GRUY FEDERAL, INC.

HVO-1528-9

INVESTIGATION AND EVALUATION OF
GEOPRESSURED-GEOTHERMAL WELLS

DETAILED REENTRY PROGNOSIS FOR
GEOPRESSURE-GEOTHERMAL TESTING OF
STATE LEASE 4183 NO. 1 WELL

GRUY FEDERAL, INC.
2500 TANGLEWILDE, SUITE 150
HOUSTON, TEXAS 77063
713/785-9200

MAY 19, 1978

PREPARED FOR THE
DEPARTMENT OF ENERGY
DIVISION OF GEOTHERMAL ENERGY
UNDER CONTRACT EG-77-C-08-1528

The Gruy Companies
... Since 1950

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GRUY FEDERAL, INC.

CONSULTANTS IN ENERGY SYSTEMS

May 23, 1978

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Mr. Ronald Stearns
Engineering and Construction Division
DOE/Nevada Operations Office
Post Office Box 14100
Las Vegas, Nevada 89114

Dear Mr. Stearns,

With this letter we are forwarding the revised detailed re-entry and testing procedures for the Pan American (Amoco) State Lease 4183 No. 1 well on the Rockefeller Game Refuge. We have been assured that the Department of Natural Resources will expedite the granting of the necessary state and local permits, including the Rockefeller Refuge permits. These permit applications will be filed May 24, 1978. It must be pointed out that approval to use the well and the lease roads have not been obtained from Amoco.

Our present plans are to test this well second with the Sun Alice C. Plantation No. 2 well as an alternate.

Very truly yours,

Richard J. Dobson
Vice President
Special Program

RJD:cas
Enclosure

Copy to:
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Mr. Keith Westhusing
Mr. Glen A. Stafford
Mr. Don G. Bebout
Mr. Raymond H. Wallace, Jr.
Mr. Joseph N. Fiore
Mr. Bennie G. DiBona
Mr. Ronald S. Toms
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GRUY FEDERAL, INC.

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Mr. Ronald T. Stearns
Engineering and Construction Division
DOE/Nevada Operations Office
P. O. Box 14100
Las Vegas, Nevada 89114

Dear Mr. Stearns:

We hereby transmit the revised reentry and testing recommendations for the Gulf Coast geopressured-geothermal well-of-opportunity program.

The Gruy Federal, Inc. Geo² L-5 well was originally drilled as the Pan American Petroleum Corporation Well No. 1 State Lease 4183 in the Little Pecan Lake Area, Cameron Parish, Louisiana.

The original recommendation and the accompanying Electric Log and Topographic Map were included in the Prospective Test Wells in the Texas and Louisiana Gulf Coast report dated March 20, 1978.

Sincerely,

M. H. Willits
Senior Engineer

MJW:mw
Enclosures

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GEOPRESSURED-GEOTHERMAL REENTRY PROSPECT L-5LITTLE PECAN LAKE AREA

CAMERON PARISH, LOUISIANA

Introduction

This Gruy Federal Type III-A geopressured-geothermal (Geo²) prospect was drilled as the Pan American Petroleum Corporation (now Amoco) No. 1 State Lease No. 4183, serial No. 99670. It is located 1,200 feet north and 2,300 feet east from the southwest corner of Section 27, Township 15S, Range 4W. The location is shown on the U.S.G.S. topographic sheet "Hog Bayou" in the Gruy Federal report "Investigation and Evaluation of Geopressured-Geothermal Wells, Prospective Test Wells in the Texas and Louisiana Gulf Coast" dated February 28, 1978. The well is accessible by lease roads off State Highway No. 82.

This Geo² prospect is located on State land within the Rockefeller Wildlife Refuge and Game Preserve. The lease is held by production from another well owned and operated by Amoco Production Company. Preliminary discussions with the State of Louisiana are very favorable for permission to test the well, however, Amoco has some reservations on approval, because they feel that the terms of their lease substantially expose them to liability and publicity should there be any blowouts or other detrimental occurrences during our activities on the well. They are considering the possibility of approval at this time.

Geology

The two primary potential Geo² aquifers penetrated by this well are from 15,575 to 15,740 feet and from 16,200 to 16,385 feet. The sand proposed for testing is the deeper of these aquifers; however, the well completion design is such that both sands may be perforated and tested simultaneously. Both of these zones are of lower Miocene age and have no apparent show of hydrocarbons on the logs. The apparent degree of mud filtrate invasion suggests a permeability of something in the lower magnitude of that normal for Miocene. During drilling operations through these sands, a mud weight of 17.2 pounds per gallon was used. This would indicate that the static aquifer pressure at

LITTLE PECAN LAKE PROSPECT
Structure Contour Map
on
14,000 Foot Sand
Scale: 1" = 1/2 Mile

16,300 feet is approximately 13,575 psia (assuming 1,000 psi overbalance of the mud column for safety). The maximum recorded temperature from the electric log is 305°F (152°C) which would indicate an aquifer temperature of 328°F (164°C) based upon correlation factors for log temperatures developed for South Louisiana by A.A.P.G.

This well is geologically located as shown on the enclosed contour map on top of the Geo² sand section.

Mechanical Condition

The enclosed diagrammatic sketch illustrates the current status of the well and the proposed mechanical condition for testing. The present condition was obtained from the plugging and abandonment reports filed with the Louisiana Department of Conservation and from the completion reports published by "Petroleum Information Corporation."

It will be necessary to tie into the 7" O.D. casing which was cut off at 6,533 feet and to run a 5" O.D. liner through the Geo² sands that were not originally cased off. The load requirements for completion of this well are well within the capability of the rig currently available to us.

This well was originally completed in a shallower sand through perforations from 15,088 to 15,102 feet as a gas producer. After depletion, the operator plugged and abandoned the well, leaving it mechanically as shown in the diagrammatic sketch shown on the following page.

Reentry Technique

A detailed reentry and recompletion prognosis is attached. In designing the equipment and specifying the procedures, the primary consideration was the safety of the operation and the experience of prudent operators who have successfully penetrated and produced from geopressured-geothermal gas reservoirs in the Louisiana Gulf Coast.

Casing Design - Since only a short tie back string of 7" O.D. casing is required, it was impractical to design a graded casing string. In order to accommodate the tensile load of hanging the casing in tension, P-110, 38 pound per foot, long tread and collar was specified.

PAN AMERICAN PETROLEUM CORPORATION
STATE LEASE 4183 NO. 1
SEC. 27 T-15S R-4-W
CAMERON PARISH, LOUISIANA

CURRENT STATUS

PAN AMERICAN PETROLEUM CORPORATION
STATE LEASE 4183 NO. 1
SEC. 27 T-15-S R-4-W
CAMERON PARISH, LOUISIANA

PROPOSED COMPLETION

Tubing Design - The tubing selected was a tapered string consisting of 2-7/8 inch, 8.70 pound per foot to run inside the 5-inch O.D. casing liner and 3-1/2 inch, 12.70 pound per foot, P-105, PH-6 Hydril threaded tubing.

The 2-7/8 inch O.D. tubing is necessary to fit into the 5-inch O.D. liner and still allow clearance for the tubing gun to pass through the seal assembly and landing nipples. The portion of the tubing which seats in the packer will be equipped with a seal assembly to allow for approximately 10 feet of expansion and contraction during flowing and plugging operations. A landing nipple and a circulating valve will be placed above the seals to permit communication between the tubing and casing if it becomes necessary.

Blowout Preventers - The enclosed well prognosis sets out the necessary safeguard specifications and procedures for surface blowout prevention as they have been adopted and gathered by IADC, API and most prudent operators in the Geo² area. A diagrammatic sketch of the BOP hookup and choke manifold which we propose for use is also enclosed.

Logging - The reentry prognosis recommends that the following open hole logs be run:

- (1) Induction electric log
- (2) Compensated neutron and compensated density logs
- (3) Caliper
- (4) Sonic

Although an induction electric log and a sonic log have been run previously on the well, these logs should be rerun in order to evaluate any invasion which has occurred since the well was completed initially and to provide an accurate depth correlation with the sidewall samples. The cased hole logs; namely, the gamma ray, cement bond, and collar locator, are desirable to establish the integrity of the cement and as a benchmark for perforating.

Perforating - The perforating will be accomplished with a 1-11/16 inch high-temperature, through tubing jet perforating gun with four shots per foot and zero phasing. When fired, this jet creates a casing entry diameter of approximately two inches beyond the cement sheath. Assuming 100 percent

PAN AMERICAN PETROLEUM CORPORATION
 STATE LEASE 4183 NO. 1
 SEC. 27 T-15-S R-4-W
 CAMERON PARISH, LOUISIANA

BOTTOM HOLE TUBING ASSEMBLY

7

7

7

firing efficiency, this configuration should provide a productivity equal to 70 percent of the open hole productivity.

In selecting the fraction of the net sand to perforate, the perforated interval length was designed to achieve a productivity equal to 1/3 of the open hole productivity. In the State Lease 4183 No. 1 well, this productivity can be accomplished by perforating approximately 92 feet. The final interval will be contingent upon the analysis of the additional open hole logs that will be run.

Wellhead Design - The wellhead christmas tree has been designed and a diagrammatic sketch is enclosed on the following page. The tree has a rated working pressure of 10,000 psi and has T-24 grade trim throughout the vertical run and on the dual flow wing assembly. All valves have geothermal seals and packing.

The tree is designed from the tubing head up so that the entire assembly can be used on other test wells. The lower casing head will have to be rented and sized to accommodate the particular size of surface casing on each well. This will in some surface casing sizes, result in the requirement to rent an additional casing spool to permit adaptation of appropriate sized and pressure rated flanges and seals.

The tree consists of two 3-1/2" full opening master gate valves and a full opening 3-1/2" swab valve. A double Y flow cross is mounted between the upper master valve and the swab valve to permit a double wing flow line arrangement. Both wings contain a 3-1/2" 10,000 psi valve with high and low pressure controlled actuators for safety purposes. These Hi-Lo safety shut in valves are to be mounted "inboard" from a 3-1/2" 10,000 psi valve. Outboard from these valves are a positive choke body on one wing and an adjustable choke on the other wing.

It should be noted that on the Gruy Federal Reports titled "Detailed Reentry Prognosis for Geopressure-Geothermal Testing of the Watkins No. 1 (dated April 13, 1978), The Dr. M. O. Miller No. 1 (dated April 21) and The Gladys McCall No. 1 (dated April 21, 1978) Wells", a 15,000 psi working pressure tree with solid stainless steel valves was specified. Since that time we have learned that a new tool has been developed by Halliburton. It is a hydraulic well head protection sleeve and is used during the time of squeezing, fracturing, etc., when maximum pressures over and above those imposed by the reservoir

GEO² CHRISTMAS TREE
TO BE ADAPTED FOR ALL REENTRY WELLS
BY GRUY FEDERAL, INC.

are applied. This is the primary reason Gruy had specified a 15,000 psi tree. This new tool is mounted on top of the swab valve on the tree and a 22,000 psi working pressure machined sleeve is hydraulically pumped down the vertical run of the tree and sealed off in the top of the tubing in the well. The tool has been tested extensively and has been on the market for less than one year. By employing its use at peak pressure requirements, we have now lowered our pressure rating requirements to a 10,000 psi working pressure tree.

General Comments - The State Lease 4183 No. 1 well has been chosen as a Geo² candidate for the following reasons:

(1) Available data indicate that the Geo² sections should be capable of producing saltwater in sufficient quantities.

(2) Modern logging equipment can be run in the open hole interval of interest and sidewall core sampling is possible.

(3) The rig load requirements to place this well on test are within the capabilities of the rig that is available.

WELL PROGNOSIS
FOR
PAN AMERICAN PETROLEUM CORPORATION
STATE LEASE 4183 NO.1
LITTLE PECAN LAKE AREA

Operational
Day

1. Prepare location.
2. Dig out and inspect 13-3/8" surface casing, extend to proper elevation and weld on casinghead.
- 1st 3. Move in rig, rig up and install BOP's.
- 4th 4. Pick up 3-1/2" drill pipe and drill out cement from the surface to 50 feet. Continue in hole and drill cement from 925 feet to the top of the cut off 9-5/8" OD casing at 1,075 feet.
5. Make trip to change bits and drill out cement from 6,433 feet to the top of the cut off 7" OD casing at 6,533 feet.
- 5th 6. Make trip with drill pipe and run impression block.
7. Make trip and prepare top of 7" OD casing for a tie back string, then lay down drill pipe.
- 6th 8. Rig up and run approximately 6,575 feet of 7" OD, 38 #, P110, LT&C casing and tie into existing casing. Cement same with sufficient cement to fill the 9-5/8" annulus to atleast 3,000 feet.
- 7th 9. Drill out cement from the 7" OD tie back point.
10. Continue in hole to top of cement plug at 12,020 feet and test casing above this point to 7,500 psi. Repair casing if necessary by cement squeeze.
- 9th 11. Condition mud to 17.2 pounds per gallon then drill cement from 12,020 feet to 12,120 feet and the cast iron bridge plug at that depth.
12. Continue in hole to the current plug back total depth of approximately 15,170 feet and condition mud.
- 11th 13. Make trip and run retrievable squeeze tool. Set same at about 15,050 feet and squeeze cement existing perforations from 15,088 feet to 15,102 feet and from 15,160 feet to 15,162 feet to a maximum and final pressure of 7,500 psi; then reverse out excess cement.
- 12th 14. Lay down squeeze tool and go in hole with bit. Drill out retainer at approximately 15,170 feet, then wash and ream old 6-1/16" hole to original total depth of 16,920 feet or at least to a depth of 16,600 feet and condition hole.

Operational
Day

	15.	Run IES electric log and Compensated Neutron and Density logs.
15th	16.	Rig up and run 1,920 feet of 5" OD 18 # P-110 F. J. casing to total depth of 16,920 feet and cement with sufficient cement to circulate the full annular space behind the liner. The liner is to be equipped with a casing shoe on bottom, a float collar two (2) joints above bottom and with centralizers on each joint of casing opposite the interval from 15,500 feet through 16,400 feet.
16th	17.	Pick up 2,000 feet of 2-7/8" work string and go in hole to the float collar on the 5 inch casing and condition hole.
	18.	Rig up and run a gamma ray-cement bond log from total depth to about 15,000 feet and block squeeze, if necessary. Squeeze top of liner, if necessary.
18th	19.	Drill out cement and condition hole to plug back total depth of about 16,850 feet. Displace the mud in the hole with 10 #/gallon CaCl ₂ water and observe the hole for back flow and pressure increase at the surface. If none occurs, lay down drill pipe.
19th	20.	Rig up and set permanent packer at 15,500 feet inside 5 inch liner.
	21.	Make up completion assembly on bottom of tubing, (see enclosed drawing). Pick up 500 feet of 2-7/8" OD, 8.7 #/foot, P-105, PH-6 Hydril tubing and 15,000 feet of 3-1/2" OD, 12.7 #/foot, P-105, PH-6 Hydril tubing. Space out tubing and set stinger with seals in packer. Pressure test the packer with to 6,500 psi differential from the bottom and to 5,000 psi from the top. Each joint of tubing is to be tested to 10,000 psi while going in the hole for completion.
	22.	Hang tubing with wrap-around hanger, remove the BOP's and nipple up the christmas tree. Test tree to 10,000 psi.
21st	23.	Release rig and rig down.
23rd	24.	Finish moving out rig. Operations on Geo ² well suspended while disposal well being drilled.
36th	25.	Move in and rig up wireline lubricator on well and test same to 10,000 psi. Perforate the interval to be selected from the new logs obtained with four (4) shots per foot. Most likely, the interval will be within the sand occurring from 16,200 feet to 16,375 feet. This will require three trips with a tubing gun which covers 46 feet per trip. Since the initial perforating

Operational
Day

gun will be fired with a differential to the well bore. Observation shall be made of the increased tubing pressure for leak off of static fluid pressure in the casing to make sure there are no leaks in the tubing or packer.

- 37th 26. Rig down wireline unit and connect the test unit for production tests.

GENERAL PROCEDURE FOR BLOWOUT PREVENTION:

1. Use BOP design as attached. The minimum assembly will consist of three preventers. The bottom and middle preventers may be Cameron QRC, Cameron Type F or Shaffer Hydraulic Single, and the upper preventer will be Hydril GK. Double preventers or space savers may be used if approved by the company supervisor. An accumulator with a closing unit is required. Accumulator reservoir pressure shall be sufficient to close all preventers simultaneously in 20 seconds with the charging pumps closed down. Minimum accumulator pressure shall be 1,500 psi initially and not less than 1,200 psi when all preventers are closed.
2. When nipping up production casing, test BOP's and choke manifold to 7,500 psi with cold water, or as specified by the company representative. BOP's will be tested at least once each day thereafter when working in open hole and once each week otherwise.
3. Have a full opening safety valve and Gray inside BOP with drill pipe connections on the rig floor.
4. Have extra pipe rams on location at all times while drilling or completing.
5. Locate all choke manifolds, lines and valves at the side of and away from the substructure. Adequately support and tie down the choke assembly.

ESTIMATED REENTRY COST
for
STATE LEASE 4183

<u>Activity</u>	<u>Est. Amount</u>
1. Lease acquisition	\$ 20,000
2. Rig transportation cost	30,000
3. Location preparation	50,000
4. Rig time - 22 days at \$5000	110,000
5. Bits	3,000
6. Mud and chemicals	30,000
7. Casinghead	2,000
8. Christmas tree	80,000 (1)
9. Casing patch	6,000
10. Rental tools and equipment	30,000
11. 3-1/2" drill pipe rental	25,000
12. Trucking	10,000
13. Cement and services	12,000
14. Logging and coring	37,600
15. Perforating	28,500
16. 500' of 2-7/8" P-105 4.7# PH-6 Hydril tubing	6,900 (1)
17. 15,000' of 3-1/2" P-105 12.95# PH-6 Hydril tubing	307,500 (1) (2)
18. Packer and subsurface equipment	3,500
19. 6,600' of 7" OD tieback casing per prognosis	137,400
20. Supervision	7,500
21. Miscellaneous	20,000
22. Contingencies	<u>45,000</u>
Total	\$ 1,001,900

(1) Can be reused on subsequent wells after minor shopping

(2) Will use all possible tubing in stock at Intracoastal City.

SALT WATER DISPOSAL WELL
FOR
PAN AMERICAN PETROLEUM CORPORATION
STATE LEASE 4183 NO.1
LITTLE PECAN LAKE AREA

The available electrical logs covering the shallow sands from ground surface through a depth of 5,000 feet indicate the fresh water sands to extend to approximately 900 feet and that adequate sand to accomodate the salt water disposal well occur above 4,000'. In view of these data the following well prognosis and estimated cost is submitted.

Operational
Day

0	1. Drive 13-3/8" OD casing to refusal of $\pm$ 125 feet.
24th	2. Move in and rig up water well rig.
26th	3. Drill 12-1/8" hole to 1,200 feet.
27th	4. Run 1,200 feet of 9-5/8" 35.0# H-40 casing with guide shoe on bottom and a float collar one joint above bottom. Use one centralizer per 100 feet of casing for bottom 500 feet and cement casing to surface.
29th	5. Drill 8-3/4" hole below surface casing to 4,000 feet.
31st	6. Run Induction Electric and Density logs and SWC if desired.
32nd	7. Run 4,000 feet of 5-1/2" OD 15.5# J-55 casing with guide shoe on bottom and float collar two joints above bottom. Run centralizers on every other joint of casing for bottom 500 feet. Cement casing with sufficient cement to get returns at the surface.
33rd	8. Make trip with 2-7/8" work string and condition hole to float collar at approximately 4,420 feet and displace mud in hole with water. Lay down work string.
34th	9. Nipple up 5-1/2" casing and install christmas tree.
10. Test casing and tree to 2,000 psi surface pressure with water in hole.
35th	11. Rig down and move out water well rig.
37th	12. Run gamma ray - cement bond log from total depth to 1,200 feet and block squeeze with cement, If necessary to obtain good bond.
13. Rig up wireline unit and run gamma ray-collar log from bottom to 1,200 feet.

GRUY FEDERAL, INC.

NVO/1528-9

Salt Water
 Pan American Petroleum
 State Lease 4183 No. 1

Operational
Day

14. Perforate approximately 50 feet of the lowest clean sand determined from electrical logs with four shots per foot using a casing bullet gun and rig down wireline unit.
- 38th 15. Test injectivity of well with rig pumps or pump truck to achieve 10,000 barrels per day injection rate at 150 psi or less. If injection rate is not sufficient, select and perforate additional sand interval or consider treatment with mud cleanout acid, or both, if deemed necessary.

Estimated Cost

1. Move in rig, drill to 4,000 feet and set two casing strings.	\$ 36,000
130 feet of 13-3/8: 65# J-55 plain end casing	3,600
1,200 feet of 9-5/8" 36# H-40 casing ST & C or LT & C	18,200
4,000 feet of 5-1/2" 15.5# J-55 ST & C or LT & C	27,500
Stand by rig time	3,000
Cement and Services	14,000
Electric logging	12,000
Perforating	4,000
Wellhead equipment	3,000
Stimulation	2,500
Miscellaneous supplies and rentals	5,000
Trucking	1,500
Contingencies	<u>14,000</u>
TOTAL WELL COST	\$ 144,300

TEST PROGNOSIS
FOR
PAN AMERICAN PETROLEUM CORPORATION
STATE LEASE 4183 NO.12
LITTLE PECAN LAKE AREA

Operational
Day

39th	1. Move in and nipple up test equipment. Hydraulically test all systems with water to 400 psi.
42nd	2. Run two Amerada RPG-3 pressure gauges with 24 hour clocks and 15,000 psi full-scale deflection to 15,153 feet, stopping for fifteen minutes each 3,000 feet. Hang bombs for two hours and record surface pressure with deadweight tester. Retrieve pressure bombs.
	3. Hook up two-pen pressure recorder to tubing upstream from the choke and to the casing to observe for tubing or packer leaks.
	4. Place well on production through adjustable choke at low setting and record surface flowing pressure every thirty minutes by deadweight tester.
	5. Record gas and liquid flow rates by calibrating the liquid turbine meter with the test tank.
43rd	6. Gradually increase the flow rate in increments until either the maximum flow rate from the well or 10,000 barrels per day is achieved. Continue to flow at this rate for 24 hours while recording surface temperature, pressure, and gas and liquid production. If maximum flow rate of well not sufficient, do one of the following:
(1) acidize
(2) perforate more interval
44th	7. Shut well in and measure surface pressure build-up with deadweight tester.
45th	8. When wellbore pressure has stabilized, run two Amerada RPG-3 pressure bombs with five day clocks and latch into landing nipple at bottom of tubing.
46th	9. Place well on production at 1,000 barrels per day, for 24 hours, monitor surface pressure, temperature and flow rates and take the following samples:
(a) Two, one liter, full well stream samples for chemical analysis.
(b) Three, one liter, separator liquid samples.
(c) Two, one liter, separator gas samples.

Operational
Day

47th	10. Increase flow rate to 4,000 barrels per day for 24 hours and sample as before.
48th	11. Increase flow rate to 7,000 barrels per day for 24 hours and sample as before.
49th	12. Increase flow rate to 10,000 barrels per day for 24 hours and sample as before.
50th	13. Shut well in, measure build-up for 24 hours, then retrieve pressure bombs.
51st	14. Place well on production at low rate and gradually increase rate over a 12-hour period until it reaches 10,000 barrels per day.
	15. Flow well at this rate for two weeks while measuring surface pressure, temperature and flow rates.
	16. Sample as before prior to shutting well in.
64th	17. Shut well in and run two pressure gauges to 16,060 feet and record until deadweight tester at surface indicates static conditions have been reached.
65th	18. Pull pressure gauges, release test equipment and move same out.
	19. Proceed with plug and abandonment operations.

DEADWEIGHT TESTER

SAFETY VALVES

CHOKE

CHOKE

SONIC SAND DETECTOR

TEMPERATURE

SCALE DETECTOR

FLOW STREAM
SAMPLER1440 psi
WP
Test
Separator

FLARE

GAS
SAMPLER

ORIFICE METER

16,000,000 BTU/HR
AIR COOLERLIQ.
METER

LIQUID SAMPLER

RELIEF
VALVE100 BBL
CALIBRATION
TANK3/125 psi, 5000 BBL/DAY
CENTRIFUGAL PUMPSFILTER
FILTERLIQUID
METER

INJECTION WELL

MUD PITS

SURFACE TESTING FACILITIES
Gruy Federal, Inc.

ESTIMATED TESTING COST
FOR
PAN AMERICAN PETROLEUM CORPORATION
STATE LEASE 4183 NO.15
LITTLE PECAN LAKE AREA

<u>Activity</u>	<u>Estimated Amount</u>
Two phase separator	\$ 16,800
Air cooler	12,600
3 centrifugal pumps	4,200
110 barrel calibration tank	60
Sand detector and manifold	3,900
200' of 3" flow lines	2,850
2-3" expansion loops with unions	900
2 pen 10,000 psi recorder	600
Deadweight pressure gauge	600
Portable quartz iodide lights	600
Temperature recorder 0-400°	600
Trailer house for personnel	900
Supervision and labor	39,600
Sampling	1,500
Pressure gauges and wireline units	<u>10,000</u>
TOTAL	\$ 95,710

STATE LEASE 4183 NO. 1
CAMERON PARISH, LOUISIANA

Analyses Required for Geo² Water and Gas

Chemical Analysis of Water

A. Metals

1. Copper
2. Zinc
3. Boron
4. Arsenic
5. Chromium
6. Mercury
7. Lead
8. Cadmium
9. Potassium
10. Sodium

B. Solids

1. Dissolved
2. Total

C. Hardness

1. Calcium Carbonate
2. Magnesium Carbonate

D. Others

1. Carbonate
2. Bicarbonate
3. Chloride
4. Iron
5. Sulfate
6. Dissolved Silicate

STATE LEASE 4183 NO. 1
CAMERON PARISH, LOUISIANA

Chemical Analysis of Vapor

A. Hydrocarbons (percent)

1. Methane
2. Ethane
3. Iso-propane
4. Normal Propane
5. Iso Butane
6. Normal Butane
7. Pentane
8. C₆+

B. Other

1. Hydrogen Sulfide
2. Carbon Dioxide
3. Radon

Chemical Properties of Water

1. Density
2. Compressibility
3. Conductivity
4. Viscosity
5. pH

Recombination PVT Analysis

1. Solution gas-water ratio
2. Formation volume factor for water
3. Supercompressibility factor of gas

STATE LEASE 4183 NO. 1
CAMERON PARISH, LOUISIANAAnalytical Costs for Geo² Water and Gas

Recombination

2 samples per well \$ 10,000

Chemical Analysis of Water

5 samples per well 750Total \$ 10,750

PLUGGING AND ABANDONMENT PROCEDURE
FOR
PAN AMERICAN PETROLEUM CORPORATION
STATE LEASE 4183 NO. 1
LITTLE PECAN LAKE AREA

1. Move in and rig up pulling unit capable of plugging and abandonment.
2. Nipple up pump trucks to well head.
3. Squeeze cement perforations.
4. If squeeze pressure is not obtained overdisplace cement into formation with water and repeat squeeze cementing until successful.
5. When squeeze pressure is obtained, unbolt christmas tree from tubing hanger, pick up tubing out of packer, and reverse excess cement.
6. Pull tubing up to 1,000 feet and spot 200 foot cement plug. Continue out of hole and spot 50 foot cement plug from 50 foot to the surface.
7. Cut off 9-5/8" casing, 3 feet below surface of ground and weld on plate.
8. Release rig.
9. Send tubing to pipeyard for inspection and repair.
10. Send christmas tree to shop for overhaul.

ESTIMATED PLUGGING COSTS
FOR
PAN AMERICAN PETROLEUM CORPORATION
STATE LEASE 4183 NO. 1
LITTLE PECAN LAKE AREA

<u>Activity</u>	<u>AMOUNT</u>
Pulling unit at \$1,000/day	\$ 4,000
Rental tools at \$500/day	4,000
Trucking	3,000
Cement and services	4,000
Supervision	2,000
Contingencies	<u>2,400</u>
Total	\$19,400

SITE-SPECIFIC ENVIRONMENTAL INFORMATION CHECKLIST
GEOPRESSURED-GEOTHERMAL WELL TEST PROGRAM
GRUY FEDERAL, INC.

STATE LEASE 4183 NO. 1

A. GENERAL

1. Is the proposed site located in the area covered by the "Gulf Coast Programmatic Environmental Assessment, Geothermal Well Testing, the Frio Formation of Texas and Louisiana," October, 1977?
Yes X No If no, explain.
2. Has a Federal, state and/or local environmental assessment been conducted previously for the proposed test well or other wells in the area? Yes No X If yes, provide a copy if available.
3. Have all required permits, licenses, and/or agreements for proposed project been obtained? Yes No X If no, explain.
Cannot be applied for until arrangements with land owner have been finalized.
4. Does the project site fall within the habitat of rare or endangered species? Yes No X If yes, explain.
5. Are known archeological sites, historic sites, or natural landmarks within or visible from the site area? Yes No X If Yes, explain.
6. Will expected continuous noise levels from site operations be 65 dBA or less at the nearest residence? Yes X No If no, explain.

B. SITE CONSTRUCTION

1. Will additional land clearing be required for the test well (e.g., drill pad, road construction, mud reserve pits, pipeline)? Yes
No X If yes, describe.
2. Will additional land clearing be required for the disposal well (e.g., drill pad, reserve pits, utilities, road construction, pipeline)?
Yes No X If yes, describe.

3. Will the site and related roads be treated to minimize dust?
Yes _____ No X If no, explain. Road and work site to be boarded.
4. Are portable sanitary facilities or an approved septic system to be used at the site? Yes X No _____ If no, explain.
5. Will liquid and solid wastes be disposed in accordance with local regulations? Yes X No _____ If no, explain.
6. Will erosion control be required for excavated areas?
Yes _____ No X If yes, explain.
7. Will dredge spoil be deposited in swamp forest or marshland?
Yes X No _____ If yes, explain. Spoil was deposited at original drilling of well to facilitate road access to well.
8. Upon completion of proposed test program, will the site be restored to as natural a condition as possible by regrading, filling, and reseedling?
Yes X No _____ If no, explain.

C. WELL TESTING AND SAFETY

1. Is fluid production from the well during testing expected to be two weeks or less in duration per formation? Yes _____ No X
If no, explain. Planned to test for 30 days.
2. Is the total dissolved solids of the produced geopressure fluid expected to be 90,000 mg/l or less? Yes X No _____ If no, explain.
3. Is the volume of geopressure fluid to be produced and injected expected to be 3,000,000 barrels or less? Yes X No _____ If no, explain.
4. Is the temperature of produced geopressured fluid expected to be 260°C or less? Yes X No _____ If no, explain.

5. Will the gas content of the produced fluid be flared? Yes X
No _____ If no, explain.
6. Will blowout preventers rated to at least 10,000 psi be used?
Yes X No _____ If no, explain.
7. Will production tubing rated to at least 20,000 psi be used?
Yes _____ No X If no, please explain. Pressure rating is 18,000 psi and is of substantial safety factor.
8. Can safety valves be operated from remote locations? Yes X
No _____ If no, explain.
9. Will the test tree be rated to at least 10,000 psi? Yes X
No _____ If no, explain.
10. Will a test well directional survey be conducted? Yes _____
No X If yes, at what interval? _____ feet, if no, explain. Well already drilled and cased.
11. Will a lined pond be used to hold all liquid effluents and production fluids that are not injected? Yes X No _____ If no, explain.
12. Has an injection permit been obtained? Yes _____ No X If no, explain. Cannot apply for permit until landowner approval obtained.
13. Will H₂S monitors be located onsite? Yes _____ No X If no, explain. No history of H₂S in area.
14. Will fire extinguishers be located onsite? Yes X No _____
If no, explain.
15. Do contingency plans exist for evacuating personnel should a blowout occur or high levels of H₂S be detected? Yes X No _____ If no, explain.
16. Will high-pressure engineering and mud logging personnel be onsite during production well drilling operations? Yes X No _____
If no, explain.