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## Fort Bliss Exploratory Slimholes: Drilling and Testing

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## **FORT BLISS EXPLORATORY SLIMHOLES: DRILLING AND TESTING**

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### **ABSTRACT**

During November/96 to April/97 Sandia National Laboratories provided consultation, data collection, analysis and project documentation to the U. S. Army for a series of four geothermal exploratory slimholes drilled on the McGregor Range approximately 25 miles north of El Paso, Texas. This drilling was directed toward evaluating a potential reservoir for geothermal power generation in this area, with a secondary objective of assessing the potential for direct use applications such as space heating or water de-salinization. This report includes: representative temperature logs from the wells; daily drilling reports; a narrative account of the drilling and testing; a description of equipment used; a summary and preliminary interpretation of the data; and recommendations for future work.

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## **I. INTRODUCTION AND BACKGROUND**

The Geothermal Research Department at Sandia National Laboratories has worked with industry since 1992 to evaluate slimhole drilling as a geothermal exploration technique. Traditionally, diamond-cored "slimholes" -- usually 3" to 4" in diameter -- have been used to measure temperature gradients while selecting sites for production-size exploration wells, but if we can demonstrate that improved testing in slimholes reliably identifies a productive geothermal resource, the cost savings and reduced environmental impact, compared to production-size holes, are compelling incentives to use slimholes for exploration.

Sandia participation in slimhole drilling projects at Steamboat Hills, Nevada<sup>1</sup>, Vale, Oregon<sup>2</sup>, and Newberry, Oregon<sup>3</sup>, generated an experience base in this drilling and testing technology. When the U. S. Army was in the planning stages for a geothermal slimhole drilling program at Ft. Bliss, they approached the Geothermal Research Department for input on the structure of this program; this consultation led to a Work-for-Others (WFO) contract from the Army to Sandia for assistance on the exploratory wells. That assistance included consultation and direction of drilling operations, numerous temperature logs during and after drilling, and project documentation. This report comprises a summary of operations, a detailed narrative of the project, daily drilling reports completed by Sandia personnel, representative temperature logs from the wells, and cost information on the drilling operations.

## **II. SUMMARY OF OPERATIONS**

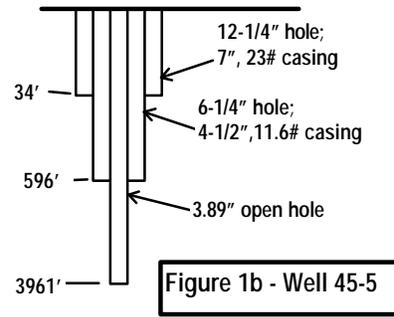
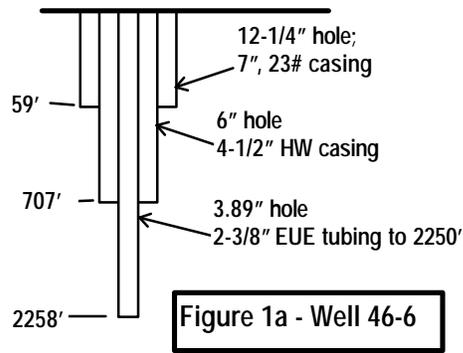
Principal goals for this program were to evaluate subsurface temperatures and reservoir characteristics for a series of wells situated along a prominent thermal anomaly in the vicinity of the McGregor Range camp. Well locations were chosen by consultation among representatives from Ft. Bliss, New Mexico State University, University of Texas - El Paso, and the Navy's Geothermal Program Office at China Lake, California. In all cases, the drilling objective was to reach the target depth as cheaply as possible while assuring hole integrity for the necessary measurements.

Designs of the four wells are shown in Figures 1a-1d, and summary well descriptions are given below the figure. Cost comparisons for the four wells are shown following the figures.

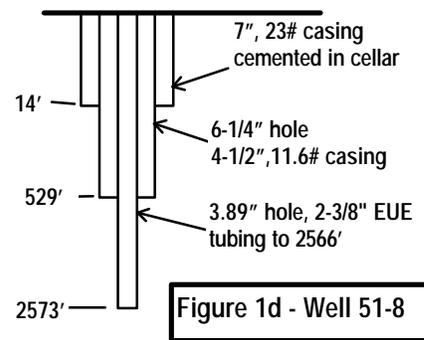
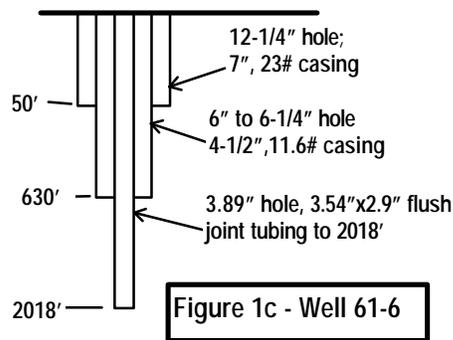
Drilling for the four wells followed the same general pattern:

- 1) set a conductor casing to a depth of 30-50',
- 2) drill ~ 6" hole through mostly sand/clay sedimentary formations to 500-600',
- 3) set 4-1/2" surface casing at that depth,
- 4) core HQ (3.89" dia.) mostly through limestone/dolomite or intrusive bedrock to TD.

Although all the drilling was plagued by lost circulation, this is not a critical problem when core drilling, so little effort was made to correct it below the surface casing. Below 1000' none of the holes had more than 30% fluid returns, and usually there were none at all. In most of these cases, drilling fluid was pumped into the drill rod annulus to improve



Note: After drilling, an inflatable packer was run in this well on 2-3/8" tubing to 3006'.



Well number	46-6	45-5	61-6	51-8
Total Depth, ft	2258	3961	2018	2573
Drilling days	30	37	19	23
Completion	2-3/8 EUE tubing to 2250'	3.89" open hole 596-3961'	2.9" ID tubing to 2018'	2-3/8 EUE tubing to 2566'
Maximum temp. @ depth	192.4°F @ 2244 ft.	182.4°F @ 495 ft.	173.2°F @ 728 ft.	180.8°F @ 2533 ft.
Bottom-hole temperature	192.4°F	181.9°F	169.3°F	180.8°F

Cost Category	Well Number			
	46-6	45-5	61-6	51-8
Rig, Mobilization	9375	9375	9375	9375
Rig, Time charges	39,560	31,810	28,493	28,988
Rig, Footage charges	88,186	190,218	78,511	106,775
Drilling fluids	22,938	19,791	10,716	20,789
Casing/Liner	10,530	4,995	13,662	2,300
Cement (casing)	5,000	5,227	3,528	3,782
BOP rental	3,500	5,500	1,200	1,500
Core boxes	716	2,067	675	1,017
Miscellaneous	1,400	3,290	2,960	5,000
<b>Total Well Cost</b>	<b>\$184,339</b>	<b>\$272,273</b>	<b>\$149,120</b>	<b>\$179,526</b>
Well depth	2258	3961	2018	2568
<b>Cost per foot</b>	<b>\$81.64</b>	<b>\$68.74</b>	<b>\$73.89</b>	<b>\$69.91</b>

lubricity and to help control downhole vibrations. In contrast, it is difficult or impossible to get a good cement job on the surface casing if there are un-healed loss zones behind it, so most of the loss zones in the upper parts of the holes were plugged with cement. This procedure varied in difficulty; loss zones in the surface holes required a total of 23 cement plugs, but 18 of these were on the first two wells. When loss zones could not be plugged while drilling, staged cement jobs were used on the surface casing.

### III. DESCRIPTION OF TEST EQUIPMENT AND METHODS

The following descriptions cover the major pieces of equipment used during the project and, where applicable, explanations of their use.

**Drill rig:** The drill rig used for this hole was a Boart-Longyear truck-mounted Model HD602, with a 60' mast, capable of pulling 40' stands of pipe, and a hoist rated at 60,000 pounds. The rig was supported on a hydraulic jack-up substructure which provided approximately 8' clearance between the bottom of the substructure and ground level. Two mud pumps were available; a Gardner-Denver duplex (150 gpm @ 260 psi) for surface drilling and reaming, and an FMC Model M12 triplex (100 gpm @ 1000 psi) for coring. A 40' parts trailer contained tools, bits, spare parts, and a welder. A water truck was also supplied with the rig.

This particular rig has a depth capability of approximately 8200' with HQ rods, and below 10,000' with a composite string of CHD101 (approximately 4" diameter) and HQ drill rods. It can reach to 14,000' with a composite string of CHD76 and NQ rods (approximately 3" diameter), enabling slimhole exploration to be used in most known geothermal areas.

Core recovery in this hole was very good, more than 99% for the H-size core and more than 90% for the larger BSF (6-1/4" diameter hole, 4" diameter core) string. The

lower percentage for the BSF string was primarily a function of large voids encountered in the upper part of the hole, where the rock was more broken.

**Surface instrumentation:** Several instruments were placed at and near the wellhead, with data collected and recorded continuously in the Sandia mobile office and displayed in real time on the rig floor and at other on-site locations. These measurements comprised the following:

- ù Drilling fluid inflow -- Flow rate was measured directly by a magnetic flow meter mounted on the suction side of the mud pump, a Doppler flow-meter mounted on the standpipe and indirectly by volume calculated from mud pump speed, obtained by a shaft encoder on the pump's crankshaft. The Doppler meter was especially valuable because it included a totalizer, giving an integrated total flow volume after a specified starting time. This enabled very accurate placement of mud, cement, LCM pills, mineral oil, etc.
- ù Drilling fluid outflow -- Return flow was measured by a SNL rolling float meter during surface hole drilling and magnetic flow meter (magmeter) during HQ core drilling; both of these instruments were mounted on the line from the pitcher nipple back to the mud pits. When outflow becomes significantly less than inflow, this is usually an indication of lost circulation.
- ù Drilling fluid temperatures -- Temperature transducers were placed in the flow lines into and out of the wellbore.
- ù Standpipe pressure -- Pressure delivered to the drillpipe is measured. This pressure is not only important as an insight on drilling performance, but sudden drops in this pressure can indicate a hole or washout in the drillpipe.
- ù Ambient air temperature -- Weather conditions were indicated by the air temperature measured under the rig.
- ù Rotary speed -- Drill string rotary speed was measured by an encoder just above the drill chuck.
- ù Chuck height and hole depth -- During most of the later drilling operations, a linear-displacement transducer was connected to the chuck which rotates the drillpipe and travels down as the drill advances. This gives instantaneous depth in real time, because the driller also increments the drill string length each time a connection is made. Chuck-height versus time gives rate of penetration, which is sometimes useful to identify different lithologies.

All transducers were connected to a signal-processing station at the drill rig and then, via a simple twisted-pair wire to the data-logging computer in the Sandia trailer. Each morning, data from the computer was down-loaded onto diskettes.

**Downhole instrumentation:** Downhole data collection during this operation was primarily limited to temperature measurements. These temperature logs were taken with Sandia's platinum-resistance-thermometer (PRT) tool which, along with a Sandia logging truck, remained on-site for the entire project. This instrument uses a simple resistance bridge, with changes in resistance measured from the surface through a four-conductor cable. Since there are no downhole electronics, temperature drift with time is negligible and the PRT temperature measurements are considered a reference standard for this kind of drilling.

An additional temperature/inclination tool was also run as part of its development program. This tool rode in the inner core tube, measured temperatures (within a few feet of the bit) and hole inclination as a function of time while drilling, and stored this data in an on-board memory. When the core tube was pulled out of the hole to retrieve core, data from the "core tube logger" (CTL) was downloaded into a computer for plotting and analysis. Letting the CTL ride in the core tube while drilling gave temperatures in that drilled interval, but the tool was also used to temperature log the entire well when the pipe was tripped for bit changes. Using the CTL as part of the normal drilling operation also meant that no additional rig time was consumed in satisfying regulatory requirements for temperature and inclination measurements at regular well depth increments.

**Inflatable packer:** Approximately six weeks after completion of drilling on well 45-5 an inflatable packer was run into the hole and set at 3000 feet. Principal motivation for this was the possibility (based on temperature logs) that higher temperatures at the bottom of the hole were being reduced by cooler waters from above. The packer isolated the intervals above and below it, while providing passage for a logging tool through the tubing which suspended the packer, through the packer inside diameter, and on to final hole depth. By observing temperature and water level changes before and after installing the packer, a way of assessing possible flow between upper and lower zones was available. Temperature changes were not significant (see Figure 7) but water level inside the tubing dropped very slowly and was different from water level outside the tubing. This implies that the packer seal remained intact and that permeability in the interval below the packer is low. There is also an opportunity to define permeability more accurately by injection tests into the intervals above and below the packer.

#### **IV. DESCRIPTION OF DATA**

Three principal types of data were obtained from this drilling project: core samples of the formations penetrated by the holes, records of drilling behavior (such as water level in the hole, changes in rate of penetration, etc.), and multiple temperature logs (both during and after drilling) in each well. (See Appendix B for summary lithology reports and drilling behavior, References 4 and 5 for a more complete discussion of lithology, and Appendix C for a list of all temperature logs taken.) After completion of drilling, a suite of geophysical logs (gamma ray, neutron, sonic, and resistivity) was run by Southwest Geophysical Surveys of Farmington, NM.

Core-sample logs are combined to construct lithologic columns of the formations penetrated by each well, and these columns can then be used to validate or compare with conceptual models of the reservoir's structure. Cores can also give a reasonably clear picture of fractures in the formation, with indications of their density, dip, and aperture.

Temperature logs are generally used to show either a comparison among several wells (as in Figure 2) or the changes in a given well over time (as in Figures 3-6). Correlation of temperature logs with lithologic logs and drilling records is also useful in identifying reservoir features such as the lost circulation zone between 950 and 1000 feet in well 45-5 (Figure 3).

From this information, the objectives are to evaluate the geothermal potential of this area and to develop a conceptual model of the reservoir structure. This analysis, however, is beyond Sandia's purview and will be done primarily by New Mexico State University.

## V. DISCUSSION

Sandia's goals in this project were to (1) consult with and advise the U. S. Army on drilling techniques which would provide an informative, cost-effective exploratory program, (2) expand our database on slimhole drilling's cost and performance, and (3) test developmental flow measurement and core-tube logging tools. All these goals were met.

In planning the exploratory program, the principal decision to be made was whether to use slimhole or conventional rotary drilling. Rotary drilling is well understood and has reasonable cost, if drilling conditions are good. In geothermal wells, however, there is almost always lost circulation (which is usually necessary for production of geothermal fluids) and these losses must be plugged or repaired before drilling very far ahead with conventional rotary tools. Wireline (slimhole) core drilling, in contrast, can drill without fluid returns for intervals of several thousand feet. A slim hole also gives significant cost reduction because of its smaller casing sizes and the smaller cement volumes required for the casing. All four wells in this program experienced severe-to-total lost circulation, so conventional drilling with cement (or LCM, although it is unlikely that would have been sufficient) in the loss zones would have been extremely expensive.

From the summary on page 3, the average cost per foot was just under \$73 for the four holes. This compares very favorably with other slimholes in Sandia's program. Costs at Steamboat NV, Vale OR, and Newberry OR were \$151, \$110, and \$199 per foot, respectively, and in each of those cases the slimhole costs were 45 to 65% of rotary drilling costs at these same locations. Although there are no large, rotary-drilled holes at McGregor Range for direct comparison, we believe that cost savings in these slimholes would have been at least as favorable.

Another comparison can be made with rotary-drilled "slim holes", although the conventional-drilling definition of slimhole is rather vague. For example, the rotary-drilled hole at Vale, OR, was considered a "slim hole", with 7" casing and 5" slotted liner, but it still cost approximately \$160/foot, compared with \$110/foot for a smaller, hybrid rotary/core drilled slimhole to the same depth approximately two miles away (see Reference 2 for a detailed cost comparison of the two holes at Vale.) To repeat a point made above, the extreme lost circulation in these holes would have made any conventional-rotary drilling difficult and expensive. Indications of this are seen with the rotary-drilled intervals in the first well. Even without lost circulation problems, however, the method used here, compared to "slimhole" rotary, gives cost savings in downhole tools (bits, stabilizers, etc.), casing, and cement, and is far more informative about the reservoir's geologic structure because of the recovered core.

In assessing a reservoir's geothermal energy potential, two very important properties (in addition to size, fluid storage, and re-charge) are temperature and permeability. Temperature was thoroughly measured in all these wells, but, aside from the obvious loss zones, permeability distribution is not well known. This could be clarified with either production or injection flow tests in the wells. We believe, from Sandia's experience and analysis, and based on extensive study of data from Japanese slimholes and production wells<sup>1,6,7</sup>, that production flow tests in slimholes can accurately predict productivity of a large hole. This question did not arise at McGregor Range, however, for the temperatures were not high enough to consider a self-supporting flow test. If this potential resource is investigated further, it is still possible that a pumped production-flow test or an injection test could be useful in better definition of each formation's permeability or productivity.

## **VI. CONCLUSIONS**

This was a successful drilling operation in terms of the information acquired within the project budget. This rig's drilling performance through extensive lost circulation zones re-confirmed the concept that wireline coring is an excellent exploration technique in terrain which is likely to have this kind of geologic structure. We have made the case above as to why these holes were cost-effective and, although interpretation will be left to others, the data collected from the slimholes was in no way incomplete compared to information from a larger well.

The drilling operations also provided an opportunity to test, calibrate, and validate the performance of Sandia-developed flow instrumentation and downhole logging tools (the CTL memory tool). These instruments were useful for this drilling project, and additional testing helps to verify their performance as a step toward commercialization.

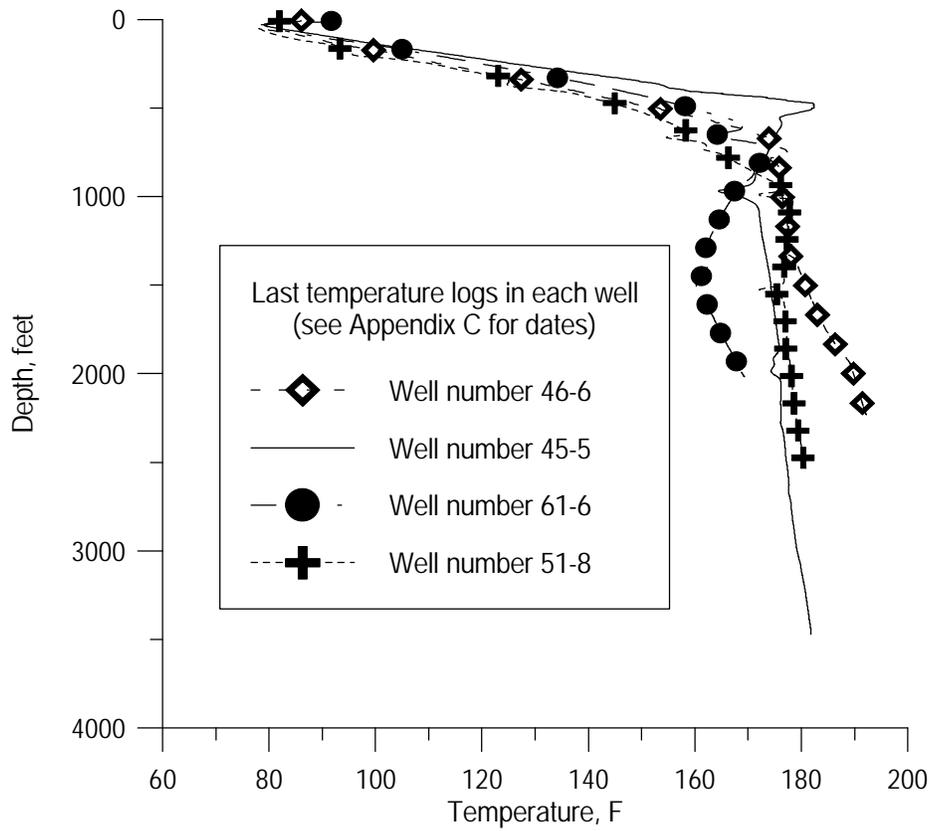
## **VII. RECOMMENDATIONS**

Although the data collected from these holes is typical of exploration drilling, there is still considerable uncertainty in modeling the geothermal reservoir here. Two methods appear to be important in further resolution of this structure: surface geophysics, specifically a CSAMT (controlled-source audio-frequency magnetotelluric) survey, and downhole fluid sampling.

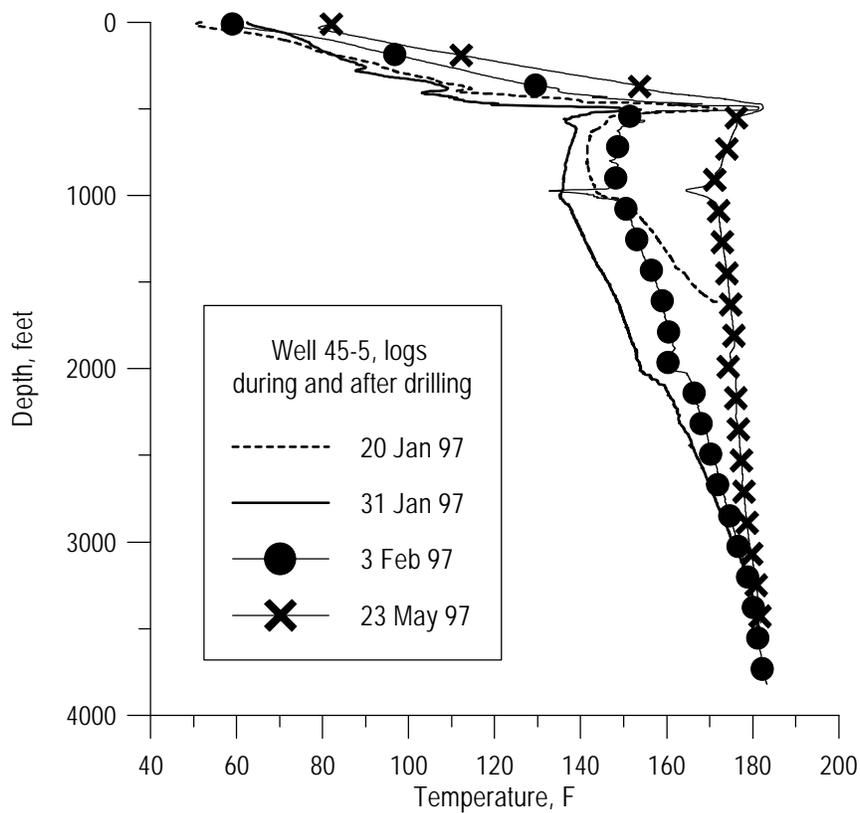
CSAMT is a survey method<sup>8</sup> which uses either a grounded electric dipole or a current loop as a source on the surface of the area to be investigated. When the source is excited at some frequency, then measurements of orthogonal components of the electric and magnetic fields are made over the survey area. The ratio of these orthogonal components can be used to calculate an apparent resistivity of the formation below the survey area. Since an aquifer, particularly one with hot, mineralized water, will show lower resistivity, the CSAMT survey is a means of identifying these low-resistivity zones.

As an adjunct to estimating resistivity from surface measurements, downhole sampling of formation fluids can be used to compare the water chemistry from different wells and to determine if the waters derive from the same source. Given the configuration of the wells, however, fluid sampling is not straightforward. All the wells except 45-5 are completed with tubing or liners to near TD, and 45-5 has an inflatable packer set at approximately 3000 feet. Bailing the packer tubing could draw formation waters into the interval below the packer, and the packer could probably be removed to sample the interval above it. The tubing in the other wells could be perforated for attempted water samples, but the heavy mud on the outside of the liners would make the source of any fluids collected uncertain.

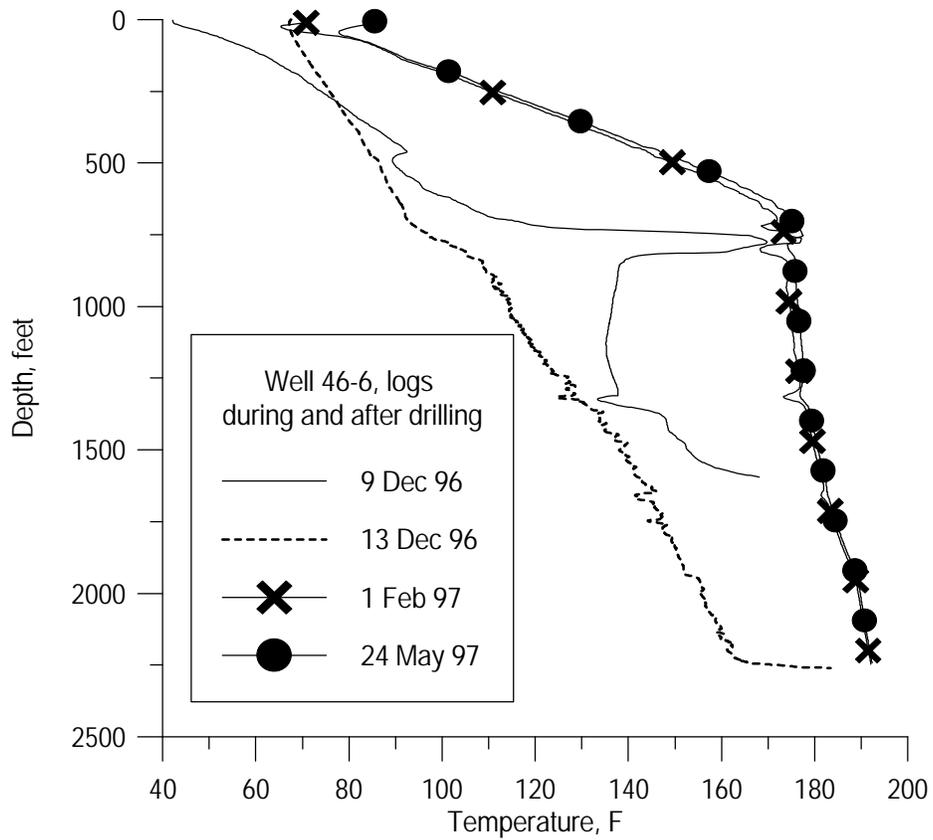
A final option would be additional drilling, if analysis of data from the existing wells gives clear indication of where the next target should be, but that decision must await interpretation of information compiled to date.



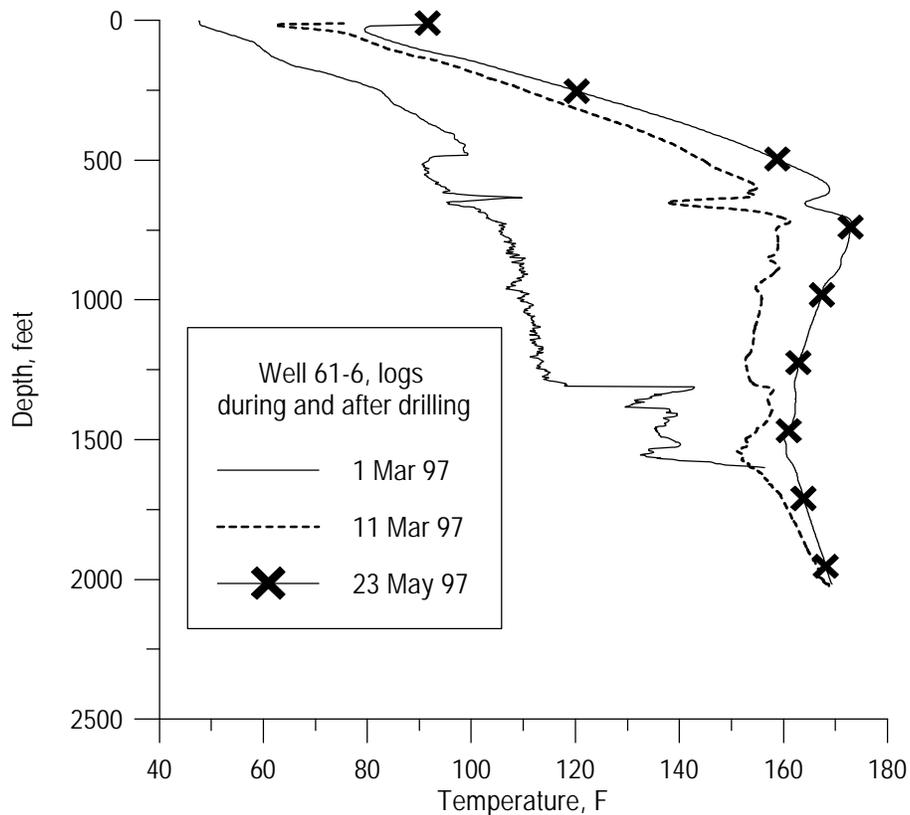
**Figure 2 - Final temperature profiles**



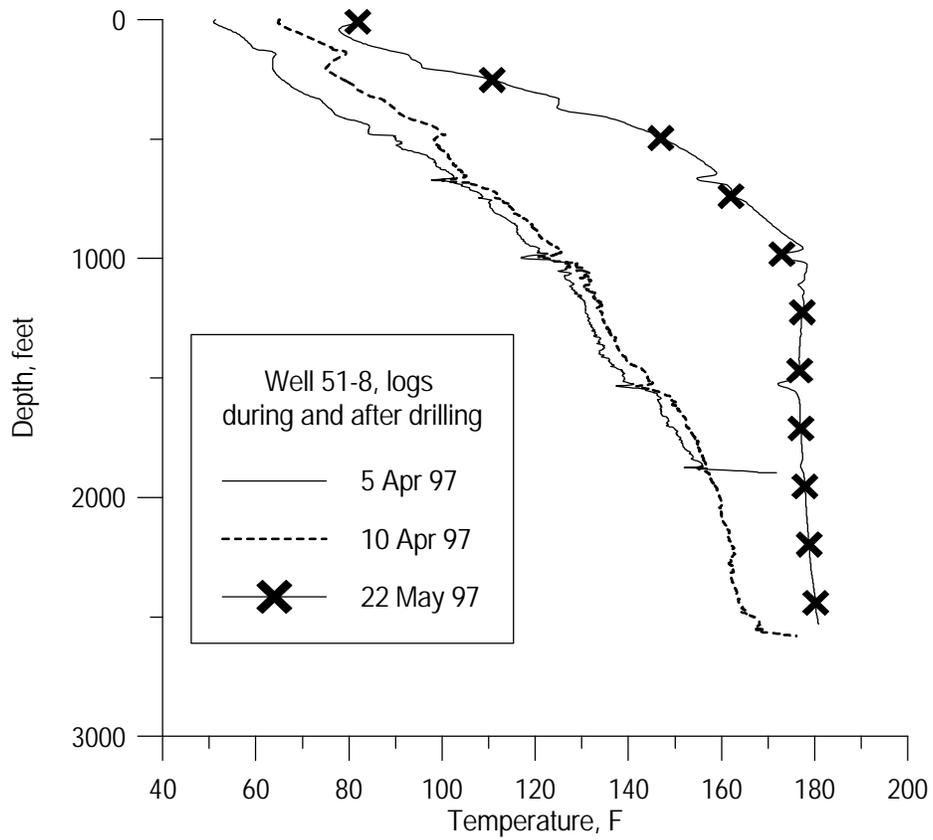
**Figure 3 - Temperature changes in well 45-5**



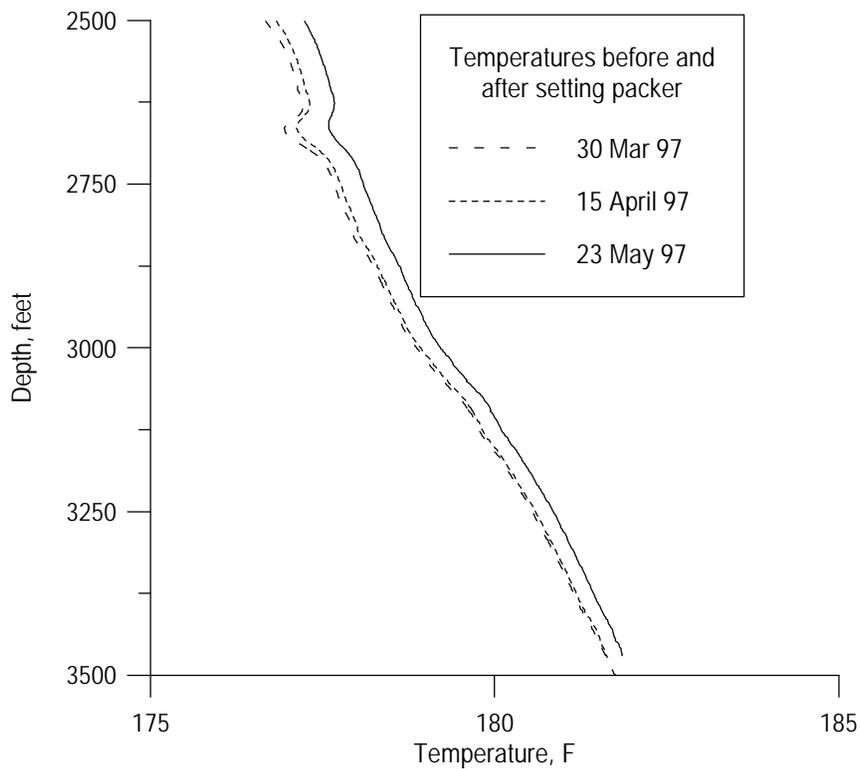
**Figure 4 - Temperature changes in well 46-6**



**Figure 5 - Temperature changes in well 61-6**



**Figure 6 - Temperature changes in well 51-8**



**Figure 7 - Temperature changes in well 45-5 before and after setting packer at 3000'.**

## **VIII. BRIEF GEOLOGIC DESCRIPTION** (summarized from References 4 and 5)

The McGregor Range geothermal system is one of twenty-seven known convective hydrothermal systems within the southern Rio Grande rift. Its co-location with the U. S. Army's Fort Bliss McGregor Range Base Camp provides a potential user for this geothermal resource, which is located in New Mexico about 30 km northeast of El Paso. The system is within a major Rio Grande rift structure, the Tularosa-Hueco basin, which has a major east-dipping boundary fault, the East Franklin Mountain fault, as its western margin. The geothermal system occurs along the eastern margin of the basin, within a small intra-basin uplift which is partially buried by basin fill and has bedrock outcrops at Davis Dome and in the vicinity of Meyer Range near the New Mexico border.

The geothermal system is described by a variety of geophysical and geochemical surveys which provided a framework to select the sites for the exploratory drilling. Three shallow seismic reflection profiles by the University of Texas at El Paso (UTEP) assisted in determining the depth to bedrock. The UTEP gravity and aeromagnetic data bases provided supplemental subsurface structural information. Reconnaissance geologic mapping, a radon soil-gas survey, a soil mercury survey, and a shallow temperature gradient survey by New Mexico State University (NMSU) delineated the thermal regime and probable upflow zones and identified a previously unmapped Pleistocene fault. Also, a detailed self-potential geophysical survey by the University of Utah and NMSU provided additional information to assess the dynamics of the geothermal system. Published ground water and geothermal surveys provided important, but poorly constrained, information on water levels, temperature gradients, fluid chemistry, and reservoir geothermometry.

Depth to bedrock is highly variable among the drill sites. Basin-fill thickness ranges from 710 feet in well 46-6 to about 30 feet in well 45-5. Basin fill consists of variably indurated pebbly-sand, sand, silt, and clay. Highly-indurated caliche (about 10 feet maximum thickness) caps the basin-fill sequence. Wind-blown sand forms a thin surficial veneer over the caliche cap.

Paleozoic limestone and dolomite and Tertiary felsite intrusives are the major bedrock units cored. Paleozoic rocks cored include: 1) Ordovician and Silurian dolomite, cherty dolomite, and chert of the Montoya Group and Fusselman Formations; 2) Devonian (?) and Mississippian black argillaceous limestone and calcareous shale and dark fossiliferous and sometimes cherty limestones of the Las Cruces, Rancheria, and Helms Formations; and 3) Pennsylvanian gray to dark gray cherty, fossiliferous limestones of the Magdalena Group. Nearly all Paleozoic units have fracture permeability, but it is less in the black Mississippian limestone and shale units. Important vuggy solution porosity and permeability is prominent in the Ordovician and Silurian dolomitic units and in Pennsylvanian limestones. Also, stylolites, when present, frequently have important solution permeability. Tertiary felsite intrusives show concordant contacts and are generally interpreted as sills. Fracture permeability also occurs in the intrusive bodies.

Formation tops and thickness drilled in each well are shown below. Coring allowed and enhanced the identification and detailed characterization of several feature which have important bearing on the configuration and dynamics of this geothermal system. A "blind" thrust fault is characterized in well 51-8. The thrust fault juxtaposes gently-dipping Silurian dolomite over steeply-dipping and overturned Mississippian black limestone and shale. Units on the hanging and footwall of the fault are pervasively fractured and deformed. This hidden structure is probably related to regional-scale, basement-cored uplifts of late Cretaceous and early Tertiary age. Large faults bounding the uplifts

enhance the potential for deeply-circulating regional ground water flows through basement rocks and may help explain the McGregor geothermal system.

Well 45-5 cored a small laccolith -- a "blister-like" intrusion of igneous rock with a flat floor and a domed roof. Limestone above the felsite intrusion shows moderate dips; however, the intrusion is floored by flat-lying limestone. Important fracture permeability is associated with the interior of the intrusion.

Major solution permeability is found in wells 45-5 and 46-6 and is especially dramatic in Pennsylvanian limestones near the static water level, above and below intrusive contacts, and near the bedrock-basin fill unconformity.

Well 45-5 (formation water level 466 feet)

Depth (below KB)	Unit
0-32	Tertiary/Quaternary basin fill
32-433	Pennsylvanian cherty limestone
433-464	Tertiary felsite porphyry sill
464-550	Pennsylvanian cherty limestone
550-864	Tertiary felsite porphyry sill
864-1195	Pennsylvanian cherty limestone
1195-1857	Devonian/Mississippian limestone and shale
1857-3099	Tertiary felsite porphyry sill
3099-3129	Devonian/Mississippian limestone and shale
3129-3649	Silurian Dolomite
3649-3961	Ordovician Dolomite

Well 46-6 (formation water level 451 feet)

Depth (below KB)	Unit
0-684	Tertiary/Quaternary basin fill
684-1145	Pennsylvanian cherty limestone
1145-1284	Tertiary felsite porphyry sill
1284-1741	Pennsylvanian cherty limestone
1741-2258	Devonian/Mississippian limestone and shale

Well 51-8 (formation water level 473 feet)

Depth (below KB)	Unit
0-460	Tertiary/Quaternary basin fill
460-655	Tertiary felsite porphyry sill
655-770	Pennsylvanian cherty limestone
770-1503	Devonian/Mississippian limestone and shale
1503-2239	Silurian Dolomite
2239-2240	thrust fault (gouge)
2240-2479	Mississippian limestone and shale (steeply overturned)
2479-2573	Pennsylvanian cherty limestone (steeply overturned)

Well 51-8 (formation water level 463 feet)

Depth (below KB)	Unit
0-605	Tertiary/Quaternary basin fill
605-1430	Tertiary felsite porphyry sill
1430-1760	Pennsylvanian cherty limestone
1760-2018	Devonian/Mississippian limestone and shale

**IX. GLOSSARY**

*The following terms are common in drilling practice; many of them are used in this report:*

annular preventer - part of the BOP stack; an inflatable bladder which seals around drillpipe, casing, drill collars, or irregularly shaped components of the drillstring.

backside - annulus between drillpipe and surface casing

balling, bit balling - lumps or balls of clay which form around a bit's cutting structure when drilling soft formations. Balling prevents the bit cutting effectively.

block, or blocked run - a core run is blocked when fractured rock wedges into the core tube and prevents further drilling before the tube is full.

Bowen spear - a fishing tool which expands inside a fish when the drillstring is pulled up

BOP - blow out preventer; one or more devices used to seal the well at the wellhead, preventing uncontrolled escape of gases or steam. Also BOPE - blow-out prevention equipment. See *annular preventer, rams*.

boot, booting - forming a plug of drilled material or fill above the bit, usually caused by inadequate hole cleaning or swelling clays.

button bit - see tri-cone bit

cave - debris that falls off the wellbore walls and accumulates in the bottom of the hole.

CIP - cement in place

fish - any part of the drillstring, or other tools, accidentally left in the hole

fishing - trying to retrieve a fish

float - essentially a check valve, used in the drillstring to keep liquid from flowing back up the drillpipe or casing

float collar - a coupling with built-in float; placed near the bottom of a casing string to prevent the heavy cement column in the annulus from flowing back into the casing. After displacing the cement in the casing with mud, the casing between the float collar and the shoe will be full of cement

float shoe - a casing shoe with built-in float; used like a float collar, except there won't be cement inside the casing

Geoset - a type of synthetic diamond cutter used in impregnated bits

H or HQ - designation of a coring tool size; rod outside diameter is 3.5", bit is approximately 3.9" OD and 2.5" ID

H<sub>2</sub>S - hydrogen sulfide; a poisonous gas sometimes found in geothermal drilling

jars - tools which apply an impulse force to the bottom of the drillstring when the string is pulled up; usually used for fishing, but sometimes included in the string for normal drilling

lay down - to take a piece of equipment out of service; e.g., to lay down a worn core rod

LCM - lost circulation material; any material used for plugging formation fractures to avoid loss of drilling fluid

lubricator - sealing element attached to the wellhead which allows a wireline to pass up and down, or which allows a logging tool to be transferred into or out of the wellbore, while there is pressure in the wellbore

matrix - the hard metal portion of a bit which holds the diamond cutting elements in place

mill tooth bit - see tri-cone bit

mislatch - the condition when the core tube, or inner barrel, is not latched into the outer rotating barrel, sometimes caused by core dropped out of the core tube. If the core tube can't be worked down over the core in the barrel, then the drillstring must be tripped to clear it.

MRT - maximum reading thermometer; a mercury thermometer which retains the reading of the highest temperature it has seen (which may not be at the bottom of the hole)

N or NQ - coring tool size; rod OD is 2.75", bit is approximately 2.98" OD and 1.875" ID (N fits inside H)

nipple up (down) - to assemble (disassemble) something; usually the wellhead or BOP stack

OEDP - open ended drill pipe; drillpipe without a bit or other bottomhole assembly, generally used to place cement at a specific point in the wellbore.

overshot - in general, any tool that latches around the outside top of another tool; usually refers to the assembly which retrieves the core tube with the wireline, or to a fishing tool which extracts a fish by gripping it around the top

PTS - pressure-temperature-spinner tool; downhole instrumentation to measure these quantities (spinner output is an indication of velocity or flow rate)

pick up - to put any piece of equipment into use; e.g., to pick up a new bit

pitcher nipple - the vertical tube around the top of the blow-out preventer; it collects the drilling mud returns and empties them back into the mud tanks

POOH - pull out of hole; bringing the drill string and tools out of the hole

possum belly - manifold which connects the return line to the shale shaker

rams, pipe or blind - rams are part of the blow-out preventer; pipe rams seal around the drill pipe if it is in the hole, blind rams seal against each other if the pipe is not in the hole

rathole - either additional hole drilled below the target depth to give room for debris, fill, etc. or, on a rotary rig, where the kelly is stored while tripping pipe

RIH - run in hole; inserting the drillstring and tools into the hole

shoe - a heavy, tapered cap that attaches to the bottom of the casing string and protects it as the casing is lowered into the hole

spud - to begin drilling a well

squeeze - to deliberately apply pressure to the wellbore, usually by closing the BOP and pumping into the well. Often done to force cement into the formation at the casing shoe or into the annulus through perforations in the casing

stab(s) - stabilizer, or stabilizers; bottom-hole-assembly components which are almost hole diameter, used to keep the drill pipe relatively centered in the hole above the bit.

stand - more than one joint of drill pipe screwed together; when tripping, pipe is handled in stands to avoid making and breaking every connection - for a coring rig, a typical stand is four ten-foot joints (40 ft), but for a large rotary rig, a stand is three thirty-foot joints (90 ft).

strip - to wear away the matrix in an impregnated diamond bit; the bit must strip to expose the diamond cutting surfaces; also, to pull out of the hole under pressure, with the annular preventer closed around the drill pipe

swage, inside or outside - a fishing tool which grabs the inside or outside of a fish by forcing an interference fit

TOC - top of cement

top job - casing cement which is placed from the top, rather than being displaced through the casing shoe. It is either pumped directly into the top of the annulus, or pumped through a tremie line to get a deeper placement in the annulus.

tremie line - a small-diameter pipe or tube run down the annulus outside of casing

tri-cone bit - a bit having three toothed, conical rollers which rotate as the bit turns and crush the rock at the bottom of the hole. The teeth can be either steel, milled into the cones (mill tooth), or tungsten carbide buttons set into the steel cones (button bit, insert bit, TCI bit)

trip - any event of pulling the drillstring or core barrel out of the hole and returning it

wash - to run in the hole with circulation, usually required to get back to the bottom of a previously drilled hole when there is fill or cave in the hole

washout - a leak in the flow path through the drillstring, usually at a threaded connection in the drillpipe or drill collars. The hole is enlarged by high-pressure drilling fluid passing through it, and frequently causes the drillstring to fail and separate.

wiper trip - running the drill string, with a bit, to the bottom of the hole to make sure there are no obstructions in the hole

WOC - wait on cement, time spent waiting for cement to cure

WOO - wait on orders, time spent waiting for directions

xover or xo - crossover; a coupling used to adapt from one thread size to another

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## **APPENDIX A**

These notes cover the drilling of four exploratory geothermal slimholes at the McGregor Range approximately 25 miles north of El Paso, Texas. Thirty-one thermal gradient holes drilled in the summer of 1995 indicate that a relatively low-temperature (~ 150°C) geothermal resource exists at a depth between 3000 and 4000 feet in the vicinity of the McGregor Range base camp. If available, this reservoir could be used for a binary power plant and possible water de-salinization.

Exploratory drilling was done by the Bort-Longyear Company (BLY), using Rig #602. This rig, which has been used on other geothermal exploratory slimholes, was operated out of the Southwest regional office in Peoria, Arizona.

## **7 November 96**

### **Well GDP 46-6; wellhead elevation ~ 4107'**

0700 - Rig, parts trailer and crew on site, start rigup.

0830 - Sub-base arrives.

1000 - Back hoe starts digging sump.

1100 - Rest of sub-base and pipe racks arrive.

1200 - Sub-base is set up, ready to drive rig on.

1400 - Two BLY trucks arrive with mud system, dog house, timbers, core rods and casing.

1500 - Start rigging up SNL instrumentation.

## **8 November 96**

0700 - Continue rigging up. Raise rig to 11' KB above ground level; position mud pumps and pits; spot parts van and frac tank; move generators into position. Continue wiring up Sandia instrumentation.

1900 - Quit for day. Not enough crew and no lights to work night tour.

## **9 November 96**

0700 - Complete rigging up. Finish wiring Sandia instrumentation and power distribution from generators.

1510 - Pick up tools and spud 12-1/4" hole, drilling with clear water. Bit wants to wander, making the drill string non-vertical. Requires patience and chains to keep rods straight.

1715 - Add another 20' joint of pipe.

1900 - Quit for day at 40' depth.

## **10 November 96**

0700 - Begin for day; service rig, mix mud. Fluid level was very low in hole and many large washouts were visible.

0800 - Fill hole with water, lower bit and it sets down on fifteen feet of fill from overnight. Continue drilling conductor hole.

0900 - Kelly down at 59' KB. Circulate hole.

1015 - POOH, lay down 12-1/4" bit.

1030 - Begin running 7", 23#/ft casing.

1055 - Complete running 2 joints casing.

1115 - Run 5 joints AQ rod as tremie line. Goes to bottom easily.

1145 - Pump fresh water through tremie to flush mud from hole.

1230 - Start mixing cement in trash barrels (no mixing tub on location) and pump with small Bean triplex pump.

1245 - CIP. Pumped 32 sacks (approximately 20% excess) of Portland cement. WOC.

- 1400 - Sandia personnel continue plumbing up flow-rate instrumentation: 3" magmeter in suction line between mud pits and pump; Doppler flow meter on standpipe; rolling-float meter (RFM) in flow line between pitcher nipple and shaker. Crew is draining and cleaning mud pits.
- 1715 - Cement has fallen back about 20', mixing additional cement for top job. Rigging up flow line from riser to shaker.
- 1800 - Top job complete, it took 6 sacks.
- 1900 - End of day for BLY. SNL RFM crew rigging up flow meter
- 2100 - RFM crew stops for the night. Flow meter working but not interfaced with computer.

### **11 November 96**

- 0700 - Start of day for BLY. Picking up BHA for 6" hole. Cement fell back ~ 4', will top later. RFM crew rigging up.
- 0800 - RIH and tag cement at 54'. Ready to flow calibrate RFM (SNL charges start)
- 1100 - Flow calibration complete. Start drilling 6" hole.
- 1300 - POOH for balled bit. Clean bit and stabilizers, RIH and start drilling at 111'.
- 1315 - On bottom drilling with full returns.
- 1630 - Lost total returns after kelly down at 197'. Work pipe and add LCM. Got 70% back. Drill ahead with partial returns.
- 1800 - Still losing ½ returns. Will POOH and run in on OEDP and cement.
- 1930 - Cement in place. RIH with OEDP to 230' and pumped a 150 gal cement plug. Displaced with water and POOH.
- 2000 - End of day, no night shift.

### **12 November 96**

- 0700 - RIH with drilling assembly.
- 0800 - Set down on fill at 80', wash to TOC.
- 1030 - Tag top of plug at 170'. Drill cement to 198' then wash, no cement.
- 1130 - POOH to change to drag bit. Still ~ 10' off TD.
- 1200 - Bit and stabs badly balled. Replace bit and clean stabs.
- 1220 - Lose returns ~ 230'. Hole is booting. Ream hole and mix LCM.
- 1300 - Get partial returns. Drill ahead.
- 1400 - Change to EZ-Mud to try to clean hole and thin returns.
- 1530 - Mud pump down at ~ 276'.
- 1645 - Pump valves cleaned of LCM and back to drilling.
- 1720 - Stop drilling at 296' to POOH for cement plug # 2. Hole still taking fluid and since we are not drilling at night we will try another plug.
- 1800 - RIH with OEDP and pump 160 gal/110' cement plug. Chase with 35 gal water.
- 1700 - CIP end of day, no night shift.

### **13 November 96**

0700 - Start of day. RIH with BHA.  
0730 - Tag bridge at 130'. Drill through bridge and wash in.  
1030 - Tagged cement at 207'.  
1110 - Start drilling new formation at 297'.  
1330 - Drilling ahead at 355' with full returns. When returns drop off, it appears the hole is booting. Working the pipe wipes the hole and full returns are maintained.  
1800 - Drill to 454' and condition the mud for trip out of hole to check tools.  
1900 - End of day, no night shift.

#### **14 November 96**

0700 - Start of day. RIH with BHA.  
0745 - On bottom drilling ahead. Only hit one tight spot at 150' on trip in. Very little fill. Full returns after ~ 280 gallon fill up.  
0800 - Sensor for flow-line temperature is in muck in possum belly. Moved sensor to return line.  
1030 - Having trouble finding class G cement. Jim Witcher got OK from Rich Estabrook to use type H. We will file sundry notice.  
1140 - Kelly hose broke, rig on repair time.  
1330 - Hose fixed, back to drilling. Bottoms up temp 94°F.  
1400 - Having trouble finding cementing contractor. Everybody is busy and we have a very small job.  
1800 - Drill to 611' and condition hole for temperature check. Pull back 27' to run probe inside DP. Ran test at 504', temp 95°F.  
1920 - POOH for the night.  
2000 - EOD for BLY.

#### **15 November 96**

0630 - Rig up for open hole temperature log.  
0700 - Start of day for BLY, rig up for temp log  
0830 - Finish temp log. Rigged down. Temp log went to 611' with no obstructions. Sat on bottom for 14 min., temp went from 157.8°F to 159.6°F.  
0900 - Back to drilling new hole with full returns. Rotary drive transmission lost lower gears. Will drill in third and order rebuilt gearbox.  
1040 - Talk with Rich Estabrook, BLM, about BHT. We will drill 100' and check with MRT and log at 150' intervals and get data for stabilized BHT. This is a permit requirement for drilling below 600' without casing.  
1400 - Formation starts to change, getting some rocks back.  
1600 - Drill to 710' and condition mud for trip out for new bit.  
1700 - End of day for BLY. Rigged up for temp log in the morning.

#### **16 November 96**

0600 - Start temperature log. 0700 - Start of day for BLY. Wait on temp log.

0800 - Logger rigged down. Pick up bit #2 for rerun.  
1000 - Lost total returns at 725'. Big loss. Can't turn rods in third gear due to vibrations caused by low fluid level in hole. Change rotary drive transmission.  
1220 - Gearbox changed. Will drill blind to make rathole for L.C. cement plug.  
1400 - Drill blind to 735', hole is not cleaning and is trying to stick pipe. Pull back 20' and check water level with Echo meter. Level ~ 465'. POOH for L.C. cement plug #3, 19 sacks ~ 190 gal.  
1420 - RIH with OEDP and pump cement. POOH  
1600 - Cement in place. Will wait until 0700 to try to fill hole.  
1700 - Change out hydraulic head drive motor on rig and haul water.  
1900 - EOD, still no night shift.

### **17 November 96**

0700 - Start of day. Cement sample is soft but cement in hole should be harder because of temperature.  
0720 - Hole filled. RIH with drilling BHA.  
0810 - Tag LCM plug at 462' (water level before cement plug). Wash in.  
1030 - Lost total returns at 720', 5' above previous loss zone. Mix LCM and drill blind.  
1130 - Drill to 742', too much torque. POOH to spot cement. RIH with OEDP. Will accelerate plug with 200 gal. 2% CCl.  
1300 - DP in hole, start mixing plug #4. 24 sacks.  
1340 - CIP. POOH  
1500 - WOC until 0700. Cement getting hard at temperature within 1 hour.

### **18 November 96**

0700 - Warm up equipment. Get ready to fill hole.  
0730 - Fill hole and trip in.  
0815 - Tag top of cement at 687'.  
0845 - Drill and wash to 710' and lose returns. Wash blind to 725' and tag hard cement.  
0920 - Drill cement blind with LCM to 735'. POOH for plug #5.  
1100 - Water level ~460' from Echo meter.  
1200 - Start mixing plug #5, 30 sacks cement, 170 gal H<sub>2</sub>O, ½ bag paper, 2 ea. 50 lb. sacks Cal-seal. Mix in 420 gal stock tank with hydraulic mixer and 3" trash pump.  
1305 - Start blending in Cal-seal.  
1318 - Start pumping into hole with trash pump. Hole fills after ~ 80 gal. Pull one stand and hook up Beam pump and pump away. Added ~ 15 gal H<sub>2</sub>O to thin cement.  
1330 - CIP.  
1620 - Surface samples set at temperature. Fill hole ~ 700 gal. mud. RIH with BHA.  
1710 - Set down at 577'. Wash and drill cuttings and LCM.  
1800 - Tag good cement at 684'.  
2045 - Drill good cement to 726' then total loss. Pump LCM and POOH.  
2315 - Drop 15 sacks of chunked bentonite in open ended drillpipe. Some bridges in DP. POOH and drop 5 sacks from surface. Plug #5A.

## 19 November 96

- 0500 - RIH with BHA Hit bridge at 270'. Drill and wash in.
- 0930 - Lost returns at 725'. Lost a little, then got it back, then lost it all.
- 1030 - Drill hard cement blind to 740'. POOH for plug.
- 1130 - Out of hole. Ready to run in OEDP.
- 1230 - OEDP at 730'. Clean plugged pipe and wait on vegetable oil for bentonite squeeze
- 1440 - Mix plug #5B Mixed 70 gal vegetable oil with 8 sacks of gel and ½ sack magma fiber. dumped 15 gal vegetable oil lead, ~ 80 gal plug and 15 gal tail. Displaced with 110 gal H<sub>2</sub>O. measured water level at 400', 60' above static. Added 15 gal H<sub>2</sub>O, pulled 100' of DP and circulated.
- 1520 - Tried to fill hole, no luck
- 1600 - Clean hole with OEDP to TD. Mix cement plug #6. 24 sacks of cement, 1.5 Cal-seal, ½ sack magma fiber and ~ 160 gal H<sub>2</sub>O.
- 1730 - CIP
- 2020 - Fill hole. RIH with BHA
- 2150 - Wash and drill cement. TOC 700'.

## 20 November 96

- 0010 - Water swivel locked up, repair.
- 0120 - Back to drilling cement.
- 0213 - Lost returns at 725'. Drill cement blind. POOH
- 0450 - Drop Enviro-plug pill and chase with mud. Plug 6A.
- 0525 - Fill hole.
- 0620 - RIH with drilling assembly and circulate at 710'.
- 0830 - Start drilling on plug.
- 0850 - Lost returns at 724'. Build mud volume to drill cement blind.
- 0900 - Talk with Rich Estabrook about casing plans. If we case short, we cannot get a meaningful shoe test because of the loss zone; then temperature limits would be 230°F drilling or 305°F stabilized. If we case below the loss zone we need a minimum of 200' of cement above shoe.
- 1000 - Order out PQ core barrel to run on HW casing and core ahead.
- 1100 - RIH with OEDP for Cal-seal cement plug #7. Will pump 120 gal lead, 10 ea. 50 lb. sacks of Cal-seal mixed with 50 gal H<sub>2</sub>O. Chase with 110 gal H<sub>2</sub>O.
- 1210 - Start mixing plug
- 1230 - CIP. POOH
- 1300 - Out of hole. Will run back in and try to fill hole.
- 1400 - Rigging up core pump.
- 1500 - RIH to 710' and try to fill. No luck.
- 1530 - POOH laying down. Will pick up HW casing and PQ coring tools and core ahead to check formation for possible casing point.
- 1600 - Rig down for mainline repairs.
- 1700 - Work on core pump.

1900 - Switch back to mud pump. Pick up HW casing for core pipe.  
2200 - PQ coring tools arrive. Make up coring tools.

## **21 November 96**

0400 - Start washing in PQ core tools.  
0430 - Core past 724' and lost returns.  
0450 - Try to pull tube at ~ 728'. Tube is stuck, break wireline trying to pull it. POOH.  
0630 - Out of hole. Clean out inner tube. Full of clay, cement and LCM.  
1000 - Lost returns at 725'. Core to 735' and pull tube. Cal-seal and cutting conglomerate.  
Drop tube and core ahead.  
1100 - Pull core from 745'. Good rock.  
1230 - Tube stuck. Try to change gears on mainline. While lowering kelly, transmission finds neutral and kelly and blocks fall. Pick up blocks and try to rotate. Need to change out main line when out of hole.  
1500 - Core rods are torqueing up. Decide to give up on PQ coring and cement casing above loss zone.  
1700 - Out of hole with HWT casing. Make up HQ rods in 20' lengths, then pick up and stand back in 40's.  
2000 - Pick up HQ and wash cave at 280'. Run to 700' and wash to bottom.  
2300 - Mix cement plug #8. 25 sacks with 1.5 sacks of Cal-seal and paper. Pump plug with rods at 740'.

## **22 November 96**

0030 - CIP. POOH and change out mainline.  
0400 - Pick up collars and BHA.  
0730 - RIH to tag and polish cement.  
0830 - Hit bridge at 280'. Fill hole and wash.  
1000 - Drill TOC at 690'. Lost returns, no cement below until 738.5 then hard cement. It looks like the crack, found during coring at 743', took the cement.  
1035 - POOH  
1100 - Check water, leave 4 stands off bottom. ~ 470'  
1130 - Gary Simpson from DDF called. He has Halliburton (Hobbs) on line to deliver 300 cubic ft. of type H with 35% silica flour. We need a tank to hold it.  
1200 - RIH with OEDP (HQ) to 735'  
1400 - Mix and pump 25 sacks cement with 2 sacks of Cal-seal and ½ sack paper. Plug #9 in place at 1420.  
1840 - RIH with 6" BHA on HQ. Tag top of cement at 680'. Fill hole. It takes ~ 1500 gal.  
1900 - Halliburton will not deliver cement unless we have a hopper for it, but we finally have a method to get cement for casing job. BLY has a vacuum truck in El Paso on an environmental project. Tank will be cleaned and dried, then drive to Dowell in Monahans, TX and load 150 sacks of type H cement with 35% silica flour. and drive back to location. We will mix in mud tank and pump with rig pumps.  
2030 - Drilling cement at 700'. Add a 10' rod and drill ahead with full returns.

2100 - Stop polishing off cement at 708.5'. This will be casing point.  
2315 - POOH

### **23 November 96**

0100 - Out of hole. Wait on materials for cementing.  
0700 - RIH for wiper trip.  
0740 - Hit bridge at 210'. Ream hole. ~ 300 gal to fill. When 725' crack is healed water level in hole is ~ 210'.  
0800 - Dowell called. Vacuum truck is there. They will load ~ 150 sacks of cement with 35% flour.  
0830 - On bottom circulating with full returns. Maybe 2' of fill  
0945 - Out of hole waiting on equipment.  
1030 - Weld up float collar and bottom 37' of casing connections.  
1200 - Strip back 7" to 4' AGL. weld on 2" nipple @ 1' AGL for top job.  
1300 - Start in hole with 4-1/2" HWT casing. Cement leaving Dowell yard. Call BLM and leave messages.  
1310 - Set 3 centralizers below float collar. Collar 36.5' up from shoe. Then centralizers every 120'  
1630 - Casing in place. Had to wash in the last 3'. Cement head finished. Stop circulation and clean mud pits for cement mixing.  
1733 - BLY vacuum truck arrives with cement powder. Start off loading  
1900 - Pump 380 gal of H<sub>2</sub>O in casing for lead. Having trouble getting cement out of truck. Mud tank has mixing water and stock tank has displacement water.  
1915 - Start mixing cement. Will mix 40 bbl of type H cement with 35% silica flour. 134 sacks, 1019 gal H<sub>2</sub>O. Mixing very slow.  
2200 - Start pumping cement at 2 bbl/min.  
2218 - Drop plug and displace. Did not see plug bump but pressure indicated lifting cement ~ 250 psi.. Had returns throughout job. No cement returns but had cement water at end of job. Pumped ~ 34 bbls, left 6" in mix tank. Outside of unloading powder and mixing, the cement job went very well.  
2220 - CIP.

### **24 November 96**

0900 - Surface samples set. Rig up to run temperature log.  
1015 - Finish temp log. TOC ~ 240'. TOC in casing 453'. Call BLM for permission to do top job. Checked capacity of 10 bbl mix tank used for displacement. It is only a little over 8 bbl. That gives us over 100' of cement in the HWT casing.  
1100 - Rich Estabrook OK's plan for top job. Mix and pump 300 gal of type H with silica flour.  
1200 - CIP. Had cement returns, they filled backside of 7".  
1400 - Run temperature log. It confirmed TOC at 220'.  
1500 - BLY off location for holiday break. Plan to be back on Saturday to nipple up.

## **25 November 96**

- 0700 - Run temp log to tag TOC on top job #1. ~ 50'
- 1100 - Mix and pump 4 sacks of type 1 cement down back side. Hole filled and did not fall back.
- 1800 - Finished rigging down return rolling float meter and flow line.

## **26 November 96**

- 0700 - Rig up mag-meters, Doppler flow meter, head position transducer. Change RTM software for core drilling. Change oil on generator.
- 1800 - EOD. Only SNL on site

## **28 November 96**

Thanksgiving, no one on site

## **29 November 96**

- 1500 - Run temperature log and rig down. Only SNL on site.

## **30 November 96**

- 0700 - BLY back from holiday break. Work on rig and equipment.
- 0800 - Unload BOP equipment and rig up H<sub>2</sub>S monitors. Have safety meeting with McGuire on H<sub>2</sub>S and BOPE.
- 1200 - Strip back 7" casing and install HW to 8-round XO. Screw on well head. Not enough room for mud cross. Remove blank flanges below blind rams and install choke and kill valves.
- 1300 - Start rigging up BOP.
- 1800 - Still nipling up stack.
- 2300 - Replace top flange on chuck drive transmission.

## **1 December 96**

- 0100 - Rig up coring pump.
- 0200 - Start in hole with HQ coring tools.
- 0415 - Wash to 467' and start coring.
- 0700 - Coring rubber top plug at 495'. 20°F air temp. Lots of lines frozen.
- 1000 - Test BOPE to 500 psi. Fix leaks in valves and blow down line. Repair hydraulic leaks.
- 1030 - Core cement.
- 1200 - Repair wireline.
- 1230 - Back to coring cement.
- 1320 - POOH for BOPE test.

- 1500 - Start BOP test.
- 1700 - BOPE test complete. All functions OK. Witnessed by Russ Jentgen and Chuck McDonnell of the BLM. RIH with coring tools.
- 1800 - Rig down for maintenance on top drive head.
- 1930 - Start coring cement at 558'.

## **2 December 96**

- 0300 - Core out insert float at 630'. Float ball held open by a piece of rubber-looking material. Could be a piece of the top plug left early?
- 0600 - Coring ahead at 708'.
- 0805 - Lost returns at 725'. Pull tube and restrict head.
- 0910 - Back to coring at 725'. Last run appears that we are falling out of old hole.
- 1300 - Core ahead to 748', 4' of new hole. Pull back 1 stand and kelly and rig up to check water level for modified shoe test. Drain and clean mud system. Lots of lines plugged with cement from casing job.
- 1339 - Water level by single point is 457.6'.
- 1409 - Water level is still 457.6'. Call BLM with water data. Run fast temperature log.
- 1530 - Rigged down logging equipment. POOH to grease rods.
- 1730 - Drill cave. Hole very sticky.
- 1900 - On bottom coring and reaming. Cave is trying to stick pipe.
- 2230 - Coring ahead with full core recovery.

## **3 December 96**

- 0630 - Pulling core at 797'. Pumping lots of fluid down the backside and inside.
- 1000 - Hit 1.3' void at 808.4'.
- 1130 - Receive modified conditions from the BLM for drilling below the HW casing. BHT survey every 200' if temp is > 190°F, every 100' if BHT is < 190°F and > 220°F and every 50' if > 220°F. Case at 250°F. These conditions are based on 75°F difference between BHT and stabilized down-hole temperatures. If we can provide data on stabilized BHT the 75°F may be reduced.
- 1400 - Talk with Russ Jentgen, BLM, about temperature restrictions for 250°F casing point. Suggested we need stabilized temp limits. He will talk with Rich Estabrook.
- 1610 - Rig down with gearbox problems. Pull off bottom and rotate with pipe wrench
- 1645 - Receive new conditions from the BLM. If it can be shown that at a BHT of 250°F the stabilized BHT is below 325°F approval to drill ahead will be granted.
- 1650 - Rig repaired, back to drilling.
- 1900 - 850' at shift change.

## **4 December 96**

- 0630 - Rig down, fan belt. Turn pipe with pipe wrench.
- 0750 - Rig repaired. Back to coring at 928'.

- 1100 - Run MRT at 948', 100°F. Vibrations are getting bad and we have to pump too much mud down the backside to control them. Will make one more core run while we ready core tube logger and then trip.
- 1245 - Drop SNL temperature/tilt core tube data logger. Will core ~ 7' from 958', then POOH to grease rods and change bit.
- 1415 - Finish core run to 966'. Start to POOH
- 1525 - Out of hole. Bit about ½ gone. Hung at ~ 740' on cave but worked through.
- 1700 - Check water level with Echo meter on trip in. Still at ~ 460'.
- 1730 - Start drilling cave at 752'. Drill 5' and ream back through.
- 1900 - Back on bottom drilling at shift change. ~ 3' of cave on bottom.

### **5 December 96**

- 0100 - Coring at 998'. Torque is down and not pumping down the backside anymore.
- 0700 - Pulling core at 968'. Night tour got 103'. Drilling good.
- 0940 - Make short trip to grease rods
- 1400 - Having problems with one tube pressuring up. Almost had to pull out to get it to release. Shorten tube.
- 1520 - Out of hole with core tube logger. Cored to 1103'. Max temp 123°F, inclination 2°
- 1800 - Still having problems pressuring up on one tube. Find small chip blocking restricted water cross.
- 1900 - Safety meeting and BOP drill. Coring ahead at 1122'.

### **6 December 96**

- 0700 - Coring at 1202' at shift change. 1197' on ground.
- 1400 - Start modification of mud mixing tank to allow mixing bentonite with water before adding the hydrated gel to the active mud system containing polymers. This will increase the bentonite yield and reduce mud costs.
- 1800 - Out of hole with core tube logger. Cored to 1255'. Max temp 120°F, inclination 2°
- 2200 - Formation change. Very broken rock.

### **7 December 96**

- 0700 - Coring ahead at shift change in very broken rock. Just pulled core at 1338'. Lots of short runs. Lost ~ 5' of core over night.
- 1200 - Start using bentonite mix tank for make-up mud. Pumps work well. This should drop mud costs.
- 1530 - Water restriction in head plugs. Pull tube at 1378'.
- 1630 - Install core tube logger and drop for core run from 1388' to 1395.5'
- 1736 - Tube and logger out of hole.
- 1800 - Max temp 118°F, inclination 2-1/4°
- 2300 - Possible 1' void at 1428'.

### **8 December 96**

- 0700 - Coring ahead at 1491' at shift change. Core on ground to 1486'.
- 0900 - Make arrangements to get 1700' of 2-3/8" EUE tubing for gradient pipe to use for liner at TD.
- 1300 - Rig needs oil change. Will run core tube data logger during shutdown. Rotate rods with pipe wrench during shutdown.
- 1340 - Rig shut down.
- 1410 - Oil change complete. Start coring ahead at 1527'.
- 1520 - Pull core tube with logger at 1535'.
- 1630 - Logger shows 128°F at 24' off bottom, bit 15' off bottom. for 30 min. Lowered to bottom without pumping and it read 136°F. After run it read 130°F. Tilt still 2-1/4°.
- 1800 - Will drill to ~ 0400 tomorrow then POOH for new bit and log.

### **9 December 96**

- 0347 - POOH at 1596' for bit and log.
- 0630 - Back in hole with new bit at 781'. Did not circulate on trip in. Rig up logger.
- 0930 - Logger rigged down. Ran temperature log in, sat on bottom for 50 minutes and logged out. Max temp on bottom 174.85°F after ~ 5 hours without circulation.
- 1045 - Back on bottom with new bit drilling. Torque high at start but getting better.
- 1200 - New bit cutting good and torque is down.
- 1900 - 1658' at shift change.
- 2330 - Generator goes down. Reduce load and restart.

### **10 December 96**

- 0630 - Pull core at 1727'.
- 0800 - Run core tube logger at start of core run at 1737'.
- 0915 - Out of hole with core tube logger at TD of 1745'. Max temperature 143°F with an inclination of 2-1/4°.
- 1800 - Drilling fast all day. 1846' coming out now. Will drill to 1946' and log temp for 12 hours.

### **11 December 96**

- 0230 - High torque, pull back 400' for grease at 1920'.
- 0500 - Get core tube logger ready for core run from 1938' to 1945'.
- 0700 - Pulling core at 1938'.
- 0817 - Pump off, finish coring to 1945'. Pull tube with CTL.
- 0834 - Tube on ground. Start trip back to 813' for temp logs.
- 0900 - CTL max temperature 152°F with an inclination of 2-1/4°.
- 0930 - Out of hole, rig on standby for logging
- 1130 - Finish first log with 1 hour on bottom logging. Out of hole and wait to log again.
- 1300 - Log indicates SBHT of 191°F.

- 1415 - Start log 2.
- 1530 - Finished logging and rigged down. Start back in hole. Rig off standby and on hourly rate.
- 1800 - Back on bottom drilling. Will drill ahead while waiting on new location and completion tubing.

### **12 December 96**

- 0700 - Pulling tube at 2055'. Good 102' night. Pumping slow down the backside. Gel only.
- 1200 - Still trying to get new location built and completion tubing from ABQ.
- 1700 - Program CTL for core run from 2136' to 2144'. Tube is now being dropped from the surface and pumped down.
- 1830 - Download CTL after coring to 2144'. Data shows temperature reversal. CTL max temperature 127°F with an inclination of 1-3/4°.
- 2000 - Ran MRT on overshot while retrieving core at 2154'. Sat on bottom for 5 min. It indicated 142°F.
- 2130 - Ran MRT on overshot while retrieving core at 2165'. Did not sit on bottom at all, just picked tube. It also indicated 142°F. It appears the MRTs are heating up on the trip in.

### **13 December 96**

- 0600 - Rig up to run mini core tube logger, temperature only, on core run from 2234'
- 0700 - Coring ahead at 2229' at shift change.
- 0805 - Start coring at 2234' with mini CTL in tube.
- 0835 - Finish core run at 2241'. Pull logger and tube, max temperature 134°F.
- 0915 - Start coring with CTL in place at 2241'.
- 0940 - Finish run at 2248'.
- 1058 - TD well at 2258'.
- 1130 - POOH to 844' for logging.
- 1238 - Start temperature log.
- 1510 - Finish temperature log.
- 1530 - Logger rigged down.
- 1600 - POOH and nipple down BOPE.
- 1900 - Pull wellhead and install completion head.
- 2100 - Rig up logger, wait on tubing. Standby.

### **14 December 96**

- 0000 - Give up waiting on Army tubing truck. Rig off payroll.
- 0630 - Start temperature log.
- 0700 - Rig on standby for logging.
- 0830 - Log complete and rigged down, BHT 190°F. RIH with HQ.
- 0900 - Mix completion mud.
- 1000 - POOH laying down HQ.

1300 - HQ laid down. Found tubing truck parked in maintenance yard. Build up handling tools and float for 2-3/8" EUE tubing.  
1400 - Start running tubing and rigging down.  
2100 - Tubing landed. Shoe at 2255' with float check 1.5' up.  
2115 - **End of drilling GDP 46-6**

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### **15 December 96**

0700 - Rig down all rig instrumentation.  
1800 - Rig and sub-base moved to new location.

### **16 December 96**

#### **Well GDP 45-5. Wellhead Elevation ~ 4117'**

0700 - Rigging up.  
0900 - Pump ~ 400 gal of clear water into 2-3/8" tubing in well GDP 46-6  
1900 - Rig ready to spud.

### **17 December 96**

1100 - Spud well.  
1400 - Finish drilling 12" hole to 24' below ground level. 35' KB. Rig on hourly rate.  
1500 - Run casing and build flowline. SNL RFM crew rigging up meter.  
1700 - Start mixing cement.  
1800 - CIP.

### **18 December 96**

0700 - Start of day. Temperature 2.5°F  
0900 - Try to get drilling water, Army stand pipe froze and broke. Rigging up Cavins slips for BSF drill pipe.  
1000 - Locate another water point. Pumped one load of water from 46-6 sump.  
1130 - Start calibrating rolling float.  
1330 - Finish calibrating rolling float.  
1400 - Start coring BSF in limestone.  
1900 - Coring ahead at 69' at shift change.

### **19 December 96**

0700 - Cored ahead all night. Some slight lost circulation zones. Mostly taking an occasional drink. Starting core run at 124' at shift change.  
0830 - Rig down for water swivel repair.  
1030 - Swivel repaired. Back to coring at 131'.

1500 - RFM erratic. Temperature logging GDP 46-6.  
1900 - Work on RFM. Coring ahead at 179' at shift change.

## **20 December 96**

0330 - Tube stuck while trying to retrieve core at 229'. Could not get tube loose or wireline to release. Break wireline and POOH.  
0720 - Back on bottom with repaired landing ring and coring ahead. Working on RFM.  
1100 - It appears RFM clamp slipped on pot. Repair and re-calibrate.  
1400 - Check water level on GDP 46-6 with Echo meter.  $422' + 8' = 430'$  in liner pipe and  $454' + 8'$  kelly above well head =  $462'$  in annulus  
1700 - Re-calibrate RFM with straight line from 33 to 50 gpm.  
1900 - 304' at shift change.

## **21 December 96**

0200 - Core slipped 2' at 349'.  
0230 - Recovered slipped core.  
0500 - Core slipped 4' but recovered.  
0700 - Hydraulic line breaks. Cannot pull tube. POOH.  
0830 - Out of hole and core retrieved. TD 379.5'. Drain pumps and drain mud system for Christmas break. Shut down all equipment and send back rental equipment. Will repair rig after break.

## **03 January 97**

0700 - Rig crew back without tool pusher. Repair equipment and get ready to drill.  
0800 - Rig running. Rig up to temperature log. Waiting on rental equipment.  
0900 - Logger rigged down. Set down on heavy mud at 350' and could not work through. Maximum temperature  $148^{\circ}\text{F}$ . Hauling water.  
1100 - RIH with BSF coring tools.  
1200 - Wash to bottom. Heavy hot mud returns.  
1230 - Rental fork lift and water truck arrive. Fork not working well. Order another one. Haul water to fill frac tank  
1430 - Start coring ahead at 380'.  
1530 - First core of the year out of the hole at 384.3'. New fork arrives on site.  
1720 - Lost all returns at 393.5'. Core blind to end of run 394'.  
1800 - Mix LCM and circulate. Pressure builds but no returns. Fracture in core is not too big. LCM should plug.  
1830 - Slug inside with 20 gal of paper and pump around. Got returns when plug hit bottom but pressure built to 700 psi and blew plug out.. Stop pumping and build volume.  
2030 - Slug again with 10 gal paper. Got 80% returns. Drop inner core tube and try to drill ahead with partial returns.  
2100 - Start to drill ahead and lost returns. Hole dry to bit. POOH for cement plug.

2300 - Mix and dump 7 sacks of Portland with 1 sack of Cal-seal. Added some gravel.

#### **04 January 97**

0130 - Fill hole

0200 - Start in hole with BHA.

0430 - Tag TOC at 354'. Core hard cement.

0800 - Core out of cement and into new hole. Core 2' with full returns.

0930 - Lost partial returns at 398' and total returns at 400.8'.

1000 - Pump LCM slugs but could not get returns. FMC core pump having problems pumping LCM. Change to Gardner-Denver mud pump.

1030 - Rig up pump and modify mud riser for backside pumping. Core is competent but has open horizontal fractures. Will try to core ahead blind while adding LCM and pumping down the backside for lubricity. Hope to core to better rock before cementing.

1200 - Restrict latch heads to build pressure.

1325 - Start coring blind at 401'.

1335 - Rig down for pressure gage repair.

1430 - Rig back up and coring.

1700 - Rig down for hydraulic repairs at 409'. Core very vuggy with lots of fractures.

1800 - Rig repaired and back to coring.

#### **05 January 97**

0600 - Coring ahead blind at 447'. Cored broken rock all night (dry to bit) pumping 50 to 70 gpm of water and ~ 12 gpm of EZ-Mud down the backside.

0900 - Rig down for drive head repairs at 455'.

1100 - Change out generators. Rig chuck transmission out. Also engine fan/water pump needs repair.

1700 - Finish drive repairs. Head lubrication pump still out. Will cement while waiting for repair parts. Start rigging up to cement. Will dump cement plug from surface.

1730 - Check water level with Echo meter ~403'

1900 - CIP. Mixed 18 sacks of type II with 2 sacks Cal-seal and 1 sack of paper. Total volume ~ 200 gal. Lead with 50 gal then add more paper and Cal-seal to 150 gal tail cement.

1930 - Check water level after cement with Echo meter; still ~ 400'.

2200 - Cement samples ready to try to fill hole but rig still down for lube pump repair.

2320 - Try to fill hole; no luck. Mix plug #3 hotter. 11 sacks of type 2 with 1 ea. 100# sack of gypsum cement.

#### **06 January 97**

0100 - Plug #3 in place.

0400 - Try to fill hole. Will not fill.

0430 - Mix 4 sacks of Enviro-plug and dump.

- 0600 - Try to fill hole, will not fill. Wait on materials and parts.
- 1030 - Rig up for temperature log. Tool set down at 401'. Very hard. Broke probe trying to work by. Ran in with single point. TD 401' and H<sub>2</sub>O @ 399'
- 1300 - Mixing hot cement plug #4. 13 sacks of type 2 with 100# of gypsum cement. Added gravel ahead and then spaced through plug. ~ 12 gal of gravel. CIP at 1320
- 1345 - Check fluid level with Echo meter. Hole acoustically noisy, Fluid may be moving or solids still falling. Looks like fluid at 320', ~ 80' higher than before plug.
- 1520 - Check fluid level again with Echo meter. Still at 320'. Noise is probably caused by very high winds and snow. Cement sample still soft. Waiting on parts for rig.
- 1800- Parts do not arrive at airport due to weather. Shut down operations until parts arrive. Blizzard conditions.

### **07 January 97**

- 0900 - Still waiting on parts. Echo meter water level, still ~320'.
- 1100 - Crew and parts arrive on site.
- 1400 - Fill hole. Start in hole with BSF coring tools.
- 1530 - Tag TOC at 314.5'. Break circulation and displace hole with mud.
- 1600 - Start coring good cement.
- 1800 - Rig down for hydraulic hose repair.
- 1900 - Back up coring ahead at 340'.

### **08 January 97**

- 0700 - Coring cement with full returns at 374'. Lots of problems with slipping core.
- 1200 - Lose circulation coring cement at 401'. Set up to core ahead blind.
- 1300 - Echo 401'.
- 1430 -Core ahead blind to 414'. Soft weak cement. cored 5' and ground 9'.
- 1450 - Echo H<sub>2</sub>O level ~ 414' (dry). POOH.
- 1635 - CIP. Very hot 40 gal plug; 5 ea. 50# Cal-seal, 5 ea. 94# Portland. Plug #5
- 1640 - Echo too noisy to read well but fluid level did not rise more than a couple of feet. Surface sample set. ~409
- 1700 - Echo still noisy, same result, 396'.
- 1710 - Try to fill hole.
- 1735 - Mix hot cement plug, 4 ea. 94# Portland, 3 ea. 50# Cal-seal. Plug #6
- 1750 - CIP
- 1830 - Echo meter shows no change and hole still very noisy. ~390'
- 1940 - Echo before plug 7, ~ 393'. Drop 1 sack of coarse tires and mix 35 gal after, 5 ea. 94# sacks of Portland and 50# Cal-seal. CIP 1950. (This plug is setting slow)
- 2025 - Echo meter shows ~ 8' of fill 384'. Will stack another hot pill
- 2100 - CIP. Mixed plug #8 with 35 gal H<sub>2</sub>O, 4 ea. 94# Portland and 2 ea. 50# sacks of Cal-seal
- 2130 - Echo meter shows some fill but still acoustically noisy ~ 377'. Starting to think it may be gas percolating up the hole. Mix larger hot plug.

2230 - Dump plug #9. Mixed 45 gal H<sub>2</sub>O, 8 ea. 94# Portland, 2 ea. 50# Cal-seal. Yield 75 gal.

2300 - Echo meter still noisy, ~ 348'. WOC

### **09 January 97**

0500 - Fill hole and pick up tools to drill and ream cement. BHA 6-1/4" mill tooth bit, bit sub, DC, Stab, DC, Stab, XO, CHD 101 rods

0630 - Start reaming cement at 204'.

0700 - Reaming at 224' at shift change.

0930 - Cement harder at 337'.

1030 - Hard cement at ~ 370'.

1120 - Lost returns in hard cement at 383'.

1155 - Void from 385' to 407'.

1300 - Wash to 455', POOH for LCM pill.

1400 - Echo meter run, H<sub>2</sub>O level ~ 380'.

1430 - Mixed fine-particle LCM pill consisting of ~150 gal of bentonite mud (50 lb Quick-Gel, viscosity 45 sec), 36 lb fine-grade ground rubber tires, 36 lb fine-grade walnut shells, and 4 lb Maxi-Seal; pumped pill into top of hole. Echo meter run, H<sub>2</sub>O level still ~ 380'.

1500 - Mixed medium-particle LCM pill consisting of ~200 gal of bentonite mud (50 lb Quick-Gel, viscosity 45 sec), 18 lb fine-grade ground rubber tires, 18 lb medium-grade ground rubber tires, 18 lb fine-grade walnut shells, 18 lb medium-grade walnut shells, and 4 lb Maxi-Seal; pumped pill into top of hole.

1530 - Mixed coarse-particle LCM pill consisting of ~200 gal of bentonite mud (50 lb Quick-Gel, viscosity 45 sec), 11 lb fine-grade ground rubber tires, 11 lb medium-grade ground rubber tires, 50 lb coarse-grade ground rubber tires, 11 lb fine-grade walnut shells, 11 lb medium-grade walnut shells, 11 lb coarse-grade walnut shells, and 4 lb Maxi-Seal; mixing tank placed on rig floor to gravity-feed pill into top of hole. Echo meter run, H<sub>2</sub>O level still ~ 380'.

1600 - Try to fill hole. No returns. Echo meter run, H<sub>2</sub>O level still ~ 380'.

1630 - Mixed LCM pill consisting of ~200 gal of bentonite mud (100 lb Quick-Gel), 2 bags of Maxi-Seal, and 1-1/2 bags of Magma Fiber; mixing tank placed on rig floor to gravity-feed pill into top of hole. About half flowed into the well through the hose, the other half had to be bucketed in.

1700 - Mixed LCM pill consisting of ~200 gal of bentonite mud (100 lb Quick-Gel), 2 bags of Maxi-Seal, and 1/3 bag of Magma Fiber; mixing tank placed on rig floor to gravity-feed pill into top of hole. Echo meter run, H<sub>2</sub>O level still ~ 380'

1715 - RIH with open ended CHD 101 rods.

1930 - CIP. Mixed 17 sacks of Portland and 100# of Cal-seal with 120 gal H<sub>2</sub>O. Lead with water and chased with 50 gal of water.

2100 - Out of hole. WOC 12 hours.

### **10 January 97**

0730 - Echo meter fluid level, no change. Try to fill hole.  
0800 - Hole will not fill. RIH with tri-cone to tag TOC  
0910 - Tag cement at 207'. Drill through and wash cement stringers to 417.7'. Top of good cement.  
0920 - Talk with BLM about L.C. problems. Got approval to core ahead blind to 600'. Will look for good rock for shoe below 550'. They want a minimum of 150 feet of cement above the casing shoe.  
1030 - Drill cement to 453'. POOH laying down CHD 101 and BHA.  
1150 - Out of hole. Shut down all equipment and listen to hole. Can hear running water.  
1200 - Start in hole with BSF coring tools. Bit still looks good.  
1730 - Core ahead to 466.8' and enter a void. Lower rods 7.5' and then wash to 478'.  
1830 - Core ahead to 479' and pull tube. Top of cave intrusive, bottom limestone.

### **11 January 97**

0100 - Core into another void at 488.8'.  
0500 - Core to 514.1' with no core recovery from 488.8 to 512.7'. Mostly void. Core to 514'.  
0630 - Pressured up after lowering tube. Try to free tube.  
0900 - Cannot free tube. POOH wet.  
1100 - Bit outside gage going. Pick up used SNL BSF 6-1/4" bit. RIH.  
1300 - Back on bottom. No problems getting in hole and very little cave.  
1600 - Ran MRT 521.7', 173° F.  
1900 - Cored to 527.7'. Having problems retrieving core. Cored 13.6' since trip and recovered 6.3'.  
2030 - Generator went down.  
2140 - Generator went down again. May be overheating. Reduce load.

### **12 January 97**

0100 - Cored to 539.7, 12' in 6 hours and recovered 3'. POOH to clear mismatch.  
0400 - Recover 5.5' of core in pipe.  
0500 - Back on bottom with no problems on trip.  
0700 - Core to 549.3 at shift change.  
0830 - Formation change, back in intrusive but more competent.  
0930 - Generator goes down again, overheating.  
1100 - Check water level after pulling core at 559', H<sub>2</sub>O at ~487'.  
1400 - Talk with Rich Estabrook about cement job on 4.5" casing. We think we can only lift casing cement just below the floor of lower cave, 517'. This will give us 80' of cement above the shoe. We will use 100% excess, 200 lineal feet of cement.  
2000 - TD for casing at 596.4'. Good rock. Start wiper trip.  
2230 - Pull back to 360' and then run back in.  
2300 - Run in hole with 10' BQ rod with a check valve on the bottom. Lower with the wire line to retrieve a water sample. DP at 480'.

### **13 January 97**

- 0100 - Retrieve another water sample with DP at TD. 0.3' of fill at bottom on trip. Start out of hole laying down BSF tools.
- 0500 - Out of hole. Nipple down mud riser.
- 0700 - Ready to run casing. Will run 13 joints of 4-1/2" T&C 11.6# N80 casing on bottom with a XO to HT casing then 1 ea. 5' HT and 4 ea. 10' HT and 3 ea. 5' HT on top to land with. Total length of casing string = 600.51'
- 0800 - Bottom joint has a shoe made from a 6-1/4" BSF bit with inside gage totally gone. It is welded to a collar.
- 0810 - Insert float in first collar, 42' above shoe. Bottom 5 couplings welded after makeup. A 6" reamer shell was welded on top of coupling #5 and built up with tape to form a bridge area for top job.
- 1130 - Casing in place. No problems getting it down other than weather. Thaw out equipment and get ready to mix cement.
- 1500 - Start mixing cement. Mixed 15 sacks of type H with 16 ea. 25# sacks of silica flour and 98 gal of H<sub>2</sub>O. Yield ~180 gal of 15.2# cement. Displace behind plug with cement in pump and 365 gal of water.
- 1630 - CIP.
- 1700 - Slowly dump 1 sack of coarse and medium rubber down the back side.
- 1730 - Check level on backside with echo meter ~ 380'. Mix accelerated plug, 9 sacks of Portland with 50 lb. of Cal-seal and 50 gal of water. Bucket down backside.
- 1805 - CIP.
- 1830 - Echo backside. Cement at ~ 330'
- 2000 - Shoe cement setting up. Warm sample hard. Backside accelerated plug firm. Get ready to mix type H and flour for top job.
- 2300 - CIP. Hole took calculated volume. Mixed and pumped 21 sacks of type H with 35% silica flour.

### **14 January 97**

- 0700 - Surface samples set. Clean up and tarp leftover cementing materials.
- 0800 - Get pump and hoses ready for pressure testing. Strip back 7" to ground level.
- 0905 - Try to pressure test casing, surface leak, repair.
- 0940 - Test casing to 500 psi. No leaks.
- 1000 - Back off casing joint at ground level and make up XO and wellhead. Baker lock both connections.
- 1030 - Start nipling up BOPE.
- 1800 - Start pressure test. Leak on choke valve at BOP and a leak on choke valve at pit.
- 1830 - Start witnessed BOP test. Blind rams and choke valves test OK.
- 1900 - Having problems getting test on pipe rams. Rams OK but leaking through core pump and bleed valve. Repair leaks.
- 2100 - Try pipe ram test again. Rams and surface equipment tests OK. Check valve leaking.
- 2200 - Complete BOPE tests. Russ Jentgen, BLM, witnessed and approved test.

2330 - Plumb in FMC core pump and tie back stack. Pick up HQ coring tools.

### **15 January 97**

0100 - Tag top of cement at 508'. Wash cement.

0130 - Start coring hard cement at 524'.

0430 - Core rubber plug at 552.6'. Core float.

0500 - Core 1 ft of new hole. Did not recover any cement below float. Float stuck in bit and cement core was ground.

0800 - Finish circulating out cement and mud. POOH for shoe test.

0900 - Fill hole and observe fluid level for 30 min.

1100 - Complete shoe test. Pressure well with blinds closed to 100 psig. Pressure dropped to 90 psi then built to 175 psi in 30 min. Russ Jentgen of the BLM witnessed and approved test.

1130 - RIH and core ahead.

1300 - Working on out-flow magmeter, which is not indicating the proper flow.

1734 - Drop CTL for core run from 638'. Start drilling at 1743.

1815 - CTL on surface. Stopped drilling at 1810 at a depth of 645'.

1900 - CTL indicates max temp 147°F, inclination 2.5°

### **16 January 97**

0700 - Cored all night. Ready to core ahead at 774' at shift change. Mud returns heating up. Max temp 118°F. Core very fractured resulting in short runs from 767'.

0900 - Change out kelly to CHD 101 rods. Chuck slipping on HQ.

1055 - Re-calibrate out-flow magmeter. Now working properly.

1230 - Back in better rock at 795'. Made 10 runs to drill 20'.

1900 - Coring ahead at shift change at 853'.

2300 - Work on wireline. Had a void for 0.6' at 872'.

### **17 January 97**

0700 - Coring ahead at 922' at shift change. 919' core on the ground.

0800 - Coring slow at 924'. POOH for bit change.

0900 - Bit polished. Pick up new bit and RIH. CTL in inner tube for trip in.

1040 - Retrieve core and CTL. Core from 924' to 930'.

1100 - CTL indicated 161°F on trip in and 149°F after drilling, inclination 2°.

1350 - Lost returns at 955'.

1405 - Check water level with echo meter after pulling tube. level ~ 378'. Prepare to slug with LCM pill.

1435 - Pill did not get returns. Prepare to drill blind.

1600 - Coring ahead with partial returns. Pumping 30 gpm of gel down the inside and ~ 15 gpm from the sump down the backside.

1900 - 986' and coring at shift change.

2200 - Slug hole with LCM. Got 25% back.

## **18 January 97**

- 0700 - Pulling core at 1078' at shift change. Getting ~ 20 % fluid returns. Running backside pump periodically.
- 1300 - Add fine walnut shells to mud system for LCM. Still getting ~ 20% returns.
- 1400 - Slug hole with paper. Not much help on returns.
- 1500 - Start cutting back the viscosity by decreasing the gel. Circulation pressure dropping and returns are up to 25%. Coring is good in solid limestone.
- 1900 - Pull tube at 1206' with CTL. Cored from 1199' to 1206.5'. Temp at start of run was 109°F and 127°F after with a tilt of 2°. Still losing about 75%.

## **19 January 97**

- 0700 - Pulling core at 1409' at shift change. Very good night. Returns holding at 33%.
- 1000 - Prepare CTL for core run at 1459'.
- 1100 - Pull tube at 1467' with CTL. Cored from 1459' to 1467'. Temp at start of run was 132°F and 150°F after with a tilt of 2.8°. Still losing about 75%.
- 1205 - Top drive transmission goes out at end of core run to 1496'.
- 1225 - Drop tube with CTL to monitor temps while changing transmission. CTL ~ 15' off bottom.
- 1250 - Stop circulation and work pipe.
- 1344 - Repair complete. Start pump.
- 1356 - Start drilling at 1496'.
- 1411 - Pull tube and CTL. Max temp 147°F.
- 1900 - 1543' at shift change.

## **20 January 97**

- 0230 - Standpipe pressures up. Bit gone at 1601'. POOH
- 0400 - Out of hole, service rig and make up 20' core barrel. Bit had outside gage gone.
- 0600 - Run in hole.
- 0730 - Stop trip in at 1000' for temperature log.
- 0745 - Start log. Have BOP drill and check BOP bolts. Function entire stack. Blinds checked at 0400 hours.
- 0915 - Logger rigged down. RIH. Temp tool sat down on cave at bit. Worked through. Log TD 1610', 10' deeper than hole. max temp 173°F
- 0930 - Check fluid level with echo meter. ~ 425'.
- 1000 - Back to coring at 1601'.
- 1200 - Pull 20' core at 1621'. Only 1 small piece of cave on top of core.
- 1900 - Coring ahead at shift change at 1710'.

## **21 January 97**

- 0700 - Pulling tube at shift change. Depth = 1870'. One 12' run last night. All others full.

- 0800 - Formation change at 1860'.
- 1030 - Pull tube at 1910' with CTL. Cored from 1890' to 1910'. Temp at start of run was 150°F and 172.6°F after with a tilt of 3.9°. Losing about 75%.
- 1040 - Start pumping down the backside. Total lost circulation.
- 1200 - Slug hole with paper at 1930' and circulate around.
- 1300 - Got some returns back but lost them when we started to drill. Core ahead blind while pumping down the backside.
- 1600 - Having problems with standpipe pressuring off. Inner tube may be too long.
- 1900 - Still having pressure problems at shift at 1981'. Shorten tube and try to core.
- 2230 - Still pressuring off. Bit may be gone. POOH to check tools at 1988'.

## **22 January 97**

- 0000 - Bit has lost outside gage. Pick up new #9 and shorten core barrel back to 10'. RIH
- 0200 - Slug hole with paper and circulate around.
- 0300 - Start coring ahead at 1988' with no returns. Pumping down the backside.
- 0440 - Start getting some returns with backside pumping at 1996'.
- 0700 - Pulling core at 2019' at shift change. Still getting returns while pumping down the backside.
- 0900 - Stop backside pump. Now running fine walnut shells in mud for L.C. Getting a trickle back.
- 1030 - Pull tube at 2057' with CTL. Cored from 2049' to 2057'. Temp at start of run was 120°F and 132°F after with a tilt of 3.9°. Losing about 95%. Rock is very broken and taking lots of fluid, probably resulting in much cooler BHT.
- 1900 - Coring at 2128' at shift change.

## **23 January 97**

- 0700 - Going in to pull tube at 2229'. No backside pumping and getting ~ 10 to 25% returns.
- 1700 - Pull tube at 2307' with CTL. Cored from 2299' to 2307'. Temp at start of run was 119°F and 144°F after with a tilt of 4.4°. Losing 100%.
- 1900 - Tube pulled at shift change at 2317'. Coring slow in hard broken rock.
- 2300 - Pressure up, bit gone at 2345'. POOH

## **24 January 97**

- 0100 - Out of hole. Inside gage gone. Pick up new #9 bit.
- 0130 - Rig up to temperature log.
- 0500 - Logger rigged down. Pick up CTL with trip extension and lower inner tube to 917'. RIH while recording depth and temperature. Sat on bottom for ~ 75 min. with wireline logging tool. Max temp 172.4°F and climbing.
- 0530 - Bit at 2335'. Pull CTL trip tool, max temp 168.7°F.
- 0600 - Start coring ahead 2345'.
- 0700 - Pulling tube at shift change at 2355'. Work on head drive lubricator pump.

- 1000 - Confirm 10' depth discrepancy between hole depth and wireline logs is due to a 10' mistake at 628'. 2 core runs logged at 628'. The hole is 10' deeper on all core logs and reports than indicated. This error occurred on Jan. 15 at ~ 1500 hours
- 1300 - Make up 10' mistake after core run to 2385'. Now 2395'.
- 1900 - Coring ahead at 2449' at shift change.
- 2030 - Drop some core and drill on mismatch at 2458'.
- 2230 - Mismatch shaken out. Core ahead at 2458'.

### **25 January 97**

- 0700 - Dropping tube to core ahead at 2529'. No longer pumping down the backside. Getting ~ 10 % returns.
- 1400 - Having problems pulling tube at 2568'. Drop release and pull wireline. Work pipe.
- 1440 - Back on inner tube with overshot.
- 1520 - Tube will not release. POOH
- 1530 - Pulling wet after 3 stands.
- 1800 - Out of hole. Tube sanded in. Sand came from contaminated mica LCM.
- 2000 - Dump mud tanks and clean.
- 2200 - Wash in and circulate sand out of hole.
- 2300 - Back on bottom coring at 2568'.

### **26 January 97**

- 0700 - Pulling core at 2649'. Not pumping down the backside. Hole taking ~ 24 gpm with 2 gpm coming back. Running fine walnut shells as LCM.
- 0830 - Start backside pump in 2<sup>nd</sup> gear.
- 1120 - Pull tube at 2683' with CTL. Cored from 2679' to 2683'. Short run, 4', blocked. Temp at start of run was 133°F and 143°F after with a tilt of 4.5°. Losing 100% returns.
- 1900 - Coring ahead at 2758' at shift change.

### **27 January 97**

- 0700 - Tube just down to core ahead at 2869' at shift change.
- 1100 - Pull tube at 2907' with CTL. Cored from 2899' to 2907'. Temp at start of run was 143°F and 158°F after with a inclination of 4.3°. Losing 85% returns.
- 1900 - 2978' at shift change.

### **28 January 97**

- 0330 - Bit cutting very slowly. POOH for bit change at 3017'.
- 0600 - Build up 20' trip tube for CTL
- 0700 - Out of hole at shift change. Make up 20' core barrel. Will run another series 8F bit.
- 0810 - Start in hole with CTL trip tube in 20' core barrel. CTL ~ 8" above bit.
- 1030 - Cannot circulate past tube. Pull trip tube and shorten both tubes.

- 1130 - Drilling cave. CTL indicates 176<sup>0</sup>F ~ 3' off bottom without circulation for 7 hours.
- 1200 - Coring ahead at 3017'
- 1530 - Still having pressure problems. POOH to remove lower landing ring installed to stabilize inner tube at coupling. Landing ring may fit too tightly to allow proper fluid circulation.
- 1800 - Out of hole. Remove center landing ring and install brass stabilizer. Re-adjust tube lengths. RIH
- 2030 - Back on bottom coring. No cave or tight spots.

### **29 January 97**

- 0400 - When trying to pull core at 3120' tube would not release. Work on stuck tube.
- 0600 - After breaking wireline, start trip out to clear tube and recover wireline.
- 0900 - Out of hole. Roll-pin on latch head came loose and locked tube in. Rebuild latch heads and weld pins. Pick up new #9 bit. Reamer shell has a cracked segment. Replace reamer shell.
- 1000 - Start back in hole. Stop at 664' and lower inner tube with CTL in drilling position. Will log temperatures on the way in and while coring ahead from 3120'.
- 1200 - Tag up at 2907'. Hole under gage. Ream to bottom.
- 1330 - Start coring ahead.
- 1530 - Finish coring to 3139'.
- 1600 - Pull tube at 3139' with CTL. Cored from 3120' to 3139'. Temp at start of run was 176<sup>0</sup>F and 185<sup>0</sup>F after with inclination of 2.8<sup>0</sup>. Losing 75% returns.
- 1900 - Coring ahead at 3177' at shift change.

### **30 January 97**

- 0700 - Core out of hole and dropping tube at 3310' at shift change.
- 1550 - Pull tube at 3390' with CTL. Cored from 3370' to 3390'. Temp at start of run was 166<sup>0</sup>F and 186<sup>0</sup>F after with inclination of 4.2<sup>0</sup>. Losing 75% returns.
- 1900 - Coring at shift change at 3427'.

### **31 January 97**

- 0700 - Coring at 3533' at shift change. Adding Tork-ease to mud to reduce high rotary torque.
- 0930 - Pressure up while coring at 3554'. Pull tube.
- 1030 - Pump another tube down but still pressuring up. Pull tube and POOH.
- 1040 - Tube stuck and wireline will not release. Break wireline and POOH.
- 1500 - Out of hole. Bit inside gage gone. Core lifter case split from over-size core. Replace landing ring. Will RIH to ~ 2000' and log. Pick up a new #2 bit
- 1630 - Rig up to log with wireline tool.
- 1900 - Finished logging and rigged down. Slip drilling line on rig. Max temperature 182<sup>0</sup>F and not rising.
- 2000 - Finished slipping line. Wait on orders from Army.

2030 - Start trip in hole from 2022'.  
2200 - On bottom coring ahead at 3554'.

### **01 February 97**

0700 - Coring at 3611' at shift change.  
0750 - Drop CTL to core at 3620'  
0830 - Blocked at 3623.5'  
0900 - Temp at start of short run was 167°F, 170°F after and 174°F while pulling with an inclination of 5°. Losing 75% returns.  
1100 - Drop tube with CTL to core from 3640'  
1315 - Pull tube at 3660' with CTL. Cored from 3640' to 3660'. Temp at start of run was 164°F and 183°F after with a inclination of 5.2°. Losing 65% returns.  
1700 - Finish temperature log of GDP 46-6. BHT of 192°F  
1900 - Coring ahead at 3712' at shift change.

### **02 February 97**

0700 - Coring ahead at shift change at 3788'.  
1300 - Pressure up, bit gone at 3815'. POOH.  
1630 - Carbide came out on outside gage protection and cut groove in face. Water-ways blocked. RIH to 565' to log.  
1700 - Rig up to temperature log. Close pipe rams and install stabbing valve with wireline pack off to log through. Rig crew securing site for one week drilling break. Will log well periodically during break to determine temperature gradient.

### **03 February 97**

0700 - Off load 2-3/8 EUE tubing from SNL for completion.  
1630 - Complete temperature log. Max temp 183.35°F. Hole is making fluid. After log fluid level went from 482.3' to 478.3' in 1 hour and 40 min.

### **04 February 97**

1010 - Check fluid level at 476.4'.  
1130 - Fluid level 476.2'. Shut down site for break.

### **11 February 97**

1500 - Finish temperature log. Max temp 183.54°F. Fluid level before log 471.5'.

### **12 February 97**

0700 - Crew back from break. Getting rig and equipment ready.  
0800 - Start back in hole from 567'.

0951 - Start pumping to condition mud. Got returns after 7 minutes.  
1200 - Pulled tube at 3817'. Two feet of new hole and very little cave. Maximum return temperature = 103°F.  
1900 - Coring at 3855' at shift change.

### **13 February 97**

0700 - Ready to core ahead at 3920'.  
0930 - RTM down for generator oil change  
1020 - RTM back on line. Wireline broke pulling tube at 3940'.  
1100 - Wire line repaired. Tube out.  
1520 - Bit went while coring with CTL in place at 3962'.  
1630 - Pull tube at 3962' with CTL. Cored from 3960' to 3962'. Temp at start of run was 177°F and 182°F after with a inclination of 4.8°. Losing 65% returns.  
1730 - Pump heavy mud around. 8.9#/gal, 100+ seconds viscosity.  
1840 - Got good returns. POOH laying down HQ drill pipe.  
2150 - Pump heavy mud at 2500'.  
2210 - Good mud returns. Continue POOH.

### **14 February 97**

0140 - Out of hole. Fill hole with heavy mud.  
0155 - Hole full. EOD for night tour.  
0700 - Start of day. Nipple down.  
0900 - BOP rigged down. Rig off payroll. Rig down all instrumentation and drilling equipment.  
1400 - Rig off sub-base  
1600 - Lower sub-base on truck and secure.  
1800 - Sub-base on new location.  
1900 - **End of drilling of GDP 45-5**

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### **15 February 97**

#### **Start of GDP 61-6. Wellhead Elevation ~ 4115'**

0700 - Start of day. Rigging up and cleaning equipment.  
1200 - Set rig on sub-base.

### **16 February 97**

0700 - Start of day. Rigging up and moving rest of supplies off of old location.  
1900 - EOD. Ready to drill but still need back-hoe to dig sump.

### **17 February 97**

0900 - Spud well with 12-1/4" tri-cone. Build up welded blade stabilizers to 6-1/4".  
1200 - Drill to 50' and POOH.  
1230 - Run 7" 23# K55 casing.  
1400 - Cement in place with tremie line.  
1500 - Top job.  
1600 - Cut off casing and weld flow nipple.  
1800 - Build flow line and install RFM.  
2120 - Start RFM calibrate.  
2145 - Finish RFM cal, start picking up tools.  
2230 - On bottom drilling ahead with 6-1/4" tri-cone.  
2240 - Lost returns.  
2330 - Pump walnut LCM, no returns. Shut down drilling until day light. No cement on site.

### **18 February 97**

0700 - Drill ahead blind in sand while pumping LCM in mud.  
0900 - POOH at 78' to slug hole.  
1200 - Still slugging hole. Get returns but it goes away on trip in. Bridged at casing shoe.  
1330 - Mix and pump through CHD 101 DP at 58': five sacks of Portland with soda ash. POOH.  
1600 - Try to fill hole. Will not fill. Water level ~ 10'. Cement and Cal-seal arrives on site.  
1700 - Mix and pump 14 sacks of Portland with 3 ea. 50# sacks of Cal-seal. DP at 58'.  
1730 - CIP. POOH. Cement on last 20' of pipe. WOC  
1900 - Cement fairly well set.  
2100 - Cement ready to drill. Unloading casing and filling sump at GDP 45-5 location.

### **19 February 97**

0030 - Fill hole, full returns. RIH with BHA.  
0100 - Tag TOC at 48'. Drill cement.  
0200 - Drill out of cement at 78' with full returns.  
0700 - Drilling ahead at 128' at shift change with full returns.  
1600 - ROP slows at 365', bit balling. POOH and pick up drag bit (ordered 6-1/4" but got 6-1/8").  
1700 - Back on bottom with 6-1/8" drag bit. ROP ~ 60'/hr. Still full returns.  
1900 - Drilling ahead at 444' at shift change. Hole is starting to boot.

### **20 February 97**

0500 - Rock getting hard and returns temperature up to 107<sup>0</sup>F. Dump mud to cool.  
0730 - Drilling very slow, rock getting harder. POOH at 611' to look at bit. This may be wiper trip for casing point.

- 0830 - Bit gone. Pick up 6" button bit and RIH. Filled hole while out. Fluid level dropping slowly.
- 0930 - Back on bottom drilling with full returns.
- 1215 - Drill to 630.2' in hard rock. Casing point for surface pipe. Circulate and condition hole for casing.
- 1300 - POOH laying down CHD 101 drill pipe.
- 1430 - Start running casing. Cut off joint 18.88' long on bottom. Insert float did not arrive from drilling contractor. Build plug-stop insert and install in second collar off bottom, 59' above shoe.
- 1700 - Finish running casing. Top of 8-round casing ~ 2' below ground level.
- 1730 - Circulate hole through casing. Have 15' of HT casing above 8 round to pump through.
- 1900 - Pick up a 43.5' joint of casing and replace top 41.85' joint.
- 2030 - Land casing.
- 2100 - Circulate hole with Beam pump. It took ~ 240 gal to fill hole. Will continue to circulate while mixing cement.
- 2130 - Start mixing cement in BLY mud tank. Will mix 78 sacks of Portland with 25% silica flour in 554 gal of H<sub>2</sub>O. Should yield 990 gal of 15#/gal cement. Will displace with 375 gal of H<sub>2</sub>O.
- 2230 - After mixing ~ 40 sacks, cement getting too thick. Air is being entrapped. Add ~ 100 gal of water and continued mixing.
- 2330 - With 56 ea. 94# sacks of Portland and 55 ea. 25# sacks of silica flour the cement was getting hot. Weight at 13.5#/gal. Could not mix any more product, too thick. Start pumping in hole. Pump at 40 gpm. Drop plug and displace.

## **21 February 97**

- 0010 - Pump pressure gradually rises to 130 psi then plug bumps at 280 psi. Shut in well and clean up. Maintained returns throughout most of job. Returns slowed at the end of displacement.
- 0300 - Change out rig mud pump for coring
- 0900 - Bleed pressure off inside of casing. Cement still green.
- 1000 - Nipple down out-flow equipment and prepare for top job.
- 1100 - Talk with BLM about cement job. Got approval for a top job and they are satisfied with the overall cement job.
- 1230 - CIP on top job. Mixed 14 lb/gal type H with 36% silica flour. Hole filled with ~ 70 gal of cement. This makes ~ 58 linear feet of cement. WOC and wait on smaller BOPE.
- 1700 - Receive BLM approval for use of small 4" annular preventer with master valve and mud cross for BOPE. The bag must be capable of closing and sealing without electric power. Also portable H<sub>2</sub>S monitoring equipment is approved. A minimum of 2 calibrated detectors must be on the rig floor at all times with alarms set at 10 ppm or less.
- 1900 - Night crew arrives on location.
- 2000 - Finish attempt to pressure test casing. RIH with coring tools.

- 2130 - Start washing cement.
- 2300 - Start coring contaminated cement at 353' cement.

## **22 February 97**

- 0500 - Core cement to 549' and POOH to test casing and nipple up stack.
- 0700 - Pressure test casing. Good test to 600 psi. Start reworking BOP equipment.
- 1100 - Pretest BOP. Lots of small leaks but BLY annular looks like it will test.
- 1130 - Call BLM to witness test.
- 1300 - Start BOP test. Still have surface equipment leaks.
- 1400 - Fixing leaks.
- 1600 - Complete BOPE testing. Tested master valve, annular, floor valve, standpipe valve, both kill valves and choke valves. Tests witnessed and approved by Russ Jentgen of the BLM.
- 1700 - Nipple up pitcher nipple and return flow line with 3" mag meter. Start in hole.
- 1730 - Tag cement at 549', kelly down will be 558.7'.
- 2000 - Core up plug just above casing shoe.
- 2030 - Core out 2' of new formation for shoe test. TD 633'. Circulate clear water.
- 2137 - Check water level at 5' 10" below floor valve.
- 2150 - Water level dropping. Refill hole and check for possible surface equipment leaks.
- 2200 - Pump into hole. Will not hold pressure. It appears shoe may be leaking. Formation looks tight. Discuss options with Rich Estabrook and Russ Jentgen of the BLM. Decide to set a cement plug and squeeze.
- 2230 - POOH to lay down core barrel and run in with open ended HQ core pipe.
- 2330 - Start mixing plug with DP at 628'. Will mix 13 sacks of type H with 12.5% silica flour and 96 gal of H<sub>2</sub>O.

## **23 February 97**

- 0100 - CIP. Pumped ~ 3.5 bbl of 15.1 lb/gal and chased with 160 gal of water.
- 0130 - Pulled out of plug ( 200') and circulated hole full with ~ 30 gal (DP displacement). POOH.
- 0150 - Out of hole. Run kelly in hole to just above master valve. Break circulation with ~ 60 gal, ~ 30 gal over DP displacement. Close annular preventer and squeeze. Hole took a small volume and pressured up to 200<sup>+</sup> psi. Shut master valve and left under pressure.
- 0200 - WOC for 10 hours then open master valve and tag. Slip drilling line and service rig.
- 0900 - Nipple down pitcher nipple and build 7" nipple for better flow.
- 1100 - Open wing valve. Hole has ~ 15 psi pressure. Bleed off pressure. Samples still green. WOC.
- 1300 - Ready to drill cement but rig down for pump repair.
- 1600 - Start in hole, tag cement stringers at 438'.
- 1800 - Coring good cement at 509'.
- 1900 - Coring cement at 529' at shift change.
- 2330 - Core out of cement and into formation at 633'.

2345 - Pull tube and fill hole for shoe test. Hole taking fluid slowly.

## **24 February 97**

0030 - Dump cement water and mix gel coring fluid. Core ahead while changing out mud.

0100 - After coring to kelly down at 638.7' re-test shoe.

0130 - Hole stayed full for 30 min static test. Tried .6 and .7 psi/ft shoe tests but pressure bled off slowly. Tests witnessed and static test approved by Russ Jentgen of the BLM.

0200 - Lost returns at 645' but got them back.

0240 - Lost total returns at 650'. Slug hole but could not get it back. Rock very broken.

0700 - Coring blind at 686' at shift change.

1330 - Run CTL on run from 749'.

1400 - Boart Longyear engineers on site to run new experimental latch heads. The heads have changeable flow restriction for lost circulation coring and a redesigned latch system. They also pump down and drop much faster.

1452 - Stop at 350' on trip out with core tube to measure inclination.

1500 - Pull tube at 757' with CTL. Cored from 749' to 757'. Temp at start of run was 64°F and 71°F after with a inclination of 2.2°. Losing 99% returns. Inclination at 350' was 1.5°.

1900 - Coring at 799' at shift change.

2115 - Trip for bit at 812'

2315 - Back on bottom coring with a series 9 HQ bit.

## **25 February 97**

0700 - Coring at 904' at shift change with 20% returns.

1200 - Temperature log GDP 45-5.

1730 - Run CTL on run from 1039'.

1800 - Pull tube at 1047' with CTL. Cored from 1039' to 1047'. Temp at start of run was 67°F and 94°F after with a inclination of 1.3°. Pumping down the backside.

1900 - Coring at 1059' at shift change.

## **26 February 97**

0700 - Cored all night except for 30 min. hydraulic repair. Tube out at 1196' at shift change.

1350 - Run CTL on short run from 1271'. Eight foot stick up.

1430 - Pull tube at 1279' with CTL. Cored from 1271' to 1279'. Temp at start of run was 97°F and 106°F after with a inclination of 2.7°. Pumping down the backside.

1700 - Fluid level dropping in hole in broken rock.

1900 - Coring short runs in very broken rock at 1322' at shift change.

## **27 February 97**

0700 - Pulling core at 1397' at shift change. Night shift made 16 tube trips for 76' of hole. Rock getting more competent. Water level deep. Hole is caving, lots of overpull on connections.

1230 - Run new insulated CTL on core run starting at 1446'.

1300 - Run blocked at 1449'. Pull tube.

1330 - Pull tube at 1449' with CTL. Cored from 1446' to 1449'. Temp at start of run was 93°F and 94°F after with a inclination of 1.7°. Pumping down the backside.

1430 - Run new CTL on core run starting at 1459'

1535 - Bit gone at 1467'. Trip with CTL still in place.

1600 - Pulling wet 80' off bottom. Pull CTL.

1645 - Pulling very tight at ~ 1350'. Work pipe.

1700 - Pull tube at ~ 1350' with CTL. Cored from 1459' to 1467'. Temp at start of run was 74°F and 88°F after with a inclination of 1.7°. At ~ 1350' CTL temperature was 108°F

1730 - RIH with new #9 bit and CTL in inner tube in drilling position.

1830 - Tag up at 1335'. Cannot work through. Pick up kelly and drill cave with CTL in tube. Max temp before washing 137°F.

1930 - Drill and wash cave to ~ 1400' then lower to 1450'.

2020 - Drill cave from 1440' to 1464' and block 3' off bottom.

2030 - Tube stuck but worked free. Pull tube with CTL, max temp 84°F after washing.

2130 - Start drilling new formation. Drilled 5' of cave.

## **28 February 97**

0700 - Coring slow at 1508' in bad rock at shift change.

0800 - Order casing to line hole.

1130 - Run echo meter after pulling tube at 1526'. H<sub>2</sub>O at ~ 512' KB

1900 - Starting core run at 1564' at shift change.

## **01 March 97**

0030 - Liner pipe arrives on location.

0130 - Try to pick tube at 1599'. Cannot latch on. POOH laying down drill pipe. Will run liner.

0500 - Out of hole. Bit about gone.

0700 - Strap liner pipe and make up 40' kelly. Pipe is N80 FL4S. It measures 3.539" OD and 2.913" ID. It is a flush joint with slightly tapered buttress threads. NQ bit will not fit. If this pipe is used as a liner the hole cannot be advanced. WOO.

0900 - Decision is made not to use this liner and run HQ to bottom with bit and reamer shell on bottom. Baker lock bottom connections.

1430 - Six inches off bottom with HQ bit. Had to drill cave at 1335', 1370' and 1440' then lower to bottom. Rig on standby. Rig up to temperature log.

1600 - Log to 1600', TD + 1' and leave tool on bottom and take 30 sec data all night. Crew moving surface-hole drilling equipment to new location.

## **02 March 97**

- 0700 - Temperature log out.
- 0900 - Temperature log in.
- 1000 - Log looks like temperature gradient increasing on bottom.
- 1400 - Decide to core ahead HQ and look for liner pipe.
- 1500 - Run temperature log in. Waiting on drilling crew.
- 1630 - Logging equipment rigged down. Bottom hole temperature 162<sup>0</sup>F and good gradient.
- 1730 - Start POOH. Rig drawworks not pulling. Pull 80' slow.
- 1900 - Change hydraulic filter, drawworks pulling fine. Not much drag.
- 2030 - Out of hole. Break down stubby barrel and make up standard core barrel
- 2100 - RIH with core barrel.
- 2300 - On bottom trying to core. Tube pressured up. This tube had the high pressure springs.

## **03 March 97**

- 0030 - Tube out. Drop tube with low pressure springs.
- 0300 - Having to pump 40 gpm to get 40 psi. Add spacer to low pressure springs and drop tube.
- 0400 - Coring with 18 gpm and 250 psi. Pressure goes up to 500 psi in shale.
- 0700 - Coring ahead at 1641' at shift change.
- 1900 - Coring ahead at 1707' at shift change.

## **04 March 97**

- 0700 - Pulling core at 1769'.
- 0830 - Drop tube with High Temperature CTL at 1778.7'
- 0900 - Start coring. Pumping down the backside in 3<sup>rd</sup> gear.
- 0941 - Stop coring at 1786.7'.
- 1010 - Pull tube. Temp at start of run was 71<sup>0</sup>F and 107.6<sup>0</sup>F after with inclination of 2.5<sup>0</sup>.
- 1900 - Pull core at 1858' at shift change.

## **05 March 97**

- 0700 - Coring at 1952' at shift change.
- 1015 - Drop tube with HTCTL at 1979'.
- 1130 - Pull tube at 1979' with CTL. Cored from 1979' to 1987'. Temp at start of run was 100<sup>0</sup>F and 117<sup>0</sup>F after with an inclination of 2.2<sup>0</sup>. Pumping down the backside.
- 1600 - POOH for logging at 2018'.
- 1730 - Out of hole. Bit looks like new but 4 segments broke pulling through cave.
- 1830 - Set on cave at 1335'. Drop tube and drill cave.
- 2054 - Finish drilling cave, go after tube. Drilled cave at 1335' to 1370', 1408', 1468' and TD.

2130 - Tube out. Rig on standby for logging.

### **06 March 97**

0430 - Rig up logger.

0730 - Logger rigged down. BHT is 167<sup>o</sup>F; this will be TD for well. POOH to 1200' and wipe for liner.

1200 - On bottom after wiper trip. Still lots of cave. Build bit sub for 2-3/8" EUE tubing.

1210 - Start out of hole laying down HQ drill pipe in 20's.

1600 - Out of hole. Not much drag coming out. Nipple down BOPE and strap 2-3/8" EUE completion tubing.

1700 - Make up BHA, HQ bit, welded XO, pup joint, float, tubing.

1900 - Running tubing at ~ 900' at shift change.

2130 - Tag up with tubing at 1336'. Drill with tubing.

2200 - Drill to about 1340'. Torque very high and erratic. Try to pull back, pipe stuck.

2300 - Work stuck pipe. Drill out and pull back 70' and pipe comes free. POOH laying down.

### **07 March 97**

0130 - Out of hole with tubing. Bit has 5 segments pulled off. Lots of damage to BHA and bottom joint of tubing. Prepare to pick up flush joint N80 FL4S liner pipe. BHA is a used HQ bit on a machined XO. Bit, XO, and bottom joint are also welded.

0230 - Strap liner pipe and start to run in hole.

0700 - Liner at 1303' at shift change. Make up 40' kelly and prepare to drill in.

0730 - Tag up at 1335' and start drilling in.

1010 - Set down on cave on bottom at 2016'. Get ready to drill cave.

1100 - Turn hole over to 50 bbl heavy mud.

1130 - Displace inside liner with 550 gal of water and burn bit in. Fill hole.

1200 - Cut off tubing at ground level and install wellhead over tubing. Fill hole. Start rig down.

1600 - Rig off sub-base.

1900 - EOD, **End of drilling of GDP 61-6**

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### **08 March 97**

**Start of GDP 51-8. Wellhead Elevation ~ 4110'**

0700 - Load out sub-base

0900 - Sub-base over hole in cement pad at new paved location.

1900 - EOD. Rig set up and almost ready to drill. Most equipment moved off old location and sump is filled in.

### **09 March 97**

- 0700 - Finish rigging up and moving equipment
- 1000 - 7" casing cemented 3' below ground level in existing cement cellar. Bottom of cellar has cement floor with re-bar. Will core drill 6-1/4" BSF through floor.
- 1300 - Return flow line nipples up and rig ready to drill. Kelly hose or surface equipment plugged. Repair.
- 1400 - Repair blockage. Remove core barrel for flow calibrate and pump through kelly.
- 1500 - Complete RFM calibration. Start drilling.
- 1515 - Core through cement floor with no problems. Core and wash kelly down. Pull out core barrel and pick up new 6-1/4" drag bit and collar.
- 1900 - Drilling ahead at shift change with full returns at 101'. Mainline hoist very slow due to hydraulic problems.
- 2230 - Start having L.C. problems at 188'. Hole is booting.
- 2330 - Seven feet of cave on connection at 198'. 30 to 50% L.C.

### **10 March 97**

- 0700 - Drilling at 292' at shift change. Hole booting all night but able to maintain full returns when circulation pressure is down. Mainline still very slow. Takes 12 minutes to make a connection. Drain filters.
- 1000 - At 338' started to lose 50+ % returns. Just out of hard clay.
- 1115 - Lost total returns at 355'. Slug hole with LCM. Got some back but then lost them all.
- 1300 - Drill blind to 395' and POOH for cement plug.
- 1440 - Back in hole with OEDP at 392'. H<sub>2</sub>O level with echo meter = 262', 135' of fluid in hole
- 1515 - Start to mix plug #1. Mix 24 sacks of Portland with 2 sacks of Cal-seal. ~ 250 gal. yield. Chase with water.
- 1600 - CIP. POOH
- 1630 - Out of hole. WOC
- 2200 - RIH to 200' and fill hole. Hole filled with ~ 500 gal. Cement still too green to drill.

### **11 March 97**

- 0030 - Start reaming and washing cement from 265'
- 0200 - Lost returns at 380' while drilling cement stringers. Drill blind to 384'.
- 0230 - POOH.
- 0300 - RIH with open ended drill pipe to 378' and prepare to mix cement plug #2.
- 0530 - CIP. Mixed and pumped 25 sacks of Portland and 3 sacks of Cal-seal.
- 0700 - WOC. Decide to start break after draining pumps, lines, etc. and securing equipment. Not enough time to wait and drill on plug. Hard plug will probably kick bit out of existing hole when drilling after break, but not many other options. Permit requires hole to be plugged or secured by BOP.
- 1100 - Rig on break until 3/19 at 0700.
- 1400 - Finish temperature logging GDP 61-6.

## **19 March 97**

0700 - Rig crew back from break. Start up equipment and assemble pumps and hoses.  
0830 - Start in hole with drilling assembly.  
0900 - Set down on cement at 227'. Start drilling and washing.  
1000 - Hard plug has kicked bit out of previous path. Making new hole.  
1440 - Lost all returns at ~ 352', just like last time.  
1600 - POOH at 396.4' for cement plug #3.  
1630 - RIH with open ended CHD 101 drill pipe to 393'.  
1700 - Rig down for fan repairs.  
1730 - Mix cement plug #3. 21 sacks of Portland and 3 ea. 50# sacks of Cal-seal.  
1900 - CIP after many problems mixing and with Beam pump. Light plug.  
1930 - Out of hole. WOC.

## **20 March 97**

0030 - RIH and fill at 305'.  
0100 - Wash to 336'. Drill cement.  
0130 - Drill good cement at 340'.  
0200 - Lost returns at 364'. Drill blind to 376' and POOH.  
0300 - RIH with OEDP to 374' and mix and pump cement plug #4. 21 sacks of Portland with 3 ea. 50# sacks of Cal-seal.  
0430 - CIP, POOH  
0500 - WOC.  
1045 - RIH with BHA  
1100 - Rig down, drawworks hydraulics.  
1145 - Hydraulics working again but problem not found, intermittent problem.  
1200 - Wash in from 234'.  
1215 - Generator goes down. Overheating. Restart and reduce load.  
1300 - Lost returns at 363'. Mix LCM and drill blind.  
1440 - Drill blind to 413' and then lost drawworks hydraulics again.  
1600 - Unable to repair hydraulics. POOH with chuck laying down drill pipe.  
1715 - Out of hole. Wait on new hydraulic motor for drawworks.

## **21 March 97**

0130 - New hydraulic motor installed on drawworks. Still not working properly but better.  
0230 - Start washing in with no returns at 285'.  
0330 - Got returns momentarily.  
0530 - Drill ahead blind to 438'. Rock getting very hard. POOH for rock bit.  
0700 - Start drilling ahead at 438'.  
1100 - Wiper trip, torque getting high.  
1630 - Drilling getting slow, hard rock at 510'.  
1830 - Bit plugged at 529'. POOH

2000 - Work on hydraulic leak.  
2100 - Finish repair. RIH  
2215 - RIH and drill cave at ~ 200'. Get returns but lost them at ~ 360'.

### **22 March 97**

0015 - Finish drilling 30' of cave to 529'. POOH  
0200 - Hit cave at ~ 210' on trip in, get returns and lose them at ~ 360'  
0410 - Drill to TD. ~ 25' of cave. POOH for another wiper trip.  
0510 - Hit cave at ~ 210' and drill. No returns.  
0600 - Drill 9' of cave to TD. POOH  
0700 - Start in for another wiper trip at shift change.  
1025 - POOH at 275'. Drilling a new hole. Pick up used 6" drag bit and RIH.  
1330 - At 321' started getting full returns while re-drilling hole.  
1430 - Drilling at 337' and lost returns.  
1730 - POOH at 425' to pick up button bit.  
1830 - Back on bottom with 1 ft of fill.  
1900 - Drilling at 435' at shift change.

### **23 March 97**

0200 - TD for casing at 529'. POOH  
0300 - Back in at 230' and drilling on bridge.  
0500 - Drill ~ 3' of fill on bottom. POOH  
0530 - Strap casing and get ready to run. Casing is J55 4-1/2" T&C 10.5 lb/ft  
0700 - Cut bottom joint into saw tooth.  
0730 - Run insert float in first collar. Make up and weld.  
0830 - Set down at ~ 230'. Could not work through. Rig up to wash.  
1100 - Can not drill or wash casing in. Pull casing and lay down.  
1130 - Out of hole. Shut down for hydraulic trouble shooting.  
1400 - Hydraulic pump for drawworks failed while trying to test system.  
1500 - Order new pump. It may arrive late tomorrow. Shut down.

### **24 March 97**

0900 - Crew cleaning up. Pump will be in at 2000 tonight.  
2300 - Install new pump. Bearing broke on function case. Shut down until new bearing is found.

### **25 March 97**

0700 - Log GDP 61-6 while waiting on parts.  
1030 - New bearing and crew arrive.  
1415 - Pick up BHA and RIH.  
1445 - Start drilling in at 220'.

1520 - Got returns back at 248'. Stop and connect flow line.  
1550 - Flow line was dropped and calibration changed on RFM. Punched in 350 GPM offset.  
1600 - Broke water swivel connection, repair.  
1650 - Water swivel repaired. Lost returns.  
1700 - Washing in old hole.  
1815 - On bottom and circulating. Five feet of cave.  
1820 - POOH  
1845 - Out of hole draining pumps, no night shift.

### **26 March 97**

0700 - Assemble pumps and warm up rig.  
0720 - RIH and tagged up at 298'. Start washing and reaming in and got returns.  
0910 - On bottom. Some bridges but very little cave. Circulate heavy mud with LCM.  
1000 - Out of hole. Lay down BHA.  
1030 - Start running casing with wash over shoe on bottom. Collar made into saw tooth with Cut Right built up to 5-5/8".  
1200 - Set down at ~ 260'. Wash and drill in to 330'.  
1500 - Lower casing to 5' off bottom and wash in. Rig up to cement  
1615 - Start mixing cement. Will mix 45 sacks of Portland with 25% silica flour. Displace with 320 gal H<sub>2</sub>O.  
1815 - CIP. Mixed 39 sacks with 37 ea. 25 # sack of silica flour. Cement getting too thick. Weight 14.8 lb/gal. No returns.  
1900 - WOC, no night shift.

### **27 March 97**

0700 - Pressure test casing. It looks good. Nipple down flow line and strip back 7" casing.  
0800 - Rig up to temperature log.  
0900 - Log sat down at 371'. TOC in annulus ~ 325'  
1000 - Mix and pump top plug of 20 sacks of Portland with 3 sacks of Cal-seal.  
1030 - Temperature log to find TOC.  
1300 - Log again. After log, mix top job #2.  
1415 - Top job #2 in place. Mixed 25 sacks Portland with 4 Cal-seal.  
1700 - Nipple up BOPE  
1800 - Pretest BOP and repair leaks. Call BLM for test.  
2110 - Complete BOPE testing. Tested master valve, annular, floor valve, standpipe valve, both kill valves and choke valves. Tests witnessed and approved by Russ Jentgen of the BLM.  
2200 - Mix and pump top job #3. 4 sacks of 50# Cal-Seal with 25 sacks of Portland.  
2300 - CIP. Run CHD 101 in hole and POOH laying down.

### **28 March 97**

0130 - Mix and pump top job #4. 15 sacks of Portland with 3 Cal-Seal. WOC.  
0600 - RIH with HQ coring tools and start washing cement at 350'.  
0700 - Washing and drilling cement at 398' at shift change.  
0930 - Drill rubber plug right at float.  
1015 - Drill float and good cement below float  
1100 - Pull tube at 529' with 6" of new hole. Change out mud.  
1236 - Fill hole for shoe test. Mud weight 8.4 lb/gal. During shoe test mix and pump top job #5, 25 sacks of Portland with 4 sacks of Cal-Seal.  
1310 - Hole stayed full.  
1314 - Connect up to kelly and lower rods. Close bag on kelly and pressure up to 86 psi with kill pump. Shut in for .6 psi/ft shoe test.  
1320 - CIP, annulus did not fill.  
1342 - Pressure up to 140 psi for 0.7 psi/ft. Hold for 30 min.  
1355 - Mix and pour 40 gal hot cement plug.  
1415 - Complete shoe tests. All tests passed. Tests witnessed and approved by Russ Jentgen of the BLM.  
1530 - Start coring at 532'  
1610 - Pull core at 539'. Mix and pump top job #6. Same 25 sacks of Portland with 4 sacks of Cal-seal.  
1700 - CIP. Backside took ~ 25 gallons and filled level holding.  
1820 - Back to coring.  
1900 - Coring at 547' at shift change.

### **29 March 97**

0320 - Slipped core at 638'. Lost 1.2'  
0620 - Started losing returns at 662'.  
0700 - Pulling core at 669' at shift change with partial L.C.  
0720 - Total lost circulation at 670'.  
0805 - Rig over-heated. Shut down for repair. Coring at 677'.  
1000 - Fan bearing gone; try to find parts.  
1400 - Give up on finding parts until Monday, 3/31. Send day tour home.  
1600 - Night tour arrives. They will strap 2-3/8" EUE tubing for packer to be run in GDP 45-5.  
2000 - Night tour goes home. Rig waiting on parts.

### **30 March 97**

0700 - Rig up to log GDP 45-5. Final log before pack off.  
0830 - Rig crew arrives to work on engine. Will try to use electric centrifugal pump to pump water from frac tank to engine and back to frac tank. Bypass engine water pump and radiator.  
1200 - Rework complete. Pull tube and slug hole. Got some back but lost them all when coring. Pumping down the backside in third gear.  
1230 - Start coring ahead blind.

- 1442 - Drop tube with HTCTL for core run starting at 686.3'. Total lost circulation.
- 1614 - Pull tube at 695' with CTL. Cored from 686' to 695'. Temp at start of run was 77°F and 79°F after with an inclination of 1.1°. Pumping down the backside.
- 1900 - Coring at shift change at 709'.
- 2300 - Down for hydraulic hose repair for 30 minutes.

### **31 March 97**

- 0515 - Generator goes down. Out of fuel and battery dead while pulling tube at 776'. Can't run rig without generator because electric pump needed to circulate engine coolant.
- 0630 - Generator back up.
- 0850 - Generator down again. May still have air in fuel.
- 0915 - Generator back on line and drilling. Need new alternator for generator.
- 1200 - Fluid level rising in hole. Coring good.
- 1500 - Dressing out packer for GDP 45-5
- 1900 - Drop tube with HTCTL for core run starting at 889' at shift change. Total lost circulation.
- 1930 - Pull tube at 897' with CTL. Cored from 889' to 897'. Temp at start of run was 89°F and 102°F after with an inclination of 0.9°. Pumping down the backside.

### **1 April 97**

- 0700 - Coring at 1026' at shift change.
- 1210 - Drop tube with HTCTL for core run starting at 1112'. Total lost circulation.
- 1245 - Pull tube at 1119' with CTL. Cored from 1112' to 1119'. Temp at start of run was 88°F and 102°F after with an inclination of 0.8°. Pumping down the backside.
- 1900 - Coring at shift change at 1179'.

### **2 April 97**

- 0700 - Pulling tube at 1309' at shift change.
- 1345 - Shut down rig to replace water pump and fan bearings. Will disconnect electric centrifugal water pump and re-install radiator.
- 1530 - Began RIH with packer on 2-3/8" EUE tubing in well 45-5. Plan is to pack off zone below ~ 3000' and observe any temperature change over a time span of days to weeks. First ~ 800' of tubing run with Smeal derrick truck, but string weight is too much for additional progress. Rig down Smeal with pipe hung in slips on wellhead.
- 1920 - Rig back up and coring at 1409'.
- 2008 - Drop tube with CTL.
- 2145 - Pull tube at 1427' with CTL. Cored from 1419' to 1427'. CTL tool did not record data. Ready low temp CTL.
- 2206 - Drop tube with CTL at 1437'.
- 2315 - Pull tube with CTL at 1446'. No data.

### 3 April 97

- 0030 - Bit gone at 1454'. POOH, outside gage gone.
- 0400 - Ream 3' of under-gage hole to bottom and core ahead with new HQ series 9 bit.
- 0700 - Pulling tube at 1475' at shift change.
- 0730 - Tube would not go down. Pull back 480' to clear core in drill pipe.
- 0815 - Drop tube with HTCTL at 1475' after short trip.
- 0858 - Pull tube at 1485' with CTL. Cored from 1485' to 1485'. Temp at start of run was 112°F and 130°F after with an inclination of 1.2°. Pumping down the backside.
- 0900 - [Packer at 45-5] Resume running tubing and packer into 45-5, using Army crane.
- 1300 - Rock blocky resulting in 5' core runs.
- 1430 - [Packer] Complete running packer on 93 joints of EUE tubing into 45-5. Center of packer is at 3006' KB. Inflate packer to 450 psi (surface reading) with Beam pump and water truck from rig. Pull up 5,000 lb (over string weight) with crane to check packer inflation; string does not move, so packer is inflated.
- 1600 - [Packer] RIH with overshot on logging truck cable to pick up standing valve from packer. (Standing valve allows packer to inflate, but must be removed for logging tool to pass below packer.) Overshot goes to bottom (~3,000') but does not retrieve valve. Bottom of overshot is full of a mixture of scale, grease, and other assorted foreign material; this is holding the jaws which should latch on the standing valve mostly open. RIH again with overshot and hit a hard bridge at 1768'; POOH with cable, and again find overshot full of gunk but no valve. Stop fishing for night.
- 1900 - Coring at 1589' at shift change.

### 4 April 97

- 0700 - Pulling core at 1699' at shift change.
- 0900 - [Packer at 45-5] Cut off box-end of AQ rod for shroud and weld it around the standing valve overshot. If valve is misaligned in hole, this may straighten it out. Also add slide hammer from drill rig's wireline. RIH (using logging truck) with modified overshot and slide hammer; can't move obstruction and can't pick it up.
- 0920 - Pull tube at 1717' with CTL. Cored from 1709' to 1717'. Temp at start of run was 70°F and 109°F after with an inclination of 1.2°. Pumping down the backside. Core looks like it's taking lots of fluid.
- 1500 - [Packer] Pick up AQ rod that was cut off for shroud part and attach Smeal sand line with welded bolt to cut end. Pick up two more joints AQ and RIH with almost 30' of rod. Tag obstruction, pull up ~200' and let rods free-fall. Obstruction moves at least 50'. POOH with Smeal and RIH with overshot on logging wireline. Tag obstruction at 1850'; can't move it or pick it. POOH with logging line and run back in with 4 rods on sand line. Hit fish again and move it at least to the end of Smeal's line (~1950'). RIH with overshot on logging cable; hit obstruction at ~2050' and move it to 2540'. Won't go past that point and still can't pick it up.

1800 - [Packer] Stop fishing for night.  
1900 - Starting core run at 1806' at shift change.

### **5 April 97**

0500 - Drilling slowing and pressure coming up. Bit may be going.  
0700 - Trying to core at 1892'. Bit may be gone.  
0715 - Start out of hole for bit change.  
1000 - Rig up for temperature log. Bit at 1002' and going in.  
1200 - Rig down logging truck. Max BHT after 1 hour was 172°F. Horner plot indicated stabilized BHT of 183°F.  
1400 - [Packer] Spooled an additional 1200' of ¼" wireline on Smeal sand line drum. Picked up 30' of AQ rods and try to work fish down. Sat down on standing valve at 2450' but could not move. Make a grapple on the bottom of an AQ rod and add to assembly, making 40' tool. Hammer on fish ~ 20 times before fish moved. Chased all the way to the standing valve seat on the bottom of the packer at 3000'. Hammered grapple on valve several times. POOH. Standing valve locked in grapple. Fish out of hole at 1800 hours.  
1800 - Drilling very slow in chert. Bit polished. Try to strip with weight, no luck. Pull tube and drop 3 nuts to strip bit.  
1900 - Coring at shift change at 1911'.

### **6 April 97**

0600 - Core slow all night. Nut bit 7 times.  
0700 - Adjusted RTM clock for daylight savings time. Coring at shift change at 1950'.  
1200 - [Packer] Rig up logging truck on hole and run temperature log. Tool drops through packer at 3007' with no problems. Sat down on heavy mud at 3430'. Pull out of hole and check water levels. Water level on the inside is 277.7' and ~ 460' on the backside. Packer is holding and open for logging.  
1655 - Drop core tube with CTL at 2008'.  
1738 - Pull tube at 2017' with CTL. Cored from 1708' to 2017'. Temp at start of run was 110°F and 142°F after with an inclination of 1.6°. Pumping down the backside.  
1900 - Coring at 2028' at shift change.

### **7 April 97**

0700 - Dropping tube to core ahead at 2119' at shift change. Coring broken cherty dolomite all night resulting in short runs.  
1200 - Down hole vibrations causing problems. Slow rotation and hold back more weight.  
1900 - Start core run at 2178' at shift change.  
2000 - Bit not drilling. POOH  
2200 - Out of hole. Bit inside gage gone and reamer shell cracked. Service rig while out of hole.  
2300 - Pick up series 8f bit and used reamer shell. RIH. Tight hole from 1170' to 1300'.

## **8 April 97**

- 0100 - On bottom ready to core. Had to ream from 1938' to 2178'.
- 0700 - Starting core run at 2203' at shift change. Coring in dolomite loaded with chert.
- 1100 - Finally get out of cherty dolomite. ROP improving.
- 1545 - Drop core tube with CTL at 2274'.
- 1640 - Pull tube at 2281' with CTL. Cored from 2274' to 2281'. Temp at start of run was 109°F and 141°F after with an inclination of 1.6°. Pumping down the backside.
- 1900 - Coring at 2300' at shift change.

## **9 April 97**

- 0700 - Cored all night with 10' runs. Coring at 2412' at shift change.
- 1010 - Drop core tube with CTL at 2448'.
- 1033 - Pull tube at 2448' with CTL. Cored from 2448' to 2457'. Temp at start of run was 105°F and 143°F after with an inclination of 1.3°. Pumping down the backside.
- 1900 - Coring at 2510' at shift change. Back in chert.

## **10 April 97**

- 0700 - Trying to release stuck inner tube at shift change at 2573'.
- 0800 - Give up on stuck tube. POOH. This will be TD unless temperature logs indicate a high temperature gradient.
- 0930 - Out of hole. Rig up to temperature log.
- 1200 - Rig down logging truck. Max BHT after 1 hour was 176°F. Horner plot indicated stabilized BHT of 183°F. Rig up Southwest Geophysical logging truck for electric and sonic logs.
- 1630 - Rig down logger. RIH with HQ for wiper run. Will come out laying down.
- 1800 - On bottom. Circulate heavy mud.
- 1930 - POOH laying down HQ core pipe.

## **11 April 97**

- 0030 - Out of hole with HQ. Nipple down BOPE and install completion well head.
- 0100 - Start picking up 2-3/8 EUE 4.7 #/ft liner.
- 0845 - Hang liner in well head. Ran 76 joints of 2-3/8" with a 3' float and 5' chopped pup joint on bottom. Total length of EUE string = 2466.6'. Top of EUE crossed over to HQ with a 1' long welded XO. 13 sticks of 10' HQ on top. Total liner length 2557.6'
- 0945 - Finish pumping 350 gal of clear water in liner. Rig up logger for gamma and neutron logs.
- 1200 - Rig down logger. Release rig.

## **APPENDIX B**

This appendix contains daily reports filed by on-site Sandia personnel during the drilling operations. These incorporate information from the drilling contractor's daily reports, from mud engineering reports, from geological core logs prepared by New Mexico State University personnel, and from lithology reports prepared by James Witcher, New Mexico State University. These reports are complementary to the field notes in Appendix A.

**DAILY DRILLING REPORT - 9 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 0 | Depth today - 0' | Hole advance last 24 hr - 0' | Core recovered - N/A '  
Last casing - N/A

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**BITS** -- Now drilling x" hole | Rotary speed - x rpm; WOB - xK lb; Rate of Penetration - avg. xx ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
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**Drilling Assembly:** N/A

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - N/A

Flow rate - x gal/min | Pressure - x psi | Returns temp - x°F max |  
Wt - 8.5 lb/gal | Vis - x sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - xx

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**Lithology of past day's drilling:**

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**Summary of events last 24 hours:**

Continued rigging up. Raised rig on sub-structure. Positioning mud pits and pumps. Spot parts van and frac tank; move generators into position. Continue wiring up Sandia instrumentation. Quit for day at 1800; not enough crew and no lights to work night tour.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 10 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 1 | Depth today - 40' | Hole advance last 24 hr - 40' | Core recovered - N/A '  
Last casing - N/A

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**BITS** -- Now drilling 12-1/4" hole | Rotary speed - x rpm; WOB - xK lb; ROP - avg. 15-20 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1	12-1/4" milled tooth	11			

**Drilling Assembly:** bit, bit sub, 3 ea x-overs, CHD101 drillpipe

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water

Flow rate - x gal/min | Pressure - x psi | Returns temp - x<sup>o</sup>F max |  
Wt - 8.5 lb/gal | Vis - x sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - xx

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**Lithology of past day's drilling:**

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**Summary of events last 24 hours:**

Completed rigging up. Picked up 12-1/4" bit and spudded hole. Bit wanted to wander, causing hole to be deviated; used chains to straighten up drill string and drilled slowly, ending with vertical hole. Pulled drillstring up and shut down for night. When crew returned in the morning, water level had dropped considerably and washouts were visible in wellbore wall. Approximately 15' of fill in hole. Mixed heavy mud and resumed drilling.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 11 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 2 | Depth today - 59' | Hole advance last 24 hr - 19' | Core recovered - N/A '  
Last casing - 7", 23# casing @ 59'

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**BITS** -- Now drilling 12-1/4" hole | Rotary speed - x rpm; WOB - xK lb; ROP - avg. 15 ft/hr

<b>Bit No.</b>	<b>Type</b>	<b>Depth in, KB</b>	<b>Depth out, KB</b>	<b>Footage</b>	<b>Hours</b>
1	12-1/4" milled tooth	11	59	48	5

**Drilling Assembly:** bit, bit sub, 3 ea xover, CHD101 drill pipe

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**Surveys:**                      **Depth**                      **Inclination**                      **Direction**                      **Bottom-hole Temperature**

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**Drilling fluid** - water, bentonite

Flow rate - x gal/min | Pressure - x psi | Returns temp - x<sup>o</sup>F max |  
Wt - 8.5 lb/gal | Vis - x sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - xx

-----  
**Lithology of past day's drilling:**

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**Summary of events last 24 hours:**

Drilled to 59' KB, ran 2 joints of 7" casing and cemented with tremie line down outside. Pumped 32 sacks Portland cement; cement fell back and added 6 sacks as top job. Completed installation of Sandia flow instrumentation.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 12 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 3 | Depth today - 237' | Hole advance last 24 hr - 178' | Core recovered - N/A '  
Last casing - 7", 23# casing @ 59'

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**BITS** -- Now drilling 6" hole | Rotary speed - 144 rpm; WOB - xK lb; ROP - avg. 30 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1	12-1/4" milled tooth	11	59	48	5
2	6" Varel milled tooth	59			

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xover, CHD101

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water, bentonite, paper

Flow rate - 125 gal/min | Pressure - 190 psi | Returns temp - 69°F max |  
Wt - 8.7 lb/gal | Vis - 34 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - 35%

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**Lithology of past day's drilling:**

50' to 198' Mostly light brown clay, siltstone and minor reddish sand.  
198' to 220' Fine to medium sand? Partial returns

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**Summary of events last 24 hours:**

Made up BHA and tagged cement at 54'. Calibrated flow instrumentation and drilled ahead to 111'. POOH to check tools for balling. Cleaned tools and continued drilling ahead. Lost total returns at 197'. Worked pipe and pumped LCM. Drilled ahead with partial returns to 237'. POOH to spot cement plug. RIH with OEDP and pumped 100' cement plug. CIP at 1930. No night shift

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 13 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 4 | Depth today - 296' | Hole advance last 24 hr - 59' | Core recovered - N/A '  
Last casing - 7", 23# casing @ 59'

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**BITS** -- Now drilling 6" hole | Rotary speed - 144 rpm; WOB - xK lb; ROP - avg. 30 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1	12-1/4" milled tooth	11	59	48	5
2	6" Varel milled tooth	59	237	178	11
3	6" drag	237			

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xover, CHD101

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water, bentonite, paper

Flow rate - 125 gal/min | Pressure - 200 psi | Returns temp - 69°F max |  
Wt - 8.7 lb/gal | Vis - 34 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - 35%

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**Lithology of past day's drilling:**

240' to 280' Clay, (clayey sand?, minor sand?) lost circulation zones with only partial returns of clay.

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**Summary of events last 24 hours:**

Ran back in hole with BHA to 80' and washed to top of cement plug at 170'. Drilled cement to 198' then out of cement and drilled fill. POOH to clean stabilizers and replace bit with three-wing drag bit. Drilled to 296' with partial returns. POOH to spot cement plug. RIH with OEDP and pumped 100' cement plug. CIP at 1900. No night shift

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 14 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 5 | Depth today - 454' | Hole advance last 24 hr - 158' | Core recovered - N/A '  
Last casing - 7", 23# casing @ 59'

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**BITS** -- Now drilling 6" hole | Rotary speed - 144 rpm; WOB - xK lb; ROP - avg. 30 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1	12-1/4" milled tooth	11	59	48	5
2	6" Varel milled tooth	59	237	178	11
3	6" drag	237			

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xover, CHD101

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water, bentonite, paper

Flow rate - 125 gal/min | Pressure - 200 psi | Returns temp - 69°F max |  
Wt - 8.7 lb/gal | Vis - 34 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - 35%

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**Lithology of past day's drilling:**

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**Summary of events last 24 hours:**

Tag cement at 207', start drilling new formation @ 297'. Drill to 454'; hole has mostly full returns, with occasional booting. Work pipe to clean hole. Condition mud and POOH to check tools. No night shift

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 15 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 6 | Depth today - 611' | Hole advance last 24 hr - 157' | Core recovered - N/A '  
Last casing - 7", 23# casing @ 59'

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**BITS** -- Now drilling 6" hole | Rotary speed - 144 rpm; WOB - xK lb; ROP - avg. 30 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1	12-1/4" milled tooth	11	59	48	5
2	6" Varel milled tooth	59	237	178	11
3	6" drag	237			

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xover, CHD101

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water, bentonite, paper

Flow rate - 125 gal/min | Pressure - 240 psi | Returns temp - 95°F max |  
Wt - 8.6 lb/gal | Vis - 34 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 9.5  
Lost circulation - Occasional

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**Lithology of past day's drilling:**

- 450-510 Red brown clay, silt, and clayey very fine sand.
  - 510-540 Dark brown clay with increased induration. Samples are small even-sized chips.
  - 550-580 Dark brown silty clay and clay, moderately indurated, even sized small chips. About 15 percent cuttings at 560 feet are dark gray-green and altered (?) clay and silty clay.
- 

**Summary of events last 24 hours:**

Ran back in hole with BHA to TD and drilled ahead. Very little fill. Still having occasional losses that appear to be caused by booting. Working the pipe and reaming clears the boots and full returns are maintained. Drill to 611', 600' GL and condition mud. Pull back 20' and run temperature survey at 541', 77°F. POOH for night. No night shift

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 16 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 7 | Depth today - 710' | Hole advance last 24 hr - 99' | Core recovered - N/A '  
 Last casing - 7", 23# casing @ 59'

**BITS** -- Now drilling 6" hole | Rotary speed - 280 rpm; WOB - xK lb; ROP - avg. 18 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1	12-1/4" milled tooth	11	59	48	5
2	6" Varel milled tooth	59	237	178	11
3	6" drag	237	710	473	25

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xover, CHD101

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'			159°F
	710'			159°F

**Drilling fluid** - water, bentonite,

Flow rate - 125 gal/min | Pressure - 220 psi | Returns temp - 99°F max |  
 Wt - 8.7 lb/gal | Vis - 50 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 10.0  
 Lost circulation - Occasional

**Lithology of past day's drilling:**

- 550-600 Dark brown silty clay and clay, moderately indurated, even-sized small chips. About 15 percent cuttings at 560 feet are dark gray-green and altered (?) clay and silty clay.
- 600-630 Dark brown clay and silt, small even-sized, dark, gray-green indurated silt (alteration ?).
- 640-680 Dark brown clay and silt. Less than 5 percent very small white cuttings (caliche?). Dark chert first noted in the lower 5 feet.
- 680-695 Formation change. Ninety percent angular dark brown to black chert with 5 percent indurated sandstone, brown clay and 5 percent caliche.
- 695-710 Dark brown and black angular chert (90 to 60 percent). Increasing gray and red to red-brown indurated sandstone clasts (10 to 30 percent). Red and brown hard and soft clay and clayey red sand and sandstone (10 percent).

**Summary of events last 24 hours:**

Ran back in hole with BHA to TD and drilled ahead. Hole in good shape. Formation getting harder. POOH for bit change. Will run open hole temperature log before tripping back in hole. No night shift. Temperature log at 0600 shows slight temperature reversal at bottom.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 17 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 8 | Depth today - 735' | Hole advance last 24 hr - 25' | Core recovered - N/A '  
 Last casing - 7", 23# casing @ 59'

**BITS** -- Now drilling 6" hole | Rotary speed - 145 rpm; WOB - xK lb; ROP - avg. 8 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1	12-1/4" milled tooth	11	59	48	5
2	6" Varel milled tooth	59	237	178	11
3	6" drag	237	710	473	25
2RR	6" Varel milled tooth	710			

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xover, CHD101

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'			159°F
	710'			159°F

**Drilling fluid** - water, bentonite,

Flow rate - 125 gal/min | Pressure - 180 psi | Returns temp - 94°F max |  
 Wt - 8.7 lb/gal | Vis - 50 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 10.0  
 Lost circulation - Total loss

**Lithology of past day's drilling:**

710-725 Medium to large sized cuttings of gray limestone (60%). Small angular, black chert cuttings (10%).  
 Small to medium red silty (very fine sand?) clay, more indurated than previous red clays (10%).  
 Small, unconsolidated quartz sandstone, tan to buff, with clayey matrix (<1%). Pale green to tan,  
 soft, calcareous material (caliche?) with angular quartz grains (<2%).

**Summary of events last 24 hours:**

Finished temperature log. Logged temperature on bottom for one hour. Ran back in hole with BHA to TD and drilled ahead. Hole in good shape. lost circulation at 725'. Tried to get it back with LCM but no luck. Water level 465'. Drilled 10 feet blind. POOH for LC cement plug #3. WOC, no night shift.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 18 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 9 | Depth today - 742' | Hole advance last 24 hr - 7' | Core recovered - N/A '  
 Last casing - 7", 23# casing @ 59'

**BITS** -- Now drilling 6" hole | Rotary speed - 145 rpm; WOB - xK lb; ROP - avg. 8 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1	12-1/4" milled tooth	11	59	48	5
2	6" Varel milled tooth	59	237	178	11
3	6" drag	237	710	473	25
2RR	6" Varel milled tooth	710			

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xover, CHD101

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'			159°F
	710'			159°F

**Drilling fluid** - water, bentonite,

Flow rate - 125 gal/min | Pressure - 180 psi | Returns temp - 94°F max |  
 Wt - 8.7 lb/gal | Vis - 50 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 10.0  
 Lost circulation - Total loss

**Lithology of past day's drilling:**

No new lithology, total lost circulation.

**Summary of events last 24 hours:**

Filled hole with mud. Wash and drill LCM out of hole. Full returns until 15' from bottom, then total loss. No cement in returns. Drill blind seven feet and POOH for cement plug #4. Mixed 24 sacks with 2% CCl to accelerate cure. CIP at 1400. Samples getting hard at temperature at 1600. WOC until report time. No night shift.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 19 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 10 | Depth today - 742' | Hole advance last 24 hr - 0' | Core recovered - N/A '  
 Last casing - 7", 23# casing @ 59'

**BITS** -- Now drilling 6" hole | Rotary speed - 145 rpm; WOB - xK lb; ROP - avg. 8 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1	12-1/4" milled tooth	11	59	48	5
2	6" Varel milled tooth	59	237	178	11
3	6" drag	237	710	473	25
2RR	6" Varel milled tooth	710			

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xover, CHD101

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'			159°F
	710'			159°F

**Drilling fluid** - water, bentonite,

Flow rate - 125 gal/min | Pressure - 180 psi | Returns temp - 94°F max |  
 Wt - 8.7 lb/gal | Vis - 50 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 10.0  
 Lost circulation - Total loss

**Lithology of past day's drilling:**

No new lithology, total lost circulation.

**Summary of events last 24 hours:**

Tag top of plug #4 at 667'. Wash and drill LCM out of hole. Full returns until 710' (15' above loss zone) then total loss. Some cement in returns. Drill hard cement blind to 735' feet and POOH for cement plug #5. Mixed 30 sacks of Portland with 2 sacks of Cal-Seal accelerated cure and paper. CIP at 1330. Samples getting hard at temperature at 1600. Fill hole with mud and run in with BHA. Tag cement hard cement at 684' and drill to 726' and lose returns. Spot 15 sacks of Enviro Plug across loss zone and let set. Washing into hole with full returns at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 20 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 11 | Depth today - 742' | Hole advance last 24 hr - 0' | Core recovered - N/A '  
 Last casing - 7", 23# casing @ 59'

**BITS** -- Now drilling 6" hole | Rotary speed - 145 rpm; WOB - xK lb; ROP - avg. 0 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1	12-1/4" milled tooth	11	59	48	5
2	6" Varel milled tooth	59	237	178	11
3	6" drag	237	710	473	25
2RR	6" Varel milled tooth	710			

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xover, CHD101

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'			159°F
	710'			159°F

**Drilling fluid** - water, bentonite,

Flow rate - 125 gal/min | Pressure - 180 psi | Returns temp - 85°F max |  
 Wt - 8.7 lb/gal | Vis - 50 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 10.0  
 Lost circulation - Total loss

**Lithology of past day's drilling:**

No new lithology, total loss circulation.

**Summary of events last 24 hours:**

Lost returns at 725' while drilling on Enviro-Plug. Drill blind to 740' and POOH. Run in with open ended drill pipe and spot Bentonite plug. Pull back and try to fill hole. No returns. Clean to bottom with no returns. Mixed 25 sacks of Portland with 2 sacks of Cal-Seal accelerated cure and paper. Cement plug #6 in place at 1730. Samples hard at temperature at 2030. Fill hole with mud and run in with BHA. Tag hard cement at 700' and drill to 726' and lose returns. POOH. Drop 10 sacks of Enviro-Plug and fill hole. Run in hole to 700' and circulate. Will start drilling on plug at 0830.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 21 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 12 | Depth today - 742' | Hole advance last 24 hr - 0' | Core recovered - N/A'

Last casing - 7", 23# casing @ 59'

**BITS** -- Now drilling 5" hole | Rotary speed - 270 rpm; WOB - xK lb; ROP - avg. 0 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1	12-1/4" milled tooth	11	59	48	5
2	6" Varel milled tooth	59	237	178	11
3	6" drag	237	710	473	25
2RR	6" Varel milled tooth	710	742	32	10
4	PQ series 2	742			

**Drilling Assembly:** PQ bit, reamer shell, 5' PQ core barrel, stabilizer, xover, HWT casing

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'			159°F
	710'			159°F

**Drilling fluid** - water, bentonite,

Flow rate - 125 gal/min | Pressure - 180 psi | Returns temp - xx°F max |

Wt - 8.7 lb/gal | Vis - 50 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 10.0

Lost circulation - Total loss

**Lithology of past day's drilling:**

No new lithology, total lost circulation.

**Summary of events last 24 hours:**

Lost returns at 725' while drilling on Enviro plug. Drill blind to 740' and POOH. Run in with open ended drill pipe and spot Cal-seal cement plug. POOH and pick up bit and collars. RIH to 700' and try to fill hole. Will not fill. Drill blind to bottom. Pull out laying down CHD 101 drill pipe and collars. Drop Enviro plug pill. Change rig over for coring. Pick up PQ coring tools and RIH on HWT casing. Wash and core to 724' and lose circulation. Washing in without returns at report time. Will try to core ahead and look for possible casing point, or we will cement back and case above 725'.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 22 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 13 | Depth today - 744' | Hole advance last 24 hr - 2' | Core recovered - 2'  
Last casing - 7", 23# casing @ 59'

-----  
**BITS** -- Now drilling 6" hole | Rotary speed - xx rpm; WOB - xK lb; ROP - avg. 0 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
2	6" Varel milled tooth	59	237	178	11
3	6" drag	237	710	473	25
2RR	6" Varel milled tooth	710	742	32	10
4	PQ series 2	742	745	2	1
2RR	6" Varel milled tooth				

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xover, HQ

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'			159°F
	710'			159°F

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**Drilling fluid** - water, bentonite,

Flow rate - 125 gal/min | Pressure - 180 psi | Returns temp - xx°F max |  
Wt - 8.7 lb/gal | Vis - 50 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 10.0  
Lost circulation - Total loss

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**Lithology of past day's drilling:**

710-725 Limestone

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**Summary of events last 24 hours:**

Cored 5' of cement and 2' of new formation. Good solid limestone. Sand from above causing too much torque to safely core ahead. POOH and run in with open ended HQ drill pipe. Wash to TD. Mix and pump cement plug across loss zone. WOC. Pick up 6" drilling assembly and RIH at report time. Will polish cement off to 711' and then run casing.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 23 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 14 | Depth today - 744' | Hole advance last 24 hr - 0' | Core recovered - 0'  
 Last casing - 7", 23# casing @ 59'

**BITS** -- Now drilling 6" hole | Rotary speed - xx rpm; WOB - xK lb; ROP - avg. 0 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
2	6" Varel milled tooth	59	237	178	11
3	6" drag	237	710	473	25
2RR	6" Varel milled tooth	710	742	32	10
4	PQ series 2	742	745	2	1
2RR	6" Varel milled tooth				

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xover, HQ

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'			159°F
	710'			159°F

**Drilling fluid** - water, bentonite,

Flow rate - 125 gal/min | Pressure - 180 psi | Returns temp - 92°F max |  
 Wt - 8.7 lb/gal | Vis - 50 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 10.0  
 Lost circulation - Full returns

**Lithology of past day's drilling:**

**Summary of events last 24 hours:**

Lost returns at 690', just into cement. Washed to 738.5' then hit hard cement. POOH and run in with open ended HQ to set cement plug #9. Mixed and pumped 25 sacks of accelerated cement. WOC. Ran in with drilling assembly and tagged top of plug at 680'. Filled hole and drilled cement to 708'. Condition mud and POOH. This will be casing point. POOH and wait on cementing materials.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 24 Nov 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 1500

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 15 | Depth today - 744' | Hole advance last 24 hr - 0' | Core recovered - 0'  
 Last casing - 4 1/2" HW casing @ 707'

**BITS** -- Now drilling 6" hole | Rotary speed - xx rpm; WOB - xK lb; ROP - avg. 0 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
2	6" Varel milled tooth	59	237	178	11
3	6" drag	237	710	473	25
2RR	6" Varel milled tooth	710	742	32	10
4	PQ series 2	742	745	2	1
2RR	6" Varel milled tooth				

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xover, HQ

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'			159°F
	710'			159°F

**Drilling fluid** - cement

Flow rate - 125 gal/min | Pressure - 180 psi | Returns temp - 92°F max |  
 Wt - 15.5 lb/gal | Vis - xx sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - Full returns

**Lithology of past day's drilling:**

**Summary of events last 30 hours:**

Make wiper trip to 708.5', very little fill. Lay down BHA. Weld up float collar and all connections below. Float is 36' off bottom. Run casing to TD. Had to wash last 2'. Mix 134 sacks of type H cement with 35% silica flour. Yields 40 bbl of 15+ lb/gal cement. Pump 8 bbl of lead water, 36 bbl of cement, drop plug and displace with 10.5 bbl of water. Cement in place at 2218. Reciprocate casing during pumping. Had returns throughout cement job. Got lead water back with some cement color but no cement. WOC. Ran temperature log 11 hours after CIP. Log indicated top of cement at 220'. Top of cement on inside is at 453'. Mixed and pumped 300 gal top job. CIP at 1200 with good cement returns. Ran another temperature log after top job to confirm top of cement job. Shut down operation for holiday break. Will resume drilling at 0700 on 11/30. Next daily drilling report will be on 12/1/96.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 1 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 1500

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 16 | Depth today - 744' | Hole advance last 24 hr - 0' | Core recovered - 0'  
Last casing - 4 1/2" HW casing @ 707'

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**BITS** -- Now drilling 3.895" | Rotary speed - 150 rpm; WOB - 1K lb; ROP - avg.. 20 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
4	PQ series 2	742	745	2	1
2 RR	6" Varel milled tooth				
5	HQ series 9	467' cement			

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'			159°F
	710'			159°F

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**Drilling fluid** - water

Flow rate - 20 gal/min | Pressure - 120 psi | Returns temp - 72°F max |  
Wt - 8.4 lb/gal | Vis - xx sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
Lost circulation - Full returns

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**Lithology of past day's drilling:**

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**Summary of events last 24 hours:**

Rig repairs and change over to coring system. Pressure test HW casing to 550 psi. Strip back 7" casing and install 7" 5M wellhead on 4 1/2" casing. Nipple up BOP stack and equipment. Install and test H<sub>2</sub>S monitoring equipment. Make up coring BHA and run in hole to top of cement. Start coring cement at 467'. at report time drilling out top plug at 495'. Plan on testing BOPE at 1400 hours.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 2 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 17 | Depth today - 744' | Hole advance last 24 hr - 0' | Core recovered - 0'  
 Last casing - 4 1/2" HW casing @ 707'

**BITS** -- Now drilling 3.895" | Rotary speed - 150 rpm; WOB - 1K lb; ROP - avg.. 20 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
4	PQ series 2	742	745	2	1
2 RR	6" Varel milled tooth				
5	HQ series 9	467' cement			

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'			159°F
	710'			159°F

**Drilling fluid** - water

Flow rate - 20 gal/min | Pressure - 120 psi | Returns temp - 87°F max |  
 Wt - 8.4 lb/gal | Vis - xx sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - Full returns

**Lithology of past day's drilling:**

**Summary of events last 24 hours:**

Core cement to 558'. Pull out of hole and test BOPE. All functions passed with no problems. Test witnessed by Russ Jentgen and Chuck McDonnell of the BLM. Core cement to 712' at report time. Will test shoe at ~ 748'

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 3 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 18 | Depth today - 797' | Hole advance last 24 hr - 53' | Core recovered - 45'  
 Last casing - 4 1/2" HW casing @ 707'

**BITS** -- Now drilling 3.895" | Rotary speed - 150 rpm; WOB - 1K lb; ROP - avg.. 20 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
4	PQ series 2	742	745	2	1
2 RR	6" Varel milled tooth				
5	HQ series 9	467' cement			

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'			159°F
	710'			159°F

**Drilling fluid** - water, bentonite, polymer

Flow rate - 25 gal/min | Pressure - 125 psi | Returns temp - xx°F max |  
 Wt - xx lb/gal | Vis - xx sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - No returns

**Lithology of past day's drilling:**

**Summary of events last 24 hours:**

Core cement to 725' and lose total returns. Core cement and cave blind to 744' then new hole to 748'. Pull back and check water level and temperature for shoe test. Water level stable at 457.6'. Clean mud system and mix coring mud. POOH and grease rods. Drill cave and condition hole. Core ahead without returns to 797' at report time. Rock is getting more competent and core recovery is now 100%.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 4 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 19 | Depth today - 928' | Hole advance last 24 hr - 131' | Core recovered - 130'  
 Last casing - 4 1/2" HW casing @ 707'

**BITS** -- Now drilling 3.895" | Rotary speed - 280 rpm; WOB - 1K lb; ROP - avg.. 11 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
4	PQ series 2	742	745	2	1
2 RR	6" Varel milled tooth				
5	HQ series 9	467' cement			

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'			159°F
	710'			159°F
	748'			115°F

**Drilling fluid** - water, bentonite, polymer

Flow rate - 25 gal/min | Pressure - 125 psi | Returns temp - xx°F max |  
 Wt - xx lb/gal | Vis - xx sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - No returns

**Lithology of past day's drilling:**

- 725-797 Mostly limestone and red clay (terra rosa).
- 797-808 Fine to medium crystalline cherty fossiliferous limestone:
- 808-810 Void or large fracture.
- 810-836 Fine to medium crystalline cherty fossiliferous limestone:
- 836-837 Highly fractured interval, nearly breccia
- 838-840 Finely crystalline cherty limestone

**Summary of events last 24 hours:**

Core ahead with no problems. Pumping down the backside to lubricate core rods.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 5 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 20 | Depth today - 1068' | Hole advance last 24 hr - 140' | Core recovered - 140'  
 Last casing - 4 1/2" HW casing @ 707'

**BITS** -- Now drilling 3.895" | Rotary speed - 280 rpm; WOB - 6K lb; ROP - avg.. 15 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
4	PQ series 2	742	745	2	1
2 RR	6" Varel milled tooth				
5	HQ series 9	467' cement	966'	221'	50
6	HQ series 9	966'			

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'	2°		159°F
	748'			115°F
	966'	1.7°		98°F

**Drilling fluid** - polymer

Flow rate - 22 gal/min | Pressure - 125 psi | Returns temp - xx°F max |  
 Wt - xx lb/gal | Vis - xx sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - No returns

**Lithology of past day's drilling:**

- 840.2 - 872.3 Fine crystalline cherty fossiliferous limestone
- 872.3 - 899.9 Fine crystalline limestone
- 899.9 - 918.0 Fine crystalline fossiliferous limestone
- 918.0 - 918.8 Fine crystalline silty limestone
- 918.8 - 922.2 Fossiliferous clayey (marly) limestone and interbedded brown shale
- 922.2 - 938.0 Fine crystalline fossiliferous limestone
- 938.0 - 958.0 Fine crystalline limestone

**Summary of events last 24 hours:**

Core ahead to 966'. Run SNL core tube logger to measure temperature while coring from 958' to 966' and to measure wellbore inclination on trip out. POOH to change bits and grease rods. Drill cave at 752' on trip in. Core ahead with 100% recovery to 1058'. Fluid level staying at 458'.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 6 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 21 | Depth today - 1197' | Hole advance last 24 hr - 129' | Core recovered - 129'  
 Last casing - 4 1/2" HW casing @ 707'

**BITS** -- Now drilling 3.895" | Rotary speed - 280 rpm; WOB - 6K lb; ROP - avg.. 15 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
4	PQ series 2	742	745	2	1
2 RR	6" Varel milled tooth				
5	HQ series 9	467' cement	966'	221'	50
6	HQ series 9	966'			

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	611'	2°		159°F
	748'			115°F
	966'	1.7°		98°F
	1100'	2°		123°F

**Drilling fluid** - polymer

Flow rate - 22 gal/min | Pressure - 125 psi | Returns temp - xx°F max |  
 Wt - xx lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - No returns

**Lithology of past day's drilling:**

None reported

**Summary of events last 24 hours:**

Make short trip to lubricate rods at 1088'. No bridge at 752' but some cave on bottom. Run SNL core tube logger to measure temperature and inclination while coring from 1096' to 1109'. Coring ahead at 1202' at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 7 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 22 | Depth today - 1338' | Hole advance last 24 hr - 141' | Core recovered - 136'  
 Last casing - 4 1/2" HW casing @ 707'

**BITS** -- Now drilling 3.895" | Rotary speed - 280 rpm; WOB - 6K lb; ROP - avg.. 15 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
5	HQ series 9	467' cement	966'	221'	50
6	HQ series 9	966'			

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	1100'	2°		123°F
	1250'	2-1/4 °		120°F

**Drilling fluid** - polymer

Flow rate - 20 gal/min | Pressure - 125 psi | Returns temp - xx°F max |  
 Wt - xx lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - No returns

**Lithology of past day's drilling:**

840.2-872.3	Fine crystalline cherty fossiliferous limestone
872.3-899.9	Fine crystalline limestone
899.9-918	Fine crystalline fossiliferous limestone
918-918-8	Fine crystalline silty limestone
918.8-922.2	Fossiliferous clayey (marly) limestone and interbedded brown shale
922.2-938	Fine crystalline fossiliferous limestone
938-958	Fine crystalline limestone
938-988.6	Fine crystalline fossiliferous limestone.
988.6-990.6	Fine crystalline limestone
990.6-1018	Fine crystalline fossiliferous limestone
1018-1028	Fine crystalline limestone and fossiliferous limestone
1028-1038	Fine crystalline limestone
1038-1119.5	Fine crystalline fossiliferous limestone.

**Summary of events last 24 hours:**

Core ahead. Rock broken from 1300' on resulting in short runs and some lost core. Run SNL core tube logger to measure temperature and inclination while coring from 1247' to 1255'. Coring ahead at 1338' at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 8 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 23 | Depth today - 1486' | Hole advance last 24 hr - 148' | Core recovered - 147'  
 Last casing - 4 1/2" HW casing @ 707'

**BITS** -- Now drilling 3.895" | Rotary speed - 280 rpm; WOB - 6K lb; ROP - avg.. 15 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
5	HQ series 9	467' cement	966'	221'	50
6	HQ series 9	966'			

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	1100'	2°		123°F
	1250'	2-1/4°		120°F
	1385'	2-1/4°		118°F

**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 125 psi | Returns temp - xx°F max |  
 Wt - xx lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - No returns

**Lithology of past day's drilling:**

- 1119.5-1144.4 Fine crystalline limestone and fossiliferous limestone
- 1144.4-1284.3 Porphyritic latite sill
- 1284.5-1315.5 Breccia zone consisting of autobrecciated latite and argillic altered limestone and calcite veins.
- 1315.5-1320.0 Medium crystalline fossiliferous limestone
- 1320.0-1321.7 Red brown clay solution cavity filled with calcite vugs
- 1321.7-1323.0 Medium crystalline fossiliferous and clayey limestone
- 1323.0-1328.0 Clay with nodular limestone
- 1328.0-1331.6 Chert
- 1331.6-1344.5 Finely crystalline limestone and fossiliferous limestone

**Summary of events last 24 hours:**

Core ahead with 100% recovery. Possible 1' void at 1428'. Coring ahead at 1491' at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 9 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 24 | Depth today - 1596' | Hole advance last 24 hr - 110' | Core recovered - 110'  
Last casing - 4 1/2" HW casing @ 707'

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**BITS** -- Now drilling 3.895" | Rotary speed - 280 rpm; WOB - 6K lb; ROP - avg.. 8 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
5	HQ series 9	467' cement	966'	221'	50
7	HQ series 9	966'	1596'	630'	90
8	HQ series 9	1596'			

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	1100'	2 <sup>o</sup>		123 <sup>o</sup> F
	1250'	2-1/4 <sup>o</sup>		120 <sup>o</sup> F
	1385'	2-1/4 <sup>o</sup>		118 <sup>o</sup> F
	1535'	2-1/4 <sup>o</sup>		136 <sup>o</sup> F

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**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 125 psi | Returns temp - xx<sup>o</sup>F max |  
Wt - xx lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
Lost circulation - No returns

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**Lithology of past day's drilling:**

None reported

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**Summary of events last 24 hours:**

Core ahead with 100% recovery to 1596'. POOH for bit change and temperature log. Temperature survey at 1535' was with the core tube logger on bottom for 1/2 hour while rig was serviced. Logging well at report time.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 10 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 25 | Depth today - 1727' | Hole advance last 24 hr - 131' | Core recovered - 131'  
 Last casing - 4 1/2" HW casing @ 707'

**BITS** -- Now drilling 3.895" | Rotary speed - 280 rpm; WOB - 6K lb; ROP - avg.. 8 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
5	HQ series 9	467' cement	966'	221'	50
7	HQ series 9	966'	1596'	630'	90
8	HQ series 9	1596'			

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	1100'	2°		123°F
	1250'	2-1/4°		120°F
	1385'	2-1/4°		118°F
	1535'	2-1/4°		136°F

**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 125 psi | Returns temp - xx°F max |  
 Wt - xx lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - No returns

**Lithology of past day's drilling:**

None reported

**Summary of events last 24 hours:**

Temperature log showed a bottom hole temperature of 174.8°F at 1596' after 5 hours without circulation. This indicates a stabilized BHT of 186°F. Coring ahead at 1732' at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 11 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 26 | Depth today - 1938' | Hole advance last 24 hr - 211' | Core recovered - 211'  
Last casing - 4 1/2" HW casing @ 707'

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**BITS** -- Now drilling 3.895" | Rotary speed - 280 rpm; WOB - 6K lb; ROP - avg.. 8 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
5	HQ series 9	467' cement	966'	221'	50
7	HQ series 9	966'	1596'	630'	90
8	HQ series 9	1596'			

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	1100'	2°		123°F
	1250'	2-1/4°		120°F
	1385'	2-1/4°		118°F
	1535'	2-1/4°		136°F
	1745'	2-1/4°		143°F

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**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 125 psi | Returns temp - xx°F max |  
Wt - xx lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
Lost circulation - No returns

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**Lithology of past day's drilling:**

Limestone

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**Summary of events last 24 hours:**

Drill ahead with no problems. Running core tube logger at report time. After this core run we will pull back to 850' and temperature log to get stabilized BHT. Will then decide whether to continue this hole or move to another location.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 12 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 27 | Depth today - 2055' | Hole advance last 24 hr - 117' | Core recovered - 117'  
 Last casing - 4 1/2" HW casing @ 707'

**BITS** -- Now drilling 3.895" | Rotary speed - 280 rpm; WOB - 6K lb; ROP - avg.. 8 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
5	HQ series 9	467' cement	966'	221'	50
7	HQ series 9	966'	1596'	630'	90
8	HQ series 9	1596'			

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	1385'	2-1/4 <sup>o</sup>		118 <sup>o</sup> F
	1535'	2-1/4 <sup>o</sup>		136 <sup>o</sup> F
	1745'	2-1/4 <sup>o</sup>		143 <sup>o</sup> F
	1945'	2-1/4 <sup>o</sup>		152 <sup>o</sup> F

**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 125 psi | Returns temp - xx<sup>o</sup>F max |  
 Wt - xx lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - No returns

**Lithology of past day's drilling:**

Limestone

**Summary of events last 24 hours:**

Ran several temperature logs at 1947'. Core tube logger measured 151<sup>o</sup>F BHT. Temperature logs on bottom indicated a stabilized BHT of 191<sup>o</sup>F from a Horner plot. Drilling ahead and building a new location at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 13 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 28 | Depth today - 2224' | Hole advance last 24 hr - 169' | Core recovered - 169'  
 Last casing - 4 1/2" HW casing @ 707'

**BITS** -- Now drilling 3.895" | Rotary speed - 280 rpm; WOB - 6K lb; ROP - avg.. 8 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
5	HQ series 9	467' cement	966'	221'	50
7	HQ series 9	966'	1596'	630'	90
8	HQ series 9	1596'			

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	1385'	2-1/4°		118°F
	1535'	2-1/4°		136°F
	1745'	2-1/4°		143°F
	1945'	2-1/4°		152°F
	2144'	1-3/4°		127°F

**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 125 psi | Returns temp - xx°F max |  
 Wt - xx lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - No returns

**Lithology of past day's drilling:**

2085 - 2234 Interbedded black shale, gray crystalline limestone, and dark gray to black clayey microcrystalline limestone.

**Summary of events last 24 hours:**

Core tube logger measured 127°F BHT at 2144'. Ran MRT at 2154', it indicated 142°F with 5 minutes on bottom. Ran another MRT at 2164' without waiting on bottom. It also indicated 142°F. It appears MRTs are heating up on the trip in. Coring ahead at report time and building new location. Will temperature log this AM and decide whether to continue or complete the well.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 14 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 29 | Depth today - 2258' | Hole advance last 24 hr - 34' | Core recovered - 34'  
Last casing - 4 1/2" HW casing @ 707'

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**BITS** -- Now drilling 3.895" | Rotary speed - 280 rpm; WOB - 6K lb; ROP - avg.. 8 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
5	HQ series 9	467' cement	966'	221'	50
7	HQ series 9	966'	1596'	630'	90
8	HQ series 9	1596'	2258'	662'	86

**Drilling Assembly:** HQ bit, reamer shell, core barrel, stabilizer, HQ drill rods

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	1385'	2-1/4 <sup>o</sup>		118 <sup>o</sup> F
	1535'	2-1/4 <sup>o</sup>		136 <sup>o</sup> F
	1745'	2-1/4 <sup>o</sup>		143 <sup>o</sup> F
	1945'	2-1/4 <sup>o</sup>		152 <sup>o</sup> F
	2144'	1-3/4 <sup>o</sup>		127 <sup>o</sup> F
	2248'	2 <sup>o</sup>		137 <sup>o</sup> F

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**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 125 psi | Returns temp - xx<sup>o</sup>F max |  
Wt - xx lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
Lost circulation - No returns

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**Lithology of past day's drilling:**

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**Summary of events last 24 hours:**

Core ahead to TD, 2258'. Pull back to 850' and temperature log. Nipple down BOPE and wellhead. Install completion head. RIH to 850' and log again. Logging at report time.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 15 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 46-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 30 | Depth today - 2258' | Hole advance last 24 hr - 0' | Core recovered - 0'  
 Last casing - 4 1/2" HW casing @ 707' with 2 3/8 EUE tubing to 2250'

**BITS -- TD**

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
5	HQ series 9	467' cement	966'	221'	50
7	HQ series 9	966'	1596'	630'	90
8	HQ series 9	1596'	2258'	662'	86

**Drilling Assembly:**

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	1385'	2-1/4 <sup>o</sup>		118 <sup>o</sup> F
	1535'	2-1/4 <sup>o</sup>		136 <sup>o</sup> F
	1745'	2-1/4 <sup>o</sup>		143 <sup>o</sup> F
	1945'	2-1/4 <sup>o</sup>		152 <sup>o</sup> F
	2144'	1-3/4 <sup>o</sup>		127 <sup>o</sup> F
	2248'	2 <sup>o</sup>		137 <sup>o</sup> F

**Drilling fluid** - bentonite

Flow rate - 20 gal/min | Pressure - 125 psi | Returns temp - xx<sup>o</sup>F max |  
 Wt - xx lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - No returns

**Lithology of past day's drilling:**

**Summary of events last 24 hours:**

Complete logs. RIH with HQ to TD and circulate heavy mud. POOH laying down. Pick up EUE tubing with float on bottom. RIH to 2250' and hang in wellhead. Rig down. This is the last drilling report for this well.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 18 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 1 | Depth today - 35' | Hole advance last 24 hr - 23' | Core recovered - N/A '  
Last casing - 7", 23# casing @ 34'

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**BITS** -- Now drilling 6 1/4" hole | Rotary speed - x rpm; WOB - xK lb; Rate of Penetration - avg. xx ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 9	35			

**Drilling Assembly:** 6 1/4 BSF core bit, reamer shell, core barrel, stabilizer, BSF core rods

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water, bentonite, polymer

Flow rate - x gal/min | Pressure - x psi | Returns temp - x<sup>o</sup>F max |  
Wt - 8.5 lb/gal | Vis - x sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - xx

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**Lithology of past day's drilling:**

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**Summary of events last 24 hours:**

Finish rigging up. Pick up 12" bit and drill conductor hole to top of limestone. Run 7" casing and cement in place. Nipple up flow line and make up coring tools. No night tour.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 19 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 2 | Depth today - 124' | Hole advance last 24 hr - 89' | Core recovered - 89'  
Last casing - 7", 23# casing @ 34'

-----  
**BITS** -- Now drilling 6 1/4" hole | Rotary speed -385 rpm; WOB - 2K lb; Rate of Penetration - avg. 5 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 9	35			

**Drilling Assembly:** 6 1/4 BSF core bit, reamer shell, core barrel, stabilizer, BSF core rods

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**Surveys:**                      **Depth**                      **Inclination**                      **Direction**                      **Bottom-hole Temperature**

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**Drilling fluid** - water, bentonite, polymer  
Flow rate - 38 gal/min | Pressure - 120 psi | Returns temp - 72<sup>o</sup>F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - none

-----  
**Lithology of past day's drilling:**  
34-124 cherty fossiliferous limestone:

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**Summary of events last 24 hours:**

Thaw out equipment and make up tools. Calibrate flow instruments. Core BSF to 124' with 100% 4" core recovery and occasional slight lost circulation.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 20 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 3 | Depth today - 229' | Hole advance last 24 hr - 105' | Core recovered - 105'  
Last casing - 7", 23# casing @ 34'

---

**BITS** -- Now drilling 6 1/4" hole | Rotary speed -385 rpm; WOB - 2K lb; Rate of Penetration - avg. 5 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35			

**Drilling Assembly:** 6 1/4 BSF core bit, reamer shell, core barrel, stabilizer, BSF core rods

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water, bentonite, polymer

Flow rate - 38 gal/min | Pressure - 120 psi | Returns temp - 82°F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - none

---

**Lithology of past day's drilling:**

124' - 229' limestone:

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**Summary of events last 24 hours:**

Core BSF to 229' with 100% 4" core recovery and occasional slight lost circulation. Made one trip for stuck inner tube. Rig was also down for two hours for water swivel repair.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 21 DEC 96**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 4 | Depth today - 380' | Hole advance last 24 hr - 151' | Core recovered - 151'  
Last casing - 7", 23# casing @ 34'

---

**BITS** -- Now drilling 6 1/4" hole | Rotary speed -385 rpm; WOB - 2K lb; Rate of Penetration - avg. 5 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35			

**Drilling Assembly:** 6 1/4 BSF core bit, reamer shell, core barrel, stabilizer, BSF core rods

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water, bentonite, polymer

Flow rate - 38 gal/min | Pressure - 120 psi | Returns temp - 82°F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - none

---

**Lithology of past day's drilling:**  
limestone:

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**Summary of events last 24 hours:**

Cored ahead to 379.5'. Tube stuck. Starting to POOH at report time. Rig will be shut down for the holidays. Will resume operations at 0700 on January 3, 1997. Next daily drilling report on the 4<sup>th</sup>.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 4 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 5 | Depth today - 394' | Hole advance last 24 hr - 14' | Core recovered - 14'  
Last casing - 7", 23# casing @ 34'

-----  
**BITS** -- Now drilling 6 1/4" hole | Rotary speed -385 rpm; WOB - 2K lb; Rate of Penetration - avg. 5 ft/hr

<b>Bit No.</b>	<b>Type</b>	<b>Depth in, KB</b>	<b>Depth out, KB</b>	<b>Footage</b>	<b>Hours</b>
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35			

**Drilling Assembly:** 6 1/4 BSF core bit, reamer shell, core barrel, stabilizer, BSF core rods

-----  
**Surveys:**                      **Depth**                      **Inclination**                      **Direction**                      **Bottom-hole Temperature**

-----  
**Drilling fluid** - water, bentonite, polymer

Flow rate - 38 gal/min | Pressure - 120 psi | Returns temp - 95°F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - none

-----  
**Lithology of past day's drilling:**  
limestone:

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**Summary of events last 24 hours:**

Ran temperature log to 350'. Max temperature 148°F. Cored ahead to 393.5' and lost returns. Slug hole with LCM and got returns back but lost them at start of drilling. Pull out of hole and mix and pump 50' cement plug. Cement in place at midnight. Tag top of plug at 353'. Core good cement to 386' at report time.

-----  
**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 5 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 6 | Depth today - 447' | Hole advance last 24 hr - 53' | Core recovered - 53'  
Last casing - 7", 23# casing @ 34'

---

**BITS** -- Now drilling 6 1/4" hole | Rotary speed -250 rpm; WOB - 2K lb; Rate of Penetration - avg. 3 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35			

**Drilling Assembly:** 6 1/4 BSF core bit, reamer shell, core barrel, stabilizer, BSF core rods

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water, bentonite, polymer

Flow rate - 70 gal/min | Pressure - 60 psi | Returns temp - xx<sup>o</sup>F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - Total

---

**Lithology of past day's drilling:**

limestone:

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**Summary of events last 24 hours:**

Core out of cement and ahead 2' with full returns. Started losing returns with total loss at 400'. Hole dry to the bit. Rigged up to core blind. Cored to 447' at report time with 100% core recovery. Hole is still dry to the bit. Pumped mud down the backside for lubricity. Rock is vuggy and fractured. Will core ahead to more competent rock, then cement back and try to regain circulation.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 6 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 7 | Depth today - 455' | Hole advance last 24 hr - 8' | Core recovered - 8'  
Last casing - 7", 23# casing @ 34'

---

**BITS** -- Now drilling 6 1/4" hole | Rotary speed -250 rpm; WOB - 2K lb; Rate of Penetration - avg. 3 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35			

**Drilling Assembly:** 6 1/4 BSF core bit, reamer shell, core barrel, stabilizer, BSF core rods

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water, bentonite, polymer

Flow rate - 70 gal/min | Pressure - 60 psi | Returns temp - xx<sup>o</sup>F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - Total

---

**Lithology of past day's drilling:**

380 - 424 cherty fossiliferous limestone and fossiliferous limestone  
434 - 455 Porphyritic dacite, sill, highly fractured

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**Summary of events last 24 hours:**

Cored to 455' and rig rotary drive failed. POOH for repair. Water level at 403'. Mix and pump cement plug while out of hole. Wait on cement for 4 hours then try to fill hole. Hole did not fill. Mix two more plugs but hole would not fill. Rig out of service for drilling but can mix plugs. Waiting on parts and cement at report time.

---

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 7 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 8 | Depth today - 455' | Hole advance last 24 hr - 0' | Core recovered - 0'  
Last casing - 7", 23# casing @ 34'

-----  
**BITS** -- Now drilling 6 1/4" hole | Rotary speed -250 rpm; WOB - 2K lb; Rate of Penetration - avg. 3 ft/hr

<b>Bit No.</b>	<b>Type</b>	<b>Depth in, KB</b>	<b>Depth out, KB</b>	<b>Footage</b>	<b>Hours</b>
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35			

**Drilling Assembly:** 6 1/4 BSF core bit, reamer shell, core barrel, stabilizer, BSF core rods

-----  
**Surveys:**                    **Depth**                    **Inclination**                    **Direction**                    **Bottom-hole Temperature**

-----  
**Drilling fluid** - water, bentonite, polymer

Flow rate - 70 gal/min | Pressure - 60 psi | Returns temp - xx<sup>o</sup>F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - Total

-----  
**Lithology of past day's drilling:**  
none

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**Summary of events last 24 hours:**

Rig still down for repair. Parts on the way but weather caused flight cancellations and roads are closed due to a blizzard. Ran temperature log. Top of previous plug appears to be 401' and water level is 399'. Mixed and pumped cement plug #4. Got ~ 60' of fill. This is 50' above initial loss zone. Will attempt to fill hole when rig is operational.

-----  
**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 8 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 9 | Depth today - 455' | Hole advance last 24 hr - 0' | Core recovered - 0'  
Last casing - 7", 23# casing @ 34'

---

**BITS** -- Now drilling 6 1/4" hole | Rotary speed -250 rpm; WOB - 2K lb; Rate of Penetration - avg. 3 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35			

**Drilling Assembly:** 6 1/4 BSF core bit, reamer shell, core barrel, stabilizer, BSF core rods

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water, bentonite, polymer

Flow rate - 70 gal/min | Pressure - 60 psi | Returns temp - 84°F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - none

---

**Lithology of past day's drilling:**  
cement

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**Summary of events last 24 hours:**

Rig back in service at 1400. RIH with BSF coring tools. Tag cement at 314.5'. Core good cement to 374' with full returns at report time. Coring is slow because of slipping core.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 9 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 10 | Depth today - 455' | Hole advance last 24 hr - 0' | Core recovered - 0'  
Last casing - 7", 23# casing @ 34'

---

**BITS** -- Now drilling 6 1/4" hole | Rotary speed -250 rpm; WOB - 2K lb; Rate of Penetration - avg. 3 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35	455	420	80
3	6-1/4" milled tooth				

**Drilling Assembly:** 6-1/4" bit, bit sub, WBS, 4-1/4" DC, WBS, DC, xover, CHD101

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water, bentonite

Flow rate - 85 gal/min | Pressure - 80 psi | Returns temp - 44°F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - none

---

**Lithology of past day's drilling:**  
cement

---

**Summary of events last 24 hours:**

Core cement to 401' and lose total returns. Set up to core blind. Core and grind weak cement to 414'. POOH for L.C. plugs. No fluid standing in well. Mixed and dumped 5 ea ~ 50 gal accelerated cement plugs. Checked for fill with Echo meter after each plug. Getting less than 20% fill. TOC ~ 350'. Fill hole and pick up tri-cone. Reaming cement stringers at report time.

---

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 10 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 11 | Depth today - 455' | Hole advance last 24 hr - 0' | Core recovered - 0'  
Last casing - 7", 23# casing @ 34'

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**BITS** -- Now drilling 6 1/4" hole | Rotary speed -250 rpm; WOB - 2K lb; Rate of Penetration - avg. 3 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35	455	420	80
3	6-1/4" milled tooth				

**Drilling Assembly:** 6-1/4" bit, bit sub, WBS, 4-1/4" DC, WBS, DC, xover, CHD101

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water, bentonite

Flow rate - 85 gal/min | Pressure - 80 psi | Returns temp - 44°F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - none

---

**Lithology of past day's drilling:**  
cement

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**Summary of events last 24 hours:**

Drill hard cement with full returns to 383' and then lost total returns. Drilled and washed cement to 455' blind. POOH. Fluid level 370'. Mix and pump 4 engineered LCM plugs. Checked fluid level after each plug and tried to fill hole. Water level never changed and hole never filled. RIH with open ended drill pipe; mix and pump 170 gal of cement. Displace with water. WOC

---

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 11 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 12 | Depth today - 514' | Hole advance last 24 hr - 59' | Core recovered - 25'  
 Last casing - 7", 23# casing @ 34'

**BITS** -- Now drilling 6 1/4" hole | Rotary speed -150 rpm; WOB - 2K lb; Rate of Penetration - avg. 3 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35	455	420	80
3	6-1/4" milled tooth	370	455	cement	
2rr	6 1/4" BSF series 2	455			

**Drilling Assembly:** 6 1/4 BSF core bit, reamer shell, core barrel, stabilizer, BSF core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - water

Flow rate - 90 gal/min | Pressure - 150 psi | Returns temp - xx<sup>o</sup>F max |  
 Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - total

**Lithology of past day's drilling:**

455 - 467 porphyritic dacite, sill, highly fractured  
 467 - 478 void  
 478 - 489 limestone  
 489 - 512 no core recovery

**Summary of events last 24 hours:**

Try to fill hole. Will not fill. RIH with tri-cone. Tag cement at 207', wash and drill to solid cement at 417'. Drill cement to 453'. POOH and pick up coring tools and core ahead blind. Hit void at 467'. Lower rods 7.5' and wash to 478'. Core to 488' and enter another void. Core to 512' with no core recovery. Core to 514' at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 12 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 13 | Depth today - 549' | Hole advance last 24 hr - 35' | Core recovered - 19'  
Last casing - 7", 23# casing @ 34'

-----  
**BITS** -- Now drilling 6 1/4" hole | Rotary speed -150 rpm; WOB - 2K lb; Rate of Penetration - avg. 3 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35	514	479	90
3	6-1/4" milled tooth	370	455	cement	
4	6 1/4" BSF used 7	514			

**Drilling Assembly:** 6 1/4 BSF core bit, reamer shell, core barrel, stabilizer, BSF core rods

-----

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	521			173°F

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**Drilling fluid** - water

Flow rate - 90 gal/min | Pressure - 150 psi | Returns temp - xx°F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - total

-----  
**Lithology of past day's drilling:**

limestone

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**Summary of events last 24 hours:**

Pull out of hole to pull stuck tube. Drilled on mis-latch. Bit outside gage going. Replace with good used series 7 BSF bit. Reamer shell in good shape. Lower through voids to TD with no problem. Rock getting more competent. Having problems recovering core. Drilled on another mis-latch. POOH to clear pipe. Coring ahead at shift change looking for a casing point.

-----  
**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 13 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 14 | Depth today - 596.4' | Hole advance last 24 hr - 47' | Core recovered - 47'  
 Last casing - 7", 23# casing @ 34'

**BITS** -- Now drilling 6 1/4" hole | Rotary speed -150 rpm; WOB - 2K lb; Rate of Penetration - avg. 3 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35	514	479	90
3	6-1/4" milled tooth	370	455	cement	
4	6 1/4" BSF used 7	514			

**Drilling Assembly:** 6 1/4 BSF core bit, reamer shell, core barrel, stabilizer, BSF core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	521			173°F

**Drilling fluid** - water

Flow rate - 90 gal/min | Pressure - 150 psi | Returns temp - xx°F max |  
 Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - total

**Lithology of past day's drilling:**

limestone

**Summary of events last 24 hours:**

Core to casing point at 596.4'. Make wiper trip and get fluid sample. POOH laying down BSF coring tools. Nipple down mud riser. Ready to run casing at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 14 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 15 | Depth today - 596.4' | Hole advance last 24 hr - 0' | Core recovered - 0'  
Last casing - 4-1/2", 11.6# casing @ 596'

-----  
**BITS** -- Now drilling 6 1/4" hole | Rotary speed -150 rpm; WOB - 2K lb; Rate of Penetration - avg. 3 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35	514	479	90
3	6-1/4" milled tooth	370	455	cement	
4	6 1/4" BSF used 7	514			

**Drilling Assembly:** 6 1/4 BSF core bit, reamer shell, core barrel, stabilizer, BSF core rods

-----

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	521			173°F

-----

**Drilling fluid** - water

Flow rate - 90 gal/min | Pressure - 150 psi | Returns temp - xx°F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - total

-----  
**Lithology of past day's drilling:**

none

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**Summary of events last 24 hours:**

Run casing to 596.4' and cement in place with 4 barrels of type H cement with 35% silica flour. Drop plug and displace with 8.7 barrels of water. CIP at 1630. Bridge backside at 390' and top with 21 sacks of type H with 35% silica flour. Hole filled right at theoretical volume. CIP at 2300. WOC

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 15 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 16 | Depth today - 597' | Hole advance last 24 hr - 1' | Core recovered - 1'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 6 1/4" hole | Rotary speed -150 rpm; WOB - 2K lb; Rate of Penetration - avg. 3 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35	514	479	90
3	6-1/4" milled tooth	370	455	cement	
4	6 1/4" BSF used 7	514	596	82	20
5	HQ series 9	596			

**Drilling Assembly:** HQ core bit, reamer shell, core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	521			173°F

**Drilling fluid** - water

Flow rate - 30 gal/min | Pressure - 250 psi | Returns temp - 96°F max |  
 Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - none

**Lithology of past day's drilling:**

none

**Summary of events last 24 hours:**

Pressure test casing. Back off casing at ground level and install wellhead. Nipple up BOPE. Repair leaks and test stack. Test witnessed and approved by Russ Jentgen of the BLM. Finish rigging up to core drill. Pick up tools and run in hole to 507'. Wash to 524' and core cement. Tag plug at 552.6'. Core out plug and float. Core to 596' and core new formation to 597'. Did not recover any cement below the float. Float stuck in core catcher and cement was ground. Circulate mud out of hole and prepare for shoe test

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 16 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 17 | Depth today - 774' | Hole advance last 24 hr - 177' | Core recovered - 177'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 495 rpm; WOB - 2K lb; Rate of Penetration - avg. 19 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35	514	479	90
3	6-1/4" milled tooth	370	455	cement	
4	6 1/4" BSF used 7	514	596	82	20
5	HQ series 9	596			

**Drilling Assembly:** HQ core bit, reamer shell, core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	521			173°F
	645	2.5°	na	147°F

**Drilling fluid** - polymer, bentonite

Flow rate - 22 gal/min | Pressure - 350 psi | Returns temp - 118°F max |  
 Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - slight

**Lithology of past day's drilling:**

none reported

**Summary of events last 24 hours:**

POOH at 597' for shoe test. Hole standing full of water. Close blind rams and pressurize well to 100 psi. In 30 minutes pressure rose to 175 psi. Test witnessed by Russ Jentgen of the BLM. Core ahead with mostly full returns to 774' at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 17 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 18 | Depth today - 919' | Hole advance last 24 hr - 145' | Core recovered - 145'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 450 rpm; WOB - 2K lb; Rate of Penetration - avg. 10 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35	514	479	90
3	6-1/4" milled tooth	370	455	cement	
4	6 1/4" BSF used 7	514	596	82	20
5	HQ series 9	596			

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	521			173°F
	645	2.5°	na	147°F

**Drilling fluid** - polymer, bentonite

Flow rate - 22 gal/min | Pressure - 350 psi | Returns temp - 108°F max |  
 Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - slight

**Lithology of past day's drilling:**

597 - 845.5 Porphyritic felsite, fractured, little or no aperture. Fracture fill is kaolinite, minor calcite.  
 Felsite may be latite, dacite, or rhyolite. Phenocrysts are altered

**Summary of events last 24 hours:**

Core ahead for the past 24 hours with 100% core recovery. Rock very broken resulting in ten short runs from 772' to 796'. Back in limestone at ~ 860' with more long core runs.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 18 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 19 | Depth today - 1078' | Hole advance last 24 hr - 159' | Core recovered - 157'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 400 rpm; WOB - 2K lb; Rate of Penetration - avg. 10 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35	514	479	90
3	6-1/4" milled tooth	370	455	cement	
4	6 1/4" BSF used 7	514	596	82	20
5	HQ series 9	596	924	328	20
6	HQ series 9	924			

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	521			173°F
	645	2.5°	na	147°F
	930	2°	na	149°F

**Drilling fluid** - polymer, bentonite

Flow rate - 30 gal/min | Pressure - 300 psi | Returns temp - 58°F max |  
 Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - 20% returns

**Lithology of past day's drilling:**

815.5 - 864.0 Porphyritic felsite, fractured,  
 864.0 - 955.0 Cherty limestone and fossiliferous limestone

**Summary of events last 24 hours:**

Trip for bit change at 924'. Ran core tube logger on trip in and while coring to 930'. BHT was 161°F and then dropped while pumping. Max temp after coring was 149°F. Core ahead with full returns to 955' then lost all returns. Fluid level dropped to 380'. Pumped LCM slugs. Returns gradually started to come back. At report time getting less than 20% back.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 19 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 20 | Depth today - 1409' | Hole advance last 24 hr - 331' | Core recovered - 331'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 420 rpm; WOB - 2K lb; Rate of Penetration - avg. 20 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35	514	479	90
3	6-1/4" milled tooth	370	455	cement	
4	6 1/4" BSF used 7	514	596	82	20
5	HQ series 9	596	924	328	20
6	HQ series 9	924			

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	521			173°F
	645	2.5°	na	147°F
	930	2°	na	149°F
	1206	2°	na	127°F

**Drilling fluid** - polymer, bentonite

Flow rate - 24 gal/min | Pressure - 350 psi | Returns temp - 64°F max |  
 Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - 33% returns

**Lithology of past day's drilling:**

limestone

**Summary of events last 24 hours:**

Core ahead. Slug hole with LCM. Thin mud to reduce circulating pressure. Returns holding at ~ 33%.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 20 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 21 | Depth today - 1601' | Hole advance last 24 hr - 194' | Core recovered - 194'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 250 rpm; WOB - 2K lb; Rate of Penetration - avg. 10 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35	514	479	90
3	6-1/4" milled tooth	370	455	cement	
4	6 1/4" BSF used 7	514	596	82	20
5	HQ series 9	596	924	328	20
6	HQ series 9	924	1601	677	

**Drilling Assembly:** HQ core bit, reamer shell, 20' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	521			173°F
	645	2.5°	na	147°F
	930	2°	na	149°F
	1206	2°	na	127°F
	1459	2.8°	na	150°F

**Drilling fluid** - polymer, bentonite

Flow rate - 24 gal/min | Pressure - 350 psi | Returns temp - 68°F max |  
 Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - 50% returns

**Lithology of past day's drilling:**

limestone

**Summary of events last 24 hours:**

Core ahead. Rig down for repair two hours. Bit went at 1601'. POOH and rig up 20' core barrel. Running in hole at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 21 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 22 | Depth today - 1870' | Hole advance last 24 hr - 269' | Core recovered - 269'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 250 rpm; WOB - 2K lb; Rate of Penetration - avg. 20 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	12	35	23	2
2	6 1/4" BSF series 2	35	514	479	90
3	6-1/4" milled tooth	370	455	cement	
4	6 1/4" BSF used 7	514	596	82	20
5	HQ series 9	596	924	328	20
6	HQ series 9	924	1601	677	

**Drilling Assembly:** HQ core bit, reamer shell, 20' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	521			173°F
	645	2.5°	na	147°F
	930	2°	na	149°F
	1206	2°	na	127°F
	1459	2.8°	na	150°F

**Drilling fluid** - polymer, bentonite

Flow rate - 22 gal/min | Pressure - 375 psi | Returns temp - 75°F max |  
 Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - 50% returns

**Lithology of past day's drilling:**

limestone

**Summary of events last 24 hours:**

Ran a temperature log (with core bit at 1000') on trip after bit change. Maximum temperature at 1601' was 173°F. This was after six hours without circulation. No fill on bottom after trip. Core ahead past 14 hours with mostly 20' core runs.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 22 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 23 | Depth today - 2019' | Hole advance last 24 hr - 149' | Core recovered - 149'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 270 rpm; WOB - 5K lb; Rate of Penetration - avg. 15 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
2	6 1/4" BSF series 2	35	514	479
3	6-1/4" milled tooth	370	455	cement
4	6 1/4" BSF used 7	514	596	82
5	HQ series 9	596	924	328
6	HQ series 9	924	1601	677
7	HQ series 9	1601	1988	387
8	HQ series 9	1988		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	521			173°F
	645	2.5°	na	147°F
	930	2°	na	149°F
	1206	2°	na	127°F
	1459	2.8°	na	150°F
	1910	3.9°	na	173°F

**Drilling fluid** - polymer, bentonite

Flow rate - 20 gal/min | Pressure - 200 psi | Returns temp - na°F max |  
 Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - total

**Lithology of past day's drilling:**

1634.6 - 1835.0 fossiliferous and argillaceous limestone  
 1835.0 - 1856.7 shale and calcareous shale  
 1856.7 - felsic intrusion

**Summary of events last 24 hours:**

Core ahead with partial to total lost circulation. Having problems with 20' inner barrels pressuring up. POOH at 1988' and change back to 10' core barrel. Bit outside gage is gone. Pick up new bit and run in hole. Slug hole with LCM. Presently pumping down the backside at ~ 9 gpm to maintain full hole. Getting 4 of the 9 gallons back.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 23 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 24 | Depth today - 2219' | Hole advance last 24 hr - 200' | Core recovered - 200'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 270 rpm; WOB - 5K lb; Rate of Penetration - avg. 15 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
2	6 1/4" BSF series 2	35	514	479
3	6-1/4" milled tooth	370	455	cement
4	6 1/4" BSF used 7	514	596	82
5	HQ series 9	596	924	328
6	HQ series 9	924	1601	677
7	HQ series 9	1601	1988	387
8	HQ series 9	1988		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	521			173°F
	645	2.5°	na	147°F
	930	2°	na	149°F
	1206	2°	na	127°F
	1459	2.8°	na	150°F
	1910	3.9°	na	173°F
	2057	3.9°	na	131°F

**Drilling fluid** - polymer, bentonite, walnut shells

Flow rate - 20 gal/min | Pressure - 200 psi | Returns temp - na°F max |  
 Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - 10 to 25% returns

**Lithology of past day's drilling:**

1856.7 - felsic intrusion

**Summary of events last 24 hours:**

Core ahead with partial returns. Not pumping down the backside and getting up to 25% returns. Rock highly fractured but getting full core runs with 100% core recovery.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 24 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 25 | Depth today - 2355' | Hole advance last 24 hr - 136' | Core recovered - 136'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 270 rpm; WOB - 4K lb; Rate of Penetration - avg. 15 ft/hr

(see 1/22 for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
6	HQ series 9	924	1601	677
7	HQ series 9	1601	1988	387
8	HQ series 9	1988	2345	357
9	HQ series 9	2345		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 1/22 for previous data)	1459	2.8 <sup>o</sup>	na	150 <sup>o</sup> F
	1910	3.9 <sup>o</sup>	na	173 <sup>o</sup> F
	2057	3.9 <sup>o</sup>	na	131 <sup>o</sup> F
	2307	4.4 <sup>o</sup>		144 <sup>o</sup> F

**Drilling fluid** - polymer, bentonite, walnut shells

Flow rate - 20 gal/min | Pressure - 200 psi | Returns temp - 64<sup>o</sup>F max |  
 Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - 0 to 10% returns

**Lithology of past day's drilling:**

1856.7 - felsic intrusion

**Summary of events last 24 hours:**

Core ahead with occasional partial returns. Pumping down the backside to maintain full hole and lubricate core pipe. Rock hard and often highly fractured but getting full core runs with 100% core recovery. Bit went at midnight. Ran temperature log on trip back in (bit at 917'). Hole clean to TD. Sat on bottom for 1 hour. Maximum temperature recorded was 172.4<sup>o</sup>F. Back to bottom and coring at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 25 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 26 | Depth today - 2529' | Hole advance last 24 hr - 174' | Core recovered - 174'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 270 rpm; WOB - 4K lb; Rate of Penetration - avg. 10 ft/hr

(see 1/22 for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
6	HQ series 9	924	1601	677
7	HQ series 9	1601	1988	387
8	HQ series 9	1988	2345	357
9	HQ series 9	2345		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 1/22 for previous data)	1459	2.8 <sup>o</sup>	na	150 <sup>o</sup> F
	1910	3.9 <sup>o</sup>	na	173 <sup>o</sup> F
	2057	3.9 <sup>o</sup>	na	131 <sup>o</sup> F
	2307	4.4 <sup>o</sup>		144 <sup>o</sup> F

**Drilling fluid** - polymer, bentonite, walnut shells

Flow rate - 20 gal/min | Pressure - 200 psi | Returns temp - 64<sup>o</sup>F max |  
 Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - xx  
 Lost circulation - 10% returns

**Lithology of past day's drilling:**

1866.7 - felsic intrusion

**Summary of events last 24 hours:**

Core ahead with partial returns. Found a 10' depth error on last trip out. This error occurred at 638' on January 15th. Two core runs were labeled 628' to 638'. Ten feet was added to the hole at 2385'.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 26 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 27 | Depth today - 2649' | Hole advance last 24 hr - 120' | Core recovered - 120'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 270 rpm; WOB - 4K lb; Rate of Penetration - avg. 15 ft/hr

(see 1/22 for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
6	HQ series 9	924	1601	677
7	HQ series 9	1601	1988	387
8	HQ series 9	1988	2345	357
9	HQ series 9	2345	2568	223
10	HQ series 8	2568		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 1/22 for previous data)	1459	2.8°	na	150°F
	1910	3.9°	na	173°F
	2057	3.9°	na	131°F
	2307	4.4°		144°F

**Drilling fluid** - polymer, bentonite, walnut shells, mica

Flow rate - 26 gal/min | Pressure - 320 psi | Returns temp - 60°F max |  
 Wt - 8.5 lb/gal | Vis - 39 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 9.5  
 Lost circulation - less than 10% returns

**Lithology of past day's drilling:**

1866.7 - felsic intrusion

**Summary of events last 24 hours:**

Tube stuck after coring to 2568'. POOH wet to clear core barrel. Replace bit and clean mud system. RIH and condition mud. Core ahead with partial to no fluid returns.

**Report by:** Ron Jacobson.

**DAILY DRILLING REPORT - 27 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 28 | Depth today - 2869' | Hole advance last 24 hr - 220' | Core recovered - 220'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 270 rpm; WOB - 4K lb; Rate of Penetration - avg. 15 ft/hr

(see 1/22 for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
6	HQ series 9	924	1601	677
7	HQ series 9	1601	1988	387
8	HQ series 9	1988	2345	357
9	HQ series 9	2345	2568	223
10	HQ series 8	2568		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 1/22 for previous data)	1459	2.8 <sup>o</sup>	na	150 <sup>o</sup> F
	1910	3.9 <sup>o</sup>	na	173 <sup>o</sup> F
	2057	3.9 <sup>o</sup>	na	131 <sup>o</sup> F
	2307	4.4 <sup>o</sup>	na	144 <sup>o</sup> F
	2683	4.5 <sup>o</sup>	na	143 <sup>o</sup> F

**Drilling fluid** - polymer, bentonite, walnut shells

Flow rate - 26 gal/min | Pressure - 320 psi | Returns temp - 60<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 39 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 9.5  
 Lost circulation - less than 10% returns

**Lithology of past day's drilling:**

1866.7 - felsic intrusion

**Summary of events last 24 hours:**

Core ahead for the last 24 hours. Presently not pumping down the backside and getting less than 10% fluid returns.

**Report by:** Ron Jacobson.

**DAILY DRILLING REPORT - 28 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 29 | Depth today - 3017' | Hole advance last 24 hr - 148' | Core recovered - 148'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 270 rpm; WOB - 4K lb; Rate of Penetration - avg. 15 ft/hr

(see 1/22 for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
6	HQ series 9	924	1601	677
7	HQ series 9	1601	1988	387
8	HQ series 9	1988	2345	357
9	HQ series 9	2345	2568	223
10	HQ series 8	2568	3017	449

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 1/22 for previous data)	1459	2.8 <sup>o</sup>	na	150 <sup>o</sup> F
	1910	3.9 <sup>o</sup>	na	173 <sup>o</sup> F
	2057	3.9 <sup>o</sup>	na	131 <sup>o</sup> F
	2307	4.4 <sup>o</sup>	na	144 <sup>o</sup> F
	2683	4.5 <sup>o</sup>	na	143 <sup>o</sup> F
	2907	4.3 <sup>o</sup>	na	157 <sup>o</sup> F

**Drilling fluid** - polymer, bentonite, walnut shells

Flow rate - 26 gal/min | Pressure - 320 psi | Returns temp - 60<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 41 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 9.5  
 Lost circulation - less than 10% returns

**Lithology of past day's drilling:**

1866.7 - felsic intrusion

**Summary of events last 24 hours:**

Core ahead for 19 hours, then the bit went. POOH for bit. Out of hole at report time. will make up 20' core barrel and trip back in.

**Report by:** Ron Jacobson.

**DAILY DRILLING REPORT - 29 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 30 | Depth today - 3120' | Hole advance last 24 hr - 103' | Core recovered - 103'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 270 rpm; WOB - 4K lb; Rate of Penetration - avg.. 15 ft/hr

(see 1/22 for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
6	HQ series 9	924	1601	677
7	HQ series 9	1601	1988	387
8	HQ series 9	1988	2345	357
9	HQ series 9	2345	2568	223
10	HQ series 8	2568	3017	449
11	HQ series 8	3017		

**Drilling Assembly:** HQ core bit, reamer shell, 20' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 1/22 for previous data)	1459	2.8 <sup>o</sup>	na	150 <sup>o</sup> F
	1910	3.9 <sup>o</sup>	na	173 <sup>o</sup> F
	2057	3.9 <sup>o</sup>	na	131 <sup>o</sup> F
	2307	4.4 <sup>o</sup>	na	144 <sup>o</sup> F
	2683	4.5 <sup>o</sup>	na	143 <sup>o</sup> F
	2907	4.3 <sup>o</sup>	na	157 <sup>o</sup> F

**Drilling fluid** - polymer, bentonite, walnut shells

Flow rate - 24 gal/min | Pressure - 320 psi | Returns temp - 61<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 41 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 9.5  
 Lost circulation - 10% to 15% returns

**Lithology of past day's drilling:**

1866.7 - 3058 felsic intrusion  
 3058 limestone

**Summary of events last 24 hours:**

Run in hole with Core Tube Logger mounted 6" inside bit. Maximum temperature 3' off bottom was 176<sup>o</sup>F. Pull out CTL. Core ahead 23' but having standpipe pressure problems. POOH to re-configure core barrel. Run back in hole and core ahead. Tube stuck and wireline broke at 3120'. POOH to clear core barrel and retrieve wireline.

**Report by:** Ron Jacobson.

**DAILY DRILLING REPORT - 30 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 31 | Depth today - 3310' | Hole advance last 24 hr - 190' | Core recovered - 190'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 270 rpm; WOB - 5K lb; Rate of Penetration - avg.. 15 ft/hr

(see 1/22 for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
6	HQ series 9	924	1601	677
7	HQ series 9	1601	1988	387
8	HQ series 9	1988	2345	357
9	HQ series 9	2345	2568	223
10	HQ series 8	2568	3017	449
11	HQ series 8	3017	3120	113
12	HQ series 9	3120		

**Drilling Assembly:** HQ core bit, reamer shell, 20' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 1/22 for previous data)	1459	2.8°	na	150°F
	1910	3.9°	na	173°F
	2057	3.9°	na	131°F
	2307	4.4°	na	144°F
	2683	4.5°	na	143°F
	2907	4.3°	na	157°F
	3120	2.8°	na	185°F

**Drilling fluid** - polymer, bentonite, walnut shells

Flow rate - 24 gal/min | Pressure - 320 psi | Returns temp - 61°F max |  
 Wt - 8.5 lb/gal | Vis - 41 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 9.5  
 Lost circulation - 25% returns

**Lithology of past day's drilling:**

1866.7 - 3057.8 felsic intrusion  
 3057.8 limestone

**Summary of events last 24 hours:**

POOH for stuck tube. Roll-pin came out and locked tube in place. Replace bit and reamer shell. Repair inner tube and weld pins. RIH with core tube logger in drilling position. Core ahead to 3139' and pull logger. Max temperature 186°F. Core ahead with fluid returns up to 25%.

**Report by:** Ron Jacobson.

**DAILY DRILLING REPORT - 31 JAN 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 32 | Depth today - 3530' | Hole advance last 24 hr - 220' | Core recovered - 220'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 270 rpm; WOB - 5K lb; Rate of Penetration - avg.. 15 ft/hr

(see 1/30 for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
11	HQ series 8	3017	3120	113
12	HQ series 9	3120		

**Drilling Assembly:** HQ core bit, reamer shell, 20' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 1/30 for previous data)	2907	4.3 <sup>o</sup>	na	157 <sup>o</sup> F
	3120	2.8 <sup>o</sup>	na	185 <sup>o</sup> F
	3390	4.1 <sup>o</sup>	na	186 <sup>o</sup> F

**Drilling fluid** - polymer, bentonite, walnut shells, Tork-ease  
 Flow rate - 24 gal/min | Pressure - 320 psi | Returns temp - 61<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 41 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 9.5  
 Lost circulation - 30% returns

**Lithology of past day's drilling:**

3057.8 - 3129.4 limestone  
 3129.4 dolomite

**Summary of events last 24 hours:**

Core ahead with full core recovery and fluid returns improving.

**Report by:** Ron Jacobson.

**DAILY DRILLING REPORT - 1 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 33 | Depth today - 3600' | Hole advance last 24 hr - 70' | Core recovered - 70'  
Last casing - 4-1/2", 11.6# casing @ 596'

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**BITS** -- Now drilling 3.9" hole | Rotary speed - 270 rpm; WOB - 5K lb; Rate of Penetration - avg.. 15 ft/hr

(see 1/30 for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
11	HQ series 8	3017	3120	113
12	HQ series 9	3120	3554	434
13	HQ series 2	3554		

**Drilling Assembly:** HQ core bit, reamer shell, 20' core barrel, stabilizer, HQ core rods

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 1/30 for previous data)	2907	4.3 <sup>o</sup>	na	157 <sup>o</sup> F
	3120	2.8 <sup>o</sup>	na	185 <sup>o</sup> F
	3390	4.1 <sup>o</sup>	na	186 <sup>o</sup> F

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**Drilling fluid** - polymer, bentonite, walnut shells, Tork-ease

Flow rate - 24 gal/min | Pressure - 320 psi | Returns temp - 63<sup>o</sup>F max |  
Wt - 8.5 lb/gal | Vis - 41 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 9.5  
Lost circulation - 30% returns

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**Lithology of past day's drilling:**

3129.4 dolomite

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**Summary of events last 24 hours:**

Core ahead to 3554' when bit went. POOH for bit. RIH to 2022' and rig up to temperature log. Maximum temperature on bottom was 182<sup>o</sup>F. Coring ahead at 3611' at shift change.

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**Report by:** Ron Jacobson.

**DAILY DRILLING REPORT - 2 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 34 | Depth today - 3770' | Hole advance last 24 hr - 170' | Core recovered - 170'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 260 rpm; WOB - 5K lb; Rate of Penetration - avg.. 11 ft/hr

(see 1/30 for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
11	HQ series 8	3017	3120	113
12	HQ series 9	3120	3554	434
13	HQ series 2	3554		

**Drilling Assembly:** HQ core bit, reamer shell, 20' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 1/30 for previous data)	2907	4.3 <sup>o</sup>	na	157 <sup>o</sup> F
	3120	2.8 <sup>o</sup>	na	185 <sup>o</sup> F
	3390	4.1 <sup>o</sup>	na	186 <sup>o</sup> F
	3660	5.2 <sup>o</sup>	na	183 <sup>o</sup> F

**Drilling fluid** - polymer, bentonite, walnut shells, Tork-ease

Flow rate - 24 gal/min | Pressure - 320 psi | Returns temp - 79<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 41 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 9.5  
 Lost circulation - 30% returns

**Lithology of past day's drilling:**

3129.4 dolomite

**Summary of events last 24 hours:**

Coring ahead at 3711' at report time. ROP dropping off with higher torque.

**Report by:** Ron Jacobson.

**DAILY DRILLING REPORT - 3 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 35 | Depth today - 3815' | Hole advance last 24 hr - 45' | Core recovered - 45'  
Last casing - 4-1/2", 11.6# casing @ 596'

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**BITS** -- Now drilling 3.9" hole | Rotary speed - 260 rpm; WOB - 5K lb; Rate of Penetration - avg.. 11 ft/hr

(see 1/30 for previous bits)

<b>Bit No.</b>	<b>Type</b>	<b>Depth in, KB</b>	<b>Depth out, KB</b>	<b>Footage</b>
11	HQ series 8	3017	3120	113
12	HQ series 9	3120	3554	434
13	HQ series 2	3554	3815	261
14	HQ series 9	3815		

**Drilling Assembly:** HQ core bit, reamer shell, 20' core barrel, stabilizer, HQ core rods

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<b>Surveys:</b>	<b>Depth</b>	<b>Inclination</b>	<b>Direction</b>	<b>Bottom-hole Temperature</b>
(see 1/30 for previous data)	2907	4.3 <sup>o</sup>	na	157 <sup>o</sup> F
	3120	2.8 <sup>o</sup>	na	185 <sup>o</sup> F
	3390	4.1 <sup>o</sup>	na	186 <sup>o</sup> F
	3660	5.2 <sup>o</sup>	na	183 <sup>o</sup> F

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**Drilling fluid** - polymer, bentonite, walnut shells, Tork-ease

Flow rate - 24 gal/min | Pressure - 320 psi | Returns temp - 79<sup>o</sup>F max |  
Wt - 8.5 lb/gal | Vis - 41 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 9.5  
Lost circulation - 30% returns

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**Lithology of past day's drilling:**

none reported

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**Summary of events last 24 hours:**

Bit went at 1300 hours. POOH for new bit. Run new bit to 565' and secure pipe rams. Install stabbing valve with wire-line pack off for temperature monitoring. Secure site for one-week drill crew break. Will log well periodically during break to determine temperature gradient. Next daily drilling report will be on 2/11/97.

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**Report by:** Ron Jacobson.

**DAILY DRILLING REPORT - 13 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 36 | Depth today - 3920' | Hole advance last 24 hr - 105' | Core recovered - 105'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 275 rpm; WOB - 6K lb; Rate of Penetration - avg.. 7 ft/hr

(see 1/30 for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
11	HQ series 8	3017	3120	113
12	HQ series 9	3120	3554	434
13	HQ series 2	3554	3815	261
14	HQ series 9	3815		

**Drilling Assembly:** HQ core bit, reamer shell, 20' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 1/30 for previous data)	2907	4.3 <sup>o</sup>	na	157 <sup>o</sup> F
	3120	2.8 <sup>o</sup>	na	185 <sup>o</sup> F
	3390	4.1 <sup>o</sup>	na	186 <sup>o</sup> F
	3660	5.2 <sup>o</sup>	na	183 <sup>o</sup> F

**Drilling fluid** - polymer, bentonite, walnut shells, Tork-ease

Flow rate - 24 gal/min | Pressure - 320 psi | Returns temp - 103<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 41 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 9.5  
 Lost circulation - 30% returns

**Lithology of past day's drilling:**

none reported

**Summary of events last 24 hours:**

Ran 3 temperature logs during the 10 day drilling break. Max bottom hole temperature was 183.5<sup>o</sup>F. Ran new bit to bottom and cored ahead with partial returns. No tight spots and very little cave on bottom.

**Report by:** Ron Jacobson.

**DAILY DRILLING REPORT - 14 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 45-5 | **Location** - Section 5, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 12' above ground level**

Days since spud - 37 | Depth today - 3961' | Hole advance last 24 hr - 41' | Core recovered - 41'  
 Last casing - 4-1/2", 11.6# casing @ 596'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 275 rpm; WOB - 6K lb; Rate of Penetration - avg.. 7 ft/hr

(see 1/30 for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage
13	HQ series 2	3554	3815	261
14	HQ series 9	3815	3961	146

**Drilling Assembly:** HQ core bit, reamer shell, 20' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 2/13 for previous data)	3390	4.1°	na	186°F
	3660	5.2°	na	183°F
	3961	4.8°	na	182°F

**Drilling fluid** - bentonite

Flow rate - 24 gal/min | Pressure - 320 psi | Returns temp - 60°F max |  
 Wt - 8.9 lb/gal | Vis - 100 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - 9.5  
 Lost circulation - 30% returns

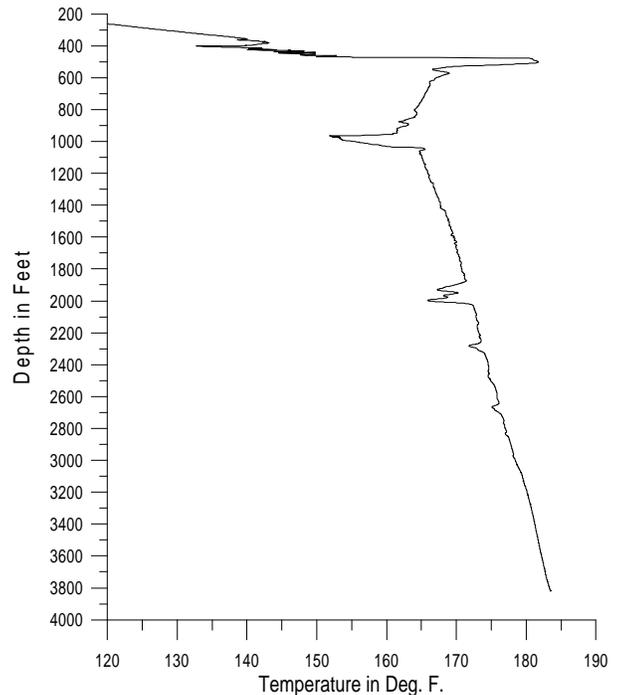
**Lithology summary for well:**

20 - 30	Recent/Pleistocene/alluvium
30 - 433.8	Penn/Magdalene Group
433.8 - 466.8	Tertiary/felsic sill
466.8 - 550.3	Penn/Magdalene Group
550.3 - 863.7	Tertiary/felsic sill
863.7 - 1856.7	Penn-Miss/Limestone (undiff)
1856.7 - 3119.4	Tertiary/felsic sill
3119.4 - 3129.4	Miss-Dev/shale (undiff)
3129.4 - 3649.3	Sil/Fusselman Dolomite
3649.3 - 3818	Ord/Montoya Group

**Summary of events last 24 hours:**

Core ahead to 3961' and bit went. This will be TD. Pump heavy mud around and POOH laying down. This is the final daily drilling report for this well.

**Report by:** Ron Jacobson.



**DAILY DRILLING REPORT - 18 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 1 | Depth today - 52' | Hole advance last 24 hr - 41' | Core recovered - na  
Last casing - 7", 23# casing @ 50'

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**BITS** -- Now drilling 6-1/4" hole | Rotary speed - 145 rpm; WOB - 2K lb; Rate of Penetration - 20 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	11	50	39	2
2RR	6-1/4" milled tooth	50			

**Drilling Assembly:** 6-1/4" bit, bit sub, WBS, 4-1/4" DC, WBS, DC, xo, CHD 101 DP

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - bentonite

Flow rate - 130 gal/min | Pressure - 300 psi | Returns temp - na °F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - total

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**Lithology of past day's drilling:**

sand

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**Summary of events last 24 hours:**

Spud hole and drill to 50'. Make wiper trip and POOH. Pick up and run conductor casing. Cement casing in place. Nipple up flow line and calibrate flow meters. Pick up 6-1/4" bit and tools. Drill 1' out of 7" shoe and lost all returns. Mix and pump LCM. Drilling ahead blind at report time and getting ready to slug hole.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 19 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 2 | Depth today - 128' | Hole advance last 24 hr - 76' | Core recovered - na  
Last casing - 7", 23# casing @ 50'

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**BITS** -- Now drilling 6-1/4" hole | Rotary speed - 200 rpm; WOB - 3K lb; Rate of Penetration - 20 ft/hr

<b>Bit No.</b>	<b>Type</b>	<b>Depth in, KB</b>	<b>Depth out, KB</b>	<b>Footage</b>	<b>Hours</b>
1RR	12-1/4" milled tooth	11	50	39	2
2RR	6-1/4" milled tooth	50			

**Drilling Assembly:** 6-1/4" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xo, CHD 101 DP

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**Surveys:**                      **Depth**                      **Inclination**                      **Direction**                      **Bottom-hole Temperature**

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**Drilling fluid** - bentonite

Flow rate - 130 gal/min | Pressure - 300 psi | Returns temp - 56°F max |  
Wt - 8.8 lb/gal | Vis - 42 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - full returns

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**Lithology of past day's drilling:**

sand

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**Summary of events last 24 hours:**

Drill blind to 78' with mud and LCM. POOH and slug hole with LCM and Enviro-Plug. Could get returns but lost them at casing shoe on trip in. Mix and pump 14 sack accelerated cement plug. WOC. Fill hole, full returns. RIH with BHA. Tag cement at 48'. Drill cement and new hole with full returns. Drilling ahead at report time with full returns.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 20 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 3 | Depth today - 608' | Hole advance last 24 hr - 480' | Core recovered - na  
Last casing - 7", 23# casing @ 50'

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**BITS** -- Now drilling 6-1/8" hole | Rotary speed - 180 rpm; WOB - 3K lb; Rate of Penetration - 30 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	11	50	39	2
2RR	6-1/4" milled tooth	50	365	315	14
3	6-1/8" drag	365			

**Drilling Assembly:** 6-1/8" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xo, CHD 101 DP

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - bentonite  
Flow rate - 130 gal/min | Pressure - 300 psi | Returns temp - 107°F max |  
Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - full to 90% returns

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**Lithology of past day's drilling:**  
sand, clay

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**Summary of events last 24 hours:**

Tri-cone bit balling up with clay at 365'. POOH and pick up drag bit. Drill ahead with mostly full returns. Formation getting hard and returns getting warm. Looking for casing point.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 21 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 4 | Depth today - 630' | Hole advance last 24 hr - 22' | Core recovered - na  
 Last casing - 4-1/2", 11.6# casing @ 630'

**BITS** -- Now drilling 6" hole | Rotary speed - 140 rpm; WOB - 3K lb; Rate of Penetration - 6 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	11	50	39	2
2RR	6-1/4" milled tooth	50	365	315	14
3	6-1/8" drag	365	611	246	14
4	6" button	611	630	19	3

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea 4-1/4" DC, XO, CHD 101 DP

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - bentonite

Flow rate - 130 gal/min | Pressure - 300 psi | Returns temp - 107°F max |  
 Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - slight.

**Lithology of past day's drilling:**

sand, hard clay, chert.

**Summary of events last 24 hours:**

Drag bit going very slowly. POOH to wipe hole and pick up button bit. RIH and drill hard rock to 630'+, casing point. Circulate and POOH laying down drill pipe and BHA. Pick up and run 15 joints of 4-1/2" 11.6 lb/ft T&C casing. Rig up cementing head and cementing equipment. Planned on pumping 100% excess of 15 lb/gal Portland cement with 25% silica flour. Due to mixing problems cement weight pumped was 13.5 lb/gal and volume was ~ 50% excess. Returns were maintained throughout cement job but no cement was returned to surface. CIP at midnight. WOC until noon and evaluate.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 22 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 5 | Depth today - 630' | Hole advance last 24 hr - 0' | Core recovered - na  
 Last casing - 4-1/2", 11.6# casing @ 630'

**BITS** -- Now drilling

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	11	50	39	2
2RR	6-1/4" milled tooth	50	365	315	14
3	6-1/8" drag	365	611	246	14
4	6" button	611	630	19	3
5	HQ series 9	630			

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - bentonite

Flow rate - 130 gal/min | Pressure - 300 psi | Returns temp - 107°F max |  
 Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - full returns

**Lithology of past day's drilling:**

cement

**Summary of events last 24 hours:**

WOC until noon. Mix and pump top job with premium cement and 35% silica flour. Hole filled with ~ 80 gal. Nipple down cementing equipment and strip back 7" casing. RIH with coring tools and clean cement to 550'. POOH and pressure test casing. Ready to start nipling up small stack.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 23 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 6 | Depth today - 633' | Hole advance last 24 hr - 3' | Core recovered - 2'  
 Last casing - 4-1/2", 11.6# casing @ 630'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 280 rpm; WOB - 1K lb; Rate of Penetration - 6 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	11	50	39	2
2RR	6-1/4" milled tooth	50	365	315	14
3	6-1/8" drag	365	611	246	14
4	6" button	611	630	19	3
5	HQ series 8F	630			

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - bentonite

Flow rate - 15 gal/min | Pressure - 300 psi | Returns temp - 82°F max |  
 Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - full returns

**Lithology of past day's drilling:**

intrusive

**Summary of events last 24 hours:**

Nipple up BOP and repair leaks. Pressure test all BOP equipment to 500 psi. Russ Jentgen of the BLM witnessed and approved tests. Drill out cement. Core through shoe and 2' of new formation. Circulate hole clean and fill for shoe test. Hole is taking fluid very slowly. Looks like a leaky shoe. Close annular and pressure hole. Won't hold pressure. POOH and lay down core barrel and RIH with open ended core pipe. Mix and displace a cement plug (13 sacks type H with silica flour). Pull out of plug and squeeze. Shut in well and WOC.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 24 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 7 | Depth today - 679' | Hole advance last 24 hr - 46' | Core recovered - 46'  
 Last casing - 4-1/2", 11.6# casing @ 630'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 280 rpm; WOB - 1K lb; Rate of Penetration - 6 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	11	50	39	2
2RR	6-1/4" milled tooth	50	365	315	14
3	6-1/8" drag	365	611	246	14
4	6" button	611	630	19	3
5	HQ series 8F	630			

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - bentonite

Flow rate - 22 gal/min | Pressure - 70 psi | Returns temp - 87°F max |  
 Wt - 8.7lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - total loss

**Lithology of past day's drilling:**

intrusive

**Summary of events last 24 hours:**

WOC and rig repairs. RIH and tag cement stringers at 422'. Wash to 469' then core hard cement to 633'. Core two feet of new hole to 635' and fill hole for shoe test. Hole taking water very slowly. Turn hole over to coring mud while coring to 638.7'. Fill hole and observe static fluid level. Hole staying full. Close annular preventer and try to increase pressure in wellbore to 0.6 psi/ft gradient. Pressure bleeding off slowly but too fast for test. Try again at 0.7 psi/ft with same results. (Based on results of these pressure tests, BLM will specify the allowable bottom-hole temperature we can reach without setting additional casing). Tests observed by Russell Jentgen of the BLM. Core ahead another 6.6' and lost total returns. Slug hole and core with returns to 651' and then lost it all. Could not get them back with LCM. Coring ahead with total lost circulation at 686' at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 25 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 8 | Depth today - 899' | Hole advance last 24 hr - 220' | Core recovered - 220'  
Last casing - 4-1/2", 11.6# casing @ 630'

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**BITS** -- Now drilling 3.9" hole | Rotary speed - 380 rpm; WOB - 4K lb; Rate of Penetration - 15 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	11	50	39	2
2RR	6-1/4" milled tooth	50	365	315	14
3	6-1/8" drag	365	611	246	14
4	6" button	611	630	19	3
5	HQ series 8F	630	812	182	22
6	HQ series 9	812			

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	350	1.5°		
	757	2.2°		71°F

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**Drilling fluid** - bentonite, walnut shells

Flow rate - 28 gal/min | Pressure - 360 psi | Returns temp - 52°F max |  
Wt - 8.7lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - 20 % returns

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**Lithology of past day's drilling:**

intrusive

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**Summary of events last 24 hours:**

Core ahead with partial returns. Trip for bit at 812'.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 26 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 9 | Depth today - 1196' | Hole advance last 24 hr - 297' | Core recovered - 297'  
 Last casing - 4-1/2", 11.6# casing @ 630'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 390 rpm; WOB - 7K lb; Rate of Penetration - 15 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	11	50	39	2
2RR	6-1/4" milled tooth	50	365	315	14
3	6-1/8" drag	365	611	246	14
4	6" button	611	630	19	3
5	HQ series 8F	630	812	182	22
6	HQ series 9	812			

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	350	1.5°		
	757	2.2°		71°F
	1047	1.3°		94°F

**Drilling fluid** - bentonite, walnut shells

Flow rate - 28 gal/min | Pressure - 360 psi | Returns temp - na°F max |  
 Wt - 8.7lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total

**Lithology of past day's drilling:**

intrusive

**Summary of events last 24 hours:**

Core ahead while pumping down the backside. Good drilling with 100% core recovery.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 27 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 10 | Depth today - 1397' | Hole advance last 24 hr - 201' | Core recovered - 201'  
 Last casing - 4-1/2", 11.6# casing @ 630'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 390 rpm; WOB - 7K lb; Rate of Penetration - 15 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	11	50	39	2
2RR	6-1/4" milled tooth	50	365	315	14
3	6-1/8" drag	365	611	246	14
4	6" button	611	630	19	3
5	HQ series 8F	630	812	182	22
6	HQ series 9	812			

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	350	1.5°		
	757	2.2°		71°F
	1047	1.3°		94°F
	1279	2.7°		106°F

**Drilling fluid** - bentonite, walnut shells

Flow rate - 28 gal/min | Pressure - 360 psi | Returns temp - na°F max |  
 Wt - 8.7lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total

**Lithology of past day's drilling:**

intrusive

**Summary of events last 24 hours:**

Core ahead while pumping down the backside. Lots of short runs in broken ground.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 28 FEB 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 11 | Depth today - 1507' | Hole advance last 24 hr - 110' | Core recovered - 109'  
 Last casing - 4-1/2", 11.6# casing @ 630'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 250 rpm; WOB - 7K lb; Rate of Penetration - 10 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	11	50	39	2
2RR	6-1/4" milled tooth	50	365	315	14
3	6-1/8" drag	365	611	246	14
4	6" button	611	630	19	3
5	HQ series 8F	630	812	182	22
6	HQ series 9	812	1467	645	52
7	HQ series 9	1467			

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	350	1.5°		
	757	2.2°		71°F
	1047	1.3°		94°F
	1279	2.7°		106°F
	1449	1.7		94

**Drilling fluid** - polymer, bentonite

Flow rate - 28 gal/min | Pressure - 120 psi | Returns temp - na°F max |  
 Wt - 8.7lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total

**Lithology of past day's drilling:**

631 - 1430     porphyritic felsite  
 1430 - 1507     fossiliferous cherty limestone and interbedded shale and limestone

**Summary of events last 24 hours:**

Core ahead to 1467' and trip for bit. Lots of drag on trip out. Work through cave at 1350'. Pick up new bit and run in to 1335' and hit cave. Drill cave and condition hole. Had to re-drill cave area several times. Still caving. Work to bottom and drill cave to TD. Ran core tube logger on trip in and saw 138°F at 1350' before circulation for cave drilling. Coring ahead at report time in very broken limestone with lots of clay.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 1 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 12 | Depth today - 1599' | Hole advance last 24 hr - 92' | Core recovered -79'  
 Last casing - 4-1/2", 11.6# casing @ 630'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 250 rpm; WOB - 7K lb; Rate of Penetration - 10 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	11	50	39	2
2RR	6-1/4" milled tooth	50	365	315	14
3	6-1/8" drag	365	611	246	14
4	6" button	611	630	19	3
5	HQ series 8F	630	812	182	22
6	HQ series 9	812	1467	645	52
7	HQ series 9	1467	1599	132	26

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	350	1.5°		
	757	2.2°		71°F
	1047	1.3°		94°F
	1279	2.7°		106°F
	1449	1.7°		94°F

**Drilling fluid** - polymer, bentonite

Flow rate - 28 gal/min | Pressure - 120 psi | Returns temp - na°F max |  
 Wt - 8.7lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total

**Lithology of past day's drilling:**

1507 fossiliferous cherty limestone and interbedded shale and limestone

**Summary of events last 24 hours:**

Core with partial core recovery in very broken rock. Lots of clay and voids. Start coring competent limestone at 1565'. Core ahead to 1599' and trip for stuck tube. Will run back in hole with liner pipe and put rig on standby for 24 to 48 hours to monitor temperatures. Depending on log results the hole will either be deepened NQ or completed.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 2 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 13 | Depth today - 1599' | Hole advance last 24 hr - 0' | Core recovered - 0'  
 Last casing - 4-1/2", 11.6# casing @ 630'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 250 rpm; WOB - 7K lb; Rate of Penetration - 10 ft/hr

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
1RR	12-1/4" milled tooth	11	50	39	2
2RR	6-1/4" milled tooth	50	365	315	14
3	6-1/8" drag	365	611	246	14
4	6" button	611	630	19	3
5	HQ series 8F	630	812	182	22
6	HQ series 9	812	1467	645	52
7	HQ series 9	1467	1599	132	26

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	350	1.5°		
	757	2.2°		71°F
	1047	1.3°		94°F
	1279	2.7°		106°F
	1449	1.7°		94°F

**Drilling fluid** - polymer, bentonite

Flow rate - 28 gal/min | Pressure - 120 psi | Returns temp - na°F max |  
 Wt - 8.7lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total

**Lithology of past day's drilling:**

1507 fossiliferous cherty limestone and interbedded shale and limestone

**Summary of events last 24 hours:**

Run HQ liner back to bottom. Had to drill cave at 1335', 1370', and 1440' then lower to bottom. Rig on standby for logging.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 3 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 14 | Depth today - 1638' | Hole advance last 24 hr - 39' | Core recovered -39'  
 Last casing - 4-1/2", 11.6# casing @ 630'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 250 rpm; WOB - 7K lb; Rate of Penetration - 10 ft/hr

(see 3/1 report for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
7	HQ series 9	1467	1599	132	26
8	HQ series 8F	1599			

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 3/1 for previous data)	1279	2.7°		106°F
	1449	1.7°		94°F

**Drilling fluid** - polymer, bentonite

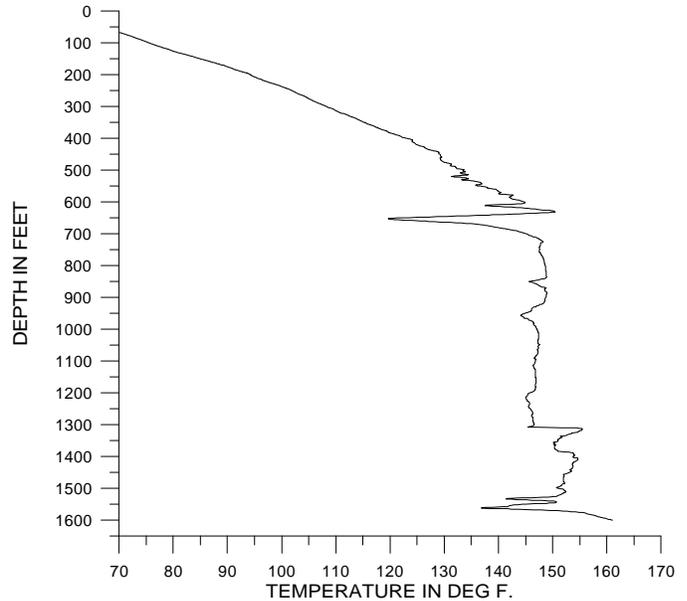
Flow rate - 18 gal/min | Pressure - 250 psi | Returns temp - na°F max |  
 Wt - 8.7 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total

**Lithology of past day's drilling:**

**Summary of events last 24 hours:**

Temperature log after 24 hour equilibration. POOH with logging liner and run in with HQ coring tools. No reaming required on trip in. Coring ahead in competent rock while pumping down the backside.

**Report by:** Ron Jacobson



**DAILY DRILLING REPORT - 4 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 15 | Depth today - 1769' | Hole advance last 24 hr - 131' | Core recovered - 131'  
 Last casing - 4-1/2", 11.6# casing @ 630'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 225 rpm; WOB - 7K lb; Rate of Penetration - 8 ft/hr

(see 3/1 report for previous bits)

Bit No.	Type	Depth in, KB	Depth out, KB	Footage	Hours
7	HQ series 9	1467	1599	132	26
8	HQ series 8F	1599			

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 3/1 for previous data)	1279	2.7°		106°F
	1449	1.7°		94°F

**Drilling fluid** - polymer, bentonite

Flow rate - 28 gal/min | Pressure - 100 psi | Returns temp - na°F max |  
 Wt - 8.7 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total

**Lithology of past day's drilling:**

**Summary of events last 24 hours:**

Core ahead for the past 24 hours. Have to rotate slower due to downhole vibrations. Pumping ~ 10 gpm down the backside.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 5 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 16 | Depth today - 1949' | Hole advance last 24 hr - 180' | Core recovered - 180'  
Last casing - 4-1/2", 11.6# casing @ 630'

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**BITS** -- Now drilling 3.9" hole | Rotary speed - 200 rpm; WOB - 7K lb; Rate of Penetration - 9 ft/hr

(see 3/1 report for previous bits)

Bit No.	Type	Depth in, KB	Depth out	Footage	Hours
7	HQ series 9	1467	1599	132	26
8	HQ series 8F	1599			

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 3/1 for previous data)	1279	2.7°		106°F
	1449	1.7°		94°F
	1787	2.5°		108°F

-----

**Drilling fluid** - polymer, bentonite

Flow rate - 18 gal/min | Pressure - 200 psi | Returns temp - na°F max |  
Wt - 8.7 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - Total

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**Lithology of past day's drilling:**

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**Summary of events last 24 hours:**

Core ahead for the past 24 hours. Downhole vibrations not as bad. Pumping ~ 10 gpm down the backside. Will temperature log on next bit trip.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 6 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 17 | Depth today - 2018' | Hole advance last 24 hr - 69' | Core recovered - 69'  
 Last casing - 4-1/2", 11.6# casing @ 630'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 200 rpm; WOB - 7K lb; Rate of Penetration - 9 ft/hr

(see 3/1 report for previous bits)

Bit No.	Type	Depth in, KB	Depth out	Footage	Hours
7	HQ series 9	1467	1599	132	26
8	HQ series 8F	1599	2018	419	65

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 3/1 for previous data)	1279	2.7°		106°F
	1449	1.7°		94°F
	1787	2.5°		108°F
	1987	2.2°		117°F

**Drilling fluid** - polymer, bentonite

Flow rate - 18 gal/min | Pressure - 200 psi | Returns temp - na°F max |  
 Wt - 8.7 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total

**Lithology of past day's drilling:**

limestone

**Summary of events last 24 hours:**

Core ahead to 2018'. POOH to wipe hole. RIH and drill cave to TD. Put rig on standby for temperature logging. BHT from temperature log = 167°F. Decide not to drill ahead. 2018' will be the TD. Getting ready for wiper trip for liner at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 7 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 18 | Depth today - 2018' | Hole advance last 24 hr - 0' | Core recovered - 0'  
 Last casing - 4-1/2", 11.6# casing @ 630'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 200 rpm; WOB - 7K lb; Rate of Penetration - 9 ft/hr

(see 3/1 report for previous bits)

Bit No.	Type	Depth in, KB	Depth out	Footage	Hours
7	HQ series 9	1467	1599	132	26
8	HQ series 8F	1599	2018	419	65

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 3/1 for previous data)	1279	2.7°		106°F
	1449	1.7°		94°F
	1787	2.5°		108°F
	1987	2.2°		117°F

**Drilling fluid** - bentonite

Flow rate - 30 gal/min | Pressure - 20 psi | Returns temp - na°F max |  
 Wt - 8.7 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total

**Lithology of past day's drilling:**

limestone

**Summary of events last 24 hours:**

Make wiper trip back to 1200' and drill cave to bottom. POOH laying down HQ core pipe. Make up 2-3/8" tubing BHA. Have an HQ bit, pup joint, float collar on bottom. RIH to 1335' and tag up on cave. Drill cave to 1340'. Torque high and erratic. Pipe trying to stick. Drill and pull back to 1260' before pipe comes free. POOH laying down tubing. Strap and pick up 3.54" x 2.9" heavy flush joint tubing with HQ core bit on bottom and run in hole. Tubing at 1300' at report time and preparing to drill tubing to TD.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 8 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 61-6 | **Location** - Section 6, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 19 | Depth today - 2018' | Hole advance last 24 hr - 0' | Core recovered - 0'  
 Last casing - 4-1/2", 11.6# casing @ 630' 3.52" liner 2018' to surface.

**BITS** -- Now drilling 3.9" hole | Rotary speed - 200 rpm; WOB - 7K lb; Rate of Penetration - 9 ft/hr

(see 3/1 report for previous bits)

Bit No.	Type	Depth in, KB	Depth out	Footage	Hours
7	HQ series 9	1467	1599	132	26
8	HQ series 8F	1599	2018	419	65

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
(see 3/1 for previous data)	1279	2.7°		106°F
	1449	1.7°		94°F
	1787	2.5°		108°F
	1987	2.2°		117°F

**Drilling fluid** - bentonite

Flow rate - 30 gal/min | Pressure - 20 psi | Returns temp - na°F max |  
 Wt - 8.7 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total

**Lithology of past day's drilling:**

cave

**Summary of events last 24 hours:**

Run liner to 2016' and drill fill to 2018'. Turn hole over to heavy mud and displace liner with water. Burn liner pipe bit in and fill inside with clear water. Cut off liner pipe at ground level and install well head. Rig down and start moving to new location GDP 51-8. This is the last drilling report for GDP 61-6.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 10 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 1 | Depth today - 292' | Hole advance last 24 hr -281' | Core recovered - 1'  
 Last casing - 7", 23# casing @ 14'

**BITS** -- Now drilling 6-1/4" hole | Rotary speed - 110 rpm; WOB - 5K lb; Rate of Penetration - 20 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage	Hours
1RR	BSF 6-1/4"	11	15	4	.5
2	Drag	15			

**Drilling Assembly:** 6-1/4" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xo, CHD 101 DP

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - bentonite

Flow rate - 110 gal/min | Pressure -250 psi | Returns temp - 77°F max |  
 Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Slight

**Lithology of past day's drilling:**

sand & clay

**Summary of events last 24 hours:**

Rig up on existing cement cellar on paved location. Set 7" mud riser in cellar and cement in place. Nipple up flow line. Calibrate flow instrumentation. Core BSF through cement cellar floor and 3' of sand. Pick up drag bit and collars and drill ahead. Hole starts booting at 187'. Able to maintain full returns except when circulation pressure is too high.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 11 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 2 | Depth today - 395' | Hole advance last 24 hr -103' | Core recovered - na'  
 Last casing - 7", 23# casing @ 14'

**BITS** -- Now drilling 6-1/4" hole | Rotary speed - 110 rpm; WOB - 5K lb; Rate of Penetration - 20 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage	Hours
1RR	BSF 6-1/4"	11	15	4	.5
2	Drag	15			

**Drilling Assembly:** 6-1/4" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xo, CHD 101 DP

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - bentonite

Flow rate - 110 gal/min | Pressure -250 psi | Returns temp - 80°F max |  
 Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Slight

**Lithology of past day's drilling:**

sand, clay & cement

**Summary of events last 24 hours:**

Lost ~ 50 % returns at 338' and lost them all at 355'. Slug hole with LCM and regained returns but lost them again. Drill blind to 395' and POOH for cement plug. RIH with open ended drill pipe Mixed and pumped 150' plug. POOH and WOC. Fluid level before plug was 262'. RIH to 200' and fill hole. Drill cement stringers from 265' to 380' and lost returns. Cleaned cement to 384' and POOH. Run back in with open ended drill pipe to 378' and mixed and pumped cement plug #2. Cement in place at 0530. Rig will be on break until 0700 on March 19th.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 20 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 3 | Depth today - 395' | Hole advance last 24 hr - 0' | Core recovered - na'  
Last casing - 7", 23# casing @ 14'

-----  
**BITS** -- Now drilling 6-1/4" hole | Rotary speed - 110 rpm; WOB - 5K lb; Rate of Penetration - 9 ft/hr

<b>Bit No.</b>	<b>Type</b>	<b>Depth in, KB</b>	<b>Depth out</b>	<b>Footage</b>	<b>Hours</b>
1RR	BSF 6-1/4"	11	15	4	.5
2	Drag	15			

**Drilling Assembly:** 6-1/4" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xo, CHD 101 DP

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**Surveys:**                      **Depth**                      **Inclination**                      **Direction**                      **Bottom-hole Temperature**

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**Drilling fluid** - bentonite

Flow rate - 110 gal/min | Pressure -250 psi | Returns temp - 84°F max |  
Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - total

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**Lithology of past day's drilling:**

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**Summary of events last 24 hours:**

Rig up pumps and service rig after crew break. RIH to 212' and drill and wash cement and fill. Drill hard cement to ~ 335' and walk off cement plug. Drill new formation to 354' and lost total returns. Same depth as original total loss. Drill blind to 396' and POOH. RIH with open ended DP. Mix and pump cement plug #3. POOH and WOC. RIH to 305'. Wash to 340' and drill cement. Lost returns at 364'. Drill blind to 376'. Pull out of hole and run in with open ended DP. Mix and pump cement plug #4. CIP at 0430. POOH and WOC.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 21 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 4 | Depth today - 438' | Hole advance last 24 hr - 43' | Core recovered - na'  
 Last casing - 7", 23# casing @ 14'

**BITS** -- Now drilling 6" hole | Rotary speed - 110 rpm; WOB - 5K lb; Rate of Penetration - 9 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage	Hours
1RR	BSF 6-1/4"	11	15	4	.5
2	Drag	15	438	423	
3RR	6" button	438			

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xo, CHD 101 DP

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - bentonite

Flow rate - 110 gal/min | Pressure -250 psi | Returns temp - na<sup>o</sup>F max |  
 Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - total

**Lithology of past day's drilling:**

**Summary of events last 24 hours:**

Wash and drill cement to 363' and lost returns. Drill blind to 415'. Drawworks hydraulics failed. POOH with head and wait on parts for 12 hours. Repair drawworks and run back in hole. Drill blind to 438' when rock became too hard for drag bit. POOH for bit change. Back on bottom with tri-cone bit at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 22 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 5 | Depth today - 529' | Hole advance last 24 hr - 91' | Core recovered - na'  
 Last casing - 7", 23# casing @ 14'

**BITS** -- Now drilling 6" hole | Rotary speed - 110 rpm; WOB - 5K lb; Rate of Penetration - 20 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage	Hours
1RR	BSF 6-1/4"	11	15	4	.5
2	Drag	15	438	423	
3RR	6" button	438			

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xo, CHD 101 DP

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - bentonite

Flow rate - 110 gal/min | Pressure -250 psi | Returns temp - na<sup>o</sup>F max |  
 Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - total

**Lithology of past day's drilling:**

**Summary of events last 24 hours:**

Drill blind to 529' when bit jets plug. POOH wet. RIH to 210' and hit cave. Drill cave with full returns to 350' then lost them. Wash and re-drill 30' of cave to TD. POOH for another wiper trip. Hit cave at 210' again and had full returns. but lost them again at 350'. Wash and re-drill 25' of cave to TD. POOH and wipe again. Hit bridge at 210' and drilled through without returns. Washed and re-drilled 9' of cave to TD. Starting back in hole at report time to wipe again to try to clean hole for casing.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 23 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 6 | Depth today - 529' | Hole advance last 24 hr - 0 | Core recovered - na'  
Last casing - 7", 23# casing @ 14'

-----  
**BITS** -- Now drilling 6-1/4" hole | Rotary speed - 110 rpm; WOB - 5K lb; Rate of Penetration - 30 ft/hr

<b>Bit No.</b>	<b>Type</b>	<b>Depth in, KB</b>	<b>Depth out</b>	<b>Footage</b>	<b>Hours</b>
1RR	BSF 6-1/4"	11	15	4	.5
2	Drag 6-1/4"	15	438	423	
3RR	6" button	438	529'	91'	

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xo, CHD 101 DP

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**Surveys:**                    **Depth**                    **Inclination**                    **Direction**                    **Bottom-hole Temperature**

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**Drilling fluid** - bentonite

Flow rate - 110 gal/min | Pressure -250 psi | Returns temp - na<sup>o</sup>F max |  
Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - total

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**Lithology of past day's drilling:**

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**Summary of events last 24 hours:**

Fell out of old hole at ~ 250' on wiper trip. POOH at 275' and pick up drag bit. Re-drill to 425' and POOH to pick up button bit. Had full returns from 321' to 337'. Drill blind to 529' and make wiper trip. Small cave at 230' and 4' of fill on bottom. Rigging up to run casing at report time.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 24 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 7 | Depth today - 529' | Hole advance last 24 hr - 0' | Core recovered - na'  
Last casing - 7", 23# casing @ 14'

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BITS -- Now drilling		Rate of Penetration - na ft/hr			
Bit No.	Type	Depth in, KB	Depth out	Footage	Hours
1RR	BSF 6-1/4"	11	15	4	.5
2	Drag 6-1/4"	15	438	423	
3RR	6" button	438	529'	91'	

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xo, CHD 101 DP

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Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - bentonite

Flow rate - 110 gal/min | Pressure -250 psi | Returns temp - na<sup>o</sup>F max |  
Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - total

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**Lithology of past day's drilling:**

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**Summary of events last 24 hours:**

Tried to run casing. Could not wash or drill it in below 240'. Pull casing and stand in derrick. Rig down at 11:00 AM for hydraulic repairs. Waiting on parts.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 26 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 8 | Depth today - 529' | Hole advance last 24 hr - 0' | Core recovered - na'  
 Last casing - 7", 23# casing @ 14'

**BITS** -- Now drilling ; Rate of Penetration - na ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage	Hours
1RR	BSF 6-1/4"	11	15	4	.5
2	Drag 6-1/4"	15	438	423	
3RR	6" button	438	529'	91'	

**Drilling Assembly:** 6" bit, bit sub, WBS, 4-1/4" DC, WBS, 3 ea DC, xo, CHD 101 DP

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - bentonite

Flow rate - 110 gal/min | Pressure -250 psi | Returns temp - na<sup>o</sup>F max |  
 Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - total

**Lithology of past day's drilling:**

**Summary of events last 24 hours:**

Rig down for repair for 52 hours. Also no night shift due to short crew. Ran in hole to bridge at 220'. Drill and washed in with 6" drag bit. Not much cave on bottom. Pull out of hole and drain pumps for the night. Getting ready for wiper trip at report time. If all goes well, we will try again to run casing.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 27 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 9 | Depth today - 529' | Hole advance last 24 hr - 0' | Core recovered - na'  
Last casing - 4-1/2", 10.5# casing @ 528'

-----  
**BITS** -- Now drilling 6-1/4" hole | Rotary speed - 110 rpm; WOB - 5K lb; Rate of Penetration - 9 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage	Hours
1RR	BSF 6-1/4"	11	15	4	.5
2	Drag 6-1/4"	15	438	423	
3RR	6" button	438	529'	91'	

**Drilling Assembly:**

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**Surveys:**                      **Depth**                      **Inclination**                      **Direction**                      **Bottom-hole Temperature**

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**Drilling fluid** - bentonite

Flow rate - 110 gal/min | Pressure -250 psi | Returns temp - na<sup>o</sup>F max |  
Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - total

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**Lithology of past day's drilling:**

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**Summary of events last 24 hours:**

Make wiper trip for casing. Drilled cave at 295' and washed to bottom. POOH and lay down BHA. Run casing with wash-over shoe on bottom. Had to wash and drill casing from 260' to 330' then lowered to bottom. Wash ~ 5' of fill on bottom. Mix and pump 39 sacks of Portland cement with 25% silica flour. Drop plug and displace with water. No returns. CIP at 1815. WOC

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 28 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 10 | Depth today - 529' | Hole advance last 24 hr - 0' | Core recovered - na'  
Last casing - 4-1/2", 10.5# casing @ 528'

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**BITS** -- Now drilling 3.9" hole | Rotary speed - 110 rpm; WOB - 5K lb; Rate of Penetration - na ft/hr

<b>Bit No.</b>	<b>Type</b>	<b>Depth in, KB</b>	<b>Depth out</b>	<b>Footage</b>
1RR	BSF 6-1/4"	11	15	4
2	Drag 6-1/4"	15	438	423
3RR	6" button	438	529'	91'
4	HQ series 9	529'		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

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**Surveys:**                      **Depth**                      **Inclination**                      **Direction**                      **Bottom-hole Temperature**

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**Drilling fluid** - bentonite

Flow rate - 110 gal/min | Pressure -250 psi | Returns temp - na<sup>o</sup>F max |  
Wt - 8.8 lb/gal | Vis - 48 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - none

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**Lithology of past day's drilling:**

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**Summary of events last 24 hours:**

Run temperature logs to find top of cement. Top appears to be at ~ 350'. Log sat down on hard cement at 372'. Mix and pump 2 top jobs. WOC. Nipple up and check BOPE. Complete BOPE testing. Tested master valve, annular, floor valve, standpipe valve, both kill valves and choke valves. Tests witnessed and approved by Russ Jentgen of the BLM. Mix and pump two more top cement jobs. Hole did not fill. WOC. Run in hole with HQ coring tools and start drilling cement. Will top again during shoe test.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 29 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 11 | Depth today - 669' | Hole advance last 24 hr - 140' | Core recovered - 139'  
 Last casing - 4-1/2", 10.5# casing @ 528'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 110 rpm; WOB - 5K lb; Rate of Penetration - 15 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage
1RR	BSF 6-1/4"	11	15	4
2	Drag 6-1/4"	15	438	423
3RR	6" button	438	529'	91'
4	HQ series 9	528'		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
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**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure -350 psi | Returns temp - 92°F max |  
 Wt - 8.5 lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - 50 %

**Lithology of past day's drilling:**

528 - 655 Porphyritic felsite  
 655 - 657 Yellow brown to red brown clay  
 657 - Fossiliferous limestone

**Summary of events last 24 hours:**

Wash and core cement to plug which was ~ 2' above insert float. Core plug, float and 39' of good cement to new formation at 528'. Cored 3 feet of new hole and conducted shoe test. Tested at .44 psi/ft, .6 psi/ft and .7 psi/ft. All pressures held for 30 minutes. Tests witnessed and approved by Russ Jentgen of the BLM. Mixed and pumped top job during shoe test. WOC. Top again and hole filled. WOC. Core ahead with full returns to 662' and then started losing 50%. Pulling core at 669' at report time.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 31 MAR 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 12 | Depth today - 776' | Hole advance last 48 hr - 107' | Core recovered - 107'  
Last casing - 4-1/2", 10.5# casing @ 528'

-----  
**BITS** -- Now drilling 3.9" hole | Rotary speed - 110 rpm; WOB - 5K lb; Rate of Penetration - 15 ft/hr

<b>Bit No.</b>	<b>Type</b>	<b>Depth in, KB</b>	<b>Depth out</b>	<b>Footage</b>
1RR	BSF 6-1/4"	11	15	4
2	Drag 6-1/4"	15	438	423
3RR	6" button	438	529'	91'
4	HQ series 9	528'		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

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<b>Surveys:</b>	<b>Depth</b>	<b>Inclination</b>	<b>Direction</b>	<b>Bottom-hole Temperature</b>
	695	1.2°		79°F

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**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 350 psi | Returns temp - na°F max |  
Wt - 8.5 lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - Total loss

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**Lithology of past day's drilling:**

657 - Fossiliferous limestone

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**Summary of events last 24 hours:**

Cored ahead 8' to 676' and rig over-heated. Lost total returns at 670'. Rig down from 8:00AM on 3/29 to 11:40 AM on 3/30. No morning report for 3/30. Slug hole with LCM but could not get returns back. Core ahead blind, pumping down the backside.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 1 APRIL 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 13 | Depth today - 1025' | Hole advance last 24 hr - 249' | Core recovered - 249'  
 Last casing - 4-1/2", 10.5# casing @ 528'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 110 rpm; WOB - 5K lb; Rate of Penetration - 15 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage
1RR	BSF 6-1/4"	11	15	4
2	Drag 6-1/4"	15	438	423
3RR	6" button	438	529'	91'
4	HQ series 9	528'		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	695	1.2 <sup>o</sup>	na	79 <sup>o</sup> F
	897	0.9 <sup>o</sup>	na	102 <sup>o</sup> F

**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 350 psi | Returns temp - na<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total loss

**Lithology of past day's drilling:**

none reported

**Summary of events last 24 hours:**

Core ahead for the past 24 hours with no problems or returns. Pumping down the backside.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 2 APRIL 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

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**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 14 | Depth today - 1309' | Hole advance last 24 hr - 284' | Core recovered - 284'  
Last casing - 4-1/2", 10.5# casing @ 528'

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**BITS** -- Now drilling 3.9" hole | Rotary speed - 280 rpm; WOB - 5K lb; Rate of Penetration - 15 ft/hr

<b>Bit No.</b>	<b>Type</b>	<b>Depth in, KB</b>	<b>Depth out</b>	<b>Footage</b>
1RR	BSF 6-1/4"	11	15	4
2	Drag 6-1/4"	15	438	423
3RR	6" button	438	529'	91'
4	HQ series 9	528'		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

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<b>Surveys:</b>	<b>Depth</b>	<b>Inclination</b>	<b>Direction</b>	<b>Bottom-hole Temperature</b>
	695	1.2 <sup>o</sup>	na	79 <sup>o</sup> F
	897	0.9 <sup>o</sup>	na	102 <sup>o</sup> F
	1119	0.8 <sup>o</sup>	na	102 <sup>o</sup> F

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**Drilling fluid** - bentonite, polymer

Flow rate - 28 gal/min | Pressure - 350 psi | Returns temp - na<sup>o</sup>F max |  
Wt - 8.5 lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
Lost circulation - Total loss

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**Lithology of past day's drilling:**

none reported

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**Summary of events last 24 hours:**

Core ahead for the past 24 hours with no problems or returns. Pumping down the backside.

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**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 3 APRIL 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 15 | Depth today - 1475' | Hole advance last 24 hr - 166' | Core recovered - 166'  
 Last casing - 4-1/2", 10.5# casing @ 528'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 280 rpm; WOB - 5K lb; Rate of Penetration - 15 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage
1RR	BSF 6-1/4"	11	15	4
2	Drag 6-1/4"	15	438	423
3RR	6" button	438	529'	91'
4	HQ series 9	528'	1454'	926'
5	HQ series 9	1454'		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	695	1.2 <sup>o</sup>	na	79 <sup>o</sup> F
	897	0.9 <sup>o</sup>	na	102 <sup>o</sup> F
	1119	0.8 <sup>o</sup>	na	102 <sup>o</sup> F
	1427	no data		no data

**Drilling fluid** - bentonite, polymer

Flow rate - 28 gal/min | Pressure - 350 psi | Returns temp - na<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total loss

**Lithology of past day's drilling:**

none reported

**Summary of events last 24 hours:**

Rig down for cooling system repairs for 6 hours. Core ahead with 100% core recovery and no fluid returns. Trip for bit change. Hole clean to bottom on trip in. Pumping down the backside.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 4 APRIL 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 16 | Depth today - 1699' | Hole advance last 24 hr - 224' | Core recovered - 224'  
 Last casing - 4-1/2", 10.5# casing @ 528'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 280 rpm; WOB - 6K lb; Rate of Penetration - 15 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage
1RR	BSF 6-1/4"	11	15	4
2	Drag 6-1/4"	15	438	423
3RR	6" button	438	529'	91'
4	HQ series 9	528'	1454'	926'
5	HQ series 9	1454'		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	695	1.2 <sup>o</sup>	na	79 <sup>o</sup> F
	897	0.9 <sup>o</sup>	na	102 <sup>o</sup> F
	1119	0.8 <sup>o</sup>	na	102 <sup>o</sup> F
	1485	1.1 <sup>o</sup>	na	130 <sup>o</sup> F

**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 270 psi | Returns temp - na<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total loss

**Lithology of past day's drilling:**

1251-1419 Black fossiliferous limestone and limestone, minor black shale  
 1419-1431 Black shale  
 1431-1483 Black to dark gray cherty limestone

**Summary of events last 24 hours:**

Trip back 480' to clear dropped core stuck in core pipe after puling tube at 1475'. Core ahead while pumping down the backside; no fluid returns.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 5 APRIL 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 17 | Depth today - 1892' | Hole advance last 24 hr - 193' | Core recovered - 193'  
 Last casing - 4-1/2", 10.5# casing @ 528'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 280 rpm; WOB - 6K lb; Rate of Penetration - 10 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage
1RR	BSF 6-1/4"	11	15	4
2	Drag 6-1/4"	15	438	423
3RR	6" button	438	529'	91'
4	HQ series 9	528'	1454'	926'
5	HQ series 9	1454'		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	695	1.2 <sup>o</sup>	na	79 <sup>o</sup> F
	897	0.9 <sup>o</sup>	na	102 <sup>o</sup> F
	1119	0.8 <sup>o</sup>	na	102 <sup>o</sup> F
	1485	1.1 <sup>o</sup>	na	130 <sup>o</sup> F
	1717	1.2 <sup>o</sup>	na	109 <sup>o</sup> F

**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 270 psi | Returns temp - na<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total loss

**Lithology of past day's drilling:**

1503 - Fine to medium crystalline dolomite

**Summary of events last 24 hours:**

Core ahead while pumping down the backside with no fluid returns. At report time, ROP is slowing and circulation pressure is up. Getting ready to trip for a new bit. Will run a temperature log before drilling ahead.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 6 APRIL 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 18 | Depth today - 1949' | Hole advance last 23 hr - 57' | Core recovered - 57'  
 Last casing - 4-1/2", 10.5# casing @ 528'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 280 rpm; WOB - 6K lb; Rate of Penetration - 3 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage
1RR	BSF 6-1/4"	11	15	4
2	Drag 6-1/4"	15	438	423
3RR	6" button	438	529'	91'
4	HQ series 9	528'	1454'	926'
5	HQ series 9	1454'	1893'	439'
6	HQ series 9	1893'		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	695	1.2 <sup>o</sup>	na	79 <sup>o</sup> F
	897	0.9 <sup>o</sup>	na	102 <sup>o</sup> F
	1119	0.8 <sup>o</sup>	na	102 <sup>o</sup> F
	1485	1.1 <sup>o</sup>	na	130 <sup>o</sup> F
	1717	1.2 <sup>o</sup>	na	109 <sup>o</sup> F

**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 270 psi | Returns temp - na<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total loss

**Lithology of past day's drilling:**

1503 - Fine to medium crystalline dolomite

**Summary of events last 24 hours:**

Trip for bit. Bit is polished and not stripping. Rock is very hard with lots of chert. Ran a temperature log on trip in with bit at 1002'. Bottom hole temperature after sitting for one hour was 172<sup>o</sup>F. Horner plot indicates a stabilized BHT of 183<sup>o</sup>F. Run to bottom with new bit and core ahead. New bit is polishing and difficult to strip. Core ahead.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 7 APRIL 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 19 | Depth today - 2119' | Hole advance last 24 hr - 170' | Core recovered - 170'

Last casing - 4-1/2", 10.5# casing @ 528'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 280 rpm; WOB - 6K lb; Rate of Penetration - 10 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage
1RR	BSF 6-1/4"	11	15	4
2	Drag 6-1/4"	15	438	423
3RR	6" button	438	529'	91'
4	HQ series 9	528'	1454'	926'
5	HQ series 9	1454'	1893'	439'
6	HQ series 9	1893'		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	695	1.2 <sup>o</sup>	na	79 <sup>o</sup> F
	897	0.9 <sup>o</sup>	na	102 <sup>o</sup> F
	1119	0.8 <sup>o</sup>	na	102 <sup>o</sup> F
	1485	1.1 <sup>o</sup>	na	130 <sup>o</sup> F
	1717	1.2 <sup>o</sup>	na	109 <sup>o</sup> F
	2017	1.6 <sup>o</sup>	na	142 <sup>o</sup> F

**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 270 psi | Returns temp - na<sup>o</sup>F max |

Wt - 8.5 lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x

Lost circulation - Total loss

**Lithology of past day's drilling:**

Cherty dolomite

**Summary of events last 24 hours:**

Dropping tube to core ahead at report time. Rock has become very broken resulting in short runs but still recovering it all. Pumping down the backside.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 8 APRIL 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 20 | Depth today - 2203' | Hole advance last 24 hr - 84' | Core recovered - 84'  
 Last casing - 4-1/2", 10.5# casing @ 528'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 280 rpm; WOB - 6K lb; Rate of Penetration - 8 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage
4	HQ series 9	528'	1454'	926'
5	HQ series 9	1454'	1893'	439'
6	HQ series 9	1893'	2178'	285'
7	HQ series 8F	2178'		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	695	1.2 <sup>o</sup>	na	79 <sup>o</sup> F
	897	0.9 <sup>o</sup>	na	102 <sup>o</sup> F
	1119	0.8 <sup>o</sup>	na	102 <sup>o</sup> F
	1485	1.1 <sup>o</sup>	na	130 <sup>o</sup> F
	1717	1.2 <sup>o</sup>	na	109 <sup>o</sup> F
	2017	1.6 <sup>o</sup>	na	142 <sup>o</sup> F

**Drilling fluid** - bentonite, polymer

Flow rate - 20 gal/min | Pressure - 270 psi | Returns temp - na<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total loss

**Lithology of past day's drilling:**

Cherty dolomite

**Summary of events last 24 hours:**

Coring slow in chert. Bit went at 2177'. POOH. Bit inside gage gone and reamer shell cracked. Pick up new bit and used reamer shell. RIH. Hole tight from 1170' to 1300' and had to ream from 1988' to 2177'. Coring ahead and pumping down the backside.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 9 APRIL 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 21 | Depth today - 2409' | Hole advance last 24 hr - 206' | Core recovered - 206'  
 Last casing - 4-1/2", 10.5# casing @ 528'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 280 rpm; WOB - 6K lb; Rate of Penetration - 14 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage
4	HQ series 9	528'	1454'	926'
5	HQ series 9	1454'	1893'	439'
6	HQ series 9	1893'	2178'	285'
7	HQ series 8F	2178'		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	695	1.2 <sup>o</sup>	na	79 <sup>o</sup> F
	897	0.9 <sup>o</sup>	na	102 <sup>o</sup> F
	1119	0.8 <sup>o</sup>	na	102 <sup>o</sup> F
	1485	1.1 <sup>o</sup>	na	130 <sup>o</sup> F
	1717	1.2 <sup>o</sup>	na	109 <sup>o</sup> F
	2017	1.6 <sup>o</sup>	na	142 <sup>o</sup> F
	2281	1.6 <sup>o</sup>	na	141 <sup>o</sup> F

**Drilling fluid** - bentonite, polymer

Flow rate - 18 gal/min | Pressure - 200 psi | Returns temp - na<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total loss

**Lithology of past day's drilling:**

1503-2239 Dolomite and cherty dolomite  
 2239-2240 Fault gouge  
 2240- Limestone and shale

**Summary of events last 24 hours:**

Core ahead with better ROP in softer rocks. Pumping down the backside.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 10 APRIL 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 22 | Depth today - 2573' | Hole advance last 24 hr - 164' | Core recovered - 164'  
 Last casing - 4-1/2", 10.5# casing @ 528'

**BITS** -- Now drilling 3.9" hole | Rotary speed - 280 rpm; WOB - 6K lb; Rate of Penetration - 10 ft/hr

Bit No.	Type	Depth in, KB	Depth out	Footage
4	HQ series 9	528'	1454'	926'
5	HQ series 9	1454'	1893'	439'
6	HQ series 9	1893'	2178'	285'
7	HQ series 8F	2178'		

**Drilling Assembly:** HQ core bit, reamer shell, 10' core barrel, stabilizer, HQ core rods

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	695	1.2 <sup>o</sup>	na	79 <sup>o</sup> F
	897	0.9 <sup>o</sup>	na	102 <sup>o</sup> F
	1119	0.8 <sup>o</sup>	na	102 <sup>o</sup> F
	1485	1.1 <sup>o</sup>	na	130 <sup>o</sup> F
	1717	1.2 <sup>o</sup>	na	109 <sup>o</sup> F
	2017	1.6 <sup>o</sup>	na	142 <sup>o</sup> F
	2281	1.6 <sup>o</sup>	na	141 <sup>o</sup> F
	2457	1.3 <sup>o</sup>	na	143 <sup>o</sup> F

**Drilling fluid** - bentonite, polymer

Flow rate - 18 gal/min | Pressure - 200 psi | Returns temp - na<sup>o</sup>F max |  
 Wt - 8.5 lb/gal | Vis - 40 sec | PV - x cP | YP - x lb/100ft<sup>2</sup> | pH - x  
 Lost circulation - Total loss

**Lithology of past day's drilling:**

None reported

**Summary of events last 24 hours:**

Core ahead while pumping down the backside. Trying to release stuck inner tube at report time. Getting ready to run geophysical logs today.

**Report by:** Ron Jacobson

**DAILY DRILLING REPORT - 11 APRIL 97**  
**FT. BLISS EXPLORATORY SLIMHOLE**  
 Time of report - 0700

**Well number** - GDP 51-8 | **Location** - Section 16, T26S, R8E, Otero County, NM

**All depth measurements refer to KB; KB = 11' above ground level**

Days since spud - 23 | Depth today - 2573' | Hole advance last 24 hr - 0' | Core recovered - 0'  
 Last casing - 4-1/2", 10.5# casing @ 528'

**BITS** -- na

Bit No.	Type	Depth in, KB	Depth out	Footage
4	HQ series 9	528'	1454'	926'
5	HQ series 9	1454'	1893'	439'
6	HQ series 9	1893'	2178'	285'
7	HQ series 8F	2178'	2573'	395'

**Drilling Assembly:** TD

Surveys:	Depth	Inclination	Direction	Bottom-hole Temperature
	695	1.2 <sup>o</sup>	na	79 <sup>o</sup> F
	897	0.9 <sup>o</sup>	na	102 <sup>o</sup> F
	1119	0.8 <sup>o</sup>	na	102 <sup>o</sup> F
	1485	1.1 <sup>o</sup>	na	130 <sup>o</sup> F
	1717	1.2 <sup>o</sup>	na	109 <sup>o</sup> F
	2017	1.6 <sup>o</sup>	na	142 <sup>o</sup> F
	2281	1.6 <sup>o</sup>	na	141 <sup>o</sup> F
	2457	1.3 <sup>o</sup>	na	143 <sup>o</sup> F

**Drilling fluid** - na

**Lithology of past day's drilling:**

2240- 2479 Limestone and shale  
 2479 - TD Limestone and cherty limestone

**Summary of events last 24 hours:**

POOH to log. Ran electric, sonic and temperature logs. RIH with HQ to wipe hole and pump heavy mud. Pull out laying down core rods. Pick up and run completion tubing. Hang tubing in well head. Will run neutron and gamma logs and then release rig. This is the final daily drilling report from Fort Bliss.

**Report by:** Ron Jacobson

## **APPENDIX C**

This appendix contains a list of all temperature logs taken during the Fort Bliss exploratory drilling. Each well's logs are listed by date taken, log depth, and brief comments on the conditions under which the log was made.

### TEMPERATURE LOGS FOR GDP 46-6

DATE	LOG DEPTH	COMMENTS
11/15/96	611'	Log for stabilized bottom hole temperature, permit requirement
11/16/96	711'	Log for stabilized bottom hole temperature, permit requirement
11/24/96	453'	Log for casing cement evaluation, top of cement ~ 220'
11/24/96	453'	Log to confirm top of cement after top job
11/25/96	453'	Log to find top of cement top job #1, TOC 50'
11/29/96	453'	Log for temperature gradient. No activity in well since 11/23/96
12/2/96	748'	Log for shoe test water level
12/9/96	1692'	Bit change. Bit at 781' on trip in. Logged on bottom for 50 min for stabilized BHT
12/11/96	1945'	Bit trip for logging. Logged on bottom 1 hour for stabilized BHT
12/11/96	1945'	Wait 8 hours and log again. Logged on bottom for 35 min for stabilized BHT
12/13/96	2258'	TD. Log with bit at 844' on trip out. Logged on bottom for 1 hr
12/14/96	2258'	Open hole log while waiting on completion tubing.
12/19/96	2248'	First log in completion tubing. Rig is off hole.
1/7/97	2242'	Log to check Mini 4-pin logging tool
1/8/97	2242'	Log to check rebuilt standard 7-pin tool. H <sub>2</sub> O at 443.1'
2/1/97	2242'	Log for gradient. H <sub>2</sub> O at 448.9'
3/4/97	2242'	H <sub>2</sub> O at 450.1'
4/15/97	2242'	H <sub>2</sub> O at 450.2'
5/24/97	2244'	Last log

### TEMPERATURE LOGS FOR GDP 45-5

DATE	LOG DEPTH	COMMENTS
1/6/97	350'	Log after Christmas break before drilling startup
1/6/97	401'	Log for lost circulation zones. H <sub>2</sub> O at 399'
1/20/97	1610'	Bit change. Bit at 1000' on trip in. Also logged out.
1/24/97	2355'	Bit change. Bit at 913' on trip in. Logged on bottom for 85 min. for stabilized BHT
1/31/97	3555'	Bit change. Bit at 2022' on trip in. Logged on bottom for 15 min for stabilized BHT
2/2/97	3815'	Bit change. Bit at 567' on trip in. Shut down for crew break.
2/3/97	3815'	No activity in hole since last log. H <sub>2</sub> O at 482.3'

2/11/976	3815'	No activity in hole since last log. H <sub>2</sub> O at 471.5'.
2/25/97	3962'	Hole completed 2/14. After log H <sub>2</sub> O at 482.3'
2/28/97	3962'	2 logs with CTL below 7-pin tool to confirm calibrations of tools
3/5/97	3952'	Also tried spinner to check for fluid movement. H <sub>2</sub> O at 478.2'
3/30/97	3640'	Heavy mud 3450' to 3640'. Last log before packer. H <sub>2</sub> O at 476.8'
4/6/97	3430'	Fast log to check access through packer. H <sub>2</sub> O at 278'
4/15/97	3470'	First slow log through packer. H <sub>2</sub> O at 485.1'
5/23/97	3470'	Last log

### TEMPERATURE LOGS FOR GDP 61-6

DATE	LOG DEPTH	COMMENTS
3/1/97	1600'	On 24 hour standby with HQ liner near TD. Logged on bottom 15 hours for stabilized BHT.
3/2/97	1600'	Still on standby. Logged on bottom 38 min for stabilized BHT.
3/2/97	1600'	Still on standby waiting on decision whether to drill ahead. Will drill ahead after log.
3/6/97	2018'	New bit 1' off bottom. Rig on standby. Logged on bottom for 68 min for stabilized BHT. This will be TD
3/11/97	2017'	First log in liner and with rig off hole. Liner full of H <sub>2</sub> O.
3/25/97	2015'	Good log. Liner still full.
4/8/97	2015'	Liner still full. No activity in well since last temperature log.
5/23/97	2018'	Last log

### TEMPERATURE LOGS FOR GDP 51-8

DATE	LOG DEPTH	COMMENTS
3/27/97	371'	Log to find top of cement
3/27/97	371'	Log to find top of cement after top job #1
3/27/97	371'	Log to find top of cement after top job #2
4/5/97	1893'	Bit change. Bit at 1002' on trip in. Logged on bottom for 1 hour for stabilized BHT.
4/10/97	2567'	POOH for stuck tube. Logged on bottom for 35 min for stabilized BHT. This will be TD.
4/14/97	2533'	First log in liner with rig off well.
5/22/97	2533'	Last log

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