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QUARTERLY TECHNICAL PROGRESS REPORT

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TITLE: IDENTIFICATION AND EVALUATION OF FLUVIAL-DOMINATED DELTAIC (CLASS I OIL) RESERVOIRS IN OKLAHOMA

Cooperative Agreement No. DE-FC22-93BC14956
Oklahoma Geological Survey (OGS), University of Oklahoma (OU)
Norman, Oklahoma 73019

Date of Report: April 28, 1994
Award Date: January 15, 1993
Anticipated Completion Date: December 31, 1997

Government Award for Current Year: $1,390,752

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Reporting Period: July 1, 1993 - September 30, 1993

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OBJECTIVES

The Oklahoma Geological Survey (OGS), the Geological Information Systems department, and the School of Petroleum and Geological Engineering at the University of Oklahoma are engaging in a program to identify and address Oklahoma's oil recovery opportunities in fluvial-dominated deltaic (FDD) reservoirs. This program includes the systematic and comprehensive collection and evaluation of information on all of Oklahoma's FDD reservoirs and the recovery technologies that have been (or could be) applied to those reservoirs with commercial success. This data collection and evaluation effort will be the foundation for an aggressive, multifaceted technology transfer program that is designed to support all of Oklahoma's oil industry, with particular emphasis on smaller companies and independent operators in their attempts to maximize the economic producibility of FDD reservoirs.

Specifically, this project will identify all FDD oil reservoirs in the State; group those reservoirs into plays that have similar depositional and subsequent geologic histories; collect, organize and analyze all available data; conduct characterization and simulation studies on selected reservoirs in each play; and

implement a technology transfer program targeted to the operators of FDD reservoirs to sustain the life expectancy of existing wells with the ultimate objective of increasing oil recovery.

The elements of the technology transfer program include developing and publishing play portfolios, holding workshops to release play analyses and identify opportunities in each of the plays, and establishing a user lab called the OGS Geosystems Extension Laboratory. The laboratory will contain all the play data files, as well as other oil and gas data files, together with the necessary hardware and software to analyze the information. Technical support staff will be available to assist interested operators in the evaluation of their producing properties, and professional geological and engineering outreach staff will be available to assist operators in determining appropriate recovery technologies for those properties.

SUMMARY OF TECHNICAL PROGRESS

The execution of this project is being approached in three phases. The current Phase 1: Planning and Analysis will last eighteen months, and includes system design, play definition, and database development activities. Data from the Natural Resources Information System (NRIS), an Oklahoma data system which has been developed through the support of the Department of Energy's Bartlesville Project Office, will provide the foundation for this data collection effort. Phases 2 and 3 will include implementation and technology transfer activities in which the collected information is organized and made available to the industry through the various methods. The milestone schedule and log for Phase 1 is included as Exhibit 1. Activities for Phase 1 have been divided into five primary tasks.

Task 1.1 Design/Develop Database Systems: Systems development activities continued during this quarter for the primary databases of the project. Initial emphasis was placed on designing input screens for the project geologists and engineers.

Work on the reservoir (subtask 1.1.1) database is in the initial stages of screen development.

Most of this quarter's system development efforts were concentrated on designing input screens and programs for the bibliographic/recovery technologies (subtask 1.1.2) database. Programming was written to conduct audit and merge functions within the database system; this feature, used in conjunction with a run-time version of the Advanced Revelations database software, will allow data to be entered at a remote site (on an independent computer not connected to the network master database) and then merged into the master database without duplication or data loss. The bibliographic/recovery technologies database is expected to become operational in October.

The operator database (1.1.3) has already been developed at the mainframe level, but by next year it will be converted to a pc-level system to facilitate contact-tracking activities.

Task 1.2 Data Research: Primary efforts for this quarter were devoted to data research activities.

As of October 1, the project staff have provided the Oklahoma Nomenclature Committee (ONC) with ten data packages, representing 108 townships in north central Oklahoma. These packages assist the ONC with the

delineation of the official oil field boundaries, with an emphasis on those areas in which FDD reservoirs occur frequently (subtask 1.2.1). Each data package contains maps and print listings of fields, leases, and wells, and represent areas that are prioritized based on their volumes of oil production from "unassigned" leases (i.e., leases outside of field boundaries). As the ONC defines new field boundaries, the NRIS field files will be updated accordingly.

Public domain data research (subtask 1.2.2) continued as the primary emphasis during this quarter. Project staff will soon begin to enter reference data regarding literature sources and theses into the new bibliographic database. By plotting the study locations of each literary reference on maps of selected reservoir production (Fig. 1A-B), the depositional definitions of the various reservoirs have become more clear. Detailed literature reviews have been initiated for the Prue, Skinner, Red Fork and Bartlesville reservoirs. Other FDD reservoirs will undergo similar analyses in the future.

A preliminary geologic province map was created this quarter by project geologists that will be subject to a peer review process. This map is an essential foundation for play analyses and should be based on the most recent structural/stratigraphic details available. The peer review process is being conducted by the Oklahoma Geological Survey and others in the local geologic community. The final product will be used and distributed by the Oklahoma Geological Survey for numerous applications in addition to this project.

Efforts were initiated to collect private domain data (subtask 1.2.3) by identifying target reservoirs for the reservoir characterization/simulation activities. NRIS data were used to create printouts of all oil production from Oklahoma fields that were discovered since 1979. These fields were sorted by their production volumes to identify fields large enough to warrant further study. The chosen fields were then analyzed to identify producing formations that are FDD reservoirs. This process narrowed the focus for targeting potentially cooperative operators. It is expected that data will be obtained from some of the targeted operators during the next quarter.

Reservoir and bibliography/recovery technology data elements (subtasks 1.2.4 and 1.2.5) continue to be captured as they are identified in various sources. The process of entering these data into the bibliography/reservoir technology database will begin in October.

Task 1.3 Play ID/Folio Plans: The strategy of quarterly scheduled Play ID/Folio planning sessions has been revised to include weekly meetings where all aspects of the plays are discussed. This has been helpful with initial play identification as well as allowing the new project staff geologist to become comfortable with working on the project team.

Each project geologists has been assigned various plays to work and after initial research, some of the reservoirs have been found non-FDD. Primary plays are still:(1) the Skiatook-Kansas City Play which includes the Layton, Marchand and Cleveland sandstones: (2) the Upper Cherokee Play including the Prue and Skinner sandstones; (3) the Middle Cherokee Play for the Red Fork sandstone; and (4) the Lower Cherokee Play including the Bartlesville and Booch sandstones.

Other identified plays include (5) the Shawnee Play (Hoover, Carmichael, and Endicott sandstones), (6) the Ochelata-Lansing Play (Cottage Grove sandstone), (7) the Marmaton Play (Peru sandstone), and (8) the Morrow Play (Upper and Lower Morrow sandstones). The Atoka Play has been removed completely from consideration including the two Atoka subplays for Gilcrease and Dutcher sandstones. Also, the Douglas Play has lost the Wade sandstone,

leaving only the Tonkawa subplay. All of these play revisions have been thoroughly documented as to why they are not considered FDD.

1.4 Computer Applications: User lab development activities (subtask 1.4.2) include both the acquisition of hardware and software, and the development of user interfaces for the data and applications that will be available through the user lab. Research is being continued on the most valuable and cost-effective hardware and software selections for the user lab, and some acquisitions have already been completed. Design efforts for the Advanced Revelations user interfaces are coinciding with the database development efforts in Task 1.1.

1.5 Management/Reporting: The third Play Leader petroleum geologist for the project began work during this quarter.

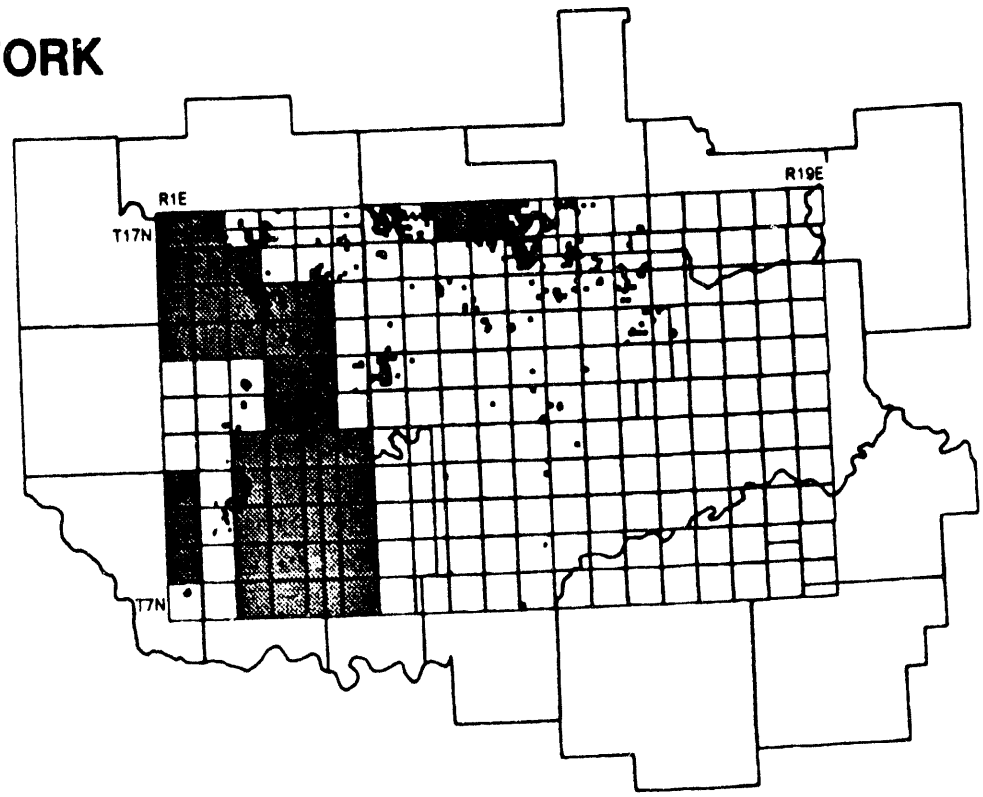
The only contract deliverable report completed during this quarter was the quarterly technical progress report for last quarter.

REFERENCES/PUBLICATIONS

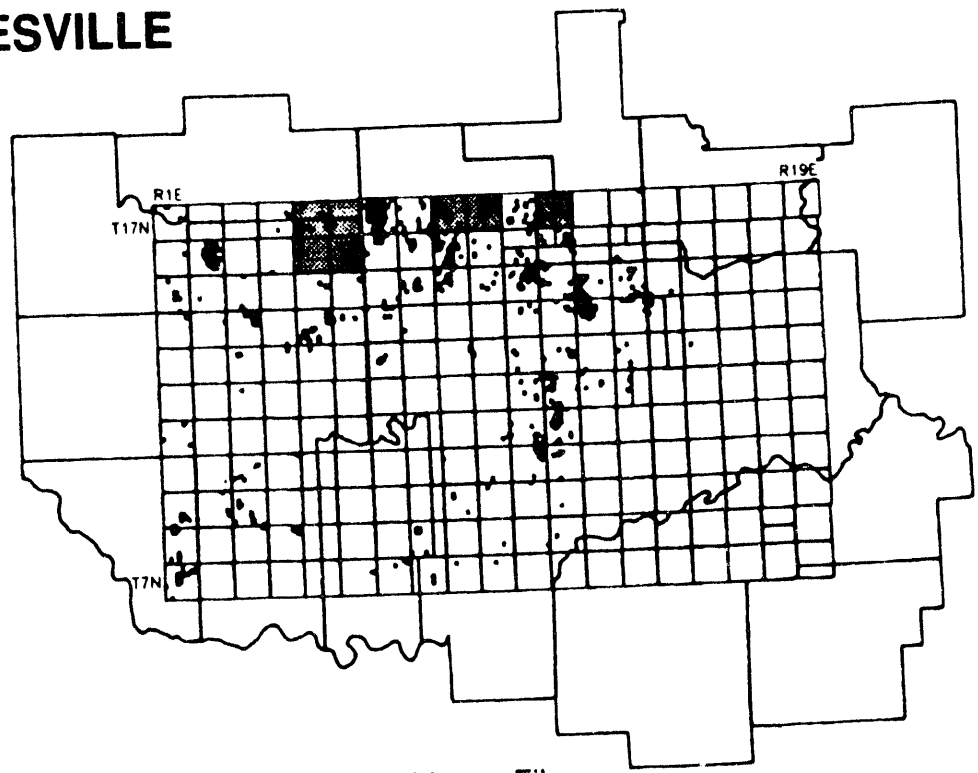
Since the project is in its early stages of planning and analysis, no publications have resulted from the project work thus far.

FDD PANEL 8 (T07N-17N, R01E-19E)

RED FORK



BARTLESVILLE



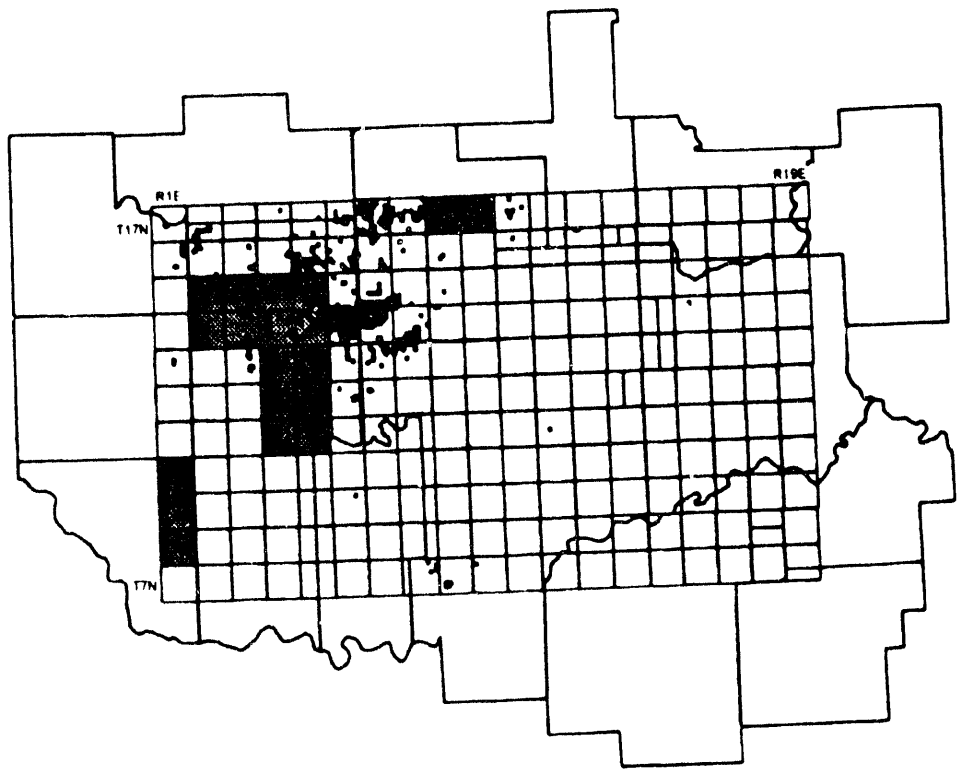
Oil Production From NRIS Lease Master File

FDD Oil Bibliographic Reference

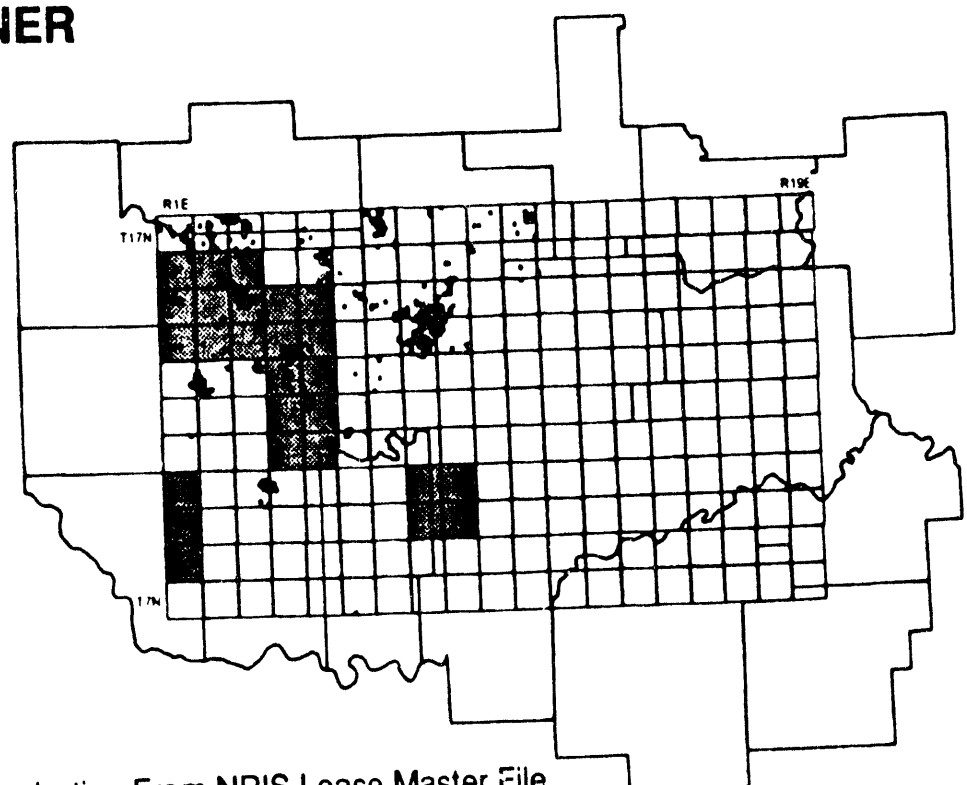
Figure 1-A

FDD PANEL 8 (T07N-17N, R01E-19E)

PRUE



SKINNER

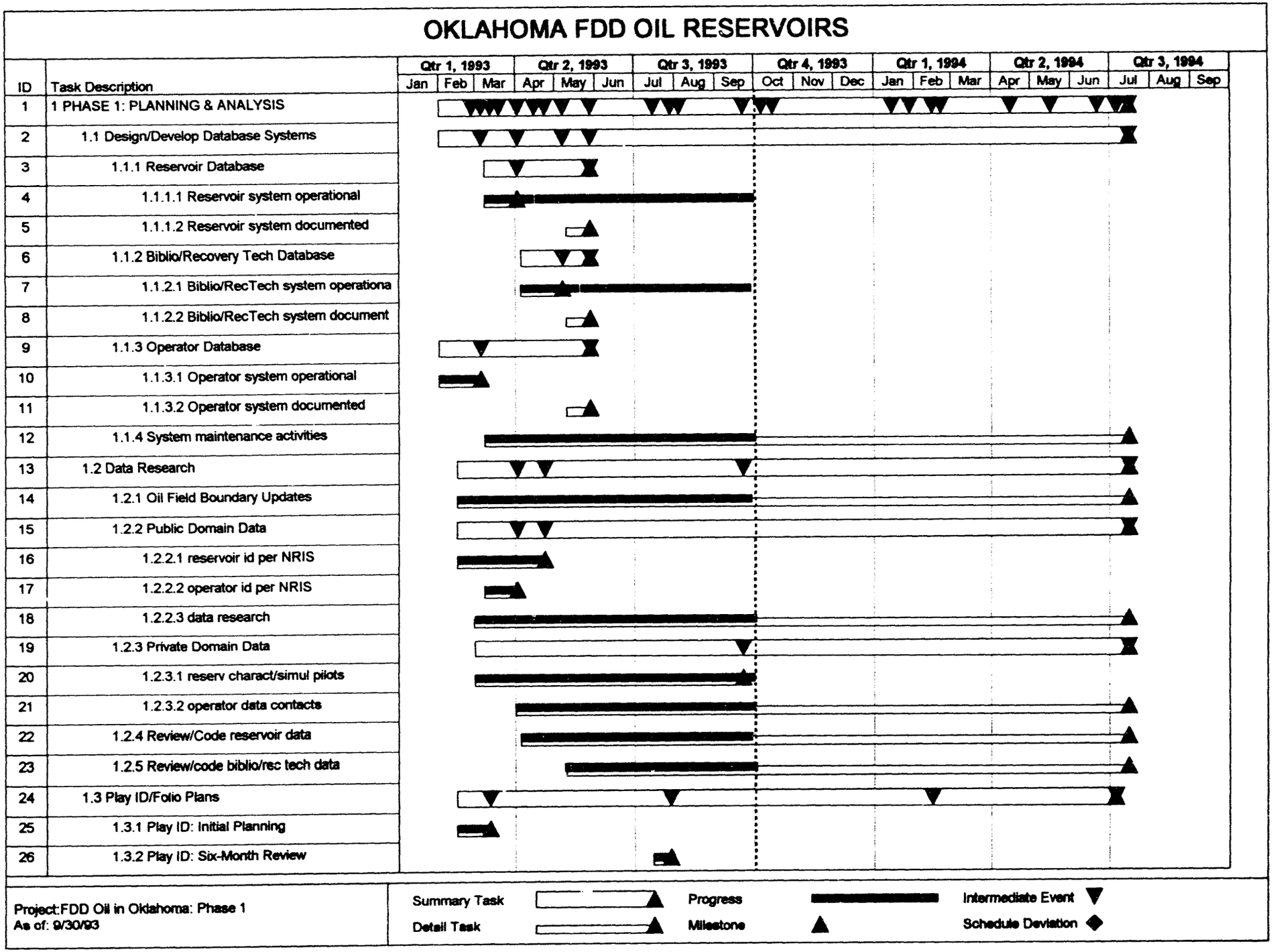


Oil Production From NRIS Lease Master File

FDD Oil Bibliographic Reference

Figure 1-B

OKLAHOMA FDD OIL RESERVOIRS



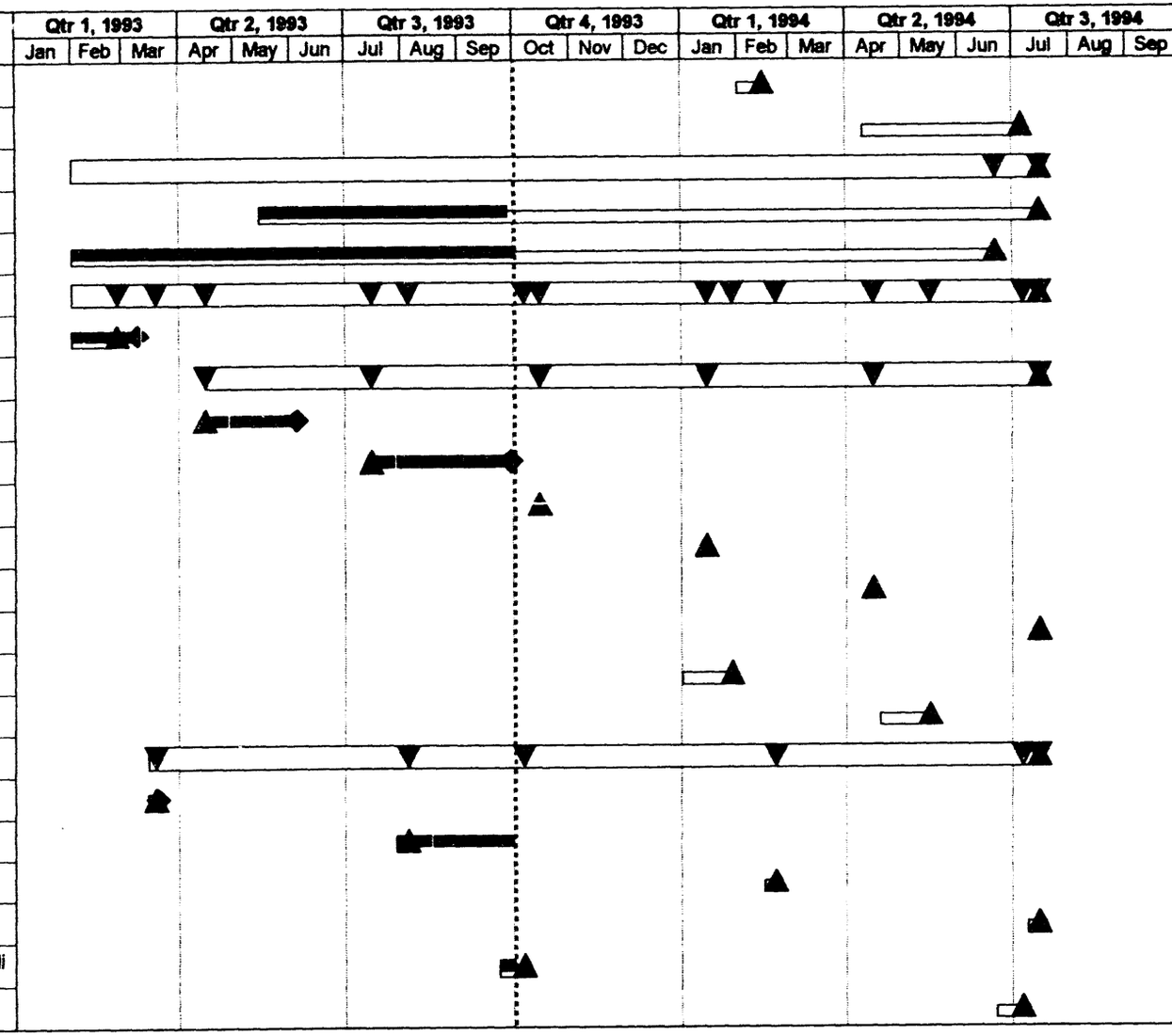
ID	Task Description
1	1 PHASE 1: PLANNING & ANALYSIS
2	1.1 Design/Develop Database Systems
3	1.1.1 Reservoir Database
4	1.1.1.1 Reservoir system operational
5	1.1.1.2 Reservoir system documented
6	1.1.2 Biblio/Recovery Tech Database
7	1.1.2.1 Biblio/RecTech system operationa
8	1.1.2.2 Biblio/RecTech system document
9	1.1.3 Operator Database
10	1.1.3.1 Operator system operational
11	1.1.3.2 Operator system documented
12	1.1.4 System maintenance activities
13	1.2 Data Research
14	1.2.1 Oil Field Boundary Updates
15	1.2.2 Public Domain Data
16	1.2.2.1 reservoir id per NRIS
17	1.2.2.2 operator id per NRIS
18	1.2.2.3 data research
19	1.2.3 Private Domain Data
20	1.2.3.1 reserv charact/simul pilots
21	1.2.3.2 operator data contacts
22	1.2.4 Review/Code reservoir data
23	1.2.5 Review/code biblio/rec tech data
24	1.3 Play ID/Folio Plans
25	1.3.1 Play ID: Initial Planning
26	1.3.2 Play ID: Six-Month Review

Project:FDD Oil in Oklahoma: Phase 1
As of: 9/30/93

Summary Task
Detail Task
Progress
Milestone
Intermediate Event
Schedule Deviation

OKLAHOMA FDD OIL RESERVOIRS

ID	Task Description
27	1.3.3 Play ID: Twelve-Month Review
28	1.3.4 Play ID: Folio/Workshop plans
29	1.4 Computer Applications
30	1.4.1 Analysis/Exhibit Prep
31	1.4.2 User Lab Plans
32	1.5 Management/Reporting
33	1.5.1 Project Management Plan
34	1.5.2 Quarterly Reports
35	1.5.2.1 q1
36	1.5.2.2 q2
37	1.5.2.3 q3
38	1.5.2.4 q4
39	1.5.2.5 q5
40	1.5.2.6 q6
41	1.5.3 Annual Report
42	1.5.4 Project Evaluation Report
43	1.5.5 Topical Reports
44	1.5.5.1 Play ID: Initial Planning
45	1.5.5.2 Play ID: 6-month review
46	1.5.5.3 Play ID: 12-month review
47	1.5.5.4 Play ID: Folio/Workshop plans
48	1.5.5.5 Reserv Char/Simulation pilot studi
49	1.5.5.6 User Lab Plans



Project:FDD Oil in Oklahoma: Phase 1
As of: 9/30/93

Summary Task
Detail Task
Progress
Milestone
Intermediate Event
Schedule Deviation

FDD Oil in Oklahoma: Phase 1

ID	Task Description	Planned Date	Actual Date	Comments
1	1 PHASE 1: PLANNING & ANALYSIS	7/15/94	NA	
2	1.1 Design/Develop Database Systems	7/15/94	NA	
3	1.1.1 Reservoir Database	5/28/93	NA	Delay due to change in approach
4	1.1.1.1 Reservoir system operational	4/2/93	NA	
5	1.1.1.2 Reservoir system documented	5/28/93	NA	
6	1.1.2 Biblio/Recovery Tech Database	5/28/93	NA	Delay due to change in approach
7	1.1.2.1 Biblio/RecTech system operationa	5/7/93	NA	
8	1.1.2.2 Biblio/RecTech system document	5/28/93	NA	
9	1.1.3 Operator Database	5/28/93	NA	Delay due to change in approach
10	1.1.3.1 Operator system operational	3/5/93	3/5/93	
11	1.1.3.2 Operator system documented	5/28/93	NA	
12	1.1.4 System maintenance activities	7/15/94	NA	
13	1.2 Data Research	7/15/94	NA	
14	1.2.1 Oil Field Boundary Updates	7/15/94	NA	
15	1.2.2 Public Domain Data	7/15/94	NA	
16	1.2.2.1 reservoir id per NRIS	4/23/93	4/23/93	
17	1.2.2.2 operator id per NRIS	4/2/93	4/2/93	
18	1.2.2.3 data research	7/15/94	NA	
19	1.2.3 Private Domain Data	7/15/94	NA	
20	1.2.3.1 reserv charact/simul pilots	9/22/93	NA	
21	1.2.3.2 operator data contacts	7/15/94	NA	
22	1.2.4 Review/Code reservoir data	7/15/94	NA	
23	1.2.5 Review/code biblio/rec tech data	7/15/94	NA	
24	1.3 Play ID/Folio Plans	7/5/94	NA	
25	1.3.1 Play ID: Initial Planning	3/12/93	3/12/93	
26	1.3.2 Play ID: Six-Month Review	7/28/93	7/28/93	
27	1.3.3 Play ID: Twelve-Month Review	2/14/94	NA	
28	1.3.4 Play ID: Folio/Workshop plans	7/5/94	NA	
29	1.4 Computer Applications	7/15/94	NA	
30	1.4.1 Analysis/Exhibit Prep	7/15/94	NA	
31	1.4.2 User Lab Plans	6/21/94	NA	
32	1.5 Management/Reporting	7/15/94	NA	
33	1.5.1 Project Management Plan	2/26/93	3/9/93	
34	1.5.2 Quarterly Reports	7/15/94	NA	
35	1.5.2.1 q1	4/15/93	6/4/93	
36	1.5.2.2 q2	7/15/93	9/29/93	
37	1.5.2.3 q3	10/15/93	NA	
38	1.5.2.4 q4	1/14/94	NA	
39	1.5.2.5 q5	4/15/94	NA	
40	1.5.2.6 q6	7/15/94	NA	
41	1.5.3 Annual Report	1/28/94	NA	
42	1.5.4 Project Evaluation Report	5/16/94	NA	
43	1.5.5 Topical Reports	7/15/94	NA	
44	1.5.5.1 Play ID: Initial Planning	3/19/93	3/20/93	
45	1.5.5.2 Play ID: 6-month review	8/4/93	NA	
46	1.5.5.3 Play ID: 12-month review	2/21/94	NA	
47	1.5.5.4 Play ID: Folio/Workshop plans	7/15/94	NA	
48	1.5.5.5 Reserv Char/Simulation pilot studi	10/6/93	NA	
49	1.5.5.6 User Lab Plans	7/6/94	NA	
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