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**INVESTIGATION AND EVALUATION OF
GEOPRESSURED—GEOTHERMAL WELLS**

Final Report. Gladys McCall No. 1 Well
Cameron Parish, Louisiana

By
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January 1979
Date Published

Work Performed Under Contract No. EG-77-C-08-1528

Gruy Federal, Inc.
Houston, Texas

U. S. DEPARTMENT OF ENERGY
Geothermal Energy

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FINAL REPORT

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CAMERON PARISH, LOUISIANA

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Prepared for the
U.S. Department of Energy
Division of Geothermal Energy
Under Contract EG-77-C-08-1528

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SUMMARY

This well, originally drilled in 1965 as Buttes Gas & Oil - Getty Oil Company No. 1 Gladys McCall, was approved for reentry and test operations after consideration of a number of reentry prospects in Cameron Parish. This was a marsh location that required 2.3 miles of board road and replacement of two bridges. Road work was commenced on June 19, 1978, and site preparation was completed on October 25.

Progress Drilling Company Rig. No. 21 moved on location on November 2. This rig was released on December 16. Reentry operations were completely unsuccessful because of failure to effect a tieback of the 7" casing. The plugging and abandonment records filed with the Louisiana Department of Conservation indicated that the top of the 7" casing was at or near the base of the 10-3/4" casing when the well was plugged. These records did not specify that the 7" casing had been dynamited one or more times during the recovery operation. Numerous attempts were made to locate and condition the 7" casing for tying back to the surface. All these were unsuccessful. The top of the 7" casing was never clearly located, or if located was subsequently lost, and therefore it was not possible to cut and recover the damaged section in order to effect a tieback.

The total cost of the attempted reentry was approximately \$1,925,000. Of this amount, some \$444,000 was spent on road and site preparation and disposal well. This expenditure can be salvaged in the event a decision is made to redrill the well.

SCOPE OF THE CONTRACT PROJECT

The original statement of work in Contract No. EG-77-C-08-1528 called for Gruy Federal, Inc. to undertake "identification, qualification, acquisition, planning, and conducting of geothermal-geopressured formation tests in up to six oil or gas wells, about to be drilled, being drilled, or being abandoned during the one-year term of the contract." The wells were to be located in the Frio Fairway of the Texas Gulf Coast, the Miocene formations of the Louisiana Gulf Coast, or other areas to be designated by the Department of Energy (DOE). Criteria for suitability of wells were specified in the contract.

This work statement was modified on September 25, 1978, to place more emphasis on "wells of opportunity," i.e., wells to be taken over as soon as possible after the operator has decided to abandon but before plugging and abandonment operations have commenced. "Reentry wells," which have penetrated or approached the aquifers of interest but have already been plugged and abandoned, were given a lower priority under the contract modification.

"Wells of opportunity" were to be obtained for testing, among other methods, by soliciting the industry through letters and personal contacts.

SITE SELECTION

At the time the Gladys McCall was approved as a test well for the geopressed-geothermal program, the industry had been slow to respond to solicitations for "wells of opportunity" that Gruy Federal could take over and test before abandonment.

The Gladys McCall test site was chosen, along with the Alice C. Plantation No. 2 site, in March 1978. The screening covered at least three alternate sites in the immediate area. DOE's screening committee (or at least some individual members of the committee) considered the first choice to be the well drilled as the Union Oil Company of California No. 1 Dr. M. O. Miller, located in Section 34, T15S, R5W, Cameron Parish, Louisiana. This well was fully cased to the surface; no casing had been removed; and the log showed some 800 gross feet of Miocene sand at 15,050 to 16,600 feet, the thickest individual sand member observed to date by the Gruy Federal staff. Site preparation cost was estimated to exceed that for the Gladys McCall site and the mechanical condition of the well was hazardous in that a "gas bubble" or a pressurized mud column was believed to exist below the lowermost plug. However, the principal deterrent was the attitude of the landowners. In a possible effort to maximize payment for use of their land, the Millers quoted a geological consultant who had advised them that the withdrawal of even relatively minor quantities of salt water from a geopressed aquifer would jeopardize the production of possible undiscovered hydrocarbons.

The next choice was the Pan Am (now Amoco) No. 1 State Lease 4183 in Section 27, T15S, R2W, Cameron Parish, Louisiana. This well is located in the Rockefeller State Game Refuge and within the designated Rockefeller Refuge geothermal fairway. Initial contacts with Amoco, the operator, were not encouraging because of the sensitive nature of the area as a game

refuge. With the active cooperation of the Louisiana Department of Natural Resources, however, Gruy Federal secured all necessary permits except for one from the Louisiana Department of Wildlife and Fisheries. That department declined to issue a permit, fearing that the grant to the State from the Rockefeller Foundation could have been voided because geothermal exploration was not one of the original exceptions to the use of the land as a wildlife refuge.

The choice then narrowed to the Watkins-Miller site in Cameron Parish, the Alice C. Plantation site in St. Mary Parish, and the Gladys McCall site in Cameron Parish. The ultimate first choice was the Alice C. Plantation, where site preparation time and expense were minimal.

A comparison of the applicable parameters of the other two sites is shown below:

	<u>Gladys McCall</u>	<u>Watkins-Miller</u>
Net sand, feet	610	310
Reservoir area, acres (approx.)	4000	7500
Apparent average porosity, %	15.8	15.8
Depth to Geo ² sand, feet (max.)	15,600	16,900
Reservoir temperature, °F		
(max., corrected)	313	311
Apparent reservoir pressure, psi	12,500	14,000
Casing required, feet: 9-5/8"	0	2900
7"	3600	11,300
5"	0	2150
Amount of open hole, feet	0	0
Original estimated total cost	\$1,493,000	\$1,555,000

The estimated cost of the access road to the Gladys McCall was offset by the cost of the extra casing required for the Watkins-Miller. However, as it turned out, the board road and site preparation costs for the Gladys

McCall were higher than estimated because the site was repeatedly flooded by heavy rainfall associated with a tropical depression that passed over the site after construction began.

The final choice of the Gladys McCall appears to have been based on the greater sand thickness, plus some uncertainty concerning the limits of the Watkins-Miller reservoir.

In retrospect, one additional factor should have been considered. We were unable to obtain the complete well file on the Gladys McCall, including details of the abandonment operation, from either the operator, Buttes, or the co-venturer, Getty Oil. However, the complete well file, including details of abandonment, was obtained for the Watkins-Miller well from Superior Oil Company. We now know that the official plugging records reported to the Louisiana Department of Conservation, which we relied on in the case of the Gladys McCall site, were in error.

OPERATIONS

Site Preparation. The contract to prepare the location for the Gladys McCall No. 1 was awarded to Ashy-Hutchinson Construction Company of Eunice, Louisiana. Construction involved rebuilding approximately 2.3 miles of board road with five bypasses, 40,000 square feet of turnaround area, and two bridges, plus repair of the existing ring levee. The requirement for the second bridge did not become apparent until after the contract had been let. Construction was begun on June 12, 1978, and was just over half complete when heavy rains began falling on July 19. Bad weather hampered operations for another two weeks. Muddy conditions at the site required driving additional piling to support the reentry rig and the saltwater disposal well drilling rig.

Toward the end of August, a tropical depression passed over the area and heavy rainfall again suspended operations. High tides and rain impeded operations from August 30 to September 25 and caused extensive damage to the board road, turnaround area, and ring levee. After the site was pumped out and the storm damage repaired, site preparation was essentially complete by September 26.

Saltwater Disposal Well. A turnkey contract to drill the saltwater disposal well was awarded to Howard's Well Service of Jennings, Louisiana, on August 25. Howard moved in equipment on the 30th and drove 119 feet of 9-5/8" conductor pipe before bad weather forced shutdown. The saltwater disposal well was spudded on September 13, and on the 19th 9-5/8" casing was set to 1086 feet and cemented to the surface. Drilling below surface casing began on September 19 and by the 21st had reached 1509 feet. An ISF log was run from 1509 to 1295 feet, showing penetration of the objective sand from 1150 to 1295 feet and additional sands from 1305 to 1365 feet.

On September 23, a 5-1/2", 15.3 #/ft, J-55 casing with a guideshoe and a float collar one joint off bottom, was run and set at 1484 feet. A gamma-ray cement bond log showed that bonding was good at the top and bottom of the sand of interest. A schematic of the completed saltwater disposal well is shown on the following page.

The rig was released on September 26 and the saltwater disposal well left idle. It was planned to perforate this well and the Gladys McCall No. 1 reentry well at the same time. The total cost was \$108,750.

Reentry. Operations on the reentry well began on October 27, while waiting for the rig. The cellar was pumped out to locate the top of the 16" conductor pipe and the 10-3/4" surface casing. Both casings had been shot off by explosives. The latter was found at a depth of 20 feet, and with considerable difficulty the flowing surface clay was excavated to this point so that a joint of 10-3/4" casing could be welded on to the cut off-portion of the original casing. The excavation and flowage void under the matting required 2,000 sacks of cement to fill.

Progress Drilling Company's Rig No. 21 was moved to the site on November 2. After necessary repairs, rigging up was completed on the 8th. Minor problems with wellhead equipment delayed reentry until November 14. Cement plugs were drilled from 36 to 41 feet, 41 to 47 feet, and 64 to 71 feet. Another plug was found at 2868 feet and drilled to 2871 feet. The bit also encountered junk (creosoted wood and paper mud sacks).

While drilling a cement plug from 3062 to 3137 feet, the bit broke through and complete mud returns were lost. The mud weight was reduced from 11.2 to 10 lb/gal and 10 pounds of lost circulation material per barrel were added. Circulation commenced and the hole was washed to 3511 feet.

WELL SCHEMATIC OF SWDW AT
GLADYS McCALL NO. 1 SITE

What appeared to be the top of the 7" casing was encountered at 3511 feet. An impression block run to this depth indicated that the casing had been shot instead of cut. A casing inspection log run from 3511 feet to the surface showed the 10-3/4" casing to be in good condition over that interval.

A 6" OD tapered mill was run to 3511 feet and milled to 3518 feet, where it broke through and pushed something (apparently junk) to 3541 feet. The 6" tapered mill was replaced with a 9-1/2" flat-bottom mill, which encountered an obstruction at 3511 feet. This assembly milled 27 feet and, when retrieved, was badly worn. An impression block run at that time was interpreted as showing the top of the 7" casing. A new 9-1/2" flat-bottom mill cut from 3537 to 3550 feet. Using a 6" pilot mill below a 3-1/2" fluted mill, junk was milled from 3550 to 3570 feet. Then, with a 5-7/8" tapered mill, it was presumed that the mill washed inside the cut-off 7" casing to a depth of 3736 feet. In an attempt to wash over the outside of the 7" casing, a 9" rotary shoe and three joints of 8-1/4" wash pipe engaged something firm at 3550 feet and rotated 11 feet. Two additional washover runs could not get below 3562 feet. Metal fingers inside the rotary shoe showed that the assembly had been running on a circular object having a diameter less than 7 inches. A collar locator log showed the 10-3/4" casing to be badly damaged below 3553 feet. A 6" tapered mill washed to 3829 feet without hitting an obstruction. Nine unsuccessful attempts were made to get a casing inspection device inside the 7" fish. An induction log was run to 3875 feet, but the resistivity recording was inconclusive because it was run in open hole. Another 9-5/8" tapered mill was run from 3553 to 3558 feet; when pulled, it showed considerable wear that suggested it had been running on the lip of the 7" casing, but by the end of November the 7" casing top had not been positively located.

A 9-1/2" impression block took 25,000 pounds weight at 3553 feet, or within the 10-3/4" casing. However, when the block was pulled, only the edges were rounded. It was not conclusive that the impression represented the 7"

casing. An assembly consisting of a 5-7/8" tapered mill with a 9-1/4" stabilizer 29 feet above it took weight where the mill was at 3581 feet (stabilizer at 3552 feet). A total of three feet was milled, with a substantial amount of metal cuttings being recovered in the mud returns. The 5-7/8" mill had no markings; the stabilizer showed wear which was interpreted as being produced by running on flared-out 7" casing.

In an attempt to wash over the supposed damaged 7" casing, and at the same time to remove supposed junk resting inside it, an assembly was run consisting of a 9' x 8" cut lip guide skirt with a 7-7/8" flat-bottom mill 12" x 7" inside. This assembly engaged a fish at 3553 feet, and milled to 3555 feet with considerable torquing. When the assembly was pulled, it showed no inside wear. Obviously this assembly did not accomplish its intended purpose. Later, it was supposed that the milling was done on damaged 10-3/4" casing.

Next a 5-7/8" tapered mill was run to 3592 feet on a joint of bent 3-1/2" drill pipe in an attempt to enter and clean out what was presumed to be the 7" casing. When the drill pipe was raised, it could not be lowered again below 3588 feet and at this point it was not possible to rotate. In retrospect, it appears that this attempt encountered metallic junk at a point outside, or even above, the 7" casing. The 5-7/8" mill was not marked.

In another attempt to enter what was presumed to be 7" casing, a 5-7/8" tapered mill was run on a bent joint of drill pipe with a 9-5/8" flat-bottom mill positioned 35 feet up from the bottom (Fig. 1)*. This stopped with the tapered mill at 3569 feet and the flat-bottom mill at 3534 feet. With this assembly 10 feet of milling progress was made with heavy torquing, after which the tapered mill dropped to 3590 feet with the flat-bottom mill at 3555 feet. It was not possible to mill deeper. The 5-7/8" mill had apparently entered open hole since it was covered with gumbo. The flat-bottom mill apparently milled on damaged 10-3/4" casing at 3555 feet.

* Figures 1 through 20 are found on Pages 19 through 38.

Next, a 5-7/8" mill was run on three 4-3/4" drill collars (Fig.2). This hit bridges at 3576 and 3945 feet, which were easily rotated through, and reached a depth of 3969 feet where a firm obstruction took 25,000 pounds of weight. Further rotation was not possible. The mill was covered with gumbo when pulled. Obviously it had run in open hole and may have encountered the side of the 7" casing at 3969 feet.

An attempt was then made to run a 5' x 3-1/2" 50-pound caliper log (Dialog), but this could not be lowered past 3577 feet. The interval 3577 to 3529 feet was logged and appeared to produce the same log as the run of November 28, 1978. An induction electric log hit the same obstruction at 3577 feet.

The next series of fishing attempts was designed on the assumption that flexible tools were entering open hole at or near the 10-3/4" casing shoe. It was thought that the top of the 7" casing was just below the 10-3/4" casing shoe, and that it could be engaged by running a stiff hookup. A 9-5/8" concave mill was run below a 9-1/4" stabilizer and seven 6-1/2" drill collars, and milled from 3559 to 3579 feet (Fig. 3). The mill was worn on the bottom; the markings appeared to confirm that the mill had run on 7" casing.

In an attempt to clean out inside of what was believed to be 7" casing, a 5-7/8" tapered mill was run on jars to 3573 feet (corrected depth) (Fig. 4), where drill pipe rotation caused the mill to roll off the obstruction. A number of unsuccessful attempts were made to enter the presumed top of the 7" casing. There were no marks on the mill.

An attempt was then made to wash over the outside of the presumed 7" casing and clean junk from the inside. The assembly consisted of a 9-5/8" burning shoe on 15 feet of 9" OD, 8-3/16" ID wash pipe below seven drill collars, and a 9-1/4" stabilizer (Fig. 5). Inside the wash pipe and 3.7 feet off bottom, a 5-7/8" flat-bottom mill was positioned. At the time it was believed that the 7" casing had been successfully washed over. The apparent

top was washed over at 3579 feet, and metal and cement were milled while washing over from 3579 to 3594 feet and cleaning out inside to 3590 feet. Both the inside of the wash pipe and the flat-bottom mill were scored; this was interpreted as metallic fish inside the 7" casing.

An apparently successful attempt was then made to tie back the 7" casing to a point up into the undamaged 10-3/4" casing. A 9-1/2" overshot was run on two joints of 9" x 8-3/16" wash pipe with a backoff joint above the wash pipe (Fig. 6). This was washed through tight spots in 10-3/4" casing from 3550 to 3560 feet, and appeared to have washed over the assumed top of the 7" casing at 3579 feet and to have engaged the 7" casing in the overshot. The safety joint was backed off at 3517 feet, thus seemingly affording a clear channel for cleanout operations inside the 7", and avoiding the tendency of the drill pipe to be sidetracked through a window in the bottom portion of the 10-3/4" casing. In order to test the overshot engagement, a pull of 25,000 pounds in excess of the drill pipe was exerted. At this point we were most optimistic that the 7" casing could be successfully and permanently repaired so that the objectives of the Geo² tests could be accomplished.

A 5-7/8" flat-bottom mill was run on bumper jars and six joints of 4-3/4" drill pipe to 4250 feet (Fig. 7), at which point what was described as settled-out barite and small junk were milled to 5018 feet. Although it was not realized at the time, it is possible that this depth was reached outside of and alongside the 7" casing, i.e., the 7" casing may not have been engaged at all.

Next, a 7" casing scraper was run above a 5-7/8" mill (Fig. 8) to prepare for a casing inspection log. This assembly hit an obstruction at 4438 feet. When pulled, the scraper blades were caked with formation material, clearly indicating that open hole had been entered once again.

A Dia-Log casing inspection tool was run and worked past a restriction at 3595 feet, but stopped at 4043 feet. The interval from 4043 to 3822 feet was logged. The log indicated the maximum limit of 8" in diameter. This could have been caused by the hole size or malfunctioning of the tool. Logging continued to 3706 feet with occasional indications of a slight reduction in hole size. At that point a restriction was encountered which resulted in the instrument being pulled out of the rope socket. An attempt to recover (Fig. 9) was unsuccessful. The fishing tool was covered with formation gumbo when pulled. There was no question that the assembly had entered open hole. A GO International X-Y caliper log was run from 4100 to 3490 feet. Open hole was logged to the bottom of the overshoot.

It was then necessary to recover the overshoot and wash pipe with the assembly shown in Fig. 10. Only the top joint was recovered. The second joint of wash pipe was recovered after considerable jarring with 85,000 pounds above the weight of the drill pipe (Fig. 11). The cut-lip guide on bottom was deeply cut and the wash pipe was scarred with vertical markings. Although the explanation did not appear completely reasonable, it was postulated that the overshoot had engaged miscellaneous junk; it was not the 7" casing as previously believed. At this point it was realized that the operation was in deep trouble.

In an attempt to remove any remaining obstruction inside the 10-3/4" casing which could have been responsible for a whipstock effect to permit tools to enter open hole, possibly alongside 7" casing, the assembly shown in Fig. 12 was run. This resulted in the 9-5/8" concave mill torquing and milling from 3555 to 3595 feet, at which point the penetration rate decreased to 1/4 foot per hour. The outside edge of the mill was worn. This could have resulted from milling the outside of 7" casing. Cement and metal were recovered on the shale shaker.

Another attempt was made to engage the 7" casing, using the knuckle joint assembly shown in Fig. 13. This was an attempt to engage the top of 7" casing in the event it should be off center in an enlarged hole. An obstruction encountered at 3557 feet was probably the window which by now was believed to have been cut in the damaged 10-3/4" casing. A second obstruction at 3581 feet was believed to be caused by formation sticking. Attempts to engage the obstruction continued to 3589 feet without success.

The assembly shown in Fig. 14 was then run in another futile attempt to locate and wash over the elusive - or phantom - 7" casing. An obstruction was again hit at 3553 feet, corresponding to the damaged section of 10-3/4" casing. This was milled to 3556 feet. The rotary shoe was left in the window of the 10-3/4" casing. In an attempt to recover the shoe with the spear assembly shown in Fig. 15, the fish was apparently pushed aside into formation gumbo, with which the tool was covered upon retrieval.

In a further attempt to correct the 10-3/4" window which was believed to be causing whipstocking of tools, the assembly shown in Fig. 16 was run. This was another stiff assembly, with five 9-5/8" and 9-1/4" stabilizers above a 9-5/8" flat-bottom bladed junk mill. This time no obstruction was encountered in the 10-3/4" casing, but a new obstruction was encountered at 3581 feet. This was milled to 3581-1/2 feet, where the tool broke through to 3586 feet, and milling was resumed to 3596 feet. The nature of this junk is unknown; it could have been the outside of 7" casing, or pieces of 7" casing produced by unreported dynamite shots. This observation applies equally to obstructions encountered in previous runs. The same assembly was run again. Milling was continued from 3596 to 3600 feet and from 3608 to 3617 feet. The mill, when pulled, was not sufficiently worn to indicate the type of junk being run on. An identical assembly was rerun; junk was milled and pushed from 3617 to 3666 feet, but no metal cuttings were recovered. The mill was only slightly worn and covered with formation gumbo. Logged open hole with Schlumberger from 3664 to 3240 feet. The bottom of

10-3/4" casing was indicated at 3554 feet, as compared to original log at 3574 feet. The log showed effects of metal from 3554 to 3596 feet and clean open hole to 3664 feet. A caliper log and directional survey were run from 3666 to 3490 feet. The hole was in gauge from 3666 to 3692 feet and was washed out from 3592 to 3552 feet. The directional survey indicated the hole to be essentially straight, with a maximum deviation of 1-1/4° from vertical.

In an attempt to determine whether the obstruction being milled was the top, side, or fragments of 7" casing, the impression block assembly shown in Fig. 17 was run. The results were inconclusive, showing junk of an indeterminate nature. Another stiff hookup with a rock bit was run in an attempt to remove possible junk from what could have been the top of 7" casing (Fig. 18). Additional hole was made from 3666 to 3679 feet, but the bit and stabilizers balled up badly with gumbo and the assembly was pulled. A 9-5/8" rock bit, this time fitted with jets to overcome gumbo, was then run and made hole from 3679 to 3787 feet with no signs of running on junk (Fig. 19).

At this point it was clear that conditions in the hole were too uncertain to permit completion of the reentry attempt. Permission was requested and received from DOE to abandon the reentry attempt and the hole was plugged in accordance with Louisiana Conservation Department regulations.

Plugging and Abandonment. After pulling out of the hole and laying down drill collars, an open-ended drill pipe was run in the hole and a cement plug was set from 3660 to 3460 feet, using 91 sacks of cement. Another plug was set from 10 to 60 feet inside the 10-3/4" casing, using 25 sacks. The 10-3/4" casing was cut off 3 feet below the mud line, a plate was welded on the top, and the remaining hole was filled with cement. Progress Drilling Company's rig was released at 7 p.m. on December 18, 1978.

Figure 20 shows (1) the presumed status of the well before reentry was attempted, based on official reports; (2) the actual status of the well based on Gruy Federal's experience in the attempted reentry; and (3) the present status of the well.

CONCLUSIONS

The following conclusions have been reached, with some being necessarily conjectural:

1. The 7" casing had been shot with explosives, probably dynamite, at more than one place, including a point inside the 10-3/4" casing.
2. The 10-3/4" casing was so damaged by a dynamite shot and the damage later aggravated by milling operations, that a window was cut which resulted in tools being diverted by a "whipstocking" effect to enter open hole and subsequently make new hole.
3. It is not conclusive whether the junk encountered in reentry operations was the top, side, or fragments of 7" casing, or portions of shattered 10-3/4" casing.
4. If only the side of the 7" casing had been established, it would have been impossible to mill a clean window and then remove sufficient casing by milling to effect a clean patch which could have withstood the pressure of the mud weight to be employed.
5. Even if the top of the 7" casing had been definitely located, it could well have proved to be dynamited at one or more lower points.
6. The official plugging report was grossly inaccurate. It is possible that more 7" casing was recovered than was reported. If so, however, it is difficult to explain the occasions when it was concluded that the top or side of the 7" casing had been located.

7. Attempted tiebacks on casing which has been recovered by shooting, rather than mechanical, chemical, or jet cutting, should always be avoided, irrespective of the other merits of a reentry prospect.
8. In the unlikely event that reentry attempts should ever be made again in wells in which some casing has been pulled, such attempts should be confined to well sites in which the location and road cost is minimal in case of reentry failure. In the case of the Gladys McCall well site, the major road expenditure had already been made and it was therefore imperative to exhaust every means of effecting a casing repair and replacement.
9. State records are not to be trusted as a sole information source. Reentries should be confined to locations where good well records are available from the original operator. Such was the case with the Alice C. Plantation test site, and also the Watkins-Miller site. It will be recalled that the latter well required considerable additional casing which offset the Gladys McCall estimated road cost. Had the Watkins-Miller well been chosen, however, the trouble due to unknown factors would have been avoided.

Purpose Of Tool Run: Attempt to locate top of 7-inch casing, get inside and dress off what was believed to be a split joint of 7-inch.

Results: Milled with 9-5/8 inch flat-bottom mill from 3534 to 3544', broke through and WIH to 3555' with flat-bottom mill. Mill on junk with no success. POOH.

Tool Analysis: 5-7/8 inch covered with gumbo, flat-bottom mill worn out on bottom and edges rounded off.

Purpose Of Run: Attempt to get inside 7-inch casing and clean out inside same.

Results: Washed and rotated down to 3969 feet.

Tool Analysis: Tapered mill covered with gumbo - mill apparently running in open hole.

Purpose Of Run: Clean out obstruction at 3577', attempt to locate and dress off top of 7-inch.

Results: Set down on obstruction at 3559', milled down to 3579' (corrected depth).

Tool Analysis: Mill worn on bottom, marking indicated that mill may have been running on 7-inch casing.

FIGURE 4

22

DATE: 12/4/78

Purpose of Run: clean out inside
apparent 7-inch casing.

Results: set down on obstruction

at 3573' (corrected to log depth),
each time rotation was started - mill
would roll off obstruction (apparently
not 7-inch casing).

Tool Analysis: No marking on mill

FIGURE 5

DATE: 12/5/78

Purpose Of Run: Attempt to wash out 7-inch casing and clean out junk inside top of 7-inch

Results: Appeared to have washed over top of 7-inch at 3579', clean out inside 7-inch to 3590' and wash over to 3594'

Tool Analysis: 5-7/8 inch mill worn, inside washpipe scored - indicating some fish inside washpipe

Purpose Of Run: Tieback 7-inch casing into 10-3/4 inch (serve as guide to clean out inside 7-inch).

Results: Worked through tight spot in casing from 3550 - 3560'. Appeared to work over 7-inch at 3579', catch 7-inch overshot

Tool Analysis: Backed off safety joint as planned and left washpipe and overshot in hole

FIGURE 7

DATE: 12/7/78

Purpose Of Run: Clean out inside 7-inch casing

Results: WIH and hit obstruction at 4250'.
Milled from 4250' to 5018' (milling what appeared to be barite)

Tool Analysis: No marking on mill

Purpose Of Run: Scrape inside of 7-inch casing in preparation to run casing inspection log.

Results: WIH and hit obstruction at 4438'.
POOH.

Tool Analysis: Scraper had gumbo caked in blades - indicating scraper had been in open hole.

Purpose Of Run: Attempt to recover Dia-
Log caliper tool lost in hole at 3607'.

Results: No indication of hitting fish
at 3607', continued in hole to 4734', set
down with 25,000 pounds. P00H.

Tool Analysis: No recovery; overshoot covered with gumbo.

Purpose Of Run: Recover cutlip guide, overshoot and two joints of washpipe set in hole 12/6/78 to tie 7-inch back to 10-3/4 inch casing.

Results: Recovered top joints of washpipe.

Tool Analysis: Threads on washpipe jumped out of box during jarring operations on washpipe assembly.

Purpose Of Run: Recover bottom joint of washpipe, overshot dressed for 7-inch casing and 9-5/8 inch cutlip guide.

Results: Jarred and pulled on fish with 85,000 pounds above pipe weight. Recovered all of fish.

Tool Analysis: Cutlip guide was cut on bottom (1/4" wide x 1/8" deep at 30° angle from vertical - probably junk cut). Had one handful of sand inside cutlip guide. Washpipe covered with gumbo to within 5' of top of joints - also had slight vertical metal marking 1-1/2" wide - 10' up from bottom

Purpose Of Run: Clean out junk in 10-3/4 inch casing that may be causing whipstock, forcing tools out window.

Results: Had torque with no weight on mill at 3560. Continued in hole and encountered obstruction at 3577', milled on metal to 3595' - penetration rate decreased to 1/2' per hour. POOH.

Tool Analysis: Mill worn on outside, edges rounded off.

Purpose Of Run: Locate top of 7-inch casing, get over top of 7-inch and catch same.

Results: Hit obstruction at 3557' (unable to catch anything) worked past 3557', continued in hole, hit obstruction at 3581' - attempted to catch fish, determined that overshot sticking in formation.

Tool Analysis: Overshot had small amount of gumbo on outside. No marking on tools - obstruction encountered at 3557' believed to be possible window in 10-3/4 inch casing

FIGURE 14

DATE: 12/12/78

32

Purpose Of Run: Attempt to locate 7-inch casing, washover and catch same.

Results: Set down on obstruction at 3553' and milled to 3556' - P00H.

Tool Analysis: Left rotary shoe and crossover sub in hole - shoe believed to be hung up in window in 10-3/4 inch casing.

Purpose Of Run: Attempt to recover crossover and rotary shoe.

Results: Tagged obstruction at 3556', attempted to engage fish - pushed through obstruction. Chased fish to 3581' - set down with 15,000 pounds. Had 35,000 pounds drag on bottom. P00H. No recovery.

Tool Analysis: Spear covered with gumbo. Tool apparently had been in open hole.

FIGURE 16

DATE: 12/13/78

Purpose Of Run: Clean out junk in

10-3/4 inch casing that may be causing possible whipstock to force tools out of window and to clean out the top of 7-inch casing.

Results: WIH. Did not tag any

obstruction in 10-3/4 inch casing.

Continued in hole, tagged obstruction

at 3581'. Mill from 3581' to 3581-1/2'

and broke through. Encountered obstruction and resumed mill at 3586 to 3596 (dragging junk up the hole while making connection).

P00H.

Tool Analysis: Tool running on junk with

marking as shown below:

FIGURE 17
IMPRESSION BLOCK RUN

DATE: 12/16/78

Purpose Of Run: Attempt to determine
if metal being milled is junk or 7-
inch casing.

Results: Set down on obstruction at
3666' with 10,000 pounds. P00H.

Tool Analysis: Two nicks cut on out-
side edge of block as indicated below:

FIGURE 18
9-5/8 INCH BIT

DATE: 12/16/78

Purpose Of Run: Clean junk and
formation off top of 7-inch casing.

Results: Drilled from 3666' to 3679'.

Bit torquing - penetration rate
not responding to weight on bit.

Tool Analysis: Bit and near bit
stabilizer balled with gumbo.

FIGURE 19

DATE: 12/16/78

Purpose Of Run: Clean junk and
formation off top of 7-inch casing.

PROSPECT L-3
GETTY & BUTTES GAS & OIL CO.
GLADYS McCALL NO. 1
E. CRAB LAKE FIELD AREA

FIGURE 20

APPENDIX

INVESTIGATION AND EVALUATION OF
GEOPRESSURED-GEOTHERMAL WELLS

DETAILED REENTRY PROGNOSIS FOR
GEOPRESSURE-GEOTHERMAL TESTING OF
GLADYS McCALL No. 1 WELL

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

JUNE 16, 1978

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

GRUY FEDERAL, INC.

CONSULTANTS IN ENERGY SYSTEMS

September 13, 1978

2500 TANGLEWILDE, SUITE 150
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Mr. Ronald T. Stearns
Engineering and Construction Division
DOE/Nevada Operations Office
P. O. Box 14100
Las Vegas, Nevada 89114

Re: Contract No. EG-77-C-08-1528
Gladys McCall No. 1 SWDW #1

Dear Mr. Stearns:

Since the preparation and submittal of our "Investigation and Evaluation of Geopressured-Geothermal Wells" for the Gladys McCall No. 1 Well, (NVO/1528-6A) we have been successful in obtaining an electrical log of the shallow sands for the area of the above captioned well. This well was originally drilled as the Getty Oil Company and Buttes Gas and Oil Company, Gladys McCall No. 1 in the East Crab Lake Area, Cameron Parish, Louisiana.

This electrical log permits us to substantially reduce our projected total depth from 4500 feet to 1500 feet. Since shallow surface sands are highly erratic in depositional continuity through this region an alternate depth objective of 2750 feet has been selected. The revision in depth has resulted in an altered cost estimate for the Saltwater Disposal Well that will serve the Gladys McCall No. 1 Reentry.

With the leadtime available to us, we have also been successful in obtaining a "turnkey" drilling contract to the 1500-foot objective and a flat footage rate below 1500 feet.

Due to the tropical disturbances that have continually delayed our drilling operations, additional monies have also been provided for standby rig time.

You will note the enclosed six pages are not numbered since these "six" pages are replacing only "three", 21, 22 and 23, and are punched and ready to put into the Detailed Reentry Prognosis for Geopressure-Geothermal Testing Program, NVO/1528-6-A.

Very truly yours,

Richard J. Dobson
Vice President
Special Programs

RJD:cas
Enclosures

THE GRUY COMPANIES—SINCE 1950

REVISED WELL PROGNOSIS

GLADYS McCALL

SALTWATER DISPOSAL WELL NO. 1

EAST CRAB LAKE AREA

CAMERON PARISH, LA.

A continued effort toward effective planning for economical Geo² operations has resulted in the location of the electric log on the surface hole for the Monterey Oil Company M. O. Miller No. 1. well. This well is located some 3,000 feet from the location site for the subject well. A review of the Monterey log indicates a good objective injection sand from 1,185 feet to 1,380 feet which contains some 150 feet of net porous saltwater sand. We are aware that this zone might not be present at the Gladys McCall site; therefore an alternate sand objective in the Monterey well occurs from 2,525 feet to 2,630 feet containing some 90 net feet of porous sand.

On the basis of these data, this revised drilling prognosis was designed for alternate target objectives with preference for the shallow objective.

Operational Day

0	1. Drive 13-3/8" O.D. R-3 P.E.B. casing to refusal or to ⁺ 125 feet, whichever occurs first.
1st	2. Move in Howard Rig, rig up and drill 12-1/4" inch hole to 1075 feet.

5th 3. Condition hole, rig up and run 1075 feet of 9-5/8 inch #37 H-40 R-3 casing with guide shoe on bottom and float collar one joint above bottom. Use one centralizer per each 100 feet of casing from bottom 500 feet. Use sufficient cement to circulate same to surface allowing 150 percent of theoretical volume.

6th 4. Nipple-up B.O.P.'s while waiting on cement.

8th Drill 8-3/4 inch hole below surface casing to 1500 feet.

9th Run Schlumberger ISF - Sonic log with caliper.

NOTE: If the sand showing between the depths of 1185 feet and 1380 feet in the Monterey Oil Company M. O. Miller No. 1 well is present and suitably developed, make trip and condition hole while rigging up casing crew to run casing. If sand is not acceptable, proceed to Step 6.

10th 5. Run 5-1/2 inch 15.5# J-55 R-3 casing to 1500 feet with shoe on bottom and float collar one joint above bottom; and with centralizers on every other joint to a height that will give a minimum of two centralizers inside 9-5/8 inch casing. Cement with sufficient cement to circulate to surface.

- 11th 6. If shallow sand is not suitable, omit Step 5 and resume drilling to a depth of 2,750 feet.
- 12th 7. Run Schlumberger ISS - Sonic log with caliper from total depth to 1500 feet.
- 13th 8. Run 5-1/2 inch 15.5# J-55 R-3 casing to 2,750 feet equipped as set out in Step 5.
- 14th 9. Nipple up 5-1/2 inch casing and make trip to top of float collar. Allow a minimum of 24 hours waiting on cement time prior to testing casing to 2,000 psi.
- 15th 10. Pull out of hole with drill pipe and run Gamma Ray cement log from top of float collar to 800 feet. If bond log indicates need for cement squeeze, perforate 1-1/2 feet above and 1-1/2 feet below base of sand for total 3-foot perforations.
11. Go in hole with R.T.T.S. tool with one joint tailpipe and squeeze perforations. Reverse out excess cement.
12. Pull R.T.T.S. tool and tailpipe up to 30 feet above top of injection sand. Perforate 1-1/2 feet above and 1-1/2 feet below injection sand for a total of 3-foot perforations using through tubing gun and proceed to squeeze these perforations.

- 17th 13. Make trip, lay down R.T.T.S. tool, pick up bit and drill out cement from both block squeeze jobs and condition mud to top of float collar.
- 18th 14. Test block squeeze perforations to 1500 psi for 30 minutes.
15. If test O. K. displace all mud from hole with water. Lay down drill pipe. Remove B.O.P. and install wellhead.
- 19th 16. Rig down and move out rig.
17. Rig up and perforate well in interval to be selected from electric log.
18. Test injectivity of well and 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.

<u>Estimated Cost</u>	<u>1st Objective Depth</u>	<u>Alternate Depth</u>
1. Drive 125 feet of 13-3/8 inch conductor pipe	\$ 3,500	\$ 3,500
2. Move in rig, drill to 1500 feet at turnkey price	24,500	24,500

<u>Estimated Cost</u>	<u>1st Objective Depth</u>	<u>Alternate Depth</u>
3. Drill 1500 feet to 2750 feet @ \$10/foot		12,500
4. Day Rate @ \$2400 per day	16,800	21,600
14 Days lost as result of storm damage on location	33,600	33,600
5. Location preparation	5,000	5,000
6. 125 Feet of 13-3/8 inch 65# J-55 plain end casing	3,850	3,850
7. 1,025 feet of 9-5/8 inch 36# H-40 casing ST & C or LT & C	12,550	12,550
8. 5-1/2 inch 15.5# J-55 ST & C @5.33/foot FOB location	8,000	14,650
9. Float equipment & centralizers	2,000	3,000
10. Mud and chemicals		2,000
11. Cement and Services	9,000	12,000
12. Electric logging	2,300	4,600
13. Perforating (320 holes)	6,000	6,100
14. Wellhead equipment	5,000	5,000

<u>Estimated Cost</u>	<u>1st Objective Depth</u>	<u>Alternate Depth</u>
15. Stimulation	2,500	2,500
16. Supervision	2,400	3,000
17. Miscellaneous supplies & rentals	7,500	7,500
18. Trucking	3,000	3,000
19. Contingencies	17,100	21,700
20. Material handling at 1.3% on all items other than Supervision and Contingencies	<u>1,450</u>	<u>1,850</u>
TOTALS	\$ 166,050	\$ 204,000

ADDENDUM TO RE-ENTRYPROGNOSISGLADYS McCALL NO. 1SECTION 27-15E-5WCAMERON PARISH, LOUISIANA

1. Compliance with all pertinent Federal, State, and local regulations is mandatory. Contact the Houston office by any assistance required in complying.
2. Reference to the original prognosis NVO/1528-2A, operations will begin with previously conditioned 10.8 lbs. per gallon in rig pits. This mud may be purchased from our drilling supplies and transported to the well site. Further drilling mud operations will be conducted according to the following plan:

<u>DEPTH</u>	<u>MUD WEIGHT</u>	<u>VISCOSITY</u>	<u>API FLUID LOSS</u>
0 - 3800	10.8 - 11.2	42 - 45	10 - 15 cc
3800 - 4700	11.2 - 11.8	45	10 - 15 cc
4700 - 6500	11.8 - 13.3	45 - 50	8 cc
6500 - 9000	13.3 - 14.6	50	6 - 8 cc
9000 - 10000	14.6 - 15.8	50 - 52	6 - 8 cc
10000 - 11000	15.8 - 16.5	50 - 55	6 cc
11000 - 11740	16.5 - 17.0	50 - 55	5 - 6 cc

Supervisors will insure a well balanced 17.0 bb/gallon prior to drilling the cement plug @ 11740 - 11928' $\pm$.

3. Perforations.

- Top perforations: 11,924 - 11,928 feet $\pm$.
- Lower perforations: 14,558 - 14,565 feet $\pm$.

NVO-1528-6A
Re-entry Prognosis
Gladys McCall No. 1

4. Casing.

a. 10-3/4" surface @ 3569 feet.

b. 7" intermediate @ 14290 feet.

1. To be tied back to surface with a BOT casing patch (pressure-actuated overshot patch).

Note: If unable to tie back 10-3/4" to surface, 36" drive pipe will be driven to refusal ($\pm$ 200') and utilized as a caisson to get inside the 10-3/4" @25 or more feet below surface and clean out to 7" top for dressing and tie back BOP nipple up will then be on the 7" casing.

c. 5" liner @ top: 13954'.
Bottom: 15598'.

5. Casing inspection log.

a. Casing inspection by logging will be utilized from the top of the 5" liner back through the 7" casing patch. The inspection log should develop the following:

1. Casing weight and possible grade.
2. Holes or potential holes in casing.
3. Major changes in thickness of casing.

b. This information should be relayed to the Houston office immediately upon completion of logging. Telecopy if facilities can be arranged. Decisions then will be made for further testing the 7" casing integrity prior to proceeding further.

6. Squeeze operations.

- a. Possible squeeze of 7" casing tie back.
- b. Possible squeeze of each set of previously listed perforations.
- c. Should it appear necessary to squeeze perforations or to test the casing (7) integrity, an RTTS tool will be utilized.
- d. All cement will be pre-tested for pumping time and strength development. Every effort in the supervisor's planning will be directed towards elimination or total reduction in rig down time while waiting on men or equipment.

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**GEOPRESSURED-GEOTHERMAL REENTRY PROSPECT L-2
EAST CRAB LAKE AREA
CAMERON PARISH, LOUISIANA**

Introduction

This Gruy Federal Type III-A geopressured-geothermal (Geo²) prospect was drilled as the Getty Oil Company and Buttes Gas and Oil Company, No. 1 Gladys McCall. It is located in Section 27, Township 15S, Range 5W, Cameron Parish, Louisiana. The well is accessible by way of the original canal levee road, approximately 2-1/2 miles south of Louisiana State Route 82; one bridge must be replaced and a board road must be laid on the levee. (Figure 1). Buttes completed this well in January, 1970, as a shut-in gas well through perforations from 11,924 to 11,928 feet. It was plugged and abandoned in April, 1970, without having produced. The location is shown on the north central area of the USGS topographic sheet "Hog Bayou". A portion of this sheet is included as Figure II, which shows this well location as well as the State Lease 4183 Nos. 1 and 2 wells on the adjacent Rockefeller Wildlife Refuge and Game Preserve.

Geology

Figure III is a generalized structural interpretation which is contoured on the first Geo² sand in the lower Miocene section. This indicates a potential drainage area of as much as 4000 acres. Lack of precise control undoubtedly will reduce this due to unrecognized faulting, but it appears that the well is capable of draining from a substantial area. The only evidence for the down-to-the-north fault shown between this well and the major regional down-to-the-coast fault further north is the low structural position of the sand top in the Sun Sturlese No. 1.

GRUY FEDERAL, INC.
Houston, Texas

Crab Lake Field Area
Cameron Parish, Louisiana

PLAT SHOWING EXISTING ROAD
FROM STATE HWY. NO.82 TO Well Loc.
GETTY & BUTTES - Gladys McCall No.1
IN SEC.27, T.15S., R.5W

GRUY FEDERAL, INC.
Houston, Texas
LOCATION MAP
Hog Bayou
Cameron Parish, Louisiana

HOG BAYOU, LA.
N2930-W9245/15

Designates Net Sand
Penetrated at 300°F+

GRUY FEDERAL, INC.
Houston, Texas

Crab Lake Field Area
Cameron Parish, Louisiana

STRUCTURE: TOP OF POROSITY
AT FIRST GEO² SAND
IN LOWER MIOCENE SECTION

The potential Geo² aquifers are encountered at depths from 14,560 to 14,780 feet, from 14,930 to 14,970 feet and from 15,145 to 15,598 feet (TD). All of these are Marginulina ascensionensis sands of lower Miocene age. No hydrocarbon saturation is evident on the resistivity log. During drilling operations through these sands the mud weight was 17.0 pounds per gallon. This would indicate that the static aquifer pressure at 15,300 feet is approximately 12,500 psi (assuming 1,000 psi overbalance). The maximum recorded mud temperature was 284 degrees Fahrenheit (140 degrees Centigrade) which would indicate an aquifer temperature of 313 degrees Fahrenheit (156 degrees Centigrade). This is based upon correction factors developed for South Louisiana by the AAPG.

A sonic log run on the well indicates that the massive sand body from 15,145 feet to 15,598 feet (TD) is fairly uniform. Copies of the applicable portions of these logs are contained in the pocket of this report. Calculated porosities range from 14.6 percent to 16.9 percent. The weighted average porosity is 15.8 percent over the net sand thickness of 271 feet. Thirty sidewall cores were taken in the geopressured sands, none of which were taken in the principal zone of interest. Porosities by core analyses compared with those computed from the sonic log show very little correlation; the core analyses porosities in all cases are higher which suggests that the cores experience a porosity increase when they are stress relieved. The low transit times in the surrounding shales tends to substantiate this compaction premise.

Mechanical Condition

Figure IV illustrates the present and proposed mechanical condition of the well. Information on the present condition was obtained from the plugging and abandonment report filed with the Louisiana Department of Conservation and from the completion card published by Petroleum Information Corporation. It will be necessary to run 3,585 feet of 7-inch OD casing with a casing patch tool and tie to the existing 7-inch casing. In terms of tubular requirements, this is the least expensive well proposed by Gruy Federal.

PROSPECT L-3

GETTY & BUTTES GAS & OIL CO.

GLADYS McCALL NO. 1

E. CRAB LAKE FIELD AREA

PRESENT STATUS

GETTY AND BUTTES GAS AND OIL CO.

GLADYS McCALL NO. 1

E. CRAB LAKE AREA

PROPOSED TEST CONFIGURATION

FIGURE IV

Reentry Technique

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

The design of the tubular program for each individual well is not optimal in the sense that it satisfies all mechanical constraints at minimum cost. Instead, tubular goods were selected on the basis of accomplishing the goals of a multi-well program at minimum cost.

Similarly, the drilling mud program was designed to track the mud weight and other physical characteristics used during the original drilling of the well. Provisions have been made to salvage as much of the heavy drilling mud as possible and store it between well operations and rig moves for subsequent reuse so that maximum savings on this item can be realized.

For estimating purposes the cost of equipment used during any reentry operation has not been allocated to each well but rather has been debited to the well for which it was first purchased. This method will cause some anomalous cost patterns between wells.

Casing Design - Since only a short tie back string of 7-inch OD 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 has been specified.

Tubing Design - Tubing has been selected on the basis of anticipated flow capacity, pressure requirements, and with joint connections that will withstand reuse in subsequent wells. To meet these requirements, we have selected the primary string to be 3-1/2" OD, 12.95# per foot, P-105 grade, PH-6

Hydril threaded pipe. No provisions have been made in this well to utilize the 3-1/2" OD tubing in inventory at Intracoastal City since it is contemplated that it will have already been in use in the first scheduled reentry project. It will, however, be used on subsequent wells as it becomes available even though the joint design is not as durable as a PH-6 Hydril connection.

This well has a 5" OD liner in the lower portion of the hole and therefore, requires that the tubing string be reduced to 2-7/8" OD, 8.70# per foot, P-105 within the 5" liner. Provisions have been made to utilize the 2-7/8" tubing which is in inventory at this time at Intracoastal City. No new tubing of this size will be required.

The tubing string will be equipped with a seal assembly on the production tube which extends through the production packer. A sufficient length of the seal assembly (approximately 10 feet) will be run to allow for expansion and contraction of the tubing within the packer element as a result of increased temperature during flowing operations and a decrease temperature during plug and abandonment operations. A landing nipple to receive the pressure bonds during production operations will be provided. A circulating, sliding sleeve valve will be placed in the tubing string immediately above the seal element to permit selective communication between the tubing and casing should this become necessary. This bottom hole tubing assembly is shown in Figure V.

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

Logging - Because the sands of interest are already behind the 5-inch OD casing, open hole logs cannot be run. Cased hole logs; namely, gamma ray, cement bond, and collar locator logs are necessary to establish the integrity of the cement bond and as a benchmark for perforating.

GETTY AND BUTTES GAS AND OIL CO.

GLADYS McCALL NO. 1

E. CRAB LAKE AREA

CAMERON PARISH, LOUISIANA

BOTTOM HOLE TUBING ASSEMBLY

BLOWOUT PREVENTER DESIGN

Minimum operating equipment for preventers will be as follows: (1) multiple pumps, driven by a continuous source of power, capable of fluid charging the total accumulator volume within twenty minutes; and (2) accumulators with a pre-charge of nitrogen at not less than 750 psi and capable of receiving a fluid charge from the (charging) pumps. Fluid charge volume shall be the amount required to increase accumulator pressure from nitrogen pre-charge pressure to rated pressure. Charging pumps are to be connected to the hydraulic operating system which is to be a closed system. When requested, an additional remote and equivalent source of power shall be available to operate the pumps. The pressurized fluid volume stored in the accumulators shall be sufficient to close all pressure operated devices simultaneously within 20 seconds with charging pumps shut down. Minimum accumulator pressure shall be 1500 psi initially and not less than 1200 psi when all preventors are closed.

The closing manifold and remote closing manifold (floor-mounted) will have a separate control for each pressure operated device. Each control will be labeled to designate which pressure device it controls and to show open and closed positions. A pressure reducer and regulator is to be provided for the Hydril GK. Hydraulic oil shall be used as the operating fluid. One-inch size seamless steel piping shall be used to connect the closing unit to the preventors. Piping is to be tested to maximum rated pump pressure. The choke manifold, the four-inch choke flowline and the four-inch relief line shall be supported by metal stands or reinforced concrete. The choke lines shall be anchored. No sharp bends or curves will be permitted in the choke flowline from the preventors to the pits. Header to have three way outlet: (1) to reserve pit, (2) to choke box, (3) to separator. Easy and safe access will be maintained to the choke manifold. If deemed necessary, walkways and stairways will be provided in and around choke manifold. All valves throughout the assembly shall be selected for operation in the presence of oil, gas and drilling fluids. Valves connected adjacent to the drilling spool and all ram-type preventers will be equipped with stem extensions, universal joints, if needed, and operating wheels which are to extend beyond edge of derrick substructure. Any other valves within the limits of the derrick substructure will be so equipped when requested.

FIGURE VI

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 1/4-inch and an effective penetration of approximately two inches beyond the cement sheath. Assuming 100 percent firing efficiency, this configuration should provide a productivity equal to 70 percent of the calculated open hole productivity.

In selecting the portion of the net sand to open to production, the perforated interval length has been designed to achieve a productivity equal to 1/3 of the calculated open hole productivity. In the Gladys McCall No. 1 well, this productivity can be accomplished by perforating approximately 110 feet.

The well will be perforated with CaCl_2 water in the hole so that a pressure differential from the formation to the well bore will exist. When the first gun is fired, water from the formation will expand into the well bore and equilibrate the pressure on both sides of the casing. Perforating in this manner will prevent mud filtrate from entering the formation with a simultaneous build-up of mud cake on the wall of the perforation.

Wellhead Design - A detailed sketch of the wellhead equipment is shown in Figure VII. The christmas tree is rated to a working pressure of 10,000 psi. All valves have T-24 steel vertical runs with packing and seals for high temperature fluids (360 degrees Fahrenheit). The tree consists of two 3-1/16 inch master gate valves and a 3-1/16 inch swab valve. Between the master gate valve and the swab valve is a double wing assembly to house the choke bodies. One wing will contain a positive choke and the other will contain an adjustable choke. Each wing will consist of a Hi-Lo safety valve and a conventional wing valve. This specific design limits the anticipated high pressures to the tree assembly, thus permitting lighter weight pipe for all surface pipes and fittings.

During squeeze cementing to plug and abandon the well, the well head pressure may exceed 10,000 psi. To overcome this problem, it is planned to

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

utilize a well head isolation tool developed by Halliburton. The tool is attached to the top of the swab valve on the tree and a mandrel is hydraulically positioned through the master gate valves, until it is locked in the production tubing. This device, rated at 20,000 psi working pressure, isolates the well head from the treating fluid pressure.

The casinghead used to set the production string has been designed to accept any casing size of the wells under consideration and be compatible both with the blow out preventers and the upper christmas tree assembly.

General Comments

The No. 1 Gladys McCall well has been proposed as a Geo² test prospect for the following reasons:

- (1) The well is within, or within an extension of a geothermal fairway identified for the DOE/DGE by the Petroleum Engineering Department of L. S. U.
- (2) The presence of thick, hot, porous and apparently permeable lower Miocene section has been established.
- (3) It appears that this sand is in communication with a large drainage area.
- (4) An agreement with the landowners whose land must be utilized or crossed has been executed.

WELL PROGNOSIS
FOR
GLADYS McCALL NO. 1
EAST CRAB LAKE FIELD AREA

**Work Day
Schedule**

1. Prepare location and drill salt water disposal well per its prognosis.
2. Dig out cellar, extend 10-3/4" casing to proper elevation and weld on casinghead.
- 15th 3. Move in and rig up drilling rig. Install BOP's.
- 19th 4. Clean out 10-3/4" OD casing with 9-7/8" OD rock bit to the top of the cut-off 7" OD casing. Run 9-7/8" OD rock bit, 6-1/2" OD drill collars, 3-1/2" OD drill pipe. Pull out of hole.
5. Run 9-1/2" OD lead impression block on bottom of 6-1/2" OD drill collars and 3-1/2" OD drill pipe. Pull out of hole.
6. If required from appearance of the lead impression block, run 6" OD long tapered carboloy junk mill to dress out top of cut-off 7" OD casing. Alternatively run a 6" OD rock bit. Run mill or bit on bottom of 4-1/8" OD drill collars and 3-1/2" OD drill pipe. Dress out top of cut-off 7" OD casing and clean out to approximately 75 feet below top of cut. Pull out of hole.

- 20th 7. Go in hole with two joints 8-5/8" OD 36# Hyd. FJ WP washover pipe, 9-3/4" tooth type carboloy rotary shoe, top bushing, and 4-1/2" API IF hydraulic oil jars on bottom of 6-1/2" OD drill collars and 3-1/2" OD drill pipe. Washover approximately 60 feet of the 7" OD casing. Pull out of hole.
8. Go in hole with hydraulic pressure operated mill dressed to cut 7" OD casing. Run on bottom of 4-1/8" OD drill collars and 3-1/2" OD drill pipe. Locate first casing collar using minimum pressure/slack-off technique, sliding cutter down-hole until cutter knives catch in joint and cutter stops moving down-hole. Bleed pressure, drop 5' to 10 feet below collar and make inside cut. Mill approximately 6" of the 7" OD casing to dress top smooth for external casing patch. Pull out of hole.
- 21st 9. Go in hole with 7" casing spear, 3 foot extension, 7-1/4" stop sub, bumper jars, and hydraulic oil jars on bottom of 4-1/8" OD drill collars. Retrieve fish.
10. Go in hole with external casing patch on bottom of 3,600 feet of 7" OD 38# P110 LT&C casing and tie casing together.
- 22nd 11. Nipple up 7" casing and install blowout preventers and test blowout preventers to 7,500 psi. Test casing patch to 7,500 psi. If casing patch leaks, repair same by squeeze cementing.
12. Go in hole with 3-1/2" drill pipe, drill collars and bit to top of cement plug at 11,740 feet.

- 23rd 13. Condition and increase mud weight to 17.0#/gal. Then drill out cement plug from 11,740 feet to 11,928 feet. Continue in hole to top of 5" liner at 13,954 feet and condition mud.
- 26th 14. Make trip and add 1,700' of 2-3/8" drill pipe on bottom. Continue in hole conditioning mud inside the 5" OD liner while maintaining 17.0#/gal. mud. Drill out cement from 14,525 feet to 14,578 feet. Then condition hole to top of float collar on 5" OD liner at approximately 15,975 feet.
- 28th 15. Make trip and test 7" OD casing from top of 5" liner at 13,954 feet to surface with 7,500 psi pressure. If casing leaks develop, locate and squeeze off leak with cement. Repeat until 7" OD casing will test to 7,500 psi.
- 30th 16. Run casing cement bond log from total depth to 13,950 feet.
17. Block squeeze poor bonding with cement, if necessary, then drill out cement.
- 32nd 18. Lay down drill pipe and pick up 13,900 feet of 3-1/2" OD 12.70#/foot P-105 PH6 hydril tubing and 600 feet of 2-7/8" OD work string. Condition hole to plug back total depth of approximately 15,575 feet and displace mud from hole with 10.0#/gal. CaCl_2 water. Test for leaks in casing string for one hour. If OK pull out of hole and remove the 600 feet of 2-7/8" OD tubing work string.

- 34th 19. Rig up wireline unit and set production packer at 15,000 feet.
20. Make up bottom hole completion equipment as shown on accompanying diagramatic sketch and go in hole with completion tubing. Test each joint of tubing to 10,000 psi while going in hole. Space out tubing and test packer to 6,500 psi differential from bottom and to 5,000 psi on top.
21. Hang tubing with wrap around hanger and nipple up christmas tree.
- 35th 22. Release drilling rig and rig down.
- 38th 23. Move rig out. Move in test equipment.
- 39th 24. Move in and rig up wireline lubricator on well. Perforate the electric log interval from 15,250 feet to 14,360 feet with 4 shots per foot with through tubing perforating gun. This will require three trips with tubing gun. After initial gun is fired, observe increased surface pressure for leak off of static fluid in casing to make sure there are no leaks in tubing or packing then rig down wireline unit.

GENERAL PROCEDURE FOR BLOWOUT PREVENTION:

1. Use BOP Design as attached. The minimum assembly will consist of 3 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 1200 psi when all preventers are closed.

2. When nipping up production casing, test BOP's and choke manifold to 7500 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 Grey 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
GLADYS McCALL NO. 1
EAST CRAB LAKE AREA

<u>Activity</u>	<u>Estimated Amount</u>	
1. Lease acquisition and legal fees	\$ 75,000	
2. Rig transportation cost	30,000	
3. Location preparation	263,600	
4. Rig time - 22 days at \$6,000	132,000	
5. Bits	2,000	
6. Mud and chemicals	45,000	
7. Casinghead	2,000	
8. Christmas tree incl. surface safety controls	80,500	(1)
9. Casing patch incl. mills equipment and service	11,500	
10. Rental tools and equipment	20,000	
11. 3-1/2" drill pipe rental	20,000	
12. Trucking (other than rig & tubular goods)	10,000	
13. Cement and services	12,000	
14. Gamma ray and cement bond log	5,600	
15. Perforating	28,500	
16. 1100' of 2-7/8" P-105 4.7# PH-6 Hydril tubing	2,000	(1) (2) (3)
17. 14,000' of 3-1/2" P-105 12.95# PH-6 Hydril tubing for location	287,000	(1) (2)
18. Packer and subsurface equipment	3,500	
19. 3600' of 7" tieback casing per prognosis	69,500	
20. Supervision (Consulting Drilling Engineer)	7,500	
21. Miscellaneous	20,000	
22. Contingencies	45,000	
23. Material handling @1.3% of all except items 1, 20, and 22	13,500	
24. G & A @ 18% of items 1 & 20	<u>14,850</u>	
TOTAL	\$1,200,550	

(See (1) (2) (3) next page)

ESTIMATED REENTRY COST
For
GLADYS McCALL NO. 1
EAST CRAB LAKE AREA

(Continued)

- (1) Requires minor shopping to reuse on other Geo² wells.
- (2) 90% can be reused on other Geo² wells.
- (3) All available tubing in stock at Intracoastal City,
Louisiana.

**SALT WATER DISPOSAL WELL
FOR
NO. 1 GLADYS McCALL**

The available electric logs covering the shallow sands from the conductor pipe to a depth of 5,000 feet indicate that the fresh water sands extend to a depth of approximately 900 feet and that sands capable of accepting high flow rate salt water occur above 4500 feet. Detailed electric logs on the specific well will isolate the exact sand to be perforated.

The basic design of the casing program conforms with the requirements of the Department of Conservation. No tubing is recommended for the well because it acts to increase the surface injection pressure and would only be utilized if backflushing is required. The need for backflushing appears to be remote for the following reasons: (1) a volume of less than 200,000 barrels will be injected, (2) filters are provided downstream from the pumps to reduce solid and scale build-up, (3) the closed system prevents bacterial growth, and (4) two injection pumps (one of which is a standby) capable of delivering 10,000 barrels per day at an injection pressure of 500 psi.

In the event that formation plugging prevents disposal of the water, coiled tubing can be lubricated into the well and the sand backwashed using nitrogen.

Operational Day

0	1. Drive 13-3/8' OD casing to refusal or $\pm$ 125 feet.
1st	2. Move in and rig up water well rig.
3rd	3. Drill 12-1/4" hole to 1,200 feet.

4th	4. Run 1,200 feet of 9-5/8", 36.0#, 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.
6th	5. Drill 8-3/4" hole below surface casing to 4,500 feet.
8th	6. Run induction electric and density logs; take sidewall cores if desired.
9th	7. Run 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.
10th	8. Make trip with 2-7/8" work string and condition hole to float collar at approximately 4420 feet and displace mud in hole with water. Lay down work string.
11th	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.
12th	11. Run gamma ray - cement bond log from total depth to 1,200 feet and block squeeze with cement, if necessary to obtain good bond.
13th	12. Rig down and move out water well rig.
39th	13. 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.

- 40th 14. 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

Move in rig, drill to 4,500 feet 13 days at \$4,200/day	\$ 54,600
Location preparation	5,000
130 feet of 13-3/8" 65# J-55 plain end casing	4,000
1,200 feet of 9-5/8" 36# H-40 casing ST & C or LT & C	14,000
4,500 feet of 5-1/2" 15.5# J-55 ST & C	24,000
Stand by rig time	4,200
Cement and Services	14,000
Electric logging	12,000
Perforating	8,000
Wellhead equipment	3,000
Stimulation	2,500
Supervision	3,900
Miscellaneous supplies and rentals	7,500
Trucking	3,000
Contingencies	14,000
Material handling at 1.3% on all items other than Supervision and Contingencies	<u>2,000</u>
	\$175,700.00

WELL TEST PROCEDURE

The well test procedure was established to provide the maximum amount of reservoir rock and fluid information that can be obtained within the fixed time frame subject to the limitations of the available equipment. The only bottomhole pressure device capable of operating at these temperatures and pressures is a 15,000 psi (full scale deflection) Amerada RPG-3 bourdon tube pressure gauge. This gauge has no surface read-out capability and has 3, 5, and 7 day clocks. The maximum accuracy of the bomb is ± 0.25 percent (37.5 psi) under controlled calibration conditions. These limitations impact the scope of meaningful transient tests which can be conducted.

Before testing commences it will be necessary to flow the well into a reserve pit in order to clean the perforations of mud and foreign solids. After this has been accomplished the well will be shut-in to measure the static reservoir pressure. The well will be placed on production at a low rate through the test equipment in order to establish the drawdown characteristics at a safe level. Every 24 hours the rate will be increased until the choke size which allows flow at 10,000 barrels per day is determined. The well will be shut-in and the pressure build-up recorded. These data will be analyzed to determine the flow capacity of the formation and the skin effect or formation damage.

During each flow period, full flow stream samples will be taken and analyzed for chemical composition. Separator gas-water ratios will be carefully metered to detect changes as a function of the flow rate.

After the well bore pressure has returned to static conditions, the well will be flowed at a rate of 10,000 barrels per day for approximately two weeks. The pressure data from this flow can be used to verify the reservoir parameters computed from the build-up analysis.

At selected intervals throughout the flow periods, separator gas and liquid samples will be taken in order for laboratory recombination studies to be conducted.

TEST PROGNOSIS
FOR
GLADYS McCALL NO. 1
EAST CRAB 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 16,060 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.
- 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 nine days while measuring surface pressure, temperature and flow rates.
16. Sample as before prior to shutting well in.
- 62nd 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.
- 63rd 18. Pull pressure gauges, release test equipment and move same out.
19. Proceed with plug and abandonment operations.

SURFACE TESTING FACILITIES

Gruy Federal, Inc.

FIGURE VIII

ESTIMATED TESTING COST

For

NO. 1 GLADYS McCALL
EAST CRAB LAKE AREA

<u>Activity</u>	<u>Estimated Amount</u>	
1. Two data headers	\$ 108	
2. Two-phase separator	3,780	
3. 100-barrel tank	1,090	
4. Two 10,000 BPD centrifugal pumps	1,940	
5. 23,400,000 BTU/hr air cooler	3,459	
6. Piping	740	
7. Sonic sand detector	300	
8. Wireline unit w/pressure gauge	1,440	
9. Gate valve w/activator	500	
10. House trailer w/power plant	850	
11. Generator	20,000	
12. Expansion loops	900	
13. Supervision and Labor	46,200	
14. Material handling	457	(1)
15. Test Accessories	<u>200</u>	
TOTAL		\$ 81,964

(1) Charged at a rate of 1.3% on all items except 14.

TABLE I

GETTY-BUTTES GLADYS McCALL NO. 1

CAMERON PARISH, LOUISIANA

Analyses Required for Geo² Water and GasChemical Analysis of Water

A. Metals

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

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

GETTY-BUTTES GLADYS McCALL 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

GETTY-BUTTES GLADYS McCALL NO. 1
CAMERON PARISH, LOUISIANA

Analytical Costs for Geo² Water and Gas

Recombination	
2 samples per well	\$ 10,000
Chemical Analysis of water	
5 samples per well	750
Material handling @1.3%	<u>140</u>
TOTAL	\$ 10,890

PLUGGING AND ABANDONMENT PROCEDURE
FOR
GETTY-BUTTES GLADYS McCALL No. 1

1. Move in and rig up pulling unit capable of plugging and abandonment.
2. Nipple up pump trucks to wellhead.
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. Remove tree and install BOP's.
7. Run in hole with tubing and set cement plug 100' in and 100' out of 5" OD liner.
8. Pull tubing and set a plug from 50' to surface.
9. Cut off 13-3/8" casing 3' below ground level and weld on plate.
10. Release rig.
11. Send tubing and casing to pipe yard for inspection and repair.
12. Send christmas tree to shop for overhaul.

ESTIMATED PLUGGING COSTS
For
GETTY-BUTTES NO. 1 GLADYS McCALL
EAST CRAB LAKE AREA

<u>Activity</u>	<u>Amount</u>
1. Pulling unit at \$1,000/day	\$ 8,000
2. Rental tools at \$500/day	4,000
3. Trucking	3,000
4. Cement and services	4,000
5. Supervision	2,000
6. Contingencies	2,400
7. Material handling on all but supervision and contingencies @1.3%	300
8. G & A at 18% of item 5	<u>400</u>
TOTAL	\$ 24,100

SITE-SPECIFIC ENVIRONMENTAL INFORMATION CHECKLIST
 GEOPRESSURED-GEOTHERMAL WELL TEST PROGRAM
 GRUY FEDERAL, INC.
 NO. L-3

(Drilled as Getty-Buttes-Gladys McCall No. 1)
 Cameron Parish, Louisiana

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 X No If no, explain.

4. Does the project site fall within the habitat of rare or endangered species?

Yes No X If yes, explain.

-2-

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 _____ No X If yes, explain.

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 2 weeks or less in duration per formation?

Yes _____ No X If no, explain.

Test expected to require 4 weeks.

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.

-5-

7. Will production tubing rated to at least 20,000 PSI, be used?

Yes _____ No X If no, explain.

Burst pressure rating for 3-1/2" P-105 tubing is 18,000 psi.

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.

Application made as of June 16, 1978, and approval expected soon.

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13. Will H_2S monitors be located onsite?

Yes _____ No X If no, explain.

No history of H_2S 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 H_2S 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 _____ No X If no, explain.

No mud logging personnel, because well is already cased, however, high pressure engineering or drilling personnel will be on site at all times.

COUNTY CAMERON
WELL EAST CRAB LAKE
GLADYS MCCALL
COMPANY GETTY OIL COMPANY AND BUTTES OIL & GAS COMPANY
FIELD EAST CRAB LAKE
COUNTY CAMERON STATE LOUISIANA
LOCATION F NE/4 SEC 27, GO S 2200' & W 1600' TO LOCATION
Sec. 27 Twp. 15S Rge. 5W
Other Services: SLC, ST 0-F T

Permanent Datum: BHF
Log Measured From: KB 21.05 ft. Above Perm. Datum
Drilling Measured From: SAME

Date	10-30-69	11-5-69	11-18-69	11-22-69
Run No.	ONE	TWO	THREE	FOUR
Depth-Driller	11944	13048	14000	14366
Depth-Logger	11944	13047	13946	14344
Blm. Log Interval	11954	13046	13945	14343
Top Log Interval	3574	11954	13045	14345
Casing-Driller	3569	3569	3569	369
Casing-Logger	3574	3574	3574	374
Bit Size	9 7/8"	9 7/8"	9 5/8"	9 7/8"
Type Fluid in Hole	GEL-CAUSTIC MONO-THIN	MONO-THIN	MONO-THIN	MONO-THIN
Dens. Visc.	10.4 42	11.1 51	11.5 56	12.5 52
pH Fluid Loss	9.5 6.9 ml	8.3 5.3 ml	8.5 4.7 ml	8.2 4.7 ml
Source of Sample	PIT	PIT	PIT	PIT
R ₁ @ Meas. Temp	1.00 94 F	0.83 104 F	0.66 80 F	0.40 100 F
R ₂ @ Meas. Temp	0.75 94 F	0.60 100 F	0.63 80 F	0.48 100 F
R ₃ @ Meas. Temp	1.55 94 F	1.25 104 F	1.29 80 F	1.25 100 F
Source R ₁ R ₂ R ₃	M C M	C M C	M C M	C M C
R ₁ @ BHT	0.46 202 F	0.39 222 F	0.35 212 F	0.35 244 F
Time Since Circ.	4 HRS	5 HRS	5 HRS	5 HRS
Max. Rec. Temp.	202 F	222 F	212 F	244 F
Equip. Location	4531 LCT	4532 LCT	4533 LCT	4534 LCT
Recorded By	COCHRAN	COCHRAN	COCHRAN	COCHRAN

Run No.	1	2	3	4
Depth-Driller				
Depth-Logger				
Blm. Log Interval				
Top Log Interval				
Casing-Driller				
Casing-Logger				
Bit Size				
Type Fluid in Hole				
Dens. Visc.				
pH Fluid Loss				
Source of Sample				
R ₁ @ Meas. Temp				
R ₂ @ Meas. Temp				
R ₃ @ Meas. Temp				
Source R ₁ R ₂ R ₃				
R ₁ @ BHT				
Time Since Circ.				
Max. Rec. Temp.				
Equip. Location				
Recorded By				

Permanent Datum: BHF
Log Measured From: KB 21.05 ft. Above Perm. Datum
Drilling Measured From: SAME

Date	11-23-69	12-8-69	12-9-69
Run No.	1	2	3
Depth-Driller	14300	14300	15598
Depth-Logger	14300	14300	15589
Blm. Log Interval	14301	14301	14290
Top Log Interval	14301	14301	14290
Casing-Driller	3574	3574	14290
Casing-Logger	3574	3574	14290
Bit Size	9 7/8"	9 7/8"	9 7/8"
Type Fluid in Hole	MONO-THIN	MONO-THIN	SPERSENE
Dens. Visc.	12.6 52	17.0 50	17.0 50
pH Fluid Loss	8.2 4.6 ml	0.0 3.2 ml	0.0 3.2 ml
Source of Sample	PIT	CIRCULATED	CIRCULATED
R ₁ @ Meas. Temp	0.73 98 F	0.45 67 F	0.45 67 F
R ₂ @ Meas. Temp	0.55 98 F	0.45 67 F	0.45 67 F
R ₃ @ Meas. Temp	1.0 98 F	0.60 67 F	0.60 67 F
Source R ₁ R ₂ R ₃	M C M	M C M	M C M
R ₁ @ BHT	0.30 238 F	0.24 284 F	0.24 284 F
Time Since Circ.	4 HRS	6 HRS	6 HRS
Max. Rec. Temp.	238 F	284 F	284 F
Equip. Location	4533 LCT	4534 LCT	4535 LCT
Recorded By	COCHRAN	COCHRAN	COCHRAN

AMPS SHORT NORMAL	2
A-16-M SHORT NORMAL	10
INDUCTION	100-1800
CONDUCTIVITY	millimhos/m = $\frac{1000}{\text{ohm-m}}$
RESISTIVITY	ohm-m/m
DEPTHS	
SPONTANEOUS-POTENTIAL	millivolts

COMPANY GETTY OIL COMPANY AND BUTTES OIL & GAS
WELL GLADYS MCCALL NO. 1
FIELD EAST CRAB LAKE
COUNTY CAMERON STATE LOUISIANA
SCHL. FR. 15588
SCHL. TD. 15589
DRLR TO 15588
Elev. KB DF GL