

DOE/BC/14960--14

1st Quarter, Fiscal Year 1996

**Post Waterflood CO₂ Miscible Flood in Light Oil
Fluvial - Dominated Deltaic Reservoirs.**

DE - FC22 - 93BC14960

Texaco Exploration & production Inc.

January 31, 1996

**Award Date: June 1, 1993
Completion Date: December 31, 1997**

Government Award for Current Fiscal Year

\$ 995,000.00

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COR (DOE) : Chandra Nautiyal
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Reporting Period : October 1st. Through December 31, 1995

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TABLE OF CONTENT

	Page
Executive Summary	1
First Quarter, 1996 Objectives	1
Discussions of Results - Field Operations	2
Discussion of Results - Technology Transfer	3
Second Quarter, 1996 Objectives	3
Figures: 1-Allocated Reservoir Production	4
2- Reservoir Map	5
3- CO ₂ Delivery	6
Management Summary report <i>removed at</i>	7
Milestone Schedule	8
Milestone Schedule Attachment	9
Financial Status Report <i>removed at</i>	10
Federal Cash Transaction Report <i>removed at</i>	11

Post Waterflood CO₂ Miscible Flood in Light Oil
Fluvial-Dominated Deltaic Reservoirs

“DE - FC22 - 93BC14960”
Technical Progress Report

First Quarter, 1996

Executive Summary.

The Port Neches Marg Area 1 production stabilized at 215 BOPD for this quarter (Fig. 1). CO₂ purchase has been discontinued since November of 1995. Currently the project performance is being evaluated using a reservoir model in order to justify additional CO₂ purchases, especially with the production rate being below expectation. CO₂ purchases will be justified based on continuous operations. Water injection is continuing in the horizontal well to maintain reservoir pressure. Wells Kuhn #17 and Stark #10 (Fig. 2) continue to inject CO₂ in the vicinity of the producing wells Kuhn #15R and Kuhn #38. reservoir production and yield will be monitored for additional WAG cycles.

First Quarter 1996, Objectives.

* Continue monitoring and optimizing the reservoir performance.

Production from wells Kuhn #15R and Kuhn #38 stabilized for this quarter at an average of 215 BOPD. Well Kuhn #42 is gas lifting an average of 200 BWPD, while all other producing wells are off production. We are awaiting the results of the reservoir simulator to make a decision on switching well Kuhn #42 to CO₂ injection to sweep the unaffected area located in the South-East portion of the reservoir. The injection well Stark #7 is plugged again after switching it to water injection for nearly one month. Water injection in the horizontal well is averaging 2000 BWPD at 950 PSI. The produced CO₂ stream of 3800 MCFD is compressed and re-injected in the reservoir. The average injection rate and pressure per well are 1900 MCFD and 1215 PSI. The reservoir pressure estimated using the tubing gradient of 0.26 PSI/ft and the above surface injection pressure is 2760 PSI. The compressor station availability has been over 95% of the time.

* Update the reservoir model.

The compositional reservoir model is being updated using the newly developed geological model to improve the reservoir description. Also included in the update the tertiary performance data from the last 3 years. Texaco's Exploration and Production Technology Department (EPTD) is performing this task. The model work should be available during the next few weeks. One of the major objectives is evaluate the affect of terminating CO₂ purchases on ultimate recovery. Other objectives are to evaluate the conversion of well Kuhn #42 to CO₂ injection and the individual well performance.

* Evaluate the need for additional CO₂ purchases.

The project performance during the last twelve months has been less than originally anticipated. The project continuous economics are greatly impacted by the cost of CO₂ purchases. Using the compositional reservoir model, Texaco is evaluating the impact of continuous CO₂ purchases (Fig. 3) on ultimate recovery. The reservoir model results will feed the economical model to perform a comparative analysis and determine the value added by purchasing additional CO₂. If the economics indicates unfavorable results, Texaco will recommend terminating CO₂ purchases while continuing to recycle the produced gas. The reservoir has about 2 BCF of CO₂ stored in the ground that can be used for continuous operations. Final decision will be made after a consulting with DOE and EPTD personnel.

Discussion of Results - Field Operations.

The following is a list of the most recent well tests taken during the month of November of 1995, for the producing and injection wells:

Producers: Kuhn #15R, 157 BOPD, 86 % BS&W, 840 PSI, 22 CK.
 Kuhn # 38, 74 BOPD, 90% BS&W, 1000 PSI, 19 CK.

Injectors: Kuhn #17, 1425 MCFD, 1194 PSI.
 Stark #10, 1978 MCFD, 1190 PSI.
 Marg Area 1H, 1986 BWPD, 950 PSI.

The Financial Status Report, Management Summary, Milestone Schedule and Federal Transaction Report are included on pages 7 through 11.

Discussion of Results - Technology Transfer.

Texaco will be presenting a paper at the up coming SPE/DOE Tenth Symposium on IOR to be held in Tulsa in April of 1996. The paper is entitled : " A new analytical method to evaluate, predict and improve CO₂ flood performance in sand stone reservoirs".

Second Quarter 1996, Objectives.

- * Continue to monitor and optimize reservoir performance
- * Make a decision on continuing CO₂ purchases
- * Complete the reservoir model.

Port Neches CO2 Project Allocated Production

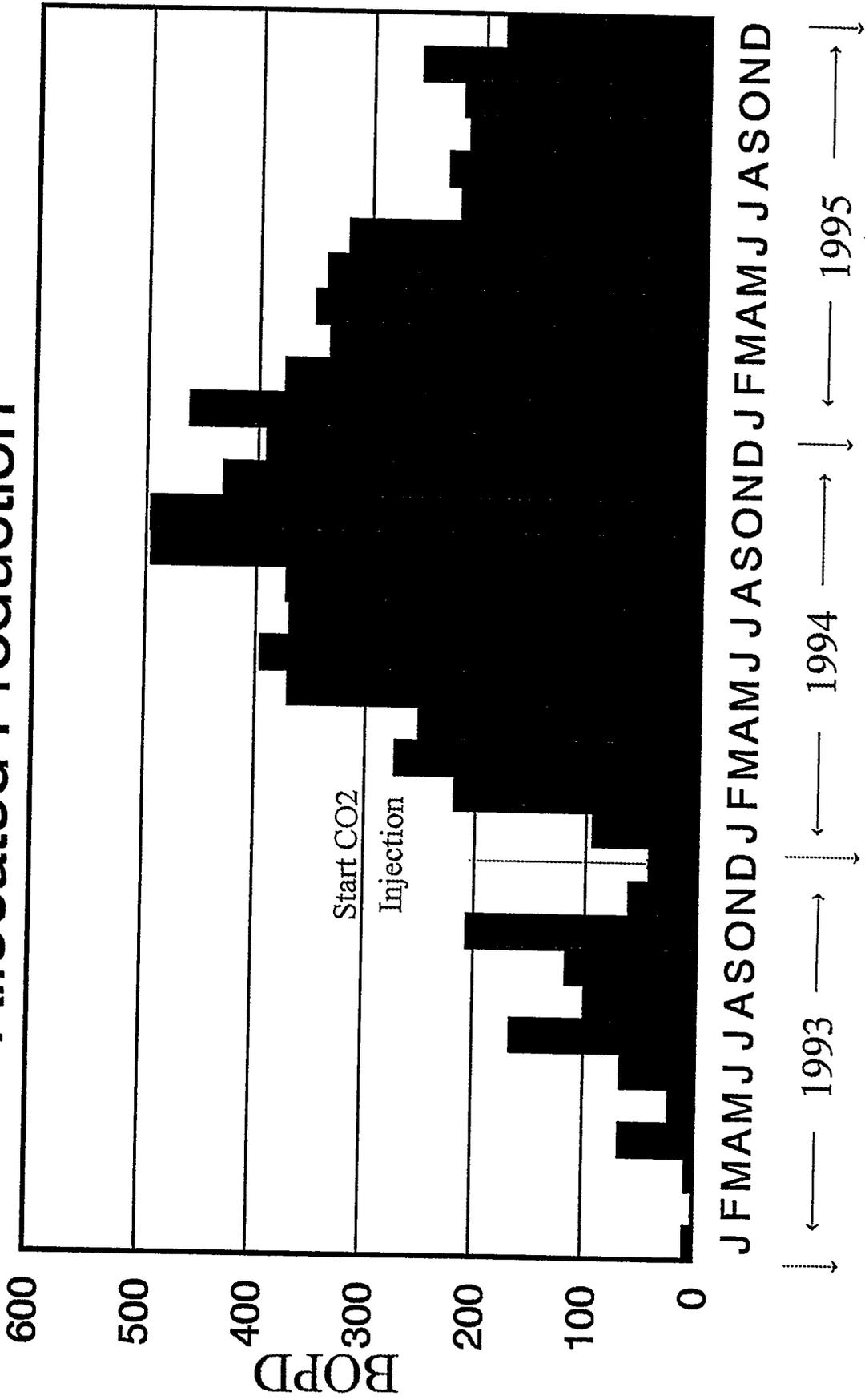
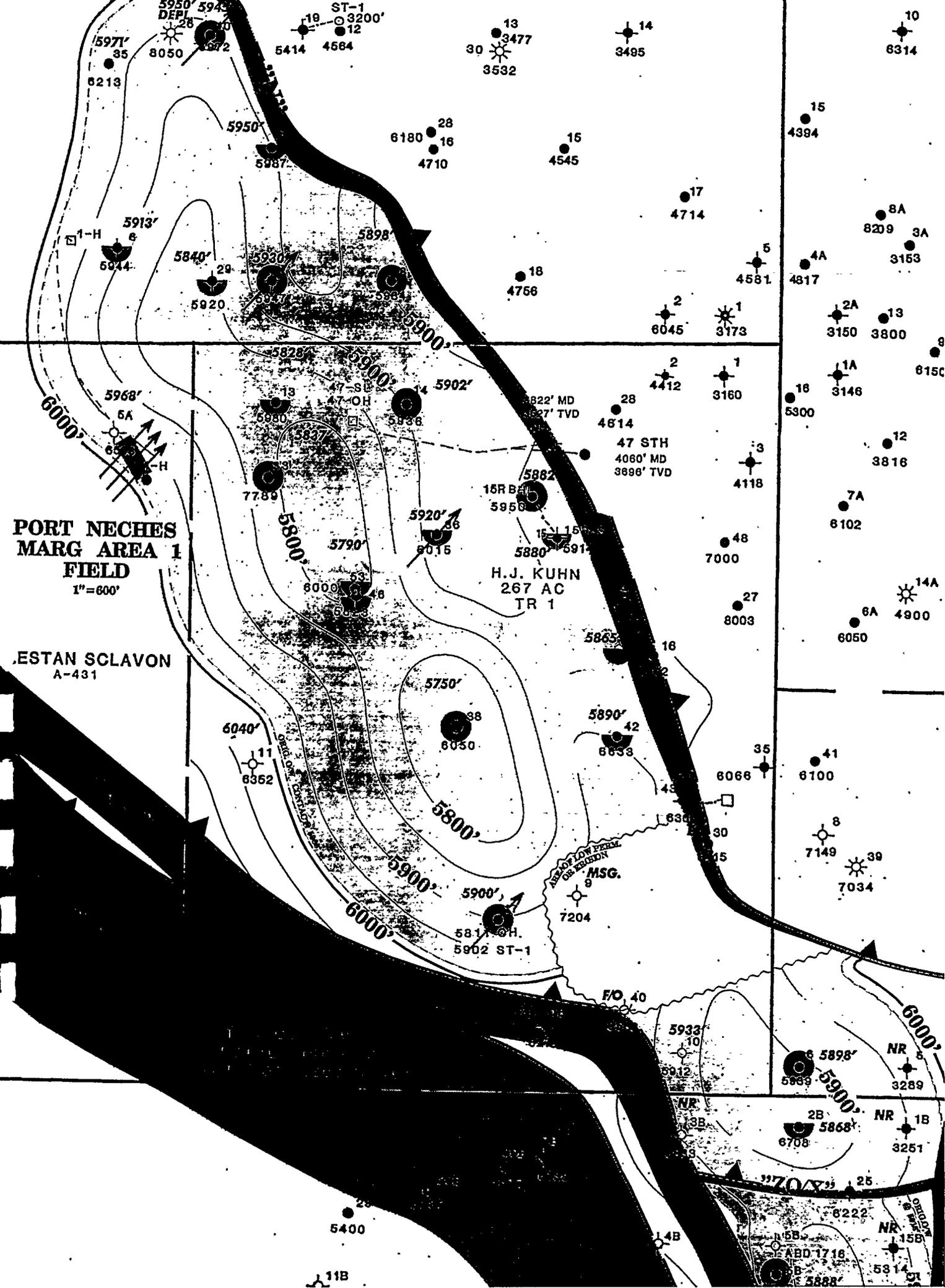
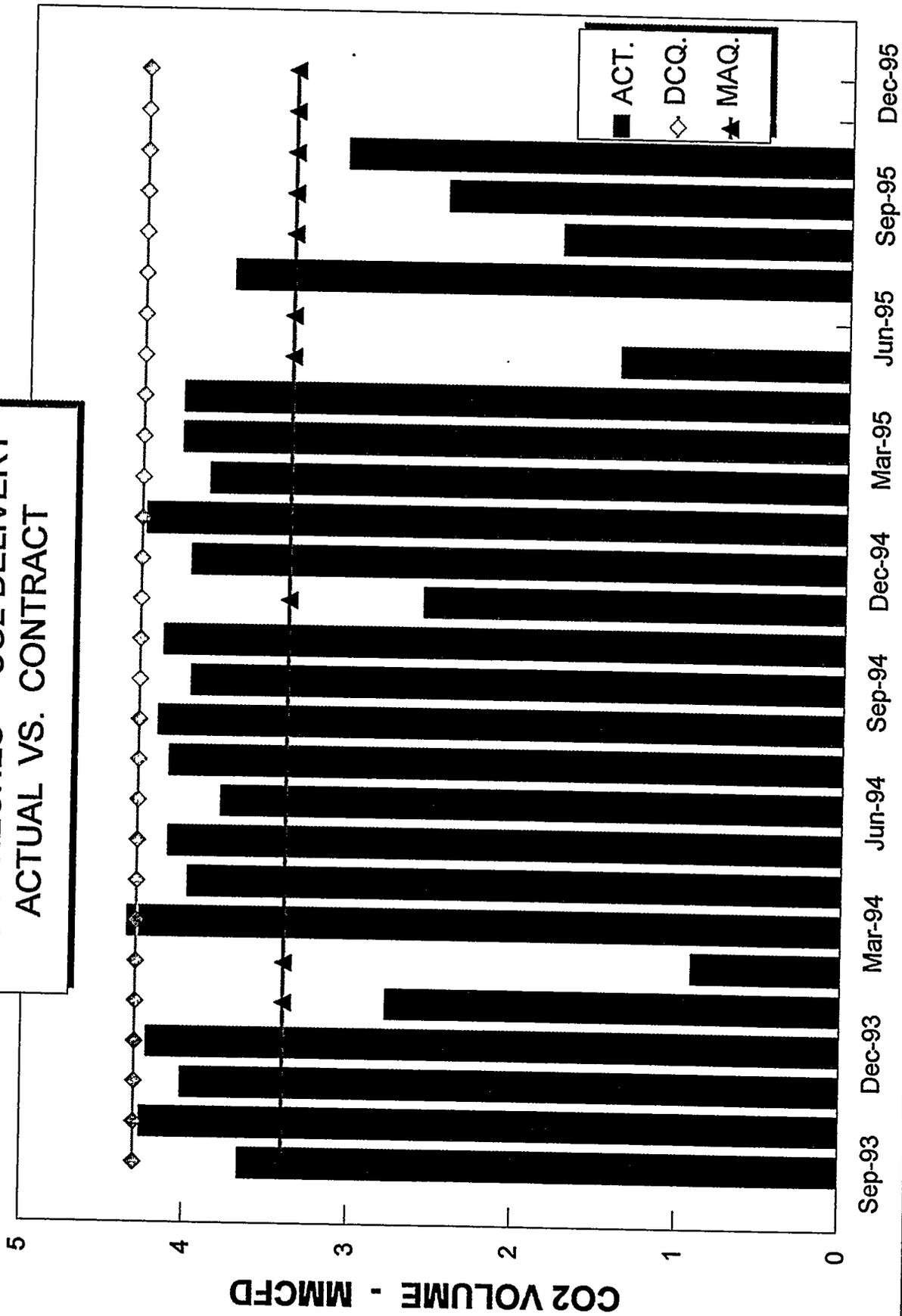


Fig. 1
4



**PORT NECHES - CO2 DELIVERY
ACTUAL VS. CONTRACT**



NOTES: 1) Jan-Feb 1994= Dupont plant down for annual maint. 2) CUM CO2 = 2.1 BCF

Fig. 3
6

U.S. DEPARTMENT OF ENERGY
MILESTONE SCHEDULE [] PLAN [X] SCHEDULE
(ATTACHMENT)

DOE F1332.3 ATTACHMENT
(11-84)

1. TITLE Post Waterflood CO2 Miscible Flood in a Light Oil Fluvial Dominated Deltaic Reservoir		2. REPORTING PERIOD Oct 1, 1995 - Dec. 31, 1995	3. IDENTIFICATION NUMBER DE-FC22-93BC14960
4. PARTICIPANT NAME AND ADDRESS Texaco Exploration and Production Inc. 400 Poydras St. New Orleans, LA 70130		5. START DATE June 1, 1993	6. COMPLETION DATE December 31, 1997

MAJOR EVENTS	DATE	DESCRIPTION	STATUS
1	10/15/92	TASK 1.1 - GEOLOGICAL RESERVOIR DESCRIPTION AND LAB TESTS	COMPLETED
2	10/15/92	TASK 1.2 - PHASE 1 RESERVOIR SIMULATION	COMPLETED
3	08/01/93	TASK 2.1 - RECEIVE DOE APPROVAL TO INJECT CO2	COMPLETED
4	08/01/93	TASK 2.2 - RESERVOIR PRESSURE IS RAISED TO 2700 PSI BY WATER INJECTION	COMPLETED
5	08/15/93	TASK 2.3 - CO2 INJECTION AND PRODUCTION FACILITY IS COMPLETED	COMPLETED
6	08/15/93	TASK 2.4 - CO2 PIPELINE IS INSTALLED	COMPLETED
7	08/15/93	TASK 2.5 - NEPA CATEGORICAL EXCLUSION IS RECEIVED	COMPLETED
8	12/31/95	TASK 3.1 - SPE PAPER AND RELEASE OF CO2 SCREENING MODEL	COMPLETED
9	12/31/94	TASK 3.2 - TOPICAL REPORT ON ENVIRONMENTAL CONSTRAINTS	COMPLETED
10	12/31/95	TASK 3.3 - TOPICAL REPORT ON FDD DATABASE	COMPLETED
11	12/31/97	TASK 3.4 - SPE PAPER ON RESERVOIR CHARACTERIZATION	PROJECT 80% COMPLETE TO BE PRESENTED 1997

INTERMEDIATE EVENTS	DATE	DESCRIPTION	STATUS
A	12/31/97	TASK 2.1 - FINAL PROJECT REPORT	TO BE COMPLETED DURING 1997
B	12/31/93	TASK 2.2 - UPDATED RESERVOIR MODEL COMPLETED	COMPLETED
C	12/01/94	TASK 2.2 - CONVENTIONAL CORE ANALYZED IN POLK "B" #39 WELL	DEFERRED
D	04/30/93	TASK 2.3 - 10 WELL WORKOVER PROGRAM COMPLETED	COMPLETED
E	10/01/93	TASK 2.3 - HORIZONTAL CO2 INJECTION WELL DRILLED, POLK "B" #2 W/O PERFORMED	HORIZ. WELL COMPLETE, POLK "B" W/O CANCELLED
F	12/01/94	TASK 2.3 - VERTICAL CO2 INJECTION WELL DRILLED (POLK "B" #39)	CANCELLED
G	06/10/93	TASK 2.5 - PERMIT FOR CO2 PIPELINE RECEIVED FROM ARMY CORPS OF ENGINEERS	COMPLETED
H	06/30/93	TASK 2.5 - HAZARDOUS SUBSTANCE PLAN SUBMITTED TO DOE	COMPLETED
I	12/31/97	TASK 2.5 - FINAL HAZARDOUS SUBSTANCE PLAN SUBMITTED TO DOE	TO BE COMPLETED DURING 1997
J	12/31/94	TASK 3.1 - CO2 SCREENING MODEL FINAL REPORT SUBMITTED TO DOE	COMPLETED
K	12/31/94	TASK 3.3 - FDD DATABASE STUDY IS COMPLETED BY LSU	COMPLETED
L	04/18/94	TASK 3.5-1ST SPE PAPER PRESENTED-PROJECT IMPLEMENTATION	LSU WORK WILL BE COMPLETED IN SPRING, 1996 COMPLETED

11. SIGNATURE OF PARTICIPANT'S PROJECT MANAGER AND DATE