Arizona*, Topical Report, August 1996, 46 pp.

PUB DATE 4/29/1999

CONTRACTOR BDM-Oklahoma, Inc.

This report contains the final phase of research in the Black Mesa basin (see NIPER/BDM- 0226 for detail on the geology, structure, tectonics, and history of oil production activities in the Black Mesa basin). In this report, the results of investigations conducted on different aspects of structure, tectonic, and oil and gas occurrences in Black Mesa basin have been synthesized for evaluation of hydrocarbon prospects and delineation of areas for detailed exploration in the basin. The report also presents an analysis of the effectiveness of relatively inexpensive, noninvasive techniques like gravity or magnetics in obtaining information on structure and tectonics in sufficient detail for hydrocarbon exploration, particularly by using the higher-resolution satellite data.

PUB ID DOE/PC/91008-23 **ORDER #** 98000502

TITLE *Naturally Fractured Reservoirs: Optimized E&P Strategies Using a Reaction-Transport-mechanical Simulator in an Integrated Approach*, Final Report, Subcontract # G4S51730, September 30, 1998, 572 pp.

PUB DATE 1/4/1999

CONTRACTOR Science Applications Int'l Co.

Major accomplishments of this project occurred in three primary categories: (1) Fractured Reservoir Location and Characteristics Prediction for Exploration and Production Planning, (2) Implications of Geologic Data Analysis and Synthesis for Exploration and Development Programs, and (3) Fractured Reservoir Production Modeling.

PUB ID DOE/PC/91008-0163 **ORDER #** 3244

TITLE *A New Methodology for Oil and Gas Exploration using Remote Sensing Data and Surface Fracture Analysis*, Topical Report, August 1995, 83 pp.

PUB DATE 2/1/1999

CONTRACTOR BDM-Oklahoma, Inc.

This methodology was used to develop new exploration leads in Osage County, Oklahoma. Areas along and adja-

cent to surface major lineaments, or of high values in residual surface-fracture frequency and density, or with surface fractures of multiple orientations are identified as anomalous locations. The five indicators identified in the case study are surface lineaments, surface fracture orientation, local residual surface-fracture frequency, local residual surface-fracture density, and surface circular and arcuate anomalies. The correlation between these indicators and subsurface structures was quantitatively evaluated, as was the relative effectiveness of these indicators in locating subsurface structures.

PUB ID DOE/PC/91008-21 **ORDER #** 98000500

TITLE *Advanced Fracture Modeling in the Uinta Basin (Utah) for Optimized Primary and Secondary Recovery*, Final Report, Subcontract # G4S51729, September 1998, 70 pp.

PUB DATE 1/5/1999

CONTRACTOR TerraTek, Inc.

The Uinta Basin in northeastern Utah has long been recognized as the second richest onshore basin in the contiguous United States in terms of hydrocarbons in-place. Despite the prolific abundance of hydrocarbons, recovery is impeded by the nature of the oil, the difficult behavior of these "conventional" reservoirs, and the sporadic deliverability associated with production through natural fractures. How to more intelligently extract these substantial reserves is a goal not only applicable to the Uinta Basin itself, but also to other difficult plays throughout the United States. Fracture systems throughout the United States are being recognized more commonly but are not sufficiently characterized or considered to take full advantage of their presence. In this regard, the Uinta Basin was ideal for the development of advanced, integrated methodology applicable to naturally fractured reservoirs. This report focuses on the development of reliable well-sitting information using an advanced, multidisciplinary approach to characterizing naturally fractured, economically "difficult" reservoirs.

PUB ID DOE/PC/91008-0062 **ORDER #** 6060

TITLE *Geologic Analysis of Priority Basins for Exploration and Drilling*, Status Report, September 1994, 29 pp.

PUB DATE 4/27/1999

CONTRACTOR BDM-Oklahoma, Inc.

There has been a substantial decline in both exploratory drilling and seismic field crew activity in the United States over the last 10 years, due primarily to the declining price of oil. To reverse this trend and to preserve the

entrepreneurial independent operator, the U.S. Department of Energy (DOE) is attempting to encourage hydrocarbon exploration activities in some of the under-exploited regions of the United States. This goal is being accomplished by conducting broad regional reviews of potentially prospective areas within the lower 48 states. Data was collected on selected areas, and studies are being done on a regional scale generally unavailable to the smaller independent. The results of this work will be made available to the public to encourage the undertaking of operations in areas which have been overlooked until this project. Fifteen criteria have been developed for the selection of study areas. Eight regions have been identified where regional geologic analysis will be performed. This report discusses preliminary findings concerning the geology, early tectonic history, structure and potential unconventional source rocks for the Black Mesa basin and South Central states region, the two highest-priority study areas.

PUB ID DOE/PC/91008-0377 **ORDER #** 5103

TITLE *Reduction of Risk in Exploration and Prospect Generation through a Multidisciplinary Basin-analysis Program in the South-Central Mid-Continent Region*, Final Report, October 1998, 365 pp.

PUB DATE 4/1/1999

CONTRACTOR BDM-Oklahoma, Inc.

There has been a substantial decline in both exploratory drilling and shallow-field workover activity in the United States over the last 15 years, due primarily to variability and ongoing uncertainties in the price of domestic oil. To reverse this trend and to preserve the entrepreneurial independent operator, the U.S. Department of Energy (DOE) is attempting to encourage hydrocarbon exploration activities in some of the under-exploited regions of the United States. This goal is being accomplished by conducting broad regional reviews of potentially prospective areas within the lower 48 states and by studying and developing ways to increase efficiency and lower exploration costs for domestic operations by independent operators, the backbone of drilling within the United States. This report will discuss a series of regional studies that were undertaken within the South-Central Mid-Continent region of the United States. Coverage is also provided about a series of innovative techniques that were used for this assessment.

PUB ID DOE/PC/91008-0376 **ORDER #** 3181

TITLE *An Exploration 3-D Seismic Field Test Program in Osage County, Oklahoma*, Final Report, October 1998, 73 pp.

PUB DATE 2/1/1999

CONTRACTOR BDM-Oklahoma, Inc.

There has been a substantial decline in both exploratory drilling and seismic field crew activity in the United States over the last 15 years due primarily to ongoing uncertainties in the price of domestic oil. To reverse this trend and to preserve the entrepreneurial independent operators, the U.S. Department of Energy (DOE) is attempting to encourage hydrocarbon exploration activities in some of the unexplored or under-exploited regions of the United States. This goal is being accomplished by conducting broad regional reviews of potentially prospective areas within the lower 48 states and by studying and developing ways to increase efficiency and lower costs of domestic exploration operations for independent operators, the backbone of the drilling industry within the United States. This report discusses a series of surveys that were conducted in Osage County, Oklahoma, to evaluate state-of-the-art, high-resolution seismic, geochemical, and microbial techniques.

PUB ID DOE/PC/91008-22 **ORDER #** 98000501

TITLE *Fractured Reservoir Discrete Feature Network Technologies*, Final Report, Subcontract # G4551728, March 7, 1996–September 30, 1998, 327 pp.

PUB DATE 1/5/1999

CONTRACTOR Golder Associates, Inc.

This report describes research carried out for the project, "Fractured Reservoir Discrete Feature Network Technologies." The report summarizes project research in five areas, (1) development of hierarchical fracture models, which provide a flexible framework for geologically realistic, discrete-fracture network generation; (2) fracture reservoir compartmentalization, block size, and tributary volume analysis, which provides quantitative evaluation of fracture network connectivity effects on production; (3) development of fractured reservoir discrete feature data analysis tools, and demonstration of those tools through application to the Yates, Texas Tract 49 and Tract 17 studies site; (4) development of tools for data integration and reservoir simulation through application of discrete feature network technologies for tertiary oil production, and demonstration of those tools at project study sites; and (5) quantitative evaluation of the economic value of the discrete feature analysis approach based on the project study site application.

PUB ID DOE/PC/91008-0226 **ORDER #** 6058

TITLE *Investigations on the Structure, Tectonics, Geophysics, Geochemistry, and Hydrocarbon Potential of the*

Black Mesa Basin, Northeastern Arizona, Final Report, March 1996, 209 pp.

PUB DATE 4/27/1999

CONTRACTOR BDM-Oklahoma, Inc

The objectives of this project are to evaluate the hydrocarbon potential of the greater Black Mesa region of northeastern Arizona. This significantly underexplored area contains only 6 wells and no commercial production. Information from remote-sensing studies, geophysical surveys, and other published stratigraphic, structural, geophysical and geochemical data were used to identify potential source beds in lower Paleozoic rocks and deeper sections that could have supplied large quantities of oil or gas to shallower reservoir formations in the region. Local faulting and structural features have provided migration pathways and favorable conditions for stratigraphic and structural traps. Hydrocarbon shows and unusually rich and pure accumulations of commercial-quality helium are widespread across the region, being found in almost every local area that has been tested by the drill.

PUB ID DOE/PC/91008-0223 **ORDER #** 5611

TITLE *An Analysis of Surface and Subsurface Lineaments and Fractures for Oil and Gas Exploration in the Mid-Continent Region*, Topical Report, March 1995, 36 pp.

PUB DATE 4/8/1999

CONTRACTOR BDM-Oklahoma, Inc

An extensive literature search was conducted and geological and mathematical analyses were performed to investigate the significance of using surface lineaments and fractures for delineating oil and gas reservoirs in the Mid-Continent region. Tremendous amounts of data were acquired, including surface lineaments, surface major fracture zones, surface fracture traces, gravity and magnetic lineaments, and Precambrian basement fault systems. An orientation, analysis of these surface and subsurface linear features was performed to detect the basic structural grains of the region. The correlation between surface linear features and subsurface oil and gas traps was assessed, and the implication of using surface lineament and fracture analysis for delineating hydrocarbon reservoirs in the Mid-Continent region was discussed.

PUB ID DOE/PC/91008-0159 **ORDER #** 6056

TITLE *Exploration 3-D Seismic Field Test/Native Tribes Initiative*, Status Report, July 1995, 64 pp.

PUB DATE 4/27/1999

CONTRACTOR BDM-Oklahoma, Inc.

To determine current acquisition procedures and costs and to further the goals of the President's Initiative for Native Tribes, a seismic-survey project is to be conducted on Osage tribal lands. The goals of the program were to demonstrate the capabilities, costs, and effectiveness of 3-D seismic work in a small-operator setting and to determine the economics of such a survey. For these purposes, typical small-scale independent-operator practices are being followed and a shallow target chosen in an area with a high concentration of independent operators. The results will be analyzed in detail to determine if there are improvements and/or innovations which can be easily introduced in field-acquisition procedures, in processing, or in data manipulation and interpretation to further reduce operating costs and to make the system still more attractive to the small-scale operator.

PUB ID DOE/PC/91008-24 **ORDER #** 98000504

TITLE *Using Microstructure Observations to Quantify Fracture Properties and Improved Reservoir Simulations*, Final Report, Subcontract # G4S51732, September 1998, 493 pp.

PUB DATE 1/8/1999

CONTRACTOR Bureau of Economic Geology/Univ. of Texas @ Austin

The research for this project, funded by the U.S. Department of Energy (DOE), provides new technology to understand and successfully characterize, predict, and simulate reservoir-scale fractures. Such fractures have worldwide importance because of their influence on successful extraction of resources. For example, many conventional U.S. reservoirs yield about one-third of the oil originally in place, but some estimates suggest that reservoirs with naturally occurring fractures yield only about 10 percent of their reserves. This is a serious technical and financial challenge for producers of reservoirs containing natural fractures. The scope of this project includes creation and testing of new methods to measure, interpret, and simulate reservoir fractures that overcome the challenge of inadequate sampling. The key to these methods is the use of microstructures as guides to the attributes of the large fractures that control reservoir behavior. One accomplishment of the project research is a demonstration that these microstructures can be reliably and inexpensively sampled. Great potential exists, therefore, for increasing the quality and quantity of fracture data acquired as well as reducing the cost.

CATEGORY: ENVIRONMENTAL, SAFETY AND HEALTH

PUB ID DOE/PC/91008-0130 **ORDER #** 6047

TITLE *Federal Environmental Regulations Impacting Hydrocarbon Exploration, Drilling, and Production Operations*, Topical Report, March 1995, 50 pp.

PUB DATE 4/27/1999

CONTRACTOR BDM-Oklahoma, Inc

Waste handling and disposal from hydrocarbon exploration, drilling, and production are regulated by the United States Environmental Protection Agency (EPA) through federal and state regulations and / or through implementation of federal regulations. Source wastes generated in these operations are exempt under the Resource Conservation and Recovery Act (RCRA) but are not exempt under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Superfund Amendments and Reauthorization Act (SARA), and other federal environmental laws. Exempt wastes remain exempt only if they are not mixed with hazardous wastes or hazardous substances. Once mixture occurs, the waste must be disposed as hazardous material in an approved hazardous waste disposal facility. Before the Clean Air Act as amended in 1990, air emission from production, storage, steam generation, and compression facilities associated with hydrocarbon exploration, drilling, and production industry were not regulated. A critical proposed regulatory change which will significantly affect Class II injection wells for disposal of produced brine and injection for enhanced oil recovery is imminent. Federal regulations affecting hydrocarbon exploration, drilling and production, proposed EPA regulatory changes, and a recent significant United States Court of Appeals decision are covered in this report. It appears that this industry will, in the future, fall under more stringent environmental regulations leading to increased costs for operations.

PUB ID DOE/5AC304 **ORDER #** 2990

TITLE *Characterization of the National Petroleum Reserve No. 3 (NPR-3) Site for Naturally Occurring Radioactive Material (NORM)*, Final Report, September 1998, 45 pp.

PUB DATE 1/21/1999

CONTRACTOR Lockheed Martin Idaho Technologies Inc.

The National Petroleum Reserve No. 3 site (NPR-3) near

Casper, Wyoming is being prepared for transfer to private industry. Remediation of the NPR-3 site has already begun in anticipation of this transfer. This report describes the collection of environmental samples at the NPR-3 site and the analysis of these samples for NORM radionuclides. Soil and sediment samples were collected from areas identified by gamma exposure surveys as likely to be contaminated with NORM radionuclides. These samples were analyzed for Ra content and Rn emanation fraction. No NORM-contaminated pipe scale was found at the NPR-3 site.

PUB ID DOE/SW/41286-1 **ORDER #** 5295

TITLE *Coiled Tubing Safety Manual*, Topical Report, January 1999, 82 pp.

PUB DATE 4/6/1999

CONTRACTOR Westpoint Technology Center

This document addresses safety concerns regarding the use of coiled tubing as it pertains to the preservation of personnel, environment and the wellbore. The scope of this document is not intended to fully replace a standard practice manual or give full detail of all safety procedures. The main contribution of this document is to provide further depth to the broad scope of these basic practices to enhance the effectiveness of the industry. The practices discussed in this document pertain to normally pressured and low-pressure wells on land or on fixed platforms/caissons in open waters.

CATEGORY: FIELD DEMONSTRATION

PUB ID DOE/BC/14936-11 **ORDER #** 7432

TITLE *Application of Advanced Reservoir Characterization, Simulation, and Production Optimization Strategies to Maximize Recovery in Slope and Basin Clastic Reservoirs, West Texas (Delaware Basin)*, Annual Report, March 31, 1998–March 30, 1999, 106 pp.

PUB DATE 6/8/1999

CONTRACTOR Bureau of Economic Geology

The objective of this Class III project is to demonstrate that detailed reservoir characterization of slope and basin clastic reservoirs in sandstones of the Delaware Mountain Group in the Delaware Basin of West Texas and New Mexico is a cost-effective way to recover a higher percentage of the original oil in place through geologically based field development. This year the project focused on reservoir characterization of the East Ford unit, a representative Delaware Mountain Group field that produces from the upper Bell Canyon Formation (Ramsey

Sandstone). The field, discovered in 1960, is operated by Orla Petco, Inc., as the East Ford unit; it contained an estimated 19.8 million barrels (MMbbl) of original oil in place. Petrophysical characterization of the East Ford was used to map porosity, permeability, net pay, water saturation, mobil-oil saturation, and other reservoir properties.

PUB ID DOE/BC/14953-21 **ORDER #** 6089

TITLE *Increased Oil Production and Reserves from Improved Completion Techniques in the Bluebell Field, Uinta Basin, Utah*, Annual Report, October 1, 1997–September 30, 1998, 47 pp.

PUB DATE 4/28/1999

CONTRACTOR Utah Geological Survey

The objective of the project is to increase oil production and reserves by the use of improved reservoir characterization and completion techniques in the Uinta Basin, Utah. To accomplish this objective, a two-year geologic and engineering characterization of the Bluebell field was conducted. The study evaluated surface and subsurface data, currently used completion techniques, and common production problems. It was determined that advanced case- and open-hole logs could be effective in determining productive beds and that stage-interval (about 500 ft [150 m] per stage) and bed-scale isolation completion techniques could result in improved well performance. In the first demonstration well (Michelle Ute well discussed in the previous technical report), dipole shear anisotropy (anisotropy) and dual-burst thermal decay time (TDT) logs were run before and isotope tracer log was run after the treatment. The logs were very helpful in characterizing the remaining hydrocarbon potential in the well. But, mechanical failure resulted in a poor recompletion and did not result in a significant improvement in the oil production from the well.

PUB ID DOE/BC/14941-14 **ORDER #** 3800

TITLE *Advanced Oil Recovery Technologies for Improved Recovery from Slope Basin Clastic Reservoirs, Nash Draw Brushy Canyon Pool, Eddy County, New Mexico*, Final Report, October 14, 1998, 68 pp.

PUB DATE 2/25/1999

CONTRACTOR STRATA Production Company

The overall objective of this project is to demonstrate that a development program -- based on advanced reservoir management methods--can significantly improve oil recovery at the Nash Draw Pool (NDP). The plan includes developing a control area using standard reser-

voir management techniques and comparing its performance to an area developed using advanced reservoir management methods. Specific goals are: (1) to demonstrate that an advanced development drilling and pressure maintenance program can significantly improve oil recovery compared to existing technology applications; and (2) to transfer these advanced methodologies to oil and gas producers in the Permian Basin and elsewhere throughout the U.S. oil and gas industry.

PUB ID DOE/BC/14989-21 **ORDER #** 5128

TITLE *Application of Integrated Reservoir Management and Reservoir Characterization to Optimize Infill Drilling*, Annual Report, June 13, 1996–June 12, 1998, 41 pp.

PUB DATE 4/27/1999

CONTRACTOR Fina Oil and Chemical Co.

Infill drilling of wells on a uniform spacing, without regard to reservoir performance and characterization, does not optimize reservoir development because it fails to account for the complex nature of reservoir heterogeneities present in many low-permeability reservoirs, and carbonate reservoirs in particular. New and emerging technologies, such as geostatistical modeling, rigorous decline curve analysis, reservoir rock typing, and special core analysis can be used to develop a 3-D simulation model for prediction of infill locations. Other technologies, such as inter-well injection tracers and magnetic flow conditioners, can also aid in the efficient evaluation and operation of both injection and producing wells.

PUB ID DOE/PC/91008-0379 **ORDER #** 3332

TITLE *Field Demonstration of Logging Technologies for Reservoir Characterization*, Final Report, October 1998, 289 pp.

PUB DATE 2/2/1999

CONTRACTOR BDM-Oklahoma, Inc.

This compilation focuses on the practical aspects of the use of wireline logging in today's domestic petroleum industry. It explores the implementation methodologies and the technical and economic successes and failures encountered in use of advanced logging technologies and the use of innovative methods to extract reservoir petrophysical information from existing wireline logs. The majority of the logging applications reviewed are those performed in projects jointly funded by the domestic petroleum industry and the U.S. Department of Energy (DOE) in DOE's Field Demonstration Program, particu-

larly under the Reservoir Class Program. Because less than one-half of the nearly 30 projects in the Reservoir Class Program have been completed, much of this work was reviewed in progress.

PUB ID DOE/BC/14991-14 **ORDER #** 2714

TITLE *Design and Implementation of a CO₂ Flood Utilizing Advanced Reservoir Characterization and Horizontal Injection Wells In a Shallow Shelf Carbonate Approaching Waterflood Depletion*, Annual Report, July 1, 1996–June 30, 1997, 22 pp.

PUB DATE 1/14/1999

CONTRACTOR Phillips Petroleum Company

The purpose of this project was to design an optimum carbon dioxide (CO₂) flood project utilizing advanced reservoir characterization and CO₂ horizontal injection wells, demonstrate the performance of this project in the field and transfer the information to the public so it can be used to avoid premature abandonment of other fields. Two primary methods were used in this work to accomplish improved economics are the use of reservoir characterization to restrict the flood to the high quality rock in the unit and the use of horizontal injection wells to cut investment and operating costs through centralization.

PUB ID DOE/BC/14942-7 **ORDER #** 3333

TITLE *Advanced Reservoir Characterization and Evaluation of CO₂ Gravity Drainage in the Naturally Fractured Spraberry Trend Area*, Final Report, September 1, 1997–August 31, 1998, 64 pp.

PUB DATE 2/3/1999

CONTRACTOR New Mexico Institute of Mining & Technology

The overall objective of this project is to assess the economic feasibility of CO₂ flooding the naturally fractured Spraberry Trend Area in West Texas. This objective was accomplished by conducting research in four areas: 1) extensive characterization of the reservoirs; 2) experimental studies of crude oil/brine/rock (COBR) interactions in reservoirs; 3) reservoir performance analysis; and 4) experimental investigations on CO₂ gravity drainage in Spraberry whole cores. This report provides results of the third year of the five-year project for each of the four areas including a status report of field activities leading up to injection of CO₂.

PUB ID DOE/BC/14934-8 **ORDER #** 5126

TITLE *Increasing Waterflood Reserves in the Wilmington Oil Field Through Improved Reservoir Characterization and Reservoir Management*, Annual Report, March 20, 1996–March 21, 1997, 121 pp.

PUB DATE 4/1/1999

CONTRACTOR City of Long Beach, & Tidelands Oil

This project used advanced reservoir characterization tools, including the pulsed acoustic cased-hole logging tool, geologic three-dimensional (3-D) modeling software, and commercially available reservoir management software to identify sands with remaining high oil saturation following waterflood. Production from the identified high oil saturated sands was stimulated by recompleting existing production and injection wells in these sands using conventional means as well as a short radius redrill candidate.

PUB ID DOE/BC/14941-13 **ORDER #** 3257

TITLE *Advanced Oil Recovery Technologies for Improved Recovery from Slope Basin Clastic Reservoirs, Nash Draw Brushy Canyon Pool, Eddy County, New Mexico*, Annual Report, October 1, 1997–September 30, 1998, 58 pp.

PUB DATE 2/1/1999

CONTRACTOR STRATA Production Company

Advanced reservoir characterization techniques are being used at the Nash Draw Brushy Canyon Pool project to develop reservoir management strategies for optimizing oil recovery from this Delaware reservoir. The reservoir characterization, geological modeling, 3-D seismic interpretation, and simulation studies have provided a detailed model of the Brushy Canyon zones. This model was used to predict the success of different reservoir management scenarios and to aid in determining the most favorable combination of targeted drilling, pressure maintenance, well simulation, and well spacing to improve recovery from this reservoir.

PUB ID DOE/BC/14957-23 **ORDER #** 2715

TITLE *Improved Oil Recovery in Fluvial Dominated Deltaic Reservoirs of Kansas - Near-Term*, Annual Report, June 17, 1997–June 17, 1998, 30 pp.

PUB DATE 1/14/1999

CONTRACTOR University of Kansas Center for Research

Two demonstration sites operated by different independent oil operators are involved in this project. The Stewart

Field is located in Finney County, Kansas and is operated by PetroSantander, Inc. This field was in the latter stage of primary production at the beginning of this project and is currently being waterflooded as a result of this project. The Nelson Lease (an existing waterflood) is located in Allen County, Kansas, in the N.E. Savonburg Field and is operated by James E. Russell Petroleum, Inc. The objective is to increase recovery efficiency and economics in these types of reservoirs. The technologies being applied to increase waterflood sweep efficiency are: (1) in situ permeability modification treatments; (2) infill drilling; (3) pattern changes; and (4) air flotation to improve water quality. The technologies being applied to improve reservoir management are: (1) database development; (2) reservoir simulation; (3) transient testing; (4) database management; and (5) integrated geological and engineering analysis.

PUB ID DOE/BC/14986-14 **ORDER #** 3831

TITLE *CO₂ Huff-n-Puff Process in a Light Oil Shallow Shelf Carbonate Reservoir*, Final Report, February 10, 1994–December 31, 1997, 82 pp.

PUB DATE 2/26/1999

CONTRACTOR Texaco Exploration & Production Inc.

The objective of this project would show that application of the CO₂ Huff-n-Puff process in shallow shelf carbonates could be economically implemented to recovery appreciable volumes of light oil. The goals of the project were the development guidelines for cost-effective selection of candidate reservoirs and wells, along with estimating recovery potential. The principal objective of the CVU and SSU CO₂ Huff-n-Puff projects was to determine the feasibility and practicality of the technology in a waterflooded SSU environment. The results of parametric simulation of the CO₂ Huff-n-Puff process at CVU, coupled with reservoir characterization, assisted in determining if this process was technically and economically ready for field implementation. The ultimate goal was to develop guidelines based on commonly available data that operators within the oil industry could use to investigate the applicability of the process within other fields. The technology transfer objective of the project was to disseminate the knowledge gained through an innovative plan in support of the DOE's objective of increasing domestic oil production and deferring the abandonment of SSC reservoirs. The tasks associated with this objective were completed in a timely manner.

PUB ID DOE/BC/14951-25 **ORDER #** 5313

TITLE *Integrated Approach Towards the Application of Horizontal Wells to Improve Waterflooding Performance*, Annual Report, January 1 - December 31, 1998, 8 pp.

PUB DATE 4/7/1999

CONTRACTOR University of Tulsa

This annual report describes the progress during the sixth year of the project on "Integrated Approach Towards the Application of Horizontal Wells to Improve Waterflooding Performance." This report is funded under the Department of Energy's (DOE's) Class I program which is targeted towards improving the reservoir performance of mature oil fields located in fluvially dominated deltaic geological environments. The project involves using an integrated approach to characterize the reservoir followed by proposing an approach reservoir management strategy to improve the field performance. In the first stage of the project, the type of data integrated includes cross bore hole seismic surveys, geological interpretation based on the logs and the cores, and the engineering information. In contrast, during the second stage of the project, it was intended to use only conventional data to construct the reservoir description. This report covers the results of the implementation from the first stage of the project. It also discusses the work accomplished so far to the second stage of the project. The production from the Shelf Unit (location of Stage I) has sustained a significant increase over more than three years.

PUB ID DOE/BC/14939-9 **ORDER #** 8076

TITLE *Increasing Heavy Oil Reserves in the Wilmington Oil Field Through Advanced Reservoir Characterization And Thermal Production Technologies*, Annual Report, April 1, 1996–March 31, 1997, 79 pp.

PUB DATE 6/25/1999

CONTRACTOR City of Long Beach, Tidelands Oil Production Co., Univ.

The objective of this project is to increase the recoverable heavy oil reserves within sections of the Wilmington Oil Field, near Long Beach, California. This is realized through the testing and application of advanced reservoir characterization and thermal production technologies. It is hoped that the successful application of these technologies will result in their implementation throughout the Wilmington Field and, through technology transfer, will be extended to increase the recoverable oil reserves in other slope and basin clastic (SBC) reservoirs. The existing steamflood in the Tar zone of Fault Block (FB) II-A has been relatively

insufficient because of several producibility problems which are common in SBC reservoir; inadequate characterization of the heterogeneous turbidite sands, high-permeability thief zones, low-gravity oil and nonuniform distribution of the remaining oil. This has resulted in poor sweep efficiency, high steam-oil ratios, and early breakthrough. Operational problems related to steam breakthrough, high reservoir pressure, and unconsolidated sands have caused premature well and downhole equipment failures. In aggregate, these reservoir and operational constraints have resulted in increased operating costs and decreased recoverable reserves.

PUB ID DOE/BC/14982-16 **ORDER #** 7917
TITLE *An Integrated Study of the Grayburg/San Andres Reservoir, Foster and South Cowden Fields, Ector County, Texas, Annual Report, August 1, 1997–July 31, 1998, 49 pp.*

PUB DATE 6/21/1999

CONTRACTOR Laguna Petroleum Corporation

A project to recover economic amounts of oil from a very mature oil field is being conducted by Laguna Petroleum Corporation of Midland, Texas, with partial funding from a U. S. Department of Energy (DOE) grant to study shallow carbonate rock reservoirs. The objectives of the project are to use modern engineering methods to optimize oil field management and to use geological and geophysical data to recover untapped potential within the petroleum reservoirs. The integration of data and techniques from these disciplines has yielded results greater than those achievable without their cooperation. The cost of successfully accomplishing these goals is to be low enough for even small independent operators to afford. This article is a report describing accomplishments for the fiscal year 1997-1998.

PUB ID DOE/BC/14938-12 **ORDER #** 5127
TITLE *Advanced Reservoir Characterization in the Antelope Shale to Establish the Viability of CO₂ Enhanced Oil Recovery in California's Monterey Formation Siliceous Shales, Annual Report, February 1, 1998–February 6, 1999, 213 pp.*

PUB DATE 4/6/1999

CONTRACTOR Chevron USA Production Company

The primary objective of this project was to conduct advanced reservoir characterization and modeling studies in the Antelope Shale. Work was subdivided into two phases or budget periods. The first phase of the project would focus on the application of a variety of advanced

reservoir characterization techniques to determine the production characteristics of the Antelope Shale reservoir. Reservoir models based on the results of the characterization work would then be used to evaluate how the reservoir would respond to enhanced oil recovery (EOR) processes. The second phase of the project would be to implement and evaluate an EOR pilot in Buena Vista Hills Field. A successful project would demonstrate the economic viability and widespread applicability of CO₂ flooding in siliceous shale reservoirs of the San Joaquin Valley. To date the project has had many accomplishments: (1) detailed reservoir characterization of Brown and Antelope shales; (3) first coreflood analysis of siliceous shales; (3) first high-resolution crosswell reflection images to be obtained in any oil field in the San Joaquin Valley; (4) mineral model to determine lithology variations and oil saturation in siliceous shales; and (5) comprehensive 3-D earth model and reservoir simulation.

PUB ID DOE/BC/14937-8 **ORDER #** 3258
TITLE *Reactivation of an Idle Lease to Increase Heavy Oil Recovery through Application of Conventional Steam Drive Technology in a Low-Dip Slope & Reservoir in the Midway-Sunset Field, San Joaquin Basin, California, Annual Report, 96/97, 59 pp.*

PUB DATE 2/1/1999

CONTRACTOR University of Utah

This project reactivates ARCO's idle Pru Fee lease in the Midway-Sunset field, California and conducts a continuous steamflood enhanced oil recovery demonstration aided by an integration of modern reservoir characterization and simulation methods. Cyclic steam was used to reestablish baseline production within the reservoir characterization phase of the project completed in December 1996. During the demonstration phase begun in January 1997, a continuous steamflood enhanced oil recovery is testing the incremental value of this method as an alternative to cyclic steaming. The objectives of the project are: (1) to return the shut-in portion of the reservoir to optimal commercial production; (2) to accurately describe the reservoir and recovery process; and (3) to convey the details of this activity to the domestic petroleum industry, especially to other producers in California, through an aggressive technology transfer program.

CATEGORY: OIL FIELD PRODUCTION AND OPERATION

PUB ID DOE/BC/14851-2 **ORDER #** 6970

TITLE *Prediction of Gas Injection Performance for Heterogeneous Reservoirs*, Annual Report, September 1996–September 1997, 99 pp.

PUB DATE 5/26/1999

CONTRACTOR Stanford University

This report describes research carried out in the Department of Petroleum Engineering at Stanford University from September 1996 - September 1997 under the first year of a three-year Department of Energy (DOE) grant on the Prediction of Gas Injection Performance for Heterogeneous Reservoirs. The research effort is an integrated study of the factors affecting gas injection, from the pore scale to the field scale, and involves theoretical analysis, laboratory experiments and numerical simulation. The original proposal described research in four main areas; (1) Pore scale modeling of three-phase flow in porous media; (2) Laboratory experiments and analysis of factors influencing gas injection performance at the core scale with an emphasis on the fundamentals of three-phase flow; (3) Benchmark simulations of gas injection at the field scale; and (4) Development of streamline-based reservoir simulator. Each stage of the research is planned to provide input and insight into the next stage, such that at the end we should have an integrated understanding of the key factors affecting field scale displacements.

PUB ID TRWPT/CRADA-003-2 **ORDER #** 8017

TITLE *Gas Injection for Schrader Bluff (GS-23F-8079H)*, Topical Report, May 1999, 28 pp.

PUB DATE 6/24/1999

CONTRACTOR TRW Petroleum Technologies

A study was initiated to evaluate the potential for oil recovery at Schrader Bluff, Alaska, using gas injection processes. The purpose of the study was to determine which gas or gas mixtures are likely to produce oil via miscible recovery mechanisms at reservoir conditions, and to estimate the recovery potential. A laboratory study was conducted to measure the swelling and miscible phase behavior properties. Prudhoe Bay MI and CO₂/NGL mixtures reduce Schrader Bluff crude oil viscosity by up to 70%; viscosities were reduced from 65 cP (downhole conditions) to about 20 cP. A simulation study showed that incremental recovery potential varied from 2% OOIP for Schrader Bluff lean gas, to 11% OOIP for Prudhoe Bay MI,

to 21.6% for 20% CO₂/80% NGL. All studies were conducted with 1:1 WAG injection scheme. Recovery would be further improved with better throughput in the lower permeable N sands. It appeared that sufficient CO₂ would be available for injection if captured from Prudhoe Bay operations (flue gas, separator gas, etc.). Benefits to reduce global warming via reduction in CO₂ emissions from North Slope operations are also discussed.

PUB ID DOE/BC/15110-1 **ORDER #** 7430

TITLE *Using Chemicals to Optimize Conformance Control in Fractured Reservoirs*, Semi-Annual Report, October 1, 1998 through December 31, 1998, 6 pp.

PUB DATE 6/8/1999

CONTRACTOR New Mexico Petroleum Recovery Research Center

This technical progress report describes work performed from October 1, 1998 through December 31, 1998, for the project, "Using Chemicals to Optimize Conformance in Fractured Reservoirs." In our first task area, disproportionate permeability reduction, a literature survey and analysis are underway to identify options for reducing permeability to water much more than that to oil. In our second task area, we are encouraging the use of our recently developed software for sizing gelant treatments in hydraulically fractured production wells. In several field applications, we noted the importance of obtaining accurate values of the static reservoir pressure before using our program. In our third task area, we examined gel properties as they extruded through fractures. We found stable pressure gradients during injection of a large volume of a one-day-old Cr(III)-acetate-HPAM gel into a 0.04-in.-wide, four-ft-long fracture. This finding confirms that gel injection (under our specific circumstances) did not lead to continuously increasing pressure gradients and severely limited gel propagation. Our experiments also provided insights into the mechanism for gel propagation during extrusion through fractures.

PUB ID DOE/BC/14851-1 **ORDER #** 6738

TITLE *Prediction of Gas Injection Performance for Heterogeneous Reservoirs*, Annual Report, September 1997 through September 1998, 88 pp.

PUB DATE 5/17/1999

CONTRACTOR Stanford University

This report describes research carried out in the Department of Petroleum Engineering at Stanford University from September 1997 - September 1998 under

the second year of a three-year grant from the Department of Energy (DOE) on the "Prediction of Gas Injection Performance for Heterogeneous Reservoirs." The research effort is an integrated study of the factors affecting gas injection, from the pore scale to the field scale, and involves theoretical analysis, laboratory experiments, and numerical simulation. The original proposal described research in four areas: (1) Pore scale modeling of three phase-flow in porous media; (2) Laboratory experiments and analysis of factors influencing gas injection performance at the core scale with an emphasis on the fundamentals of three-phase flow; (3) Benchmark simulations of gas injection at the field scale; and (4) Development of streamline-based reservoir simulator. Each state of the research is planned to provide input and insight into the next stage, such that at the end we should have an integrated understanding of the key factors affecting field-scale displacements.

PUB ID DOE/PC/91008-0328 **ORDER #** 3994

TITLE *Planning & Implementation of an Alkali-Surfactant-Polymer (ASP) Field Project*, Topical Report, September 1997, 22 pp.

PUB DATE 3/5/1999

CONTRACTOR BDM-Oklahoma, Inc.

BDM Petroleum Technologies conducted research on ASP flooding as a part of the U.S. Department of Energy (DOE) plan to maximize the economic producibility of our domestic oil resource. ASP flooding shows promise of being cost-effective because alkali, in addition to reinforcing the activity of surfactants, reduces the depletion of surfactant and polymer that occurs because of retention in the reservoir. The Warden ASP project has progressed from the initial planning stage to construction of an injection plant. An ASP chemical system was designed based on laboratory evaluation that included interfacial tension, mobility requirements, rock-alkali interaction, fluid compatibilities, and core tests. Field cores were obtained from the Permian No. 5 and No. 6 sands on the Warden lease in Sho-Vel-Tum oil field.

PUB ID TRWPT/CRADA-002-1 **ORDER #** 4203

TITLE *Evaluation of In Situ Combustion for Schrader Bluff (GS-23F-8079H)*, Topical Report, March 1999, 46 pp

PUB DATE 3/10/1999

CONTRACTOR TRW Petroleum Technologies

Initial screening processes were applied to determine which of the EOR methods were most appropriate for

Schrader Bluff. In situ combustion was among the methods considered potentially favorable and was evaluated further. Laboratory-scale tube runs were followed by simulation sensitivity studies to determine if the kinetic parameters for the crude oil were favorable. This report describes the results of the (1) initial screening, (2) experimental tube runs, and (3) simulation sensitivity studies as related to in situ combustion in Schrader Bluff.

PUB ID DOE/PC/91008-0374 **ORDER #** 3175

TITLE *In-Situ Combustion Handbook, Principles and Practices*, Topical Report, November 1998, 403 pp.

PUB DATE 2/1/1999

CONTRACTOR BDM-Oklahoma, Inc.

The purpose of this handbook is to present a state-of-the-art knowledge and best practices of the ISC technology in simple terms. It is aimed at operators and engineers who are unfamiliar with this aspect of oil recovery technology. The scope of this handbook includes, but is not limited to the following topics: (1) The fundamentals of ISC processes, (2) Combustion kinetics, (3) Geology and site section criteria for fireflood projects, (4) Engineering of an ISC project, (5) Case history of past projects and lessons learned from them, and (6) ISC well completion and operational practices.

Computer Software & Supporting Documentation

Personal Computer Programs are available on 3.5" HD 1.4 MB disks.

1. **DOE/BC-88/1/SP.** *EOR Predictive Models: Handbook for Personal Computer Versions of Enhanced Oil Recovery Predictive Models.* BPO Staff. February 1988. 76 pp. NTIS Order No. DE89001204. FORTRAN source code and executable programs for five EOR Predictive Models shown below are available. The five recovery processes modeled are Steamflood, In-Situ Combustion, Polymer, Chemical, and CO₂ Miscible Flooding. The models are available individually. Min Req.: IBM PC/XT, PS-2, or compatible computer with 640 Kbytes of memory.

a. **DOE/BC-86/6/SP.** *Steamflood Predictive Model, Supporting Technology for Enhanced Oil Recovery.* Dec 1986, 594 pp. NTIS Order No. DE87001219.

b. **DOE/BC-86/7/SP.** *In-Situ Combustion Predictive Model*, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 263 pp. NTIS Order No. DE86000264.

c. **DOE/BC-86/10/SP.** *Polymer Predictive Model*, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 394 pp. NTIS Order No. DE87001207.

d. **DOE/BC-86/10/SP.** *Polymer/Waterflood Predictive Model: Windows Version 1.1*: June 1995. This is an update to the Polymer Flood Predictive Model (PFPM) released in 1986. An addendum is available describing the updated economic cost and tax functions included in this release. This serves as a supplement to the original PFPM user's manual. This version runs out of the Microsoft Windows environment and supports post-processing graphics. Min Req.: 80386, 4 Mbytes extended memory, and Windows v3.1.

e. **DOE/BC-86/11/SP.** *Chemical Flood Predictive Model*, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 360 pp. NTIS Order No. DE87001208.

f. **DOE/BC-86/12/SP.** *CO₂ Miscible Flood Predictive Model*, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 469 pp. NTIS Order No. DE87001209.

g. **DOE/BC-86/12/SP.** *CO₂ Miscible Predictive Model: Windows Version 1.1*: 1995. This is an update to the CO₂ Miscible Flood Predictive Model (CO₂PM) released in 1986. This version runs out of the Microsoft Windows environment and supports post-processing graphics. Min Req.: 80386, 4 Mbytes extended memory, and Windows v3.1.

2. **DOE/BC-95/2/SP.** *Infill Drilling Predictive Model: User's Guide and Documentation Manual - Release 1.2.0*, Feb. 1995 for the PC. FORTRAN source code and executable program. Min Req.: 80386/80387, DOS v3.1, and 2 Mbytes extended memory.

a. **DOE/BC-95/2/SP.** *Infill Drilling Predictive Model: Windows Version 1.1*: June 1995. This is an update to the Infill Drilling Predictive Model (IDPM) released in 1995. This version runs out of the Microsoft Windows environment and supports post-

processing graphics. Min Req.: 80386, 4 Mbytes extended memory, and Windows v3.1.

3. **DOE/BC/14960-7.** *CO₂ Prophet: Water and CO₂ Flood Prediction Software*. CO₂ Prophet, conceived by Texaco Exploration and Production Technology Department (EPTD), was partially developed as part of the DOE Class I cost-share program "Post Waterflood, CO₂ Flood in a Light Oil, Fluvial Dominated Deltaic Reservoir" under DOE Contract No. DE-FC22-93BC14960. Min Req.: 80386/80387 and 4 Mbytes extended memory and will run under the Microsoft Windows environment. DOE does not provide technical support for this application.

4. **DOE/BC-89/3/SP.** *Handbook for Personal Computer Version of BOAST II: A Three-Dimensional, Three-Phase Black Oil Applied Simulation Tool*. Bartlesville Project Office. January 1989. 82 pp. NTIS Order No. DE89000725. FORTRAN source code and executable program. Min. Req.: IBM PC/AT, PS-2, or compatible computer with 640 Kbytes of memory.

5. **NIPER-542.** *BOAST-VHS: FORTRAN source code and executable program*. User's Guide and Documentation Manual, National Institute for Petroleum and Energy Research (NIPER). January 1992. 92 pp. NTIS Order No. DE92001021. Min. Req.: IBM PC/AT, PS-2, or compatible computer with 640 Kbytes of memory. Math coprocessor optional.

6. **DOE/BC/14831-18.** *BOAST-3: FORTRAN Source code and executable program*. User's Guide and Documentation Manual. Bartlesville Project Office, September 21, 1996 (version 1.6). BOAST-3 is a modified version of BOAST-II containing postprocessors COLORGRID and B3PLOT2. The executable was compiled with the 32-bit Microsoft PowerStation FORTRAN and is 100% compatible with Windows. Min Req.: 386/486 PC environment.

7. **BOAST98:** (Version 4.2.3) FORTRAN 90 source code and executable program. Visual, dynamic, and interactive update of BOAST3. Rock region saturation corrected by WOC and GOC. Interacts with EdBOAST. Beta tested. User's Guide and Documentation Manual. National Petroleum Technology Office by TRW Petroleum Technologies,

December 1998. Compiled with Lahey FORTRAN 90 and ISS/Interacter. Min. Req. Windows95, Windows NT, or Windows 3.1 with Win32s installed. Recommend 32 MB memory. Anticipate need of 40 to 100 MB disk space.

8. **EdBOAST:** *Version 1.3.3*, FORTRAN 90 source code and executable program. Dialog oriented reservoir data editor for input files directed to BOAST98 and BOAST3. Graphic plots and spreadsheet import/export features. Interacts with BOAST98. Beta tested. User's Guide. National Petroleum Technology Office by TRW Petroleum Technologies, December 1998. Compiled with Lahey FORTRAN 90 AND ISS/Interacter. Min. Req. Windows98, Windows NT, or Windows 3.1 with Win32s installed. Recommend 32 MB memory.

9. **DOE/BC-91/2/SP. MASTER:** *Miscible Applied Simulation Techniques for Energy Recovery - Version 2.0*. User's Guide and Technical Manual. Morgantown Energy Technology Center (METC). February 1991. 192 pp. NTIS Order No. DE91002222. FORTRAN source code and executable program. Min. Req.: See Users Guide.

10. **NIPER-705. PC-GEL:** *A Three-Dimensional, Three-Phase, Permeability Modification Simulator*. IIT Research Institute, National Institute for Petroleum and Energy Research (NIPER). October 1993. 190 pp. NTIS Order No. DE94000104. FORTRAN source code and executable program. Min. Req.: IBM PC/AT, PS-2, or compatible computer with 640 Kbytes of memory Math coprocessor optional

11. **DOE/BC/20006-18. TRACRL-Single-Well Chemical Tracer Test Simulator.** A deliverable as part of "The Single-Well Chemical Tracer Method for Measuring Residual Oil Saturation-Final Report." Bartlesville Energy Technology Center (BETC), predecessor to National Institute for Petroleum and Energy Research (NIPER). October 1980. 190 pp. FORTRAN source code and sample input datasets for both PC and Apple environments. Executable program for the PC.

12. **DOE/PC/91008-0042. NPC Public Database:** (*NPCPUBDB.GEO*) Database developed for the National Petroleum Council (NPC) for its 1984 assessment of the nation's enhanced oil recovery

(EOR) potential. The technical data description is at the reservoir level. Included with the database are the Appendices from the "TORIS Data Preparation Guidelines" defining the data elements in the database. Available in ASCII or Spreadsheet format.

13. **DOE/PC/91008-0151. Crude Oil Analysis Database: COADB, v2.0, 1995.** Database contains information on 9,056 crude oil analyses performed at the National Institute for Petroleum and Energy Research (NIPER). A printed user's guide is available by request. The database is also available on disk. Min Reqs.: DOS v5.0, 80386 processor, 4 MB RAM, and 20 MB hard disk memory.

14. **DOE/PC/91008-0227. Risk Analysis and Decision Making Software:** Software package includes tools for Monte Carlo simulation, best fit for distributed functions, sample or rank correlation, investment risk analysis, and EOR method screening. Developed at the National Institute for Petroleum and Energy Research (NIPER) by BDM-Oklahoma, Inc. A printed user's guide is available by request. Min Req. Windows v3.11, 8 MB hard disk space, 8 MB RAM, VGA color monitor, and an 80486 processor.

15. **DOE/PC/91008-0261. FRAC-EXPLORE:** Analyzes the characteristics and patterns of subsurface lineaments, fractures, and other geological features for the purpose of identifying the locations of potential subsurface oil and gas reservoirs. Developed at the National Institute for Petroleum and Energy Research (NIPER) by BDM-Oklahoma, Inc. A printed user's guide is available by request. Min Req. Windows v3.1, 6 MB hard disk space, 4 MB RAM, VGA color monitor configured to at least 800x600 resolution, and an 80386 processor.

16. **Microbial Transport Simulator:** The microbial transport simulator (MTS) is a three-dimensional, three-phase, multiple-component numerical model that permits the study of the transport of microorganisms and nutrients in porous media. Microbial parameters incorporated into MTS include: microbial growth and decay, microbial deposition, chemotaxis, diffusion, convective dispersion, tumbling, and nutrient consumption. Governing equations for microbial and nutrient transport are coupled with continuity and flow equations under conditions appropriate for a black oil reservoir. The model's mathematical formu-

lations and preparation procedures of data files for conducting simulations using MTS are described in the electronic manual. Min. Req.: IBM PC/AT, PS-2, or compatible computer with 640 Kbytes of memory. Math coprocessor optional.

17. **DOE/PC/91008-0346.** *User's Guide and Documentation Manual:* The improved PC-GEL permeability modification simulator is an improved version of National Institute for Petroleum and Energy Research's (NIPER's) PC-GEL permeability modification simulator. It is developed under a cooperative research and development agreement (CRADA) established between BDM-Oklahoma, Inc. and Schlumberger Dowell. In addition to the features included in the PC-GEL simulator, the improved version includes a radial model, a thermal energy equation in both rectangular and cylindrical coordinates, (r,0,z), a modified version of Schlumberger Dowell's wellbore simulator, a fully implicit time-stepping option, and the temperature-dependent gelation kinetics and fluid rheology of an inorganic delayed gel system (DGS). Detailed description of the development of these new features is reported in a topical report entitled, "Development of an Improved Permeability Modification Simulator."

18. **DOE/PC/91008-0361.** *Maganom Software USER'S GUIDE:* Maganom is a computer program for modeling magnetic data over 2-D structure. The program computes the magnetic anomalies across 2-D structure (models) to allow you to compare observed and computed magnetic data across the model structure. If a match between the computed and the observed magnetic values is unsatisfactory, you construct a new model and rerun Maganom to recalculate new magnetic values. In this way, you can continue calculations until you obtain a satisfactory match between the observed and the calculated values.

19. **DOE/PC/91008-0349.** *Gravanom Software USER'S GUIDE:* Gravanom is a computer program for modeling gravity data over 2-D structure. The program computes the gravity anomalies across 2-D structure (models) to allow you to compare observed and computed gravity data across the model structure. If a match between the computed and the observed gravity values is unsatisfactory, you construct a new model and rerun Gravanom to recalculate gravity values. In this way, you can continue calculations until you

obtain a satisfactory match between the observed and the calculated values.

20. **DOE/PC/91008-0344.** *Development of an Improved Permeability Modification Simulator:* This report describes the development of a permeability modification simulator. The improved simulator is developed through the modification of the existing PC-GEL permeability modification simulator to include a radial, a thermal energy equation, a modified version of Schlumberger Dowell's wellbore simulator, and a fully implicit time-stepping option. The developed simulator describes the flow of the injected fluid in the wellbore, through the perforations, and the reservoir. Flow in the reservoir is three dimensional and includes thermal conduction/convection among the injected fluid, the reservoir formation, the reservoir fluids, the overburden, and the underburden.

21. **Exploration and Production CD-ROM:** A new CD-ROM available from the DOE's National Petroleum Technology Office (NPTO) contains more than 20 programs, database applications, and model documentation fields for the oil and gas industry. The CD also features BOAST '98—the newest version of the DOE's popular software. The software can also be downloaded from the NPTO website at www.npto.doe.gov/software/softindx.html

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