GL00752

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WELL DESIGN DISCUSSION

It is our recommendation that as soon as a specific location is staked, that a gravel, caliche, or all-weather pad be built to accommodate a drilling rig which will be specified at a later date. The rig capable of drilling and completing this operation, needs to be able to conform to the set of drilling orders included with this report.

As soon as the pad is built, conductor pipe should be set to a depth of 50'. It should be at least 20" in diameter. This will divert fluid returns to metal circulating pits where proper solids control can be monitored.

When the drilling rig is moved on location, the well should commence surface drilling with a 17-1/2" mill-tooth, sealed bearing bit. If the contract for the drilling rig is based on a footage rate, then the responsibility for the bits will lie with the rig and not with the operator. If the responsibility for the bits lies with the operator, then it should be noted that it will require 2 bits to drill the 2000' necessary to set surface casing. The bit type will be decided when the first bit's performance can be evaluated.

The drilling fluid for this stage of the well should consist of gel and water, hereafter referred to as "native mud." This native mud should contain enough filtration control additives to lower the water loss to 6 to 8 cc/ml. by 500'. This will help build a filter cake on the walls of the well bore and minimize fluid invasion. This will also facilitate the evaluation of shallow oil sands which may be present in the surface hole.

After the surface hole is drilled and circulated clean, it should be logged using a dual-induction spherically focused log with a compensated density-neutron log. Side wall cores should be taken in any zones that the logs indicate to be possibly productive.

Upon completion of the log evaluation, surface casing should be set. It should be at least API Grade K-55 with an outside diameter of 13-3/8". It should weigh no less than 54.5 pounds per foot. Proper casing hardware should include a float shoe, float collar, double bow turbolizers, and centralizers. The casing string should be cemented from casing shoe to surface.

While allowing 12 hours for cement to set, the casing head and BOP should be nippled up. Upon completion of nipple up operation, a 12-1/4" mill-tooth sealed bearing drilling bit should be picked up and run in the hole. The

cement plug should be drilled out and drilling into the new formation should continue until the bit dulls. When the bit dulls, it should be replaced with a carbide insert (button) bit and drill to the top of the Hosston. Again, if the drilling contract is based on a footage rate, the drilling contractor will provide the bits.

The drilling fluid for this stage of the well will be similar to the native mud system used in the surface hole. It should be lignosulfonate based drilling fluid. Mud weight should be minimized, and proper flow parameters should be monitored. A 10-12 cc/ml. water loss should be maintained.

The drilled interval from the base of the Edwards to the top of the Hosston should be then logged using the same log program as the surface hole log.

Upon completion of the log evaluation, a 9-5/8" casing liner should be run. It should be no less than API Grade J-55 and should weigh no less than 36 pounds per foot. The liner should be set at $1800' \pm$.

Cement should be circulated from the 9-5/8" casing shoe back to 1500'. After allowing 12 hours for the cement to set, the cement on top of the liner should be drilled out with a mill tooth drill bit. After the liner top has been dressed, it should be pressure tested to insure that the liner annulus

does not communicate with the 13-3/8" surface casing. If the pressure test fails, an additional cement job to squeeze the top of the liner will be required. Upon completion of the squeeze job, the cement plug will have to be drilled out and the liner top redressed. The liner top should then be retested. If the pressure test proves satisfactory, a 8-3/4" mill tooth drill bit should be run to the bottom of the 9-5/8" liner and the well bore should be displaced with fresh water. A polymer drilling fluid should be introduced at this stage.

A compatible mud system could be an X-C polymer mud. This polymer uses a zanthium gum base as a viscosifier and uses starch as a filtration control additive. Other mud recommendations are included in this report. The X-C polymer mud is more expensive than some Ben-ex systems, but this polymer is also biodegradable.

Solids control equipment is very important at this stage. Suspended solids and cuttings must be monitored and minimized as much as possible. This may require mud cleaners, dual screen shakers, and mud centrifuges.

When the proper drilling fluid is prepared and in place, then the Hosston Formation can be drilled. The size of bit will be 8-3/4" in diameter. The type of bit will be determined at a later date. Diamond core, mill-tooth, or carbide

insert bits are all available in this size.

After the agreed interval of the Hosston is drilled and evaluated, then the open hole should be underreamed to enlarge the well bore. Then a conventional gravel pack is recommended. A string of API Grade J-55 7" casing is perforated and wrapped with #304 stainless steel wire. The annulus is packed with uniformly sized gravel. The exact size of the screen and sand grains will be designed upon evaluation of the water sand. The method of gravel and screen placement will also depend upon the water sand evaluation.

After the screen and gravel pack is in place, then the drilling rig should be released and moved off location. Once all of the rig equipment is removed, then a cement bond log should be run from the 9-5/8" casing shoe to the top of the cement. This should satisfy all jurisdictional agencies involved and insure that a good cement bond exists between the casing and formation.

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DRILLING ORDERS

Well Name: Lackland AFB #1 Total Depth: 4200 Date: 6-3-83

Prospect: _____ AFE No.: _____

State: Texas County: Bexar Sec _____ T _____ R _____

Location: To be determined

_____ Elevation: _____

Drilling

Hole Size	Depth	Max. Angle
	to	
17-1/2"	0 to 2000	2°, 1°/200'
12-1/4"	2000 to 3850	5°, 2°/500'
8-3/4"	3850 to 4200	5°, 2°/500'

Casing

Size	Description	Setting Depth	Cement Amount
20"	Conductor	50'	
13-3/8"	J-55 54.5 lbs./ft.	2000'	See Remarks
9-5/8"	J-55 36 lbs./ft.	3850'	See Remarks
7"	Wire-wrapped screen	4200'	None

Remarks: Cement amount to be determined based on open hole caliper logs.

Permit No. _____ Serial No. _____

Geology

Objective Sands: Hosston Formation

Start Samples: _____ Large _____ Small _____

Start Mud Logger: _____ Mud Logger Co. _____

Send Samples to: _____

Remarks: _____

Logging Depths: 1) 2000' 2) 3850' 3) 4200' 4) _____

Electric Logging Services:

Type	Log Run No.
DI SFL CDL - CNL, SWC, RFT	1
DI SFL CDL - CNL, SWC, RFT	2
DI SFL CDL - CNL, SWC, RFT	3

Required Mud Properties

Depth	Weight	Vis.	W.L.	Remarks
0-500	8.5-8.8	40	NC	Native mud
500-2000	8.5-8.8	40	6-8	Lignosulfonate
2000-3850	8.5-8.8	40	10-12	Lignosulfonate
3850-4200	8.5-8.8	40	6-8	Biodegradable Polymer

Approvals:

Manager Drilling & Production

H Fischer

Exploration Department

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CASING MAKE UP

13-3/8" Surface Casing:

1, 13-3/8" float shoe on bottom joint.

1, 13-3/8" float collar on top of bottom joint.

13-3/8" x 17-1/2" double bow turbolizers spaced 1 per joint through the Edwards Formation.

1, 13-3/8" x 17-1/2" cement basket at the top of the Edwards Formation.

1, 13-3/8" x 17-1/2" cement basket at the base of the conductor pipe.

Float shoe and float collar must be thread locked in place.

9-5/8" Casing Liner:

1, 9-5/8" float shoe on bottom joint.

1, 9-5/8" float collar on top of bottom joint.

9-5/8" x 12-1/4" double bow turbolizers spaced 1 per joint for the bottom 500'.

1, 9-5/8" x 12-1/4" cement basket at the base of the surface casing.

1, 9-5/8" x 13-3/8" Liner hanger at 1800'.

Float shoe and float collar must be thread locked in place.

CASING DESIGN SKETCH