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Phase II Drilling Operations at the Long Valley Exploratory Well (LVF 51-20)

John T. Finger, Ronald D. Jacobson

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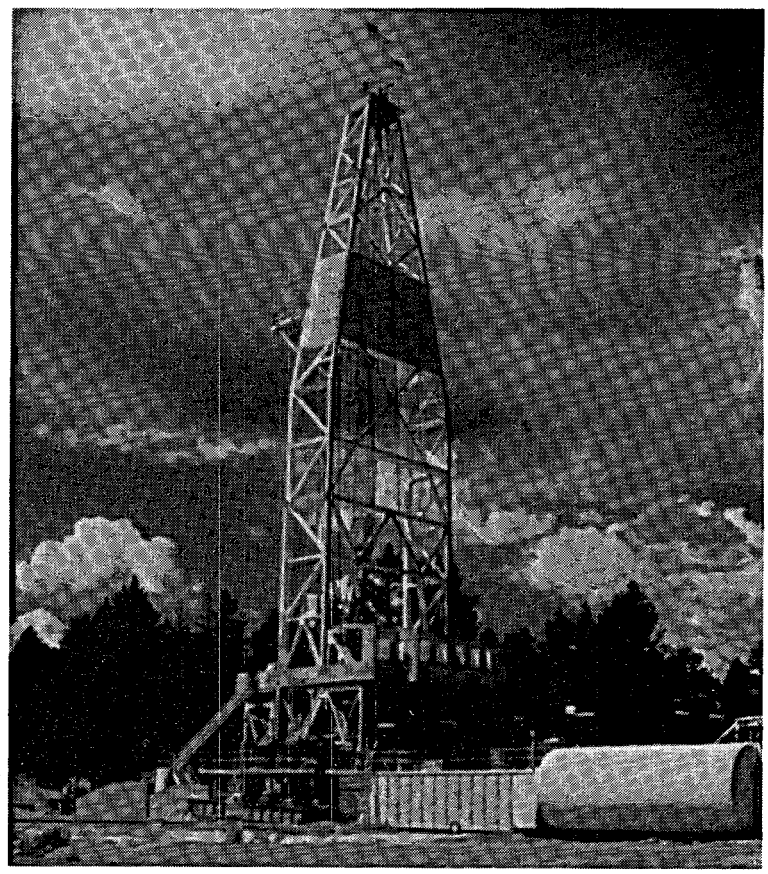

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PHASE II DRILLING OPERATIONS AT THE LONG VALLEY EXPLORATORY WELL (LVF 51-20)

John T. Finger
Ronald D. Jacobson

Geothermal Research Department 6111

ABSTRACT

This report describes the second drilling phase, completed to a depth of 7588 feet in November, 1991, of the Long Valley Exploratory Well near Mammoth Lakes, California. The well in Long Valley Caldera is planned to reach an ultimate depth of 20,000 feet or a bottomhole temperature of 500°C (whichever comes first). There will be four drilling phases, at least a year apart, with scientific experiments in the wellbore between active drilling periods.

Phase I drilling in 1989 was completed with 20" casing from surface to a depth of 2558', and a 3.8" core hole was drilled below the shoe to a depth of 2754'. Phase II included a 17-1/2" hole out of the 20" shoe, with 13-3/8" casing to 6825', and continuous wireline coring below that to 7588'. This document comprises a narrative log of the daily activities, the daily drilling reports, mud logger's reports, summary of drilling fluids used, and other miscellaneous records.

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TABLE OF CONTENTS

I. INTRODUCTION

The Long Valley Exploratory Well is the deepest hole ever drilled into a young silicic caldera. It provides a unique scientific opportunity to study the eruptive and evolutionary processes in the caldera, but its immediate goal is to give better definition of the hydrothermal resource available for commercial development. Many kinds of geophysical evidence[1] indicate a massive thermal source beneath the caldera, but because subsurface groundwater flow appears to mask or distort much of the heat flow, the source has not been accurately defined.

Phase I of the exploratory drilling was done in 1989[2]. That phase resulted in 26" hole to 2568' with 20" casing set to 2558', and a 3.8" (HQ) core hole to a TD of 2754 feet. The first phase was plagued with very severe problems of lost circulation in the upper 1000' of the hole, and the additional time and material spent on solving those problems carried the drilling expense above the original budget. Fortunately, there was no lost circulation below 1000', and the hole was completed straight and vertical with an excellent cement job. We achieved practically complete core recovery in the 186' of core hole, but left the core rods stuck, preventing most scientific measurements other than temperature logs.

Phase II rotary drilling occupied August and September of 1991, with core drilling during November. Rotary drilling (17-1/2" hole) reached a maximum depth of 7130', but hole deviation was severe, approaching 5^0 at TD. To avoid problems in subsequent drilling, we cemented the hole back to 6826' (where the deviation was approximately $2\text{-}1/2^0$) and set 13-3/8" casing at 6825 feet. We again followed the large-hole casing with HQ-size core hole to a TD of 7588', and again got more than 99% core recovery. All the core drilling is in a metamorphic formation, the Mt. Morrison roof pendant. Although there is some slough and fill at the bottom of the core hole, it is open to below 7500' and is available for scientific measurements until Phase III drilling begins.

Cost of Phase II drilling, including the coring, was approximately $2.3 million. Funds were provided in roughly equal shares by the US Department of Energy, through Sandia's Geothermal Research Division, and the California Energy Commission, through a grant to Mono County.

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(1) "The geophysics of a restless caldera - Long Valley"; J B Rundle, D P Hill; Ann. Rev. Earth Planet. Science; 16; 1988

(2) "Phase I Drilling Operations at the Magma Energy Exploratory Well (LVF 51-20)"; J T Finger, R D Jacobson; Sandia Report SAND90-1344; Sandia National Laboratories, 1990

II. SUMMARY OF DRILLING OPERATIONS

Phase II of the Long Valley Exploratory Well was completed to a depth of 7588 feet in November 1991. The drilling comprised two sub-phases: (1) drilling 17-1/2 inch hole from the Phase I casing shoe at 2558 feet to a depth of 7130 feet, plugging back to 6826 feet, and setting 13-3/8 inch casing at 6825 feet; and (2) drilling a 3.85-inch core hole deviated out of the previous wellbore at 6868 feet and extending to 7588 feet. Ultimate depth of the well is planned to be 20,000 feet, or at a bottomhole temperature of 500°C, whichever comes first.

The first Phase II drilling task, which went relatively smoothly, was to fish a string of core rod stuck in the core hole since Phase I. The core string extended from the bottom of the core hole approximately 15 feet back into the cased hole, where it was contained in the string of ODP drill pipe which had guided it during the coring and had been left hanging in the wellbore to simplify re-entry to the core hole. Total length of the fish was 242 feet; approximately 230 feet of it came out in one piece, and the remaining 10^+ feet was milled up and pulled out with magnets. Rotary drilling then continued in the same Bishop Tuff entered at 2040 feet during Phase I. This formation, with some rhyolite intrusions, extended to 5900 feet, and progress in it was excellent, with more than 300 feet drilled on some days.

At 5900 feet, the borehole intersected the top of a highly mixed breccia. This rock includes fragments of both its neighbors: the Bishop Tuff above it and the Mount Morrison roof pendant below it. Although a 30-foot spot core was taken in this formation, the mechanism of the breccia's origin is still not clear. This is a significant stratum, extending from 5900 to 6645 feet. It is also a considerably harder rock than the Bishop Tuff; rate of penetration dropped and hole deviation increased in this interval.

True "basement" rock starts at 6645 feet; this is the metamorphic rock (hornfels) of the Mount Morrison roof pendant, so named because it outcrops near Mount Morrison north-west of the drill site. This unit was originally sedimentary rock, but was metamorphosed by the heat from a large granitic intrusion approximately 90 million years ago. It is hard and abrasive, with severe bit wear and rates of penetration frequently under 10 feet per hour. Hole deviation also increased in this interval, reaching almost 5° from vertical at a depth of 7130 feet. Deviation this large would present a problem at the beginning of Phase III drilling, but directional re-drilling at the bottom of this hole would have been very expensive. To avoid both of these scenarios, the well was plugged back to 6825 feet, where deviation was under 2-1/2°.

Before casing was set at this depth, 26 sidewall cores were taken in the interval between 3000 and 6700 feet, and the open hole was logged with conventional wireline tools (oriented caliper, gamma ray, sonic, dual induction) and a borehole televiewer. Following casing, preparations were made for approximately 700 feet of continuous wireline coring below the casing shoe. A 6-1/8 inch rathole was drilled approximately 50 feet below the shoe, and a string of Ocean Drilling Program drill pipe with an orienting wedge at the bottom was run into the hole and hung there with the wedge in the rathole. The drill pipe/wedge assembly guides the coring string out the side of the plugged-back wellbore and also forms a relatively small annulus around the core rods to reduce vibration and improve cuttings transport.

After a hiatus of about a month, a small coring rig was mobilized and placed on the floor of the big drill rig in such a position that it could run the core string through the string of hanging drill pipe. (This is the same coring technique used at the end of Phase I.) The core rig rotated the core rods and provided fluid circulation through the core string, while the big rig provided hoisting capability for tripping the core string, as well as electrical power to operate both rigs. The core hole entered the formation from the wellbore at 6868 feet and reached 7588 feet. All the cored interval was in the same rock (hornfels) as the lower part of the 17-1/2 inch hole. Coring was fairly slow (average rate-of-penetration about 3 feet/hour), but obtained more than 99 percent core recovery. Several temperature logs have been done in the core hole since the completion of coring; bottomhole temperature has stabilized at approximately 104^{o}C.

The well is available for scientific investigation and still has the drill pipe hanging in the wellbore for access to the core hole. Several experiments have been proposed for the summer of 1992, including hydrofracture, fluid sampling, injection/permeability tests, gravity measurements, wireline logs in the core hole, vertical seismic profiling in the cased hole, and, finally, a passive seismic monitor fixed semi-permanently in place. If the proposed program is completely funded, some of the experiments will require pulling the drill string out of the hole; in this event, further access to the core hole will be lost.

III. NARRATIVE OF DAILY OPERATIONS

This narrative log of the daily activities comprises the notes made at the time of the described activities. These descriptions are duplicated, to some extent, in the Daily Drilling Reports contained in Appendix A.

Mention of a specific company in these notes should not be construed as a recommendation of that company to the exclusion of other companies able to provide the same products or services.

2 August 91

0800 - Rig-up is nearing completion; Nabors Loffland equipment is almost all on site. Major hardware problem is the unavailability of catalytic conversion equipment for the diesel exhaust. Requirements of the Air Pollution Control District are to limit the NO_x emissions to less than 250 lb/day, equivalent to burning 850 gal/day fuel. Since we will be burning significantly more than that at some times, abatement is necessary. The catalytic converter that we had originally scheduled to use is tied up in a lawsuit and no equivalent is available. I talked to Larry Cameron and Ellen Hardebeck at the Bishop Air Pollution Control District this morning and described the situation to them; they agreed that, until the converter becomes available, we can run the diesel with the injector timing retarded and that procedure will qualify as "Best Available Control Technology".

1800 - Rig-up has continued through the day; lacking pump parts and other small items. Chuck Ward (Unocal foreman) is on site and on contract. Plan to put rig and crew on day-rate in the morning. Desert Drilling Fluids on-site for mud. Will mobilize Epoch Well Logging for mud logging at the end of the fishing operation.

3 August 91

0700 - Pump parts arrived last night, now installed. Number 3 generator has gone out with a bad field; new generator is on the way from Bakersfield. Fishing tools/man en route to site for extraction of Phase I core rods. (See Section VII)

0900 - Rig on day-rate and pulling ODP drillpipe.

1200 - Almost all ODP pipe is out of hole, but second drill-pipe centralizer is hung on wellhead spool. Will disconnect spool, raise it together with stuck centralizer, place slips on pipe below spool, and remove centralizer.

1300 - Stuck centralizer comes free, but has one broken wing. Good news is that the broken piece is caught in the next centralizer down, avoiding one more fish in the hole. All pipe out of the hole; will next nipple up BOP and prepare for fishing job.

1700 - There are mismatched seal grooves between the top flange of the double rams and the bottom flange of the annular preventer; seal ring will start into the groove on the rams but will not seat. Decision is to go ahead and nipple up the BOP as designed, and do the fishing job with this stack. Rationale is that: the rams work properly to provide

protection; we will not be making any new hole into a potential pressure source; and we will still get some protection from the annular preventer. This has been cleared with BLM (Bakersfield), who agreed that we did not have to test the BOP until after fishing. After the fishing, we will exchange the double gate rams or modify them to accept the correct seal ring.

1900 - Fishing tools arrive. Crew begins to inspect (Magnaflux) the kelly.

4 August 91

0700 - Discuss fishing operation with Bill Herrin (Tri-State Oil Tools). Sequence of operations will be: go in with mill and dress off flared core-rod end; pull out mill and lay it down; go back in with 11-5/8" ODP four-cone core bit on wash pipe with non-rotating centralizer, and try to get over the core rod; drill down the outside of the core rod to TD; pull out wash pipe; if core rod doesn't come out with wash pipe, go back in with an overshot and try to grab it.

1200 - Going in hole with first set of fishing tools. Bottom-hole-assembly - guide sleeve with shear-pinned centralizer, mill with 3-5/8" ID (will pass over core rod after the flared section is milled off), cross-over, drill pipe.

1530 - Mixing mud. Hole is now full of the corrosion inhibitor left from Phase I. That water can't be used for mixing mud, so we will divert it into the sump as fresh mud is circulated into the hole.

2200 - Mud mixed; ready to begin milling with fishing tool.

2330 - Milling appears to have been successful. Will circulate all the water out of the hole, then pull out and lay down milling tool, pick up wash pipe and ODP bit, and try to get over core rod.

5 August 91

0730 - Running in hole with wash pipe.

1030 - Over the core rod with bit and wash pipe. Drilling cement and washing over core rod at 4-5 ft/hr.

2000 - Drilling through bottom of cement at 2568'.

6 August 91

0700 - Drilling Bishop Tuff and washing over core rod at 2690'.

1400 - Washed to bottom of core rod at 2754'. Pump pressure is up to 1100 psi, indicating that the core bit is plugging the center of the ODP bit. Will rotate slowly while circulating the hole clean, hoping to stick the core bit in the ODP bit. If that happens, we can bring the core rod out of the hole inside the wash pipe.

1530 - Picking up wash pipe, weight indicator and wet string (*pipe full of drilling fluid, indicating bit is plugged*) indicate that core rod is inside wash pipe. Coming out of hole slowly to avoid shaking core rod loose.

1800 - Wash pipe at KB; core rod is not in it. Will lay down wash pipe and go in hole with overshot to try and catch rod.

2030 - Running in hole with overshot/grapple on drill pipe.

2300 - Tag top of core rod; weight indicator shows that the drill string has picked up about 1000 pounds (which is the weight of the core string). Coming out of hole to see if we've really got the core rod.

7 August 91

0045 - Top of core rod at rotary table and clamped off.

0230 - Bottom of core rod at table; stabilizer (*which was thought at the time to be the reamer shell*) is hanging loose in the connection, leaving the bit still in the hole. Called Bakersfield for tools; will get a magnet and a junk basket to try and retrieve the bit. Core rod appears to be in good condition.

1100 - Fishing tools arrive; pick up magnet and 5 drill collars and start in hole.

1330 - Tag bottom and try to get magnet as far down as possible; rotate drillstring, work up and down, and circulate. Drill string eventually doesn't go any farther, start out of hole to see whether magnet caught bit.

1500 - Magnet out of hole; scratches on surface indicate that magnet was on bit, but it didn't hold. Possibility that bit is face up. Starting back in hole with junk basket.

1930 - Out of hole with junk basket; it's full of steel, which turns out to be parts of the core barrel. Error in measurement meant that, when we thought we had everything out of the hole but the bit, the core barrel was still in with the bit. Since the top of the core barrel is well mangled, we are sending for mills to mill up the rest of the junk.

8 August 91

0730 - Waiting on fishing tools. Drilling crew is changing out the new set of BOP rams.

0800 - Fishing tools arrive.

1000 - Drilling crew completes BOP change-out; will begin picking up fishing tools.

1145 - On bottom with 10-3/4" mill and 5 ea DC; rotating at 50 rpm and 10-15,000 lb WOB.

1530 - Have made about 2' new hole with mill; coming out of hole with mill. Will go back in with junk basket, try to make about 18" hole with it and pull up the remaining junk. Visited by Frank Dalton, BLM field inspector, who looked at BOP and signed off on the blow-out equipment. Will pressure test the BOP, using rig pumps, after fishing is completed.

1700 - Going back in hole with junk basket.

1830 - Junk basket hangs up on ledge at casing shoe. After looking at pieces of core barrel which are stuck in watercourses of mill, fisherman thinks that the junk would tear up the fingers of the junk basket anyway. Pulling out of hole with basket; will run back in with magnet and try to get out as much as possible. New magnet is stronger than the one that we ran before.

2200 - First magnet run comes out with about 5 lb steel; pieces of core rod are milled up to an average size of 1" x 2". Plan is to keep running magnet until it comes up empty.

9 August 91

0700 - Coming off bottom with fourth magnet run; second and third runs have produced about the same amount of metal as the first run, but we haven't yet seen any signs of the core bit. Bits and stabilizers for the primary hole (17-1/2") are on location.

1000 - Fourth magnet run has a lot of very fine metal fragments on it; fifth run will stop at bottom and circulate at least bottoms-up time (less than one hour at 1000 gpm) to see if some of the smaller metal cuttings can be circulated out of the hole.

1100 - A few metal fragments come back over the shakers, but no significant observable amounts. Adding up the weights of all the junk retreived so far gives approximately 84.5 lb; since core barrel itself weighs 85-90 lb plus reamer shell and landing ring, it appears that most of the junk, except the bit, is out of the hole.

1300 - Coming out of the hole with the fifth magnet run.

1400 - Fifth magnet run has only 1.0 lb steel on it, but there are still some pieces big enough to jam a roller bit so we will go back in for another magnet run.

1900 - Sixth magnet run was back up to 4 lb steel, so will continue running.

2400 - Seventh and eighth run still bringing back large pieces of steel.

10 August 91

0700 - Two more magnet runs have retrieved about 1 more lb steel, but the last run had no big pieces. Total junk retrieved so far = 92.2 lb. We will pick up the 17-1/2" bit left from Phase I and open the 11-5/8" washover hole down to TD of the core rod (approximately 2758').

1800 - Have picked up new drilling assembly (17-1/2" bit, 3 point reamer, bit sub, 11" DC, integral blade stabilizer, 2 - 11" DC, 3 - 10" DC, crossover, 6 jts heavy weight drill pipe) and are running in hole to open 11-5/8" to 17-1/2".

2345 - Have opened hole to 2688'. Rate of penetration has been running 30-40 ft/hr but slows suddenly to almost nothing, even with 45,000 lb WOB. Core log doesn't show anything unique about the formation at this

point, so it appears that the bit is dull. Will pull the milled tooth bit and pick up a new insert bit.

11 August 91

0700 - Opening hole at 2730' with insert bit. Running low WOB (10,000 lb) to protect bearings, so rate of penetration is fairly low (15-20 ft/hr).

0930 - Have drilled to 2760'. Last depth during fishing was 2758', so we are past the point where any remaining large steel fragments would be expected. Drilling was fairly smooth with WOB up to 40,000 lb, even without a shock sub. Conclusion is that the hole is clean and we can drill ahead. Will pull out of hole, complete the BOP test, and pick up a shock sub and another stand of drill collars.

1500 - Complete BOP pressure test: pipe rams hold 3000 psi for 15 minutes, bleed off 180 psi; annular preventer holds 1000 psi for 15 minutes; blind rams hold 3000 psi for 15 minutes. Run in hole with BHA = bit, roller reamer, shock sub, 12" monel DC, integral blade stabilizer (IBS), 2-11" DC, IBS, 1-11" DC, 5-10" DC, 6-HeavyWeight.

2000 - String hangs up at 2647', pick up kelly to ream it down.

2200 - On bottom at 2760'. Survey at 2722', deviation = 1-1/2°. Drilling ahead at 2762'.

12 August 91

0700 - Drilling ahead at 2960'. Survey at 2815'; deviation = 1-1/2°.

1200 - Drilling ahead at 3065'. Survey at 2939'; deviation = 3/4°.

1700 - Drilling ahead at 3115'. Survey at 3065'; deviation = 1/2°

13 August 91

0600 - Drilling ahead at 3378'. Last survey at 3317'; deviation = 1°.

1200 - Drilling ahead at 3477'. Last survey at 3440'; deviation = 1°.

1430 - Pulling out of hole to gauge tools. Depth = 3490'.

1700 - Bit cutting structure is in good condition, 1/16" undergauge. Will pick up another IBS to go between 10" DC and HW drill pipe. Running back in hole.

14 August 91

0600 - Drilling ahead at 3665'. Last survey at 3572'; deviation = 1°. Still making hole at a good rate; major problem at the moment is wet cuttings. We have put coarser screens in the shakers and cut back on the pump rate, but there is still a lot of liquid coming into the chip bin. Have called the shaker factory rep for help. Have added de-foamer to the mud.

1200 - Drilling ahead at 3760'. Last survey at 3694'; deviation = 1-1/4°. Cuttings are coming out drier now, so that problem is somewhat better,

although we still have a lot of very wet, sloppy cuttings stored in the chip bin.

2000 - Drilling ahead at 3868'. Survey at 3821'; deviation = 1/2°.

15 August 91

0600 - Drilling ahead at 4039'. Last survey at 3947'; deviation = 3/4°. Cuttings are somewhat drier coming over shaker, but the chip drying area is full of very muddy cuttings and we have no place to spread the new cuttings to dry them. Existing cuttings are too wet to stack higher than the sides of the chip bin, so have called the Sweco rep to come look at the situation and propose a method to process the cuttings.

1000 - Result of consultation on the cuttings problem is that we will get decomposed granite from Bishop to mix with the wet cuttings and dry them enough to stack or dispose.

1200 - Drilled to 4122'. Survey at 4071'; deviation = 3/4°. Pulling out of hole to gauge tools.

1500 - Bit is 1/8" undergauge; picking up new bit, stabilizers, and roller reamer. Running back in hole.

16 August 91

0600 - Drilling ahead at 4267'. Last survey at 4198'; deviation = 1/4°.

1200 - Drilled to 4372, circulate and survey at 4322', deviation = 3/4°.

1800 - Drilling ahead at 4450'. Received permission from Jay Cass, Water Quality Board, to begin disposing of the water containing corrosion-inhibitor (which had stood in the casing since Phase I) and the drill cuttings which had been analyzed by Zalco Lab in Bakersfield.

17 August 91

0600 - Drilling ahead at 4623'. Last survey at 4575'; deviation = 1/4°.

1200 - Drilling ahead at 4692'. Rate of penetration for the last 20-30 ft has slowed to approximately 8.5 ft/hr; not clear whether this is a hard intrusion in the tuff or some change in the drilling hardware. Mud loggers catch sample from formation at 4680'; shows same tuff as the previous drilling.

1800 - Drilling rate has picked up somewhat, to about 10 ft/hr, but is still lower than seen previously in the Bishop Tuff and the rhyolite. Will continue to adjust the drilling parameters in an attempt to improve the rate of penetration.

18 August 91

0600 - Drilling ahead at 4823'. Last survey at 4700'; deviation = 1/2°. Drilling rate has remained at about 10 ft/hr overnight, total progress for last 24 hours is 200 feet.

0915 - Have lost pump pressure; drilling crew has inspected surface equipment and found no leaks, so will trip out and check drilling assembly for washouts.

1400 - Pin on shock sub is cracked, causing washout in monel drill collar box. Washout is too deep to field-dress, so will lay down monel and use only inclination surveys (hole has been very straight so this is allowed by drilling permit). Will send monel to Bakersfield for re-facing and threading.

Lost power to one of the flow-line cleaners; trying to find whether it's a circuit breaker or mud-cleaner problem.

1700 - Picked up new bit (Hughes X33) since previous bit seemed to be for a harder formation than we're drilling. Picked up re-dressed 3-pt reamer but it was incorrectly bored for the drill pipe float; laid it down and picked up a new 3-pt reamer. Re-calibrated Sandia H_2S system since the Epoch system has no alarm on the rig floor.

1800 - Running back in hole. Will take a survey when we get on bottom, and will put maximum-reading thermometers (MRT) in the survey tool.

2000 - Maximum-reading-thermometer (MRT) reading shows bottom hole temperature $142^{o}F$; inclination is approximately $1/4^{o}$.

19 August 91

0600 - Drilling ahead at 5007'. Rate of penetration has picked up to about 15 ft/hr since changing bit, but this may also be due to a change in rock. For whichever reason, the cuttings back over the shakers are larger than before.

1000 - Centrifuge goes out with broken motor bracket, apparently caused by unbalance in the centrifuge. There are other problems with the centrifuge; we will try to get a new centrifuge coming this way from Bakersfield. Mud cleaners are repaired and are working hard trying to catch up with the solids load from last night (mud weight is up over 9.4 lb/gal).

1200 - Drilling ahead at 5053', but pump pressure has dropped again to about 1500-1600 psi. Centrifuge problem is cracked motor mount brackets; will get them welded and will have Sweco man watching operation for a couple of days.

1500 - Pump pressure remains low, inflow volume is increasing, and ROP is dropping to less than 10 ft/hr. Conservative procedure is to trip out and look at tools; that's what we'll do.

1930 - Conservatism wins, barely. The top 11" drill collar is cracked around at least 3/4 its circumference on the box end. We will lay down both sides of the bad connection, pick up two new 10" collars, and run back in the hole. Will keep a very sharp lookout for any further pressure drops. Inspection crew will be standing by in Bakersfield; at first sign of problem we will notify them to come this way and will inspect the complete string.

2200 - Continued pulling BHA out of hole; found another crack in the bottom 11" collar. This one is not as severe as the one above (about 90° of its circumference) but laid down that collar also. Monel drill collar returned from repair, so picked it up for new drilling assembly. Replaced IBS at top of 10" collars. Ran in hole, took survey, and resumed drilling.

20 August 91

0600 - Drilling ahead at 5114'. Last survey at 5045'; deviation = 1/2°. Centrifuge brackets have been re-welded, but there still seems to be too much vibration in the centrifuge operation.

1330 - Drilling ahead at 5220'. Survey at 5171'; deviation = 3/4°, bottom hole temperature approximately 136°F.

1800 - Drilling ahead at 5277'. Drilling rate has slowed to less than 10 ft/hr, but is constant (indicating that bit is not deteriorating rapidly). Will continue to operate with existing BHA and will vary drilling parameters to try improving performance.

21 August 91

0330 - Centrifuge finally shakes enough to short out its power; rig hand says flames are coming from motor. Will call company to bring a complete new centrifuge.

0600 - Drilling ahead at 5358'. Last survey at 5298'; deviation = 1°, bottom hole temperature approximately 144°F.

1500 - Drilling has continued to be slow, and now bit seems to be torquing up. This could mean either that the bit is damaged or that the rock is fractured. Will pull out of hole, gauge tools, inspect (Magnaflux) the bottom hole assembly, and look at the bit.

2130 - Bit is somewhat worn (approximately 1/8" under gauge), but not apparently enough to cause the slowdown in drilling rate or the erratic torque readings. Preliminary conclusion is that formation changes have affected the performance. Will go back in with the M-84 bit pulled previously (it's for a harder formation than the X-33 just pulled). Will also inspect BHA and cut drilling line on this trip out.

22 August 91

0600 - Pacific Inspection crew has just finished BHA inspection; found a crack in the last 11" drill collar box (all three 11" collars have cracked box connections). Laid down that collar, picked up another 10" collar.

1000 - Rig crew is slipping drilling line; will RIH when complete.

1230 - Temperature survey when on bottom; mud temperature has decreased from 144°F yesterday to 138°F today with no circulation, indicating that the rock is cooler than the mud (i.e., hydraulic work of the pumps on the mud is heating it to a higher temperature than the in-situ formation temperature).

1300 - Drilling ahead at 5428'; still a lot of torque pulses in the drill string with little (15-20K) weight on bit.

1600 - Drilling at 5452'. Drillstring torque has smoothed out and rate of penetration varies from 6-9 ft/hr. Mud logger's samples do not indicate a different kind of rock.

1800 - Number 2 (south) duplex mud pump goes down, piston is bad. Will continue drilling with No. 1 only, pump pressure is down to about 1100 psi and ROP is less than 5 ft/hr.

2400 - Pump is back on line, but drilling has not picked up appreciably. ROP is 6-10 ft/hr, with some zones apparently unconsolidated.

23 August 91

0600 - Drilling at 5539'. Last survey at 5459'; deviation = 1-1/4°, temperature is 140°F. Drilling still fairly slow, generally less than 10 ft/hr.

0830 - Catalytic converter for diesel engines arrives on site. Will begin installing it (requires shutting down all engines for 4-8 hours) as soon as all pieces are in place.

1200 - Pulling drill string back into casing in preparation for shutting down power. Have drilled to 5573', lifted off bottom, and circulated for one hour to allow mud loggers to get latest samples. Spotted 50 bbl LCM pill at bottom of hole.

1430 - Diesels off for converter installation. Site powered down.

1800 - Diesel exhaust plumbing installed, ammonia plumbing and control system not yet connected. Will run tonight; can hook up the rest of the system without turning off engines. Running back in hole.

1900 - Drilling at 5575'; ROP = 8.5 ft/hr.

24 August 91

0600 - Drilling at 5683'. Last survey at 5616'; deviation = 1-3/4°. ROP continues to vary from about 8 ft/hr to more than 20 ft/hr. ROP, small but steady lost circulation, and the increase in deviation indicate more fractured formation. Holding back WOB to about 38 Klb in an effort to forestall further deviation.

1100 - Survey at 5683'; deviation is a full 2°, i.e. increased at least 1/4° over the last 60'. Will hold back more on weight (35Klb) and increase rotary speed to try and straighten up. If hole continues to build angle, we will go to a different BHA.

After survey, circulated staged flow rates (0-90 strokes/min) to calibrate flow instrumentation for lost circulation research.

2300 - Drilled to 5823' with varying ROP. Survey at 5773'; deviation = 2.5°, will come out of hole to change BHA.

25 August 91

0600 - Still coming out of hole. Bit, 3-pt reamer, and stabilizers are all at least 3/8" under gauge; will pick up all new tools, including Smith 3JS bit.

BHA is: bit, shock sub, monel collar, IBS, 1-11" DC, IBS, 1-11" DC, 7-10" DC, IBS, HW drill pipe

1630 - Have reamed back in hole; drilling with 18 Klb WOB and 65 rpm rotary speed. ROP varies from about 6 to 9 ft/hr. Will drill approximately 50' and survey.

2400 - Drilled to 5872'. Survey at 5831'; deviation slightly under 2-1/2°. Will continue drilling with same WOB and will survey every 60' until inclination drops below 2°.

26 August 91

0600 - Drilling at 5903'. Rate of penetration has slowed to 3-4 ft/hr; will put some more weight on bit.

1030 - Apparently there is clear evidence from the cuttings that we are through the Bishop Tuff into basement rock. Drilling is still slow (3-4 ft/hr) even with 30 Klb WOB.

Inspected and function tested all Scott Paks and escape packs.

1400 - Drilled to 5932'. Survey at 5886'; deviation = 2°. Will increase WOB to attempt improvement in ROP.

27 August 91

0030 - Drilled to 5998' (avg ROP = 8.2 ft/hr) and surveyed at 5962'. Deviation = 2-1/4°. Will continue to drill with these parameters.

0530 - Lost 600 psi pump pressure and 30,000# string weight. Appear to be twisted off between the 11" and 10" collars. Pulling out of hole. Have called Midway fishing service.

1000 - BHA is out of the hole; pin on lowermost 10" collar is twisted off.

1030 - Have called Halliburton to start laying out equipment locations for cement job. They arrive with first cement bin; will start spotting cement trucks and laying out location for casing, ODP pipe, etc.

1700 - All drilling tools laid down; running in hole with fishing assembly. BHA = overshot grapple, jars, 8" drill collars, drill pipe.

1900 - Grapple is on fish and weight indicator shows that it's all coming out. Chaining out of hole to avoid unnecessary rotation.

28 August 91

0200 - Complete fish is out of hole. Stabilizers are at least 2" under gauge but bit is in good condition, approximately 1/16" under gauge with teeth lightly worn and bearings tight. Will lay down tools and inspect complete BHA; Pacific Inspection crew is on site. Have called Eastman to bring core barrel and operator for one 30' core run. This will be

useful for stratigraphy and will be a test of how well this type of equipment works in this rock.

1300 - Inspection completed; rejected - shock sub (pin broke while being made up after inspection), 2 joints heavy weight drill pipe, 2 crossovers - top and bottom of heavy weight.

1700 - Eastman hand is making up coring assembly. Will be using 30' core barrel with 8-1/2" x 4" diamond bit.

1930 - Running in hole with coring assembly.

29 August 91

0600 - Coring at 6045' (13 ft of core). Rate of penetration is low, under 2 ft/hr, but operation seems to be going well. WOB is 18 Klb, rotary speed is 60 rpm, and flow rate is 330 gpm. Will continue coring.

1400 - Reached 30 ft core, core barrel required 20 Klb to pull (indicating core recovery), and started out of the hole.

1800 - Laid down core barrel and retrieved 29+ feet of core. Core is a competent ash with many chunks of basement rock in it. We are apparently still somewhat above, but close to, the true basement rock. Picked up drilling assembly and reamed back into hole.

30 August 91

0600 - Opening core hole at 6035'; rock is quite hard, ROP is about 7 ft/hr.

1200 - Reached bottom of core hole at 6061'. Survey at 6031'; deviation = 2°. Will continue to drill ahead with stiff BHA and survey again in 90'.

1800 - Continue drilling to 6108' with ROP under 8 ft/hr.

31 August 91

0600 - Drilling ahead at 6182'. Last survey at 6121'; deviation = 1-3/4°. ROP still low, averaging 6.6 ft/hr.

1200 - Coming out of hole from 6205' to inspect tools.

1400 - Stabilizers are in gauge; bit teeth and bearings are worn and it is under gauge (IADC grade 6-6-1/4) on some rows of teeth and appears to be balling with a clay seam that can be expected to lie just on top of the basement. Will run in hole with new bit (HTC EP1084) which should be suitable for the basement rock we believe to be just below.

1930 - Bit is on bottom, but is hardly drilling. Various combinations of WOB and rotary speed don't seem to have much effect. Bit may be balling; will continue drilling and see if penetration improves.

1 September 91

0600 - Drilling ahead at 6270'. ROP has averaged about 6.2 ft/hr since reaching bottom with new bit. Last survey after reaching bottom with bit trip; deviation = 1-3/4°.

1200 - Drilling ahead at 6308'. Survey at 6251'; deviation = 2-1/4°. Mud cleaning centrifuge is down again; it's putting out mostly liquid. Will shut it off and call service man.

1800 - Drilling ahead at 6360'. ROP has been approximately 9 ft/hr.

2 September 91

0600 - Drilling ahead at 6455'. Last survey at 6343'; deviation = 2-1/4°. ROP has improved to 8.4 ft/hr for the last 24 hours, probably due to the fractured nature of the rocks drilled. Centrifuge has been serviced and is working well again.

1200 - Drilling ahead at 6506', ROP continues to be approximately 9 ft/hr. Last survey at 6441'; deviation is 2-1/4°.

1800 - Drilling ahead at 6573'. Still good rate of penetration.

3 September 91

0600 - Drilling ahead ot 6678'. Last survey at 6548'; deviation = 2^0. Bottom hole temperature had increased to 156^0F. When going back to bottom after survey, found 30' fill in the hole. This correlates with torque and drag on the drillstring, indicating either lack of competent formation or very brittle rock. Last four loads of casing have arrived and are being unloaded.

1200 - Drilling ahead at 6750' with good rate of penetration. Will come out of hole after next survey to inspect BHA and tools. Pacific Inspection crew is on site for that, and is also doing drift check on casing.

2400 - PI crew has inspected BHA; laid down shock sub (cracked pin), two IBS (one washed out, one under gauge), 12" monel (damaged thread next to IBS washout), one 10" DC (cracked pin), and two heavy-weight drill pipe (cracked pin).

4 September 91

0130 - Monel DC is on its way to Bakersfield to be re-cut. Getting a 10" monel from Eastman to use as a backup, or maybe to use in a 10" string if we can find a 10" shock sub. Will run in hole without a monel and drill until new tools arrive. Major motivation for this is that the source test on the catalytic converter is scheduled for this morning, and the motors need to be working fairly hard for this test. We're not sure whether the test operator can stand by long enough for us to get a new monel collar for a drilling test.

1000 - Catalytic converter test is under way; seems to be working fine so far. Larry Cameron, Air Pollution Control District, is on site to witness the test. Jay Cass, Water Quality Board, is also here and has looked over the cuttings disposal - he sees no problem with leaving the chips on site or putting them in the county dump.

1200 - Cheryl Seath, BLM - Bishop, also visited. Discussed reclaiming the middle sump, and she had no objections.

1800 - Plan to continue drilling through the night and come out of the hole in the morning to check tools and pick up the new drilling assembly.

5 September 91

0600 - Drilling at 6910'. Will circulate and pull out of hole next kelly down.

1530 - Have laid down 11" drill collars and Griffin shock sub. Will pick up 10" monel and Bowen shock sub for new drilling assembly. Temperature log before going back in hole.

1800 - Running in hole with temperature log; estimate time required about 4 hours. Will pick up drilling assembly and run in hole after temp log.

2400 - Complete temperature log; bottomhole temperature is approximately 200^{o}F with a sharp increase in gradient between 6000' and 6900'.

6 September 91

0100 - Running in hole. Wash and ream 60' to TD; 25' fill in the hole. Survey at 6858'; deviation = 2-1/2^{o}.

0600 - Drilling ahead at 6918'. ROP about 6.5 ft/hr.

1800 - Drilling ahead at 6995'; ROP still the same. Cuttings show little change in rock.

1900 - Survey at 6951'; deviation = 4-1/4^{o}. Decrease WOB to 30Klb and increase rotary speed to 75 rpm.

7 September 91

0600 - Drilling ahead at 7044'. Survey at 7006'; deviation = 4-1/4^{o}. Pull out of hole to change BHA.

1400 - Running in hole with new BHA = bit, 10" monel, IBS, 10" DC, IBS, 10-10" DC, IBS, crossover, 4-HW drill pipe, crossover.

1630 - Running in hole; re-survey at 6720' (2-1/4^{o}) and 6813' (3-3/4^{o}).

1800 - Ran in two more singles to 6855' and stuck pipe. Worked pipe free and reamed tight hole to 6870'.

1930 - Worked pipe back to 6855' and stuck. Pipe will not move up or down; will not rotate, either. Called Midway (fishing) and Dia-Log (free-point survey and back-off charge).

8 September 91

0600 - Dia-Log arrives and begins rigging up.

0900 - Running in for free-point survey. Tool shows no movement in 10" drill collars, but may be caused by the greater area of the collars compared to the drill pipe. Will try back-off charge at bottom of top-most collar.

1200 - First back-off charge fails; will try heavier charge.

1530 - Back-off works. Weight indicator and collar-locator log show that BHA is backed off where desired.

1630 - Coming out of hole with drill pipe and top collar.

1800 - When string gets out, find that back-off is actually at the top of the top collar, not the bottom. Indicates significant error in logging, but is still OK because it leaves a large thread (7-5/8 reg) for the fishing tool to grab.

2200 - Going in hole with fishing assembly: screw-in sub (7-5/8 pin down), bumper sub, jars, and 6-8" collars.

9 September 91

0200 - Tag top of fish at 6470' and screw into it. Jar on fish; it comes free on the sixth jar. Come out of hole to 6735' and circulate for an hour.

0830 - Just coming out with fishing tools.

1100 - Lay down fish and fishing tools and begin picking up new BHA.

1600 - Run in hole with new, stiff BHA: bit, 6-pt reamer, bumper sub, 10" drill collar, IBS, 10" drill collar, IBS, 7-10" drill collars, crossover, drilling jars, 3-8" drill collars, crossover. By reaming, this assembly should straighten out the dogleg; it is also able to jar, in case of trouble.

2000 - Begin reaming at 6394'.

2300 - Torque begins to increase while reaming at 6830' and continues high to 6890' - this is the interval where the bit and previous BHA were stuck.

10 September 91

0130 - Circulate and survey at 6899'; inclination = 3-1/2°, but no azimuth reading without monel collar.

0400 - Continue reaming to 7039'; survey at 7025', inclination = 4-1/4°.

0500 - Drilling at 7044'.

1200 - Rate of penetration is low (3-4 ft/hr) and cuttings indicate that we're going through another vein of quartzite.

1400 - Torque on drillstring is very erratic; stalls completely at times. ROP is very low and mud logger reports increasing amounts of metal in cuttings. Will circulate and survey.

1600 - Survey is 4-1/4°; but drilling is still too slow to be normal. Will come out of hole to inspect BHA.

1930 - BHA out of hole. Stabilizers and 6-point reamer are in good condition, but bit is a near-disaster. It is extremely worn (about 3" under gauge) with exposed bearing races and many missing teeth. Shirttails are all very thin; we are lucky not to have left a cone in the hole. Since upper parts of BHA are in very good condition, it appears that

the bit has been worn by junk in the hole. Will send for a magnet to fish junk.

11 September 91

0600 - Coming out of hole with first magnet run.

1000 - Magnet/junk sub carries ball bearings, bearing retainers, steel fragments, and pieces of teeth. There do not appear to be as many bearings as should have come from bit.

1115 - Begin monthly BOP test required by BLM regulations.

1330 - Finish BOP test; all parts of BOP are within required limits.

1430 - Running back in hole for second magnet trip.

2100 - Second magnet trip brings up more bearings and steel fragments, although not as much as first trip. Will run in hole for another magnet trip.

12 September 91

0600 - Third magnet run brings up a small amount of metal, but not enough to appear significant. We will make up a drilling assembly with a used bit and try drilling; this will indicate whether there is still junk in the hole. As the drill string is run into the hole, we will survey with an Eastman electronic multi-shot tool to verify the hole geometry.

1000 - Cutting and slipping drilling line.

1400 - Have been running into hole with full stands (3 joints) of pipe. At 6700' we will start running in single joints, with a survey point at each connection.

1700 - Survey complete; tool retrieved on wireline overshot. Results confirm previous single-shot surveys - hole inclination is above 4-1/2° in the lower 200' of hole and dogleg severity is a maximum of 2.77 deg/100ft. We will drill another 60' with a dropping assembly and see whether angle improves.

13 September 91

0100 - Survey at 7115' shows angle at 5°. We will plug back to approximately 6800' and re-drill; this depth has inclination of 2-1/2° and we will try to stay below this figure. Halliburton and Eastman are on the way.

0500 - Broke tongs; can't get out of the hole. Waiting on tongs.

0800 - Re-evaluation of drilling situation has led to the conclusion that we stand to risk a great deal of money (approximately $600/hour) in attempting to straighten this hole and we have no particular assurance that the attempt will be successful. Since the re-drill would, in the best scenario, take us very close to our budget limit we have decided to set casing at approximately 6800' and core down to 7500'. This will allow us to get a good, straight casing job which will provide an excellent starting point for Phase III drilling. It is also much

cheaper to re-drill this section of the hole with the 12-1/4" Phase III tools than with the 17-1/2" tools now used.

1200 - Called Schlumberger for logging and Oklahoma Casing for the "Okie-Yoke" casing stabber. Released Epoch Well Logging and KBS backhoe service. Called tool companies to pick up bits and tools.

1700 - Cement plug in place. Will WOC for 4 hours and tag top of cement to check depth and hardness.

2130 - Tag top of cement at 6825'. Will pull out of hole and rig for wireline logging.

2300 - Wireline logging underway. Caliper log first to help choosing points for sidewall coring.

14 September 91

0600 - Sonic log still underway; sidewall coredriller tool left Farmington at 0500 today.

1200 - All wireline logs complete; appear to be successful. Word from coredriller is that he is in Page, AZ. Will pick up re-run bit and tools to polish off top of cement plug.

1600 - Tag top of cement at 6825'; polish off to 6826'. Circulate 4-1/2 hours. Pull out of hole and lay down 10" drill collars. Wait on Schlumberger.

15 September 91

0730 - Coredriller still not at location. Call Schlumberger dispatcher and find out that he won't be here till noon.

1230 - Coredriller arrives; starts rigging up.

1600 - After much experimentation and cable re-heading, decide that Schlumberger wireline truck has defective cable. Will send that truck to Bakersfield for diagnosis and get another truck headed this way.

1700 - Running in hole to circulate in preparation for televiewer logs. BHTV not yet on location.

2300 - BHTV and operator arrive. Begin setting up to calibrate.

16 September 91

0200 - Schlumberger back-up wireline truck arrives.

0530 - Starting in hole with sidewall coring tool.

1100 - Coring tool jams; get bit free and come out of hole. Have nominally taken 17 cores. Unload core catcher and find 13 good cores and 1 partial. Tool is undamaged; will go in for another run.

1200 - Televiewer is assembled and working properly at the surface.

1600 - Second coring run back to surface; attempted 21 cores, retrieved 11. Will go back for one more try at the zone where there is a large gap with no cores.

1900 - Out of hole with final core run. Attempted 8 cores, retrieved one partial core. Will go in with a wiper trip before the televiewer; core tool required 3500 lb pull to get through some sections.

17 September 91

0400 - In hole with televiewer running on Sandia logging truck. Getting good pictures but this logging truck (BLT) doesn't have enough power to pull the tool at the bottom of the hole. Will switch to another logging truck with more powerful drawworks but less cable (Kluge) and log from 6000' to casing point.

0700 - Turns out that Kluge actually has enough cable to get to 6820'. Run in hole again and begin logging up from TD.

2400 - Televiewer log almost finished. Appears to be getting good data except for washed out spots where there is almost no signal return.

18 September 91

0130 - Completed televiewer log and rig down. Run in hole to circulate before casing.

0800 - Pulling out of hole. Okie-Yoke is rigged up. Halliburton and Bill's Casing Service on site. Midway here with liner hanger and taper mill.

1300 - Finish picking up liner hanger and stand it back. Begin running in hole with casing.

2400 - Casing almost all in place; job is going smoothly so far.

19 September 91

0200 - Fill casing; set hanger at 1600'.

0530 - Rig up Halliburton and pressure test lines.

0600 - Begin pumping cement. Pump 5000 ft^3 slurry (13.45 lb/gal), 500 ft^3 tail (15.5 lb/gal).

0930 - Displace cement with 420 bbl mud and pressure goes up to 3000 psi. This is less displacement than calculated, meaning that all the cement has not been pushed through the float shoe at the bottom of the casing. Apparently the wiper plug on the bottom of the casing hanger detached early and got to the float collar before it should have arrived. This wiper plug has a hole in the center through which the cement passes, and which is sealed by a dart released from the cementing head at the surface (i.e., when the volume of cement calculated to fill the casing annulus has been pumped, passing through the wiper plug, a metal/rubber dart is dropped and travels down the drill pipe to seal the hole through the wiper plug.) There is a pressure spike on the pump truck record which may have been the shear pins (which hold the wiper plug) breaking.

1000 - Rig down Halliburton and Okie-Yoke. Lay down high-strength 5" drill pipe used to run casing.

1300 - Rig down casing-service truck. Pick up 12-1/4" bit and drilling assembly (bit, IBS, bit sub, 6-8" drill collars, crossover, 3-HW drill pipe, crossover). Run in hole to 1600'.

1700 - Drilling liner hanger seals.

2030 - Tag cement at 2800'. Drilling out cement.

20 September 91

0600 - Cleaning out cement at 4058'.

1000 - Firm cement at approximately 4200'. Drilling at about 75 ft/hr.

1600 - Drilling cement at 4637'; pulling out of hole to do temperature log in an attempt to find the top of cement in the annulus.

1800 - Running in hole with temp log; will start logging down at 2000'.

2000 - Log indicates top of cement in annulus to be at approximately 3300'. This is inferred from the fact that there is an essentially featureless temperature log above that depth, but below 3300' there is correlation between temperature variations in this log and washouts shown in the caliper log. Will re-log interval from 4637' to 3000' coming out of the hole.

2400 - Resume drilling cement at 4637'.

21 September 91

Spent the day drilling out cement in the casing from 5010' to 6680'. Average rate of penetration was approximately 65 ft/hr. Also strapped ODP drill pipe in preparation for hanging it in the hole.

22 September 91

0730 - Drilled through cement to float collar at 6736'. When we reached the FC, the returns brought up a mixture of red rubber fragments and a large piece of black rubber. The red rubber appears to be the wiper plug, and the piece of black rubber has the right color and radius to be part of the dart. The implication is that the dart and plug were together; i.e., either the dart was somehow released early, or it somehow passed through a long interval of cement to rest on the wiper plug. Both of these events seem highly unlikely, since the dart was held in place with a sturdy retainer pin which had to be unscrewed to release the dart (this procedure was witnessed by several people): conversely, the process to force the dart through hundreds or thousands of feet of cement is certainly not obvious. Only clarification provided by this evidence is that the possibility of sealing the wiper plug with a foreign body seems to be eliminated.

(Another possibility, which now seems the most likely, is that the flowing cement stripped the rubber seal off the dart even though the metal body of the dart remained in place until deliberately released.

This rubber was then enough to seal the wiper plug and break its shear pins.)

1130 - After drilling out shoe, drilled about 10' with 12-1/4" bit.

1500 - Pulled out of hole, laid down bit and stabilizer, picked up taper mill.

1800 - Bored approximately 4' (6836' to 6840') with taper mill. Circulate.

2000 - Begin POOH. Rig up lay-down truck and begin laying down contractor's drill pipe, collars, and tools.

23 September 91

0400 - Finish laying down drill pipe and tools.

0600 - Pick up ODP drill pipe and RIH with 6-1/8" bit and 4-3/4" drill collars.

1430 - Finish RIH and rig down lay-down truck.

1600 - Drill 6-1/8" hole from 6840' to 6880' and circulate bottoms up.

1700 - Survey at 6875'; inclination is 2-3/4° (no azimuth because of steel collars.)

1800 - Circulating while waiting on corrosion inhibitor chemicals which will be added to the water that displaces the mud in the hole.

24 September 91

0230 - Corrosion inhibitor has arrived but it is difficult to inject and there is not enough water to displace the mud in one slug. Displace 480 bbl of mud with water containing chemicals.

0700 - Rigged additional pumps to provide water for displacement; will pump two suction pit volumes (approximately 600 bbl each) through the hole.

0900 - Mud cleaning equipment, intended to process the mud dumped into the sump, arrived yesterday morning but has so far failed to perform well consistently. Technician and new centrifuge are on the way from Bakersfield.

1500 - POOH with bit and drill collars.

1800 - Nippling down BOP. Install Sandia spool with drill-pipe hanger.

2230 - RIH with ODP drill pipe/window wedge, the assembly which will be left hanging in the hole in preparation for core drilling. The window wedge is a kick-off device at the bottom of the ODP drill pipe. It hangs in the 6-1/8" hole and will steer the core string out of the plugged-back 17-1/2" hole so that we will be coring formation, not cement.

25 September 91

0500 - Use rate gyro survey tool to orient window wedge. Wedge is oriented to deviate the core hole approximately 1-1/2° away from the trajectory, in

the opposite azimuth, of the big-hole deviation so that the core will go into the formation as soon as possible. POOH with survey tool and rig down logging.

0600 - Nipple up 10" master valve on wellhead.

Mud cleaning operation to lower fluid level in sump continues for approximately one week, but no drilling or logging activities take place. Solids removed from sump are stacked in chip bin and will be used to partially fill middle sump before Phase III drilling. Liquid remaining in sump will have at least a year to dry before reclaiming sump.

Close site until beginning of core drilling, which awaits the availability of tools and crew.

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30 October 91

Re-occupied site and set Tonto core rig on floor of Loffland Rig 202. Core drilling will be the same procedure used in Phase I; the Tonto rig will rotate the core rods and retrieve the core, and the big rig will trip the core rods and provide power. The core rods will be turning inside the ODP drill pipe hung in the hole at the end of the rotary drilling. This pipe will act as a bushing (to restrain the side motion of the relatively flexible core rod) and an artificial wellbore (to give a small annulus for the core drilling circulation). Each shift will have a driller and supervisor from Tonto, and a driller, derrickman, and supervisor from Loffland. Operations will begin under a restriction from the BLM/Forest Service that we can only operate in daylight hours to avoid disturbing the mule deer migration.

1800 - Hauled fluid return hose (goes from riser to fluid system) and repaired rod-hanger from Reno. BOP test had gone slowly because water in BOP stack had frozen. Thawed out BOP, filled it with oil, and successfully tested stack (pipe and blind rams, annular) to 1500 psi. Notified BLM of BOP test. Began running core rod into hole with drill-off tool as BHA. Visit from US Forest Service personnel to observe rig lights and noise after dark; they were satisfied with conditions and will recommend to the BLM that we be allowed to go to 24 hour operation.

31 October 91

1800 - Continued running core rods into hole for most of the day. Process is fairly slow, since it involves making up 10' rods into 30's, then hoisting the 30's into the V-door or the mousehole, then making up that joint onto the string in the hole while tightening each 10' joint with the drill chuck. Core rods with drill-off tool are at bottom of casing by 1800 hours. Will leave them hanging, with fluid circulating, overnight.

Received permission from the BLM to go on 24 hour operation with certain restrictions on: the amount of lighting we can use, which equipment will be operated at night, and keeping road traffic to a minimum. Plan to begin round-the-clock drilling tomorrow night.

1 November 91

0600 - Rigged up drill with quill rod, water swivel, and other equipment necessary for drilling ahead. Minor problems with hydraulic system.

0830 - Drilling ahead in cement with bull-nose bit (drill-off tool). Estimate it will take 16' of new hole (after the top of the wedge) to get out of cement into formation.

1430 - Have drilled down approximately 20'; will trip rods and pick up a core barrel to verify that hole is completely out of the cement and into formation. When standing core rods back in 90' lengths, there is considerable bend in the rods, so we will pick up two stands of the ODP drill pipe and use them as braces and supports for the core rods.

1730 - Because of the lighting restrictions at night, we will not continue tripping after dark. Quit until morning; tripped out to 4625'.

2 November 91

0600 - Resume tripping out.

0930 - Bit at surface; pick up core barrel and bit. Start tripping back in.

1330 - Core bit is at window wedge; begin reaming deviated hole drilled with bull-nose bit.

1630 - Finish reaming. Start cutting core.

1900 - Cored approximately 7'; core barrel is apparently blocked and will retrieve it. Rigging up wire-line.

2000 - Retrieved approximately 3' of fractured core. Core is a combination of formation (hornfels) and cement. Running in new core barrel.

3 November 91

0200 - Twisted off at bottom of quill rod. Break is just below the rotary table; able to unscrew broken part below rotary and screw in mating pin from above. Circulate.

0600 - Retrieve core tube (inner barrel) and set new barrel. Core ahead. Retrieved core has a piece of the cementing-float rubber, as well as chunks of Early Rhyolite (from Phase I - about 2000'), on top of the core. Apparently lots of junk was not cleaned from the hole, either during drilling or cementing, and is now falling into the core hole. This is probably aggravated, if not caused, by the lost circulation in the core hole.

1230 - Retrieved core barrel with approximately 6' core. Core is similar to earlier hornfels, with extensive intersecting, healed fractures. Rock is hard, but brittle. More rubber on top of this core.

1500 - Mix and pump high-viscosity sweep; wash and ream to bottom. Core ahead.

1930 - Cored to 6896'. Retrieved core tube with approximately 9.5' core. Set new core tube. Cored ahead.

2230 - Water swivel broke when bearings seized and hose wrapped around core string and bail. Repaired water swivel and removed bail.

4 November 91

0130 - Coring ahead after repairing swivel.

0500 - Cored to 6906'. Retrieved core tube with approximately 9.5' core.

1800 - Continued coring for balance of the day. No operational problems, but rate of penetration is low - 1.5-2 ft/hr. Directional survey at 6926'; inclination = 1.75^{0}, azimuth = 140^{0}. Core hole is at the same azimuth as the big hole, but beneath it and diverging from its trajectory.

5 November 91

1600 - Have continued coring through the day at the same low rate of penetration. Just pulled core from 6956'.

6 November 91

1800 - Today's coring has gone well, if slowly. Rate of penetration was about 1.5-2 ft/hr for the first part of the day, but picked up to about 2-3 ft/hr later. No major differences in the rock, although the samples collected later in the day contained more calcite veining than most of those previously.

Received part of Tonto's core orientation hardware today. This system uses a camera built into the core barrel to orient scribed lines on the core with low side of the hole (assuming that the hole is deviated at least 2 degrees). After pulling the core tube with the core oriented to low side, then a normal single-shot camera is run out the end of the core barrel to get the azimuth of the hole's low side. Combining these two measurements gives azimuth of the core. We will try to evaluate the system for this hole when the rest of the parts arrive.

Surveyed hole deviation; inclination = 3^{0}, azimuth = 134^{0}. This means that the hole has kicked off as planned and is beneath the 17-1/2" hole previously drilled to this depth.

7 November 91

1800 - Continued coring at about the same rate (2-3 ft/hr) to 7054'. At that point, the rate of penetration fell to less than 1 ft/hr, and the core recovery started to deteriorate. Core retrieved was quartzite, which was highly fractured when returned to the surface.

8 November 91

0800 - Continued slow drilling to 7066' (12 feet in 13 hours),

1400 - Core to 7074'; retrieve 6' core from this interval.

1930 - Core to 7079'; pressure/torque indications are that bit is worn. Also some reasons to believe that the core tube is mis-latched, that is, the inner tube is not properly latched to the core barrel so that the inner tube rides up in the barrel while drilling and leaves the core below the inner tube in the barrel. This means that the inner tube can't get down to the landing ring and latch, and therefore requires a trip to clear the core barrel. Since we can't trip at night because of the lighting restrictions, rigged to circulate through the night.

9 November 91

0600 - Began tripping out the core rods.

1200 - Laid down old bit (severely worn) and 10' core barrel; picked up new bit and 20' barrel, and ran in hole.

1800 - Washed and reamed to bottom; resumed coring at 7079', still at a low rate in quartzite.

10 November 91

0800 - Pulled core from 7107'; found that we had re-entered the hornfels at 7098'. Surveyed hole deviation at 7100'; inclination = 3.25^{0}, azimuth = 134^{0}.

2400 - Continued coring to approximately 7150' at an average rate of 3.5 ft/hr. Formation continued to be primarily hornfels.

11 November 91

1500 - Have continued coring to approximately 7184'; rate of penetration is fairly good (4-5 ft/hr), but core tube tends to block and prevents taking advantage of the longer (20') tube now in place.

2000 - Cored to 7190', tube blocked, tripped tube, and pumped down another tube. When pumping down a new tube, the waterways are taped over so that it requires a significant pressure to open them. This assures the tube being at the bottom of the core barrel. When the core tube was pressured up, the pump pressure went to 600 psi and fell sharply to 150 psi. Increased pump volume would not raise pressure; this indicated either a failure in the core rods or a loss of the lower BHA. Pulled up into casing (4 stands of pipe) and rigged to circulate until morning.

12 November 91

0630 - Started tripping out; found split (6" long) in the middle of rod from approximately 2800' deep. Laid down the bad rod and continued tripping out.

1100 - Laid down the BHA (outside gauge of bit was completely worn) and picked up the non-magnetic BHA to be used with the core orientation equipment.

1500 - Ran in the hole with this assembly and resumed coring at 7190'.

1800 - Cut 10' core with this assembly, pulled back off bottom, and sent overshot wireline down to retrieve core tube. Tube is stuck in core

barrel. Rewound wireline and worked core rods (put weight on bit, rotated, etc) in an attempt to free the inner tube. Made another attempt with wireline, but tube is still stuck. Will try working the pipe further, since, once again, we can't trip the string at night because of lighting restrictions.

13 November 91

0630 - Worked pipe until about 2400 last night, and pulled wireline up to 75% of its rated strength, but inner tube is still stuck. Tripping out.

1000 - Returned core barrel to surface. Found that OD of new core catcher shoe is larger than that of the previous catcher, and therefore would not fit through the stabilizer inside the reamer shell. Removed stabilizer, which is not really needed anyway, picked up coring assembly, and started tripping back in hole.

We had cut 8' core with the orienting assembly before getting stuck; the rock was similar to the earlier hornfels formation with one zone of silicified clay.

1900 - Finished drilling the first 10' section with the full orientation gear. This assembly includes the multi-shot camera, scribing core catcher, and non-magnetic core barrel. The camera is set to take pictures at 2 minute intervals, although many of them won't be useful because they will be taken while the core string is rotating. The orientation technique uses the required stop in drilling every 2.5' (when the core rig is re-chucked) to wait for the camera to take a picture, thus giving a definite orientation at 2.5' intervals. This allows for the possibility of core rotation during the drilling.

First 10' run is very good; scribe lines are well defined, rock is competent, and multi-shot film gives good results. Replaced core tube and ran back in hole to continue drilling.

14 November 91

0600 - Drilling has continued through the night with good results. First oriented core run was from 7198' to 7208'; we have gotten two additional runs (to 7228') by 0600. Both additional runs have been competent rock with good scribe lines.

1800 - Continued oriented coring. Progress is to 7250', still in competent rock with good orientation and good core recovery.

15 November 91

0800 - Finished last oriented core run at 7278'. Start tripping out to lay down orientation tools and pick up normal tools with 20' core barrel.

1800 - Trip back in with normal coring tools.

16 November 91

0100 - Finished tripping in coring tools. Thawed frozen mud lines. Pumped 56 barrels to break circulation and reamed 30' of smaller (3.75") hole left by orienting bit. Core ahead.

17 November 91

1800 - Continued coring ahead; increased weight of core string has caused some problems with chuck slipping. Using the big rig to hold back 4-6 Klb.

18 November 91

1800 - Coring ahead last 24 hours (78' core recovered). Preparing to test low-side orienting sub.

19 November 91

1800 - Bit failed at 2300 hours last night. Ran three single-shot surveys to check repeatability for low-side orientation. Started tripping for bit change at daylight. Dropped inner tube at three different depths to measure acoustic attenuation; this is part of an experiment for Sandia acoustic telemetry project. Bit back on bottom.

20 November 91

1800 - Cored ahead for the last 24 hours. No operational problems, but core tends to block so runs are not very long. Oriented one 7' run with the low-side orientation system.

21 November 91

1530 - Suspended coring at 7578'. Tripped core string back into casing in preparation for temperature log.

22 November 91

1800 - Ran temperature log to 7520'. Temperature tool stuck slightly going through the orienting wedge, but hole was clean and had no trouble coming back out. Cleaned mud tanks and displaced drilling fluid with 180 bbl of water doped with fluoroscein dye, which will be used to determine fluid flow into or out of the wellbore. Cored 10' while displacing mud. Phase II coring complete with 720' cored and 99.2% core recovery.

23 November 91

Completed tripping out and laying down core rods. Released Tonto and Loffland rigs. End of Phase II drilling operations.

IV. HOLE DESCRIPTION, POST-DRILLING

The following description gives the condition of the hole at the end of coring, and is therefore important to any researcher who wishes to do experiments in the wellbore.

Generally, the casing program is described in Figure 1, although the figure does not show a 40" mud riser to 39' depth. This is fairly self-explanatory, but two points must be emphasized: (1) the outside of the 13-3/8" liner is uncemented above approximately 3300 feet, and (2) the top of the liner is mechanically fixed to the inside of the 20" casing at about 1600 feet, but this joint is not a fluid seal. These points are relevant to any analysis of fluid entering or leaving the wellbore.

As of April 1992, the string of ODP drill pipe hanging in the wellbore extends from surface to the top of the core hole and provides access to the core hole, but does not seal the core hole from the large diameter hole outside the drill pipe. As described in the narrative, the ODP pipe was used as an "artificial wellbore" to contain the core string during coring - the minimum inside diameter of the ODP pipe is 4-1/8 inches. It is likely that this string of pipe will be pulled and laid down during scientific operations in the summer of 1992.

The wellhead has a 10" master valve above the drill-pipe hanger; this valve is kept closed when operations are not in progress in the wellbore. This means that, even after the drill pipe is removed from the hole, the maximum size which can be inserted into the well is approximately 10" diameter. There is additional access to the wellbore (outside the ODP pipe) through choke and kill lines and valves below the master valve.

Figure 2 is a printout of the well's deviation, based on a survey done inside the ODP drill pipe. This survey extends from 2700' (approximately the bottom of the Phase I casing) into the top of the core hole at approximately 7000 feet.

Figure 3 is a temperature log done on December 16, 1991. Again, this log is done inside the drill pipe down to the top of the core hole.

Finally, copies of the data tapes from the wireline logs done at the end of the rotary drilling are available at a cost of approximately $200 from Schlumberger-LOGSAVE, phone (303) 470-2545. In requesting tapes, use Sandia/DOE as the company name and LVF 51-20 as the well identification.

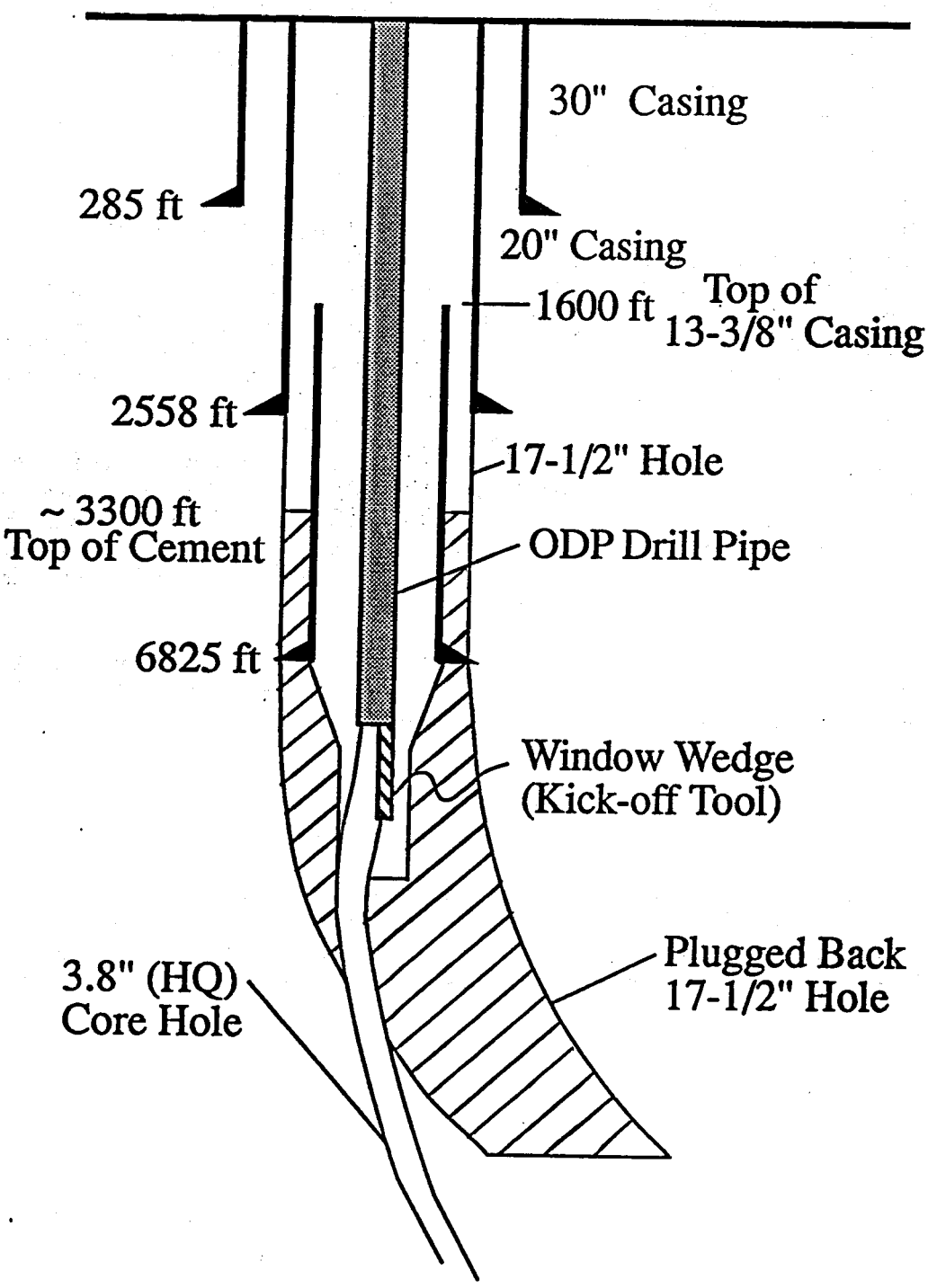

Figure 1 - Diagram of casing in LVF 51-20

SURVEY CALCULATION REPORT

PROBE #: 2005 FILENAME: SANDIA

Customer: DOE SANDIA NATIONAL LABS
Location: MAMMOTH
Field: LONG VALLEY CALDERA
Operator: ROBERT ZEMAN
Time: Thu Sep 12 16:41:00 1991

Well no: LVF 51-20
Rig Name: LOFFLAND 202
Comments:

Section Plane: 0.00
Vertical Section Origin:
North: 0.00
East: 0.00
Declination (Mag to True): 15.00
Convergence (True to Grid): N/A
Mag Convergence (Mag to Grid): N/A
Depth Unit: FEET

Azimuth Compensation Applied: None
Survey Correction Applied: None.
Survey Calculation Method: Radius of Curvature

RECORD OF SURVEY

Depth	Inc	Azimuth	TVD	VS	N coord	E coord	DL
2700.0	1.33	335.94	2699.6	40.0	40.0N	7.3W	0.00
2799.0	1.37	325.08	2798.6	42.0	42.0N	8.4W	0.26
2893.0	1.06	338.31	2892.6	43.7	43.7N	9.4W	0.44
2987.0	0.67	326.57	2986.6	45.0	45.0N	10.0W	0.45
3082.0	0.83	331.88	3081.5	46.1	46.1N	10.7W	0.18
3176.0	0.72	359.15	3175.5	47.3	47.3N	11.0W	0.40
3270.0	0.67	12.94	3269.5	48.4	48.4N	10.9W	0.19
3365.0	1.31	338.89	3364.5	50.0	50.0N	11.0W	0.89
3459.0	1.03	341.90	3458.5	51.8	51.8N	11.6W	0.30
3554.0	0.86	336.35	3553.5	53.3	53.3N	12.2W	0.20
3648.0	0.55	332.20	3647.5	54.4	54.4N	12.7W	0.33
3742.0	1.15	6.61	3741.5	55.7	55.7N	12.9W	0.81
3837.0	0.94	11.06	3836.4	57.4	57.4N	12.7W	0.23
3931.0	0.64	5.22	3930.4	58.7	58.7N	12.5W	0.34
4025.0	0.88	8.27	4024.4	59.9	59.9N	12.3W	0.26
4119.0	0.77	6.06	4118.4	61.3	61.3N	12.2W	0.12
4214.0	0.53	1.81	4213.4	62.4	62.4N	12.1W	0.26
4308.0	0.48	43.38	4307.4	63.1	63.1N	11.8W	0.38
4403.0	0.80	22.27	4402.4	64.0	64.0N	11.2W	0.41
4497.0	0.64	26.66	4496.4	65.1	65.1N	10.7W	0.18
4591.0	0.48	20.76	4590.4	65.9	65.9N	10.4W	0.19
4686.0	0.21	100.85	4685.4	66.2	66.2N	9.9W	0.51
4780.0	0.40	29.87	4779.4	66.4	66.4N	9.5W	0.41
4874.0	0.81	138.10	4873.4	66.5	66.5N	8.6W	1.07
4969.0	0.64	258.90	4968.4	65.5	65.5N	8.9W	1.32

Figure 2 - Wellbore Deviation Survey

SURVEY CALCULATION REPORT

PROBE #: Z005 FILENAME: SANDIA

Azimuth Compensation Applied: None
Survey Correction Applied: None.
Survey Calculation Method: Radius of Curvature

RECORD OF SURVEY

Depth	Inc	Azimuth	TVD	VS	N coord	E coord	DL
5063.0	0.53	241.97	5062.4	65.2	65.2N	9.8W	0.21
5157.0	0.77	216.26	5156.4	64.5	64.5N	10.6W	0.39
5252.0	0.83	185.67	5251.4	63.3	63.3N	11.1W	0.45
5346.0	0.94	146.76	5345.3	61.9	61.9N	10.8W	0.64
5441.0	0.95	147.75	5440.3	60.6	60.6N	9.9W	0.02
5535.0	1.26	152.32	5534.3	59.0	59.0N	9.0W	0.34
5629.0	2.02	140.47	5628.3	56.8	56.8N	7.5W	0.88
5724.0	2.24	147.72	5723.2	53.9	53.9N	5.5W	0.37
5818.0	2.68	162.71	5817.1	50.3	50.3N	3.8W	0.82
5912.0	2.30	156.58	5911.0	46.4	46.4N	2.3W	0.49
6007.0	2.30	155.34	6006.0	43.0	43.0N	0.8W	0.05
6101.0	2.04	146.61	6099.9	39.8	39.8N	0.9E	0.45
6196.0	2.06	148.22	6194.8	37.0	37.0N	2.8E	0.06
6291.0	2.54	135.29	6289.7	34.0	34.0N	5.1E	0.74
6385.0	2.61	155.78	6383.7	30.5	30.5N	7.5E	0.98
6480.0	2.46	161.16	6478.6	26.6	26.6N	9.0E	0.30
6574.0	2.11	152.31	6572.5	23.2	23.2N	10.5E	0.53
6670.0	2.07	159.62	6668.4	20.0	20.0N	11.9E	0.28
6701.0	2.11	150.47	6699.4	19.0	19.0N	12.4E	1.08
6732.0	2.16	151.65	6730.4	18.0	18.0N	13.0E	0.23
6764.0	2.25	150.06	6762.4	16.9	16.9N	13.6E	0.34
6795.0	2.38	147.04	6793.3	15.8	15.8N	14.2E	0.57
6827.0	2.78	156.03	6825.3	14.6	14.6N	14.9E	1.76
6858.0	2.90	160.60	6856.3	13.1	13.1N	15.5E	0.84
6890.0	3.70	167.64	6888.2	11.4	11.4N	16.0E	2.77
6921.0	3.91	169.66	6919.1	9.3	9.3N	16.4E	0.82
6953.0	4.42	171.15	6951.1	7.0	7.0N	16.8E	1.61
6984.0	4.47	170.59	6982.0	4.7	4.7N	17.2E	0.22
7015.0	4.48	167.76	7012.9	2.3	2.3N	17.6E	0.71
7046.0	4.46	166.67	7043.8	-0.1	0.1S	18.1E	0.28
7066.0	4.55	167.17	7063.7	-1.6	1.6S	18.5E	0.47

CLOSURE: Distance - 18.56
Direction - 94.90

Figure 2, continued - Wellbore Deviation Survey

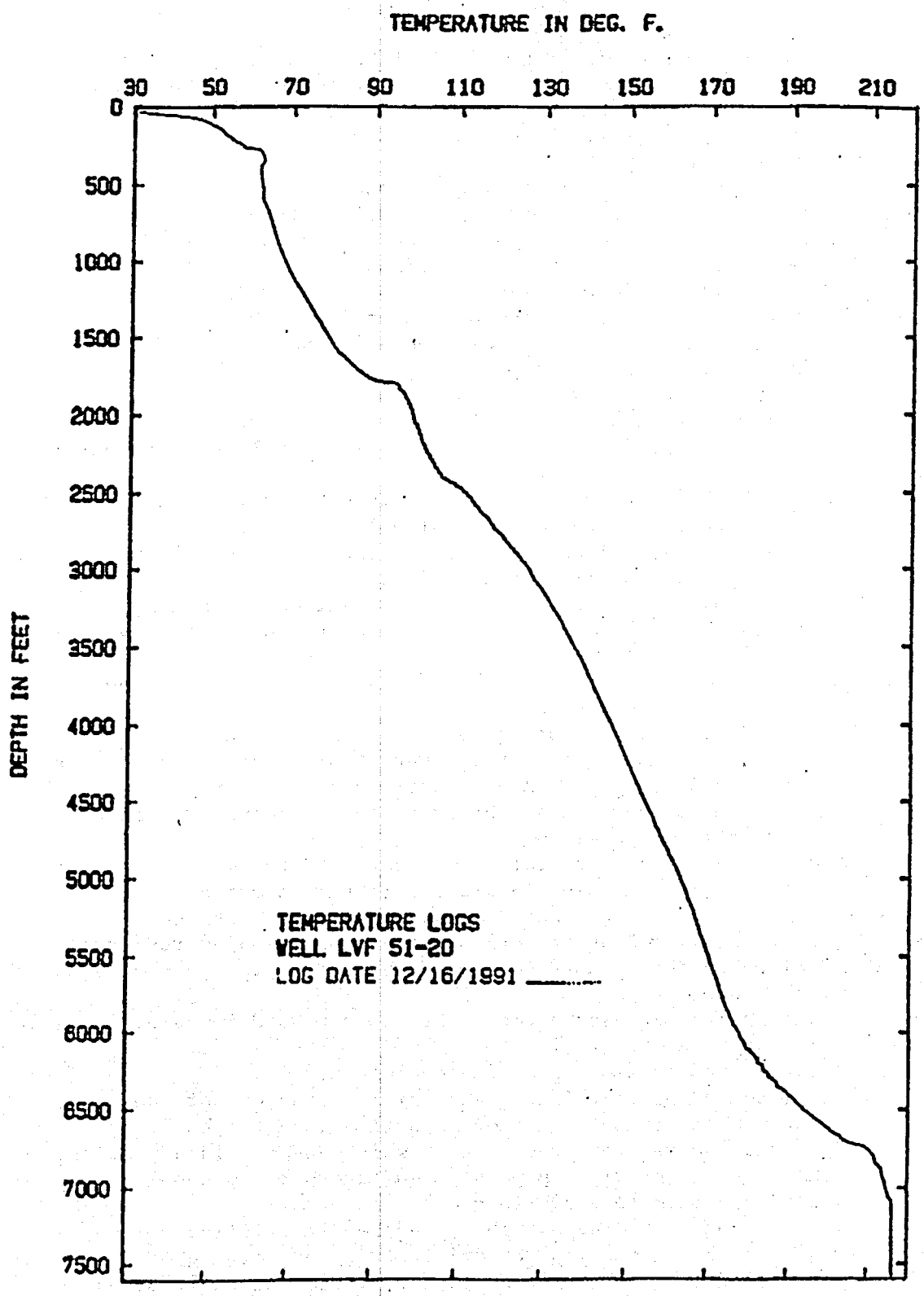

Figure 3 - Temperature Log, 16 December 91

V. GLOSSARY

bbl - barrel; standard unit of fluid measure in drilling practice, equals 42 standard gallons.

BHA - bottom hole assembly; the combination of bit, stabilizers, drill collars, and other tools at the bottom of the drill string, i.e., everything below the drill pipe.

BOP - blow out preventer; the mechanism that seals the wellbore and isolates it from the surface.

box - female thread on drill string component.

chain out - to trip out without rotating the drill string below the connection being broken; done when string is believed to be damaged or when bringing out a fish.

DC - drill collars; the heavy-walled tubular sections of the drill string used just above the bit to apply weight.

fish - unwanted hardware in the hole; usually the result of drill string failure or stuck pipe.

fishing - the process of removing a fish from the hole.

HW - heavy weight; describes drill pipe with an extra heavy wall thickness - used as a transition between drill collars and normal drill pipe.

IBS - integral blade stabilizer; a one-piece stabilizer with spiral blades protruding to the nominal hole diameter.

junk - generally small pieces of metal in the hole; usually the result of bit failure or milling up a fish.

junk basket - a fishing tool; an open-bottomed cylinder with hinged fingers which allow junk to enter the cylinder but prevent it from falling back out.

KB - kelly bushing; the reference level at the rig floor from which all depths are measured.

kelly - the uppermost member of the drill string, which has a square or hexagonal cross-section; the rotary table engages this cross section and thereby turns the drill string.

lay down - taking out of service a tool or piece of equipment, either temporarily or permanently.

LCM - lost circulation material; particulate matter mixed with the drilling fluid to plug loss zones in the formation.

liner - a casing string that does not extend back to surface.

ODP - Ocean Drilling Program; organization that manages research drilling in the ocean - source of the drill pipe used as a core rod bushing.

pick up - putting into service a tool that was not used immediately prior to that time.

pin - male thread on a drill string component.

POOH - pull out of hole; tripping the drill string out of the hole.

RIH - run in hole; tripping the drill string into the hole.

ROP - rate of penetration; the rate at which the bit is advancing.

stand - three joints of drill pipe screwed together and handled as a unit (approximately 90' long).

TD - total depth; the deepest point reached in drilling.

trip - the process of pulling the drill string out of the wellbore (breaking every third joint to form stands of drill pipe), usually to change bits or other parts of the BHA, and returning it to the wellbore.

WOB - weight on bit; the force applied to the bit by the weight of the drill string components.

WOC - wait on cement; time spent waiting for cement to cure.

VI. SUMMARY OF RIG SPECIFICATIONS

BRIEF SPECIFICATIONS FOR RIG #202

The Nabors-Loffland rig used for this drilling has drilled the two deepest holes (both below 30,000 feet, both in Oklahoma) in the United States. Some of the rig capacities are listed below.

* Mast capacity: 1000 tons
* Height to crown: 177 feet
* Maximum hook load: 750 tons as rigged (30,000 ft of 5" drillpipe); can be rigged for 1000 tons
* Pump capacity: 2 pumps; 736 gpm each at 3260 psi
* Drill pipe: 5-1/2"; 5-1/2" full hole tool joints
* Prime movers: 3 ea Catepillar D-399 1100 hp diesels
* Mud system: 1400 barrel capacity; shakers, desanders, desilters

BRIEF SPECIFICATIONS FOR THE TONTO CP-50 CORING RIG

The Tonto CP-50 is built as an underground diamond coring rig. Although it is often truck-mounted and used with a mast for surface drilling, it was mounted for this application on the Loffland rig floor and powered by the Loffland rig generators.

* Manufacturer: Chicago Pneumatic
* Powerpack: 200 hp, 460 volt, 3 phase electric motor
* Drive: Hydrostatic
* Maximum single line pull: 30,000 lb
* Depth capacity: 11,000 ft
* Drill pipe: HMQ wireline drill rods, 3-1/2" OD x 3-1/16" ID
* Pump capacity: 2 pumps; 35 gpm each at 1000 psi
* Mud system: 900 gallon mud tank, with 300 gallon mixing tank

VII. DETAILS OF FISHING OPERATIONS

The problem: At the end of Phase I drilling in 1989 we used a wire-line core rig with ODP drill pipe as a core-rod bushing to take HQ core approximately 185' below the 26" hole (core hole TD = 2754'). The core string stuck at the bit and later stuck higher in the core hole. We used a jet cutter to sever the core string inside the ODP pipe approximately 15' above the surface of the cement in the casing. We left the ODP pipe in place, around the top of the core string, until the beginning of Phase II drilling in August 1991. Total length of the fish was 242 feet.

Operations:

1) Used rig to pull ODP drill pipe. We originally left the drill pipe in place with the top of the core rod inside it so that it would be easier to get a fishing tool inside the core rod. Consensus of the fisherman and the drilling foreman was that the core rod was so solidly stuck, after two years, that going into it with a spear would almost certainly part the core rod and leave two fish instead of one.

2) Top of core rod was sticking up about 15' above the surface of the cement in the casing. Plan was to get an 11-5/8" ODP four-cone bit, on washover pipe, over the core rod and use it to drill-over/wash-over to the bottom of the core rod. The top of the rod was flared out where it was cut, however, so the first step in washing over was to dress off the flare at the top of the rod. This operation was done with an inside-conical mill having hard facing on the inside of the cone and a throat slightly larger than the outside diameter of the core rod, i.e., after the flare was gone, the core rod slid freely through the mill. The cone mill was below a guide sleeve with a shear-pinned non-rotating centralizer. This kept the mill centered until it was on the core rod, and then the pins sheared after starting rotation to avoid wear or damage to the centralizer arms. This procedure went smoothly.

3) The next step was to get over the core rod with the ODP bit and drill down the outside to the core rod TD. Bottom-hole assembly was ODP 11-5/8" four-cone bit, crossover, non-rotating centralizer, 9 joints wash pipe, drive sub, bumper sub, jars, crossover, 6 ea 8" drill collars, crossover. Wash bit went over core rod and we began drilling the cement above the casing shoe. Weight on bit was about 10,000 lb and rate of penetration was 4-5 ft/hr.

Drilling down to core bit continued at the same penetration rate; washover bit stopped at 2753', apparently stuck on either the core bit or the reamer shell above it. Pump pressure spiked up to about 1100 psi, indicating that the core rod was plugging up the washover bit. Continued rotating for about an hour while circulating the hole clean. Raised drill string to the jar's stroke and come down on the bit with about 40,000 lb. Our hope was to stick the core bit inside the four-cone bit and bring it all out together.

Weight indicator showed that the core rod was in the wash pipe at first, but it apparently came out, for it was not there when the wash pipe came to surface. Laid down wash pipe and picked up overshot grapple.

4) Drilling assembly for the overshot is: 8-1/2" x 3-1/2" overshot with 3' extension and 10-1/2" skirt; bumper sub; jars; 3 ea 8" drill collars; crossover; drill pipe. Ran in hole and tagged top of core rod at 2515'; worked overshot down approximately 4' over the core rod and circulated. Pump pressure spiked to about 2000 psi, indicating that the core barrel was plugged; pressure relaxed and did not reappear. Pulled out of hole, bringing all of the core rod and the stabilizer, which was thought to be the reamer

shell. It's possible that the pressure spike was the core barrel/bit being pumped off the bottom of the core rods.

5) At this point, the core barrel, reamer shell, and bit were still in the hole but a miscount of the length we had retrieved led us to believe that only the bit was still in the hole. Based on that assumption, we next ran a magnet (10-1/2" magnet, 2 ea 8" drill collars) in the hole to try picking up the core bit. Scratches on the magnet showed that we had been in contact with steel junk, but nothing came up. Laid down the magnet and picked up a junk basket (10-1/2" basket; bit sub; 5 ea 8" drill collars; crossover; drill pipe). Worked over the fish for about 4' and came out of the hole. Approximately 5' of the core barrel (in long split pieces) was wedged in the basket.

At this point, the situation of having more than we had realized in the hole became clear. Since it appeared that there was no more hope of getting the remaining metal out of the hole with magnet or junk basket, we decided to mill up the remaining core barrel/bit assembly.

6) Went in the hole with 10-3/4" junk mill (BHA = mill; drive sub; 5 ea 8" drill collars; crossover; drill pipe). Milled on junk for approximately 3 hours - 50 rpm/10-15,000 WOB. Came out of hole and laid down mill; picked up 11-3/4" junk basket. Ran in hole with junk basket, but it wouldn't go past the ledge at the top of cement. Pulled out of hole and laid down basket; picked up 10-1/2" magnet (this is stronger than the one used before). Ran in hole with magnet and picked up approximately 7.8 lb steel, mostly in pieces averaging 1" x 2". Kept running magnet in hole until no large pieces came up; this was a total of 10 magnet runs. Last magnet run held only 0.4 lb steel, all in the form of very small shavings. Total weight of steel recovered from junk basket and magnet was 92.2 lb, which was very close to the weight of the core barrel plus reamer shell.

7) Since further magnet/junk basket runs did not appear productive, we decided to go in with an old 17-1/2" bit and open the 11-5/8" washover hole down to the bottom of the core hole. We would then try to drill ahead as a test of whether there was still any major junk left. The used milled tooth bit (Security S3SJ) worked well down to 2688", opening hole at 30-40 ft/hr. At that point, however, penetration almost stopped. Core log didn't show anything unique at this depth, so we decided to pull the bit. It was very dull, so we picked up a new Security insert bit (S-88) and continued opening hole. Reached 2758', depth of the last fishing run, and continued drilling ahead to 2760'. There was no roughness or high torque to indicate any junk left in the hole, so we concluded that the fish had been all milled up. Continued drilling ahead, recovering occasional small pieces of junk from the top of the roller reamer, but with no further evidence of large steel in the hole.

VIII. BRIEF DESCRIPTION OF PHASE II GEOLOGY

This description covers the geology encountered in drilling Phase II of the Long Valley Exploratory Well. Phase II comprises a 17-1/2" hole from 2568' to 6825' and a 3.86" core hole below that to 7588 feet.

In general, the rocks traversed during this drilling phase are the Bishop Tuff, which is the material erupted when the giant Long Valley volcano formed the present caldera 700,000 years ago, and below it the so-called basement rock, which is material already in place before the eruption. There is also a fairly thick layer of highly mixed rocks between these other two well-defined formations.

All the rock from approximately 2040' (reached during Phase I drilling) to 5900' is called Bishop Tuff, but there are major intervals of rhyolite intrusion into the tuff. The tuff and the rhyolite are chemically similar to each other and to granite, but the tuff is called "pyroclastic" because it is formed of material explosively ejected from the volcano. The rhyolite, however, is younger than the tuff and intruded into it in the form of lava which then cooled as a unit. In contrast, the tuff consists of small particles of glass which accumulated and stuck together as a contiguous mass. Glass fragments result when magma cools too rapidly for crystals to form and there is only the amorphous state; the rhyolite cooled more slowly, so it contains small crystals. Logically enough, the tuff also tends to contain more crystals of other minerals than the rhyolite because it has picked up these fragments while passing through other materials during magmatic movement and ejection. In the Phase II interval, the two rocks frequently looked similar but the drilling rate was usually higher in the rhyolite.

The basement rock, which extends from about 6645' to the bottom of the hole was, at one time, a sedimentary rock such as shale. Approximately 90 million years ago, however, the heat from a granitic intrusion beneath this rock caused its metamorphosis into the present rock called hornfels. (The hornfels, which often contains many different minerals, looks similar to basalt and is called a metasediment. Hornfels is chemically similar to the rhyolite, except for a high graphite content which gives the rock a dark-grey to black color. The graphite is metamorphosed carbon, probably remains of plant material in the original sediments.) Based on the evidence of similar rocks which outcrop elsewhere, there may be several thousand feet of metasediments between the Bishop Tuff and the underlying granite.

Possibly the most interesting part of the drilled interval is the transition section between the Bishop Tuff and the basement. This interval from approximately 5900' to 6645' is primarily a "tuff breccia", or a mixture of sharp, angular fragments from the formations above and below it. Many other minerals are present, but the proportion of metasediments increases with depth and its degree of alteration decreases as the basement is entered at about 6645'. Samples from this interval also contain a large amount of clay, pyrite, and quartz crystals - probably a product of groundwater circulation at high temperature. The key question about this interval is how it came to be between the primary layers of tuff and basement. Answers must necessarily be speculative, but this segment of highly mixed rock may be material which has accumulated in a fault, or it could signify flow from more than one vent during the original eruption.

IX. DRILLING FLUID SUMMARY

The following components and additives were used in the drilling fluids during Phase II operations. We were restricted at all times by California Regional Water Quality Control Board regulations on permissible additives - no toxic substances were allowed in the drilling fluids.

MATERIAL	QUANTITY USED
(Rotary Drilling)	
Hydrogel (Bentonite)	164,850 lbs
C-Lignite	26,350 lbs
Lime	25,750 lbs
Caustic	7,200 lbs
DMS	215 gal
Kwik-Seal C	2550 lbs
Kwik-Seal M	1200 lbs
Soda Ash	50 lbs
Interlube	90 gal
Magma Fiber	520 lbs
Aluminum Stearate	100 lbs
Bicarb	2500 lbs
Barite	7000 lbs
Defoamer	175 gal
Desco	4000 lbs
Fluid Loss Reducer	1200 lbs
Drispac SL	1150 lbs
Detergent	40 gal
CMC	4000 lbs
(Core Drilling)	
Kwik-Ben	4250 lbs
Intervis	165 gal
Drispac	250 lbs
Tork Ease	175 gal
Tork Ease C.	200 lbs
Drill Det.	15 gal
Soda Ash	400 lbs
Ground Paper	120 lbs
Cottonseed Hulls	100 lbs

APPENDIX A - DAILY DRILLING REPORTS

These daily reports were prepared by Sandia National Laboratories during drilling and were circulated to a distribution list of approximately 50 people.

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-5-91 | Time of Report 0800 | Days since spud: 2 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 2568 ft | Depth Yesterday 2568 ft | Progress __0__ ft | Rotating Hours 0

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling ____" Hole

---

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1										
2										
3										

Lithology:	Interval	Description
	_____ - _____ ft	
	_____ - _____ ft	

Drilling Fluid:

Mud Wt. 8.7 lb/gal | Vis 56 cp | PV 20 cp | YP 14 lb/100ft^2 | pH 10.5 | Returns temp ___^{0}F

Flow rate 756 gpm | Pump pressure 150 psi, strokes/min 54 | Lost circulation ___ bbl

Composition: 1/2 sk/bbl bentonite, ___ lignite,

Other: Caustic

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79

Drill Collars: __ @ __", __ @ __", __ @ __" | DC wt. (in air) _____ lb | DC length ____ ft

Bottom Hole Assembly: Total length 11.96 ft

Description: guide shoe, mill, crossovers

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

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SUMMARY OF YESTERDAY'S OPERATIONS

Magna-flux kelly, function tested BOP, strapped drill pipe, made up 3-1/2" ID mill for dressing top of core rod. Ran in hole to 2500' and mixed mud. Displaced water in hole with mud. Dressed top of core rod at 2515'. Pulled out of hole and laid down milling tool; inside of mill showed wear, indicating that it was over the core rod. Picked up 6 ea 8" drill collars and started back in hole with wash pipe.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-6-91 | Time of Report 0800 | Days since spud: 3 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 2677 ft | Depth Yesterday 2568 ft | Progress 109 ft | Rotating Hours 19-1/2

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling 11-5/8" Washover Hole

---

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1										
2										
3										

Lithology:	Interval	Description
	_____ - _____ ft	
	_____ - _____ ft	

Drilling Fluid:

Mud Wt. 8.7 lb/gal | Vis 42 cp | PV 13 cp | YP 8 lb/100ft^2 | pH 10.5 | Returns temp ___^{0}F

Flow rate 655 gpm | Pump pressure 450 psi, strokes/min 60 | Lost circulation ___ bbl

Composition: 25 lb/bbl bentonite, ___ lignite,

Other: Caustic

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79

Drill Collars: 6 @ 8", __ @ __", __ @ __" | DC wt. (in air) 25,000 lb | DC length 180.2 ft

Bottom Hole Assembly: Total length 485.1 ft

Description: 11-5/8" core bit, 9 jts washpipe, drive sub, bumper sub, jars, crossover, 6 ea 8" DC, crossover.

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

---

SUMMARY OF YESTERDAY'S OPERATIONS

Picked up drilling assembly and worked over the core rod at 2515'; bit is 4-cone ODP core bit which fits over the core rod and drills 11-5/8" OD. Washed over core rod, drilling new 11-5/8" hole, from 2522' to 2677'.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-7-91 | Time of Report 0800 | Days since spud: 4 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 2756 ft | Depth Yesterday 2677 ft | Progress 79 ft | Rotating Hours 8

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - N/A Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1										
2										
3										

Lithology:	Interval	Description
	_____ - _____ ft	
	_____ - _____ ft	

Drilling Fluid:

Mud Wt. 8.7 lb/gal | Vis 50 cp | PV 22 cp | YP 7 lb/100ft^2 | pH 10 | Returns temp ___^{0}F
Flow rate 655 gpm | Pump pressure 450 psi, strokes/min 60 | Lost circulation ___ bbl
Composition: 25 lb/bbl bentonite, ___ lignite,
Other: Caustic

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 6 @ 8", __ @ __", __ @ __" | DC wt. (in air) 25,000 lb | DC length 180.2 ft
Bottom Hole Assembly: Total length 485.1 ft
Description: (1) Washover string same as yesterday; (2) 8-1/2" x 3-1/2" overshot w/3' extension and 10-1/2" skirt; bumper sub; jars; 3 ea 8" DC; crossover; drill pipe

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

SUMMARY OF YESTERDAY'S OPERATIONS

Washed over core rod to 2756'; stopped making hole, indicating that the core bit was against the ID of the ODP washover bit. Stayed on the core bit, rotating and circulating bottoms up for approximately one hour. Raised drill string to extension of jars and came down on the core bit with about 40,000 pounds, trying to wedge the core bit into the ODP bit. Came out of the hole with the washover string, and found that the core rod was not in the wash pipe. Laid down washover tools and picked up overshot assembly. Ran in hole and tagged top of core rod at 2515'; worked overshot approximately 4' down over core rods, and circulated fluid. Pump pressure spiked to about 2000 psi, indicating that the core barrel and/or bit was plugged; pressure then relaxed and did not reappear. Came out of hole. Retreived all core rod and reamer shell (which was loose in the connection), but left bit in hole. Called Bakersfield for 10" magnet and junk basket to go after core bit.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-8-91 | Time of Report 0800 | Days since spud: 5 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 2756 ft | Depth Yesterday 2756 ft | Progress 00 ft | Rotating Hours 0

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - N/A Hole

---

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1										
2										
3										

Lithology:	Interval _____ - _____ ft	Description

Drilling Fluid:

Mud Wt. 8.7 lb/gal | Vis 52 cp | PV 23 cp | YP 9 lb/100ft^2 | pH 10 | Returns temp ___^{0}F

Flow rate 655 gpm | Pump pressure 450 psi, strokes/min 60 | Lost circulation ___ bbl

Composition: 25 lb/bbl bentonite, ___ lignite,

Other: Caustic

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79

Drill Collars: 5 @ 8", __ @ __", __ @ __" | DC wt. (in air) 21,000 lb | DC length 150 ft

Bottom Hole Assembly: Total length 166.5 ft

Description: Junk basket, bit sub, 5 ea 8" DC, crossover, 81 jtf drillpipe = 2550.5'

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

---

SUMMARY OF YESTERDAY'S OPERATIONS

Made up magnet and 5 ea drill collars; went into hole and worked over fish. Came out of hole; scratches on magnet showed that we had been in contact, but brought up nothing. Picked up junk basket and worked over fish for about 4'. Brought up basket with pieces of core barrel in it. Measurement showing only the bit left in the hole was in error; core barrel was also there. Brought up approximately 5' of core barrel; sent for additional fishing tools. Will mill up remaining junk in hole. Drilling crew is changing BOP rams (original set has defective seal ring groove) while waiting for fishing tools.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-9-91 | Time of Report 0800 | Days since spud: 6 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 2756 ft | Depth Yesterday 2756 ft | Progress 00 ft | Rotating Hours 0

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - N/A Hole

---

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1										
2										
3										

Lithology:	Interval _____ - _____ ft	Description

Drilling Fluid:

Mud Wt. 8.85 lb/gal | Vis 46 cp | PV 19 cp | YP 6 lb/100ft^2 | pH 10 | Returns temp ___^{0}F
Flow rate 655 gpm | Pump pressure 450 psi, strokes/min 60 | Lost circulation ___ bbl
Composition: 25 lb/bbl bentonite, ___ lignite,
Other: Caustic

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 2 @ 8", __ @ __", __ @ __" | DC wt. (in air) 8,400 lb | DC length 60.6 ft
Bottom Hole Assembly: Total length 71.5 ft
Description: 10-1/2" dia. magnet, bit sub, 2 ea 8" DC, crossover,
84 jts drillpipe = 2712'

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

---

SUMMARY OF YESTERDAY'S OPERATIONS

Changed out and function tested BOP. Picked up 10-3/4" junk mill and milled on core barrel for approximately 3 hours. No metal in returns. Pulled out of hole with mill and picked up 11-1/4" junk basket. Basket hangs up on the ledge between casing and washover hole. Pull out basket and pick up 10-1/2" magnet. Run in hole with magnet, circulate briefly, and pull out. Magnet comes back with about 5 lb steel fragments on it. Pieces of core barrel are about 1" by 2". Will keep running magnet until it comes up empty (three magnet runs by 0800).

Site visit by Frank Dalton, BLM, who inspected and approved BOP equipment.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-10-91 | Time of Report 0800 | Days since spud: 7 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 2756 ft | Depth Yesterday 2756 ft | Progress 00 ft | Rotating Hours 0

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - N/A Hole

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Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1										
2										
3										

Lithology:	Interval _____ - _____ ft	Description

Drilling Fluid:

Mud Wt. 8.8 lb/gal | Vis 44 cp | PV 18 cp | YP 5 lb/100ft^2 | pH 9.5 | Returns temp ___^{0}F
Flow rate 1000 gpm | Pump pressure 750 psi, strokes/min 100 | Lost circulation ___ bbl
Composition: 25 lb/bbl bentonite, ___ lignite,
Other: Caustic; circulated high-viscosity sweep to pick up steel cuttings.

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 2 @ 8", __ @ __", __ @ __" | DC wt. (in air) 8,400 lb | DC length 60.6 ft
Bottom Hole Assembly: Total length 71.5 ft
Description: 10-1/2" dia. magnet, bit sub, 2 ea 8" DC, crossover,
84 jts drillpipe = 2712'

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

---

SUMMARY OF YESTERDAY'S OPERATIONS

Completed seven additional magnet runs (total of 10). Total junk retrieved from junk basket and magnets = 92.2 lb, which is very close to the weight of the core barrel and other parts. On the last magnet run, there were no large pieces of steel but only fine shavings. We will take the 17-1/2" bit left here after Phase I and open the 11-5/8" washover hole down to the TD of the core hole (approximately 2758'). At that point, we will try to drill a few feet of new hole to make sure that there are no major pieces of junk left. If we are able to drill the new hole, we will lay down the old bit and pick up a new bit with full drilling assembly (monel drill collar, etc), complete the BOP test, and drill ahead.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-11-91 | Time of Report 0800 | Days since spud: 8 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 2756 ft | Depth Yesterday 2756 ft | Progress - open hole 172 ft | Rotating Hours 7

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - Open 17-1/2" Hole

---

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688						
3										

Lithology:	Interval _____ - _____ ft	Description

Drilling Fluid:

Mud Wt. 8.8 lb/gal | Vis 39 cp | PV 14 cp | YP 2 lb/100ft^2 | pH 10.5 | Returns temp ___^{0}F
Flow rate 1035 gpm | Pump pressure 2100 psi, strokes/min 95 | Lost circulation ___ bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 3 @ 11", 3 @ 10", 6 @ 5"HW | DC wt. (in air)57,000 lb |
DC length; 11" - 88.04', 10" - 92.06'
Bottom Hole Assembly: Total length 386.72 ft
Description: Bit, 3 pt reamer, bit sub, 1-11" DC, IBS, 2-11" DC, 3-10" DC, crossover, 6-5" heavy weight drill pipe

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Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

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SUMMARY OF YESTERDAY'S OPERATIONS

Ran in hole with used 17-1/2" milled tooth bit left from Phase I. Began opening 11-5/8" washover hole in casing cement at 2528'. Opened hole to 2688' at 30-40 ft/hr, but penetration stopped at that point. Looked at the core log and found nothing unique about the formation. Pulled 17-1/2" milled tooth bit (which was dull) and picked up new 17-1/2" insert bit. Continued opening hole at about 15-20 ft/hr.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-12-91 | Time of Report 0800 | Days since spud: 9 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 2920 ft | Depth Yesterday 2756 ft | Progress - 164 ft | Rotating Hours 11

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688						
3										

Lithology:	Interval _____ - _____ ft	Description

Drilling Fluid:
Mud Wt. 8.9 lb/gal | Vis 46 cp | PV 17 cp | YP 5 lb/100ft^2 | pH 10.5 | Returns temp 112^{0}F
Flow rate 983 gpm | Pump pressure 2000 psi, strokes/min 90 | Lost circulation ___ bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 1 @ 12" 3 @ 11", 6 @ 10", 6 @ 5"HW | DC wt. (in air) 75,000 lb |
DC length; 304 ft | Bottom Hole Assembly: Total length 488 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 2-11" DC, IBS, 1-11" DC, 5-10" DC, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	2711'	1-1/2^o	337	
	2815	1-1/2	327	0.25 deg/100 ft

SUMMARY OF YESTERDAY'S OPERATIONS

Opened hole to 2758' (depth of last fishing run). Continued rotating slowly with light weight on bit to try and detect any junk left in hole. No high torque or rough drilling to indicate junk. Drilled ahead 2' to clean up bottom of hole and to make sure no junk remained. Increased WOB up to 45,000 lb and drilled fairly smoothly. Pulled out of hole.

Completed BOP pressure test with test plug in wellhead: Pipe rams held 3000 psi for 15 min, dropped 180 psi; annular preventer held 1000 psi for 15 min, no pressure drop; blind rams, choke and kill lines held 3000 psi for 15 min, no pressure drop.

Ran in hole with drilling assembly, drilled 17-1/2" hole to 2920'.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL — DAILY DRILLIING REPORT

Date: 8-13-91 | Time of Report 0600 | Days since spud: 10 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 3378 ft | Depth Yesterday 2920 ft | Progress - 458 ft | Rotating Hours 22

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688						

Lithology: Interval	Description
2950 - 3050 ft	Dominant: rhyolite — Rhyolite is generally nearly white to pale grey or green, dense, aphyric, and commonly veined with silica.
3300 - 3330 ft	Dominant: rhyolite
	Remainder of this drilling interval is predominantly lt-med grey tuff with conspicuous quartz crystals in most cuttings, very slight trace biotite, RR loose k-spar, trace to common disseminated pyrite, micro-brecciated cuttings.

Drilling Fluid:
Mud Wt. 9.1 lb/gal | Vis 49 cp | PV 20 cp | YP 14 lb/100ft^2 | pH 10.5 | Returns temp 126^{0}F
Flow rate 983 gpm | Pump pressure 2350 psi, strokes/min 90 | Lost circulation 29 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 1 @ 12" 3 @ 11", 6 @ 10", 6 @ 5"HW | DC wt. (in air) 75,000 lb |
DC length; 304 ft | Bottom Hole Assembly: Total length 488 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 2-11" DC, IBS, 1-11" DC, 5-10" DC, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	2939'	3/4^o	240	0.72 deg/100 ft
	3065	1/2	259	0.39
	3192	1/2	343	0.53
	3317	1.0	335	0.41

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled 17-1/2" hole from 2920' to 3378'. Progress was very good, penetration rate averaging 20 ft/hr and hole deviation not exceeding 1 degree. Cuttings coming off the shakers are very wet falling into the chip catching bin; this results from foam in the drilling fluid, high pump rate, and fine screens in the shakers. We have added defoamer to the mud and installed spray bars over the shakers to wash some of the foam off the cuttings; this has made a significant improvement. Added Kwik-Seal LCM after minor lost circulation.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-14-91 | Time of Report 0600 | Days since spud: 11 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 3665 ft | Depth Yesterday 3378 ft | Progress - 287 ft | Rotating Hours 16

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688						

Lithology: | Interval | Description

This interval is 100% tuff. It is typically lt-med grey that is "fresher" than that in the previous 24 hours. Quartz crystals remain the most common phenocryst with minor distinct sanidine of similar size - 0.5-2mm. Slight traces of biotite and pyrite throughout. Decrease in pyrite over previous 24 hours. Trip at 3490' brought up clay-dominant banded ash that contained clasts of tuff (this lithology removed from stabilizers).

Drilling Fluid:
Mud Wt. 9.0 lb/gal | Vis 46 cp | PV 19 cp | YP 7 lb/100ft^2 | pH 10.5 | Returns temp 128^{0}F
Flow rate 983 gpm | Pump pressure 2100 psi, strokes/min 90 | Lost circulation 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 1 @ 12" 3 @ 11", 6 @ 10", 6 @ 5"HW | DC wt. (in air) 75,000 lb |
DC length; 304 ft | Bottom Hole Assembly: Total length 488 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 2-11" DC, IBS, 1-11" DC, 5-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	3440'	1^o	335	0.0 deg/100 ft
	3572	1	345	0.13

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled 17-1/2" hole from 3378' to 3490'. Plugged bit nozzle. Pulled out of hole, gauged tools, and unplugged bit. Picked up another Integral Blade Stabilizer and put it above the 10" drill collars. Ran in hole and drilled 17-1/2" hole from 3490' to 3665'.

Still unable to completely solve the problem of wet cuttings coming over the shakers.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-15-91 | Time of Report 0600 | Days since spud: 12 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 4039 ft | Depth Yesterday 3665 ft | Progress - 374 ft | Rotating Hours 22

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688						
3										

Lithology: | Interval | Description

This interval is predominantly tuff, with "ashy" tuff/rhyolite below approx 3900'.

General description: 3665' - 3900' lt-med grey tuff, dom light tones w/occ flow characteristics and common phenocrysts; by 3910' a softer white "ashy" tuff or rhyolite becomes the dominant lith. This lith is associated with a marked increase in drill rate at the top. Common disseminated pyrite, scattered calcareous cuttings, and rare phenocrysts. Occasional clayey cuttings within this lower interval.

Drilling Fluid:
Mud Wt. 9.2 lb/gal | Vis 47 cp | PV 17 cp | YP 9 lb/100ft^2 | pH 10.5 | Returns temp 131^{0}F
Flow rate 936 gpm | Pump pressure 1945 psi, strokes/min 85 | Lost circulation 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 1 @ 12" 3 @ 11", 6 @ 10", 6 @ 5"HW | DC wt. (in air) 75,000 lb |
DC length; 304 ft | Bottom Hole Assembly: Total length 493 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 2-11" DC, IBS, 1-11" DC, 5-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	3694'	1-1/4^o	355^o	0.26 deg/100 ft
	3821	1/2	5	0.59
	3947	3/4	355	0.20

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled 17-1/2" hole from 3665' to 4039' with full returns. Adjusted tilt angle on shakers to give more delay time. Cuttings are coming back somewhat drier, but are still collecting rapidly.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-16-91 | Time of Report 0600 | Days since spud: 13 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 4267 ft | Depth Yesterday 4039 ft | Progress - 228 ft | Rotating Hours 14

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121						

Lithology: Interval	Description	
4040-4120	Grey tuff	Grey tuff is typically hard w/occaional flow char. and common phenocrysts.
4120-4175	White rhyolite	
4175-4210	Grey tuff	
4210-4240	White rhyolite	White rhyolite is typically firm, lacking phenocrysts.
4240-4267	Grey tuff	

Infrequent clayey cuttings are present, with some "running ash".

Drilling Fluid:

Mud Wt. 9.4 lb/gal | Vis 49 cp | PV 15 cp | YP 10 lb/100ft^2 | pH 11.5 | Returns temp 133^{0}F
Flow rate 1004 gpm | Pump pressure 2300 psi, strokes/min 92 | Lost circulation 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 1 @ 12" 3 @ 11", 6 @ 10", 6 @ 5"HW | DC wt. (in air) 75,000 lb |
DC length; 304 ft | Bottom Hole Assembly: Total length 493 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 2-11" DC, IBS, 1-11" DC, 5-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	4071'	3/4^o	40^o	0.36 deg/100 ft
	4198	1/4	345	0.42

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled 17-1/2" hole from 4039' to 4121' with full returns. Pulled out of hole and changed out bit, three-point reamer, and 2 IBS. Ran in hole to 4121' with no fill. Drilled from 4121' to 4267'.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-15-91 | Time of Report 0600 | Days since spud: 12 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 4039 ft | Depth Yesterday 3665 ft | Progress - 374 ft | Rotating Hours 22

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688						
3										

Lithology: | Interval | Description

This interval is predominantly tuff, with "ashy" tuff/rhyolite below approx 3900'.

General description: 3665' - 3900' lt-med grey tuff, dom light tones w/occ flow characteristics and common phenocrysts; by 3910' a softer white "ashy" tuff or rhyolite becomes the dominant lith. This lith is associated with a marked increase in drill rate at the top. Common disseminated pyrite, scattered calcareous cuttings, and rare phenocrysts. Occasional clayey cuttings within this lower interval.

Drilling Fluid:

Mud Wt. 9.2 lb/gal | Vis 47 cp | PV 17 cp | YP 9 lb/100ft^2 | pH 10.5 | Returns temp 131^{0}F
Flow rate 936 gpm | Pump pressure 1945 psi, strokes/min 85 | Lost circulation 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 1 @ 12" 3 @ 11", 6 @ 10", 6 @ 5"HW | DC wt. (in air) 75,000 lb |
DC length; 304 ft | Bottom Hole Assembly: Total length 493 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 2-11" DC, IBS, 1-11" DC, 5-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	3694'	1-1/4^o	355^o	0.26 deg/100 ft
	3821	1/2	5	0.59
	3947	3/4	355	0.20

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled 17-1/2" hole from 3665' to 4039' with full returns. Adjusted tilt angle on shakers to give more delay time. Cuttings are coming back somewhat drier, but are still collecting rapidly.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-16-91 | Time of Report 0600 | Days since spud: 13 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 4267 ft | Depth Yesterday 4039 ft | Progress - 228 ft | Rotating Hours 14

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121						

Lithology:	Interval	Description	
	4040-4120	Grey tuff	Grey tuff is typically hard w/occaional flow char. and common phenocrysts.
	4120-4175	White rhyolite	
	4175-4210	Grey tuff	
	4210-4240	White rhyolite	White rhyolite is typically firm, lacking phenocrysts.
	4240-4267	Grey tuff	

Infrequent clayey cuttings are present, with some "running ash".

Drilling Fluid:

Mud Wt. 9.4 lb/gal | Vis 49 cp | PV 15 cp | YP 10 lb/100ft^2 | pH 11.5 | Returns temp 133^{0}F
Flow rate 1004 gpm | Pump pressure 2300 psi, strokes/min 92 | Lost circulation 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 1 @ 12" 3 @ 11", 6 @ 10", 6 @ 5"HW | DC wt. (in air) 75,000 lb |
DC length; 304 ft | Bottom Hole Assembly: Total length 493 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 2-11" DC, IBS, 1-11" DC, 5-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	4071'	3/4^o	40^o	0.36 deg/100 ft
	4198	1/4	345	0.42

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled 17-1/2" hole from 4039' to 4121' with full returns. Pulled out of hole and changed out bit, three-point reamer, and 2 IBS. Ran in hole to 4121' with no fill. Drilled from 4121' to 4267'.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL — DAILY DRILLIING REPORT

Date: 8-17-91 | Time of Report 0600 | Days since spud: 14 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 4623 ft | Depth Yesterday 4267 ft | Progress - 356 ft | Rotating Hours 22.5

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121						

Lithology: Interval	Description	
4260-4510	Grey tuff	Grey tuff is typically hard w/occasional flow char. and common phenocrysts.
4510-4600	White rhyolite	White rhyolite is typically firm, lacking phenocrysts.

Traces breccia and marked increase in pyrite in 4520' sample where the lith changes from tuff to rhyolite.

Drilling Fluid:
Mud Wt. 9.4 lb/gal | Vis 48 cp | PV 19 cp | YP 10 lb/100ft^2 | pH 11.5 | Returns temp 139^{0}F
Flow rate 928 gpm | Pump pressure 2160 psi, strokes/min 85 | Lost circulation 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 1 @ 12" 3 @ 11", 6 @ 10", 6 @ 5"HW | DC wt. (in air) 75,000 lb |
DC length; 304 ft | Bottom Hole Assembly: Total length 493 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 2-11" DC, IBS, 1-11" DC, 5-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	4322'	3/4^o	315^o	0.53 deg/100 ft
	4449	3/4	35	0.76
	4575	1/4	45	0.40

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled 17-1/2" hole from 4267' to 4623' with full returns.

Changed shaker screens to 150 mesh. Cuttings are still coming back wet, but we are mixing them with decomposed granite to dry out the mixture. Received permission from the Water Quality Board to begin disposing of the cuttings and the Phase I corrosion-inhibitor water first pumped from the casing.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-18-91 | Time of Report 0600 | Days since spud: 15 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 4823 ft | Depth Yesterday 4623 ft | Progress - 200 ft | Rotating Hours 21

Size and Depth of Last Casing: 20 " at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
									Open Hole	
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121						

Lithology:	Interval	Description	
	4600-4650	White rhyolite	White rhyolite is typically firm, lacking phenocrysts.
	4650-4800	Wht. rhy. tuff	Tuff is pred. white and similar in color to the rhyolite. This tuff is less altered than previous intervals and drills slower.

Drilling Fluid:
Mud Wt. 9.3 lb/gal | Vis 44 cp | PV 15 cp | YP 8 lb/100ft^2 | pH 11.8 | Returns temp 145^{0}F
Flow rate 991 gpm | Pump pressure 2450 psi, strokes/min 85 | Lost circulation 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 1 @ 12" 3 @ 11", 6 @ 10", 6 @ 5"HW | DC wt. (in air) 75,000 lb |
DC length; 304 ft | Bottom Hole Assembly: Total length 493 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 2-11" DC, IBS, 1-11" DC, 5-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	4700'	1/2^o	35^o	0.21 deg/100 ft

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled 17-1/2" hole from 4623' to 4823' with full returns. Rate of penetration dropped to less than 10 ft/hr for most of the last day. Lithology does not appear to be very different from the previous mixture of Bishop Tuff and rhyolite, but drilling rate has slowed appreciably. The only identifiable difference in the rock is that the current tuff shows less alteration than that encountered higher in the hole.

Cuttings are coming back somewhat drier and we are now able to haul some of them to the landfill, so the chip drying area is beginning to clear up.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL — DAILY DRILLIING REPORT

Date: 8-19-91 | Time of Report 0600 | Days since spud: 16 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 5007 ft | Depth Yesterday 4823 ft | Progress - 184 ft | Rotating Hours 13

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854						

Lithology: Interval	Description
4800-4970	Wht to gry tuff: White tuff becomes grey by 4820-40' and remains grey to current depth.
4970-4980	Rhyolite: Rhyolite dominant by this depth

Tuff is hard and shows minor evidence of alteration until 4930' where the rhyolite becomes a 10-30% fraction of sample. Also present with the rhyolite is silica veining and trace amounts clay-dominant cuttings - possibly ash or altered rhyolite. Trace amounts of pyrite throughout increase with the rhyolite. Rhyolite is occasionally altered to a clay.

Drilling Fluid:
Mud Wt. 9.4+ lb/gal | Vis 65 cp | PV 22 cp | YP 14 lb/100ft^2 | pH 12 | Returns temp 138^{0}F
Flow rate 917 gpm | Pump pressure 1950 psi, strokes/min 86 | Lost circulation 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 79
Drill Collars: 1 @ 12" 3 @ 11", 6 @ 10", 6 @ 5"HW | DC wt. (in air) 75,000 lb |
DC length; 317 ft | Bottom Hole Assembly: Total length 501 ft
Description: Bit, 3 pt reamer, shock sub, bit sub, IBS, 2-11" DC, IBS, 1-11" DC, 6-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	4800'	1/4^o		

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled 17-1/2" hole from 4823' to 4854' when pump pressure dropped about 250 psi. Inspection of surface equipment showed no leaks, so tripped drill string to look for washouts. Pin on shock sub was cracked and had washed out the connection between it and the monel drill collar. Laid down the shock sub and monel (hole is straight, so we will use inclination surveys until the monel is repaired). Picked up a new, softer formation, bit to try improving rate of penetration. Ran survey with maximum-reading thermometers attached to camera when drill string was back on bottom; temp showed 142^{o}F at bottom hole.

One of the flow-line cleaners went out at approximately 1700 and there was no way to use only the remaining one. We were without the cleaners for most of the night and the mud has accumulated a significant amount of fines.

Rate of penetration has picked up to approximately 15 ft/hr since changing bit.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-20-91 | Time of Report 0600 | Days since spud: 17 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 5114 ft | Depth Yesterday 5007 ft | Progress - 107 ft | Rotating Hours 9.5

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854						

Lithology:	Interval	Description
	4990-5100	Pred. wht rhylt: White rhyolite dominant throughout with 5-20% grey tuff.

The rhyolite is firm to hard, generally aphyric, often contains disseminated pyrite and occasionally silica veining. The lowest section of this interval contains increased amounts of open fracture evidence (euhedral quartz) and increased amounts xenoliths - typically dark finely crystalline metasediments.

Drilling Fluid:

Mud Wt. 9.5 lb/gal | Vis 41 cp | PV 15 cp | YP 7 lb/100ft^2 | pH 11.7 | Returns temp 112^{0}F
Flow rate 949 gpm | Pump pressure 2300 psi, strokes/min 88 | Lost circulation 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 146
Drill Collars: 1-12", 1-11", 7-10", 6-5"HW |DC wt (in air) 78,000 lb |DC length 310 ft
Bottom Hole Assembly: total length 494 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 1-11" DC, 1-10", IBS, 6-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	4989'	1°		
	5045	1/2	200°	

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled 17-1/2" hole from 5007' to 5050' where pump pressure began dropping from about 1900 psi to less than 1600 psi. Continued drilling to 5070' when pump strokes also began increasing. Pulled out of hole to look for washouts. Found box end of top 11" drill collar severely cracked (at least 3/4 of circumference) and washed out. Laid down that 11" collar and the 10" collar above it (10" pin was also washed). Continued pulling out of hole and found a smaller (approximately 90°) crack in the bottom 11" collar. Laid that collar down also. Monel drill collar returned from repair as other drill collars were coming out, so we picked it up for the drilling assembly (see above).

Resumed drilling ahead at approximately 12-15 ft/hr.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-21-91 | Time of Report 0600 | Days since spud: 18 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 5358 ft | Depth Yesterday 5114 ft | Progress - 244 ft | Rotating Hours 22

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6		Open Hole	
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854						

Lithology:	Interval	Description
	5110-5160	Pred. wht to lt gry tuff
	5160-5180	White rhyolite
	5180-5250	Lt grey tuff
	5250-5280	Wht rhyolite
	5280-5340	Lt grey tuff

Tuff is predominately light grey, but occasionally becomes very white. Typically possesses an aphanitic ground mass w/phenocrysts of quartz and sanadine, and commonly contains dark grey xenoliths. Overall alteration is minimal, with localized pyrite and silica veining and crystalline pyrite encrustations. Some chloritization is rarely observed. Rhyolite is predominantly white, commonly earthy in appearance, and frequently is associated w/white clay alteration. Pyrite veining and encrustation are locally common. The overall texture is fine grained, and occasional minute mafic crystallites are observed.

Drilling Fluid:
Mud Wt. 9.4 lb/gal | Vis 37 cp | PV 11 cp | YP 6 lb/100ft^2 | pH 11.5 | Returns temp 144^{0}F
Flow rate 928 gpm | Pump pressure 2250 psi, strokes/min 86 | Lost circulation 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 154
Drill Collars: 1-12", 1-11", 7-10", 6-5"HW |DC wt (in air) 78,000 lb |DC length 310 ft
Bottom Hole Assembly: total length 494 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 1-11" DC, 1-10", IBS, 6-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	5171'	3/4^o	195^o	
	5298	1	155^o	

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled 17-1/2" hole from 5114' to 5358'. Rate of penetration dropped to less than 10 ft/hr for much of the night, but progress is still reasonably good. Chips are drier coming off the shakers and the chip-drying bin is getting clear. Will suspend hauling cuttings to the dump until more accumulate.

Mud-cleaning centrifuge has been plagued with vibration problems - broke motor mount welds two days ago. Company service man re-welded brackets, but vibration shook centrifuge loose again and shorted out its power connection. New centrifuge is on its way to site.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-22-91 | Time of Report 0600 | Days since spud: 19 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 5428 ft | Depth Yesterday 5358 ft | Progress - 70 ft | Rotating Hours 9

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55

Lithology:	Interval	Description
	5340-5410	Pred. wht to lt gry tuff

Tuff is predominately light grey, being gradational to mostly white, possesses an aphantic ground mass with phenocrysts of subhedral quartz, sanadine, and minor plagioclase feldspar, with scattered dark gray xenoliths. Alteration is minimal with minor chloritization and localized pyrite and silica veining.

Drilling Fluid:
Mud Wt. 9.5+ lb/gal | Vis 40 cp | PV 14 cp | YP 7 lb/100ft^2 | pH 11.5 | Returns temp 148^{0}F
Flow rate 928 gpm | Pump pressure 2300 psi, strokes/min 86 | Lost circulation 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 154
Drill Collars: 1-12", 8-10", 6-5"HW | DC wt (in air) 70,000 lb | DC length 312 ft
Bottom Hole Assembly: total length 496 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 2-10" DC, IBS, 6-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	5362'	1^o	147^o	0.22 deg/100ft

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled 17-1/2" hole from 5358' to 5428'. Rate of penetration continued to be less than 10 ft/hr, but was consistent. At 5428' the drill string began experiencing severe, erratic torque, indicating that either the bit was damaged or that there were fractures in the formation. Pulled out of hole to look at bit, found it somewhat worn (enough to cause low penetration rate) but not damaged to cause torque fluctuations. Had BHA inspected while tools were out of hole, found one more cracked box on the 11" drill collar. [All three 11" collars have had cracked box threads] Will re-run M-84 bit pulled previously.

New centrifuge received and installed last night.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-23-91 | Time of Report 0600 | Days since spud: 20 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 5539 ft | Depth Yesterday 5428 ft | Progress - 111 ft | Rotating Hours 16

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55

Lithology:	Interval	Description
	5400-5530	Pred. wht to lt gry tuff (Minor white rhy 5400-5440)

Tuff is predominantly hard, light grey to nearly white, and contains scattered phenocrysts of subhedral quartz w/lesser amounts of sanidine and fair traces of dark grey/black xenoliths. A slight trace of biotite is present, minor chloritization and disseminated pyrite are found throughout. The rhyolite is white with abundant disseminated elongate specks resembling horneblende.

Drilling Fluid:
Mud Wt. 9.4 lb/gal | Vis 36 cp | PV 10 cp | YP 4 lb/100ft^2 | pH 11.5 | Returns temp 133^{0}F
Flow rate 928 gpm | Pump pressure 2300 psi, strokes/min 86 | Lost circulation 150 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 157
Drill Collars: 1-12", 8-10", 6-5"HW | DC wt (in air) 70,000 lb | DC length 312 ft
Bottom Hole Assembly: total length 496 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 2-10" DC, IBS, 6-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	5459'	1-1/4^o	137^o	0.32 deg/100ft

SUMMARY OF YESTERDAY'S OPERATIONS

Ran back in hole after BHA inspection. Cut and slipped drilling line. Drilling has continued to be slower than upper part of hole, varying from 6-10 ft/hr. Present bit (Sec M-84 re-run) is drilling at about the same rate as the previous softer formation bit. Bottomhole temperatures have stayed about 130-140^{0}F for the last 1000'.

Hole has begun to lose small amounts of fluid - about 150 bbl during yesterday's trip and 8-10 bbl/hr since then. We are not trying to stop this fluid loss, since we need to dilute the mud system anyway.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-24-91 | Time of Report 0600 | Days since spud: 21 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 5683 ft | Depth Yesterday 5539 ft | Progress - 144 ft | Rotating Hours 12.5

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428						

Lithology:	Interval	Description
	5530-5670	White to lt grey tuff

Tuff is predominantly hard, light grey to nearly white, and contains scattered phenocrysts of subhedral quartz w/lesser amounts of sanidine and fair traces of dark grey/black xenoliths. Increased pyrite and fracture evidence present throughout this interval are associated with increased drilling rate.

Drilling Fluid:
Mud Wt. 9.3 lb/gal | Vis 41 cp | PV 11 cp | YP 8 lb/100ft^2 | pH 11.7 | Returns temp 139^{0}F
Flow rate 983 gpm | Pump pressure 2350 psi, strokes/min 90 | Lost circulation 150 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 164
Drill Collars: 1-12", 8-10", 6-5"HW | DC wt (in air) 70,000 lb | DC length 312 ft
Bottom Hole Assembly: total length 496 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 2-10" DC, IBS, 6-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	5616'	1-3/4^o	148^o	0.37 deg/100ft

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled from 5539' to 5572' before beginning installation of catalytic converter on diesel engines. This converter is required by the Air Pollution Control District to reduce NO_x emissions. Until this converter became available, the APCD has permitted us to run with the injector timing retarded on the engines. Installation of the exhaust manifold required about eight hours; three hours with engines shut down. Pulled drill string back into casing before shutting down engines.

Resumed drilling at approximately 7:00 PM. Penetration rate is still erratic, with some spots over 20 ft/hr and some under 8 ft/hr. Hole inclination increased to 1-3/4^o on the last survey, so reduced weight on bit in hopes of avoiding further deviation. Drilled to 5683'.

Slight lost circulation (10-20 bbl/hr) continues.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-25-91 | Time of Report 0600 | Days since spud: 22 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 5822 ft | Depth Yesterday 5683 ft | Progress - 139 ft | Rotating Hours 16

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59

Lithology:	Interval	Description
	5690-5810	White to lt grey tuff

Tuff is heavily altered 5670'-5700, becomes less altered by 5710'. Mildly altered whitish cuttings dominant through the drilled interval, Increased trace black xenoliths plus trace green chloritized cuttings. Persist good trace pyrite throughout interval.

Drilling Fluid:
Mud Wt. 9.2+ lb/gal | Vis 38 cp | PV 10 cp | YP 7 lb/100ft^2 | pH 11.8 | Returns temp 139^{0}F
Flow rate 983 gpm | Pump pressure 2000 psi, strokes/min 90 | Lost circulation 300 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 164
Drill Collars: 1-12", 8-10", 6-5"HW | DC wt (in air) 70,000 lb | DC length 312 ft
Bottom Hole Assembly: total length 496 ft
Description: Bit, 3 pt reamer, shock sub, 12" monel DC, IBS, 2-10" DC, IBS, 6-10" DC, IBS, crossover, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	5678'	2^o	151^o	0.43 deg/100ft
	5773'	2.5	158	0.60

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled from 5683' to 5727' and surveyed at 5678'. Hole inclination was 2^o (1-3/4^o on previous survey). Held back weight on bit to approximately 35,000 lb (instead of the previous 55,000 lb) and increased rotary speed. Drilled to 5822' and surveyed at 5773'; deviation had increased to 2-1/2^o. Pulled out of hole to change BHA, will go back in with an angle-dropping assembly. All tools are at least 3/8" under gauge; will pick up new bit, stabilizers, and the 11" drill collars that have been re-cut and threaded.

Lost circulation of 20-30 bbl/hr continues, but is not a serious problem.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-26-91 | Time of Report 0600 | Days since spud: 23 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 5903 ft | Depth Yesterday 5822 ft | Progress - 81 ft | Rotating Hours 12.5

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822						

Lithology:	Interval	Description
	5820-5890	Predominantly white tuff

Tuff is predominantly white with scattered phenocrysts of quartz and occasionally feldspar. Typically hard with few heavily altered cuttings. Minor pyrite and chloritic cuttings through drilled interval; strong trace black to dark grey, trace light green xenoliths.

Drilling Fluid:

Mud Wt. 9.1+ lb/gal | Vis 41 cp | PV 9 cp | YP 10 lb/100ft^2 | pH 11.8 | Returns temp 143^{0}F
Flow rate 983 gpm | Pump pressure 2100 psi, strokes/min 96 | Lost circulation: minor
Composition: bentonite, lignite, Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 170
Drill Collars: 1-12", 2-11", 7-10", 6-5"HW | DC wt (in air) 76,000 lb | DC length 267 ft
Bottom Hole Assembly: total length 516 ft
Description: Bit, shock sub, 12" monel DC, IBS, 1-11" DC, IBS, 1-11" DC, 7-10" DC, IBS, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	5831'	2.5^o	158^o	0.0 deg/100ft

SUMMARY OF YESTERDAY'S OPERATIONS

Ran in hole with new drilling assembly and reamed 4 joints to bottom at 5822'. Lower 49' of hole was under gauge. Drilled with 20,0001b WOB to 5872' and surveyed at 5831'; deviation was slightly under 2.5^o. Rate of penetration was approximately 7-8 ft/hr at the beginning of this interval, but has slowed to less than 4 ft/hr at the end. We will increase the WOB and survey at 60' intervals.

Minor lost circulation continues, but is not a serious problem.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-27-91 | Time of Report 0600 | Days since spud: 24 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6031 ft | Depth Yesterday 5903 ft | Progress - 128 ft | Rotating Hours 21.5

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822						

Lithology:	Interval	Description
	5900-6020	Predominantly lithic tuff/tuff breccia

Black metasediments become the dominant lithology within samples from 5903'. These clasts/cuttings commonly are angular with a rind of or embedded in a white tuff. At the top of this interval black-dark grey hornfels, occasionally phyllites, quartzites, and green matasediments are present. Samples become predominantly dark grey/black hornfels and white tuff w/minor amounts of quartzite by 5970'.

Drilling Fluid:

Mud Wt. 9.2 lb/gal | Vis 35 cp | PV 8 cp | YP 6 lb/100ft^2 | pH 11.5 | Returns temp 143^{0}F
Flow rate 950 gpm | Pump pressure 2050 psi, strokes/min 88 | Lost circulation: minor
Composition: bentonite, lignite, Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 170
Drill Collars: 1-12", 2-11", 7-10", 6-5"HW | DC wt (in air) 80,000 lb | DC length 296 ft
Bottom Hole Assembly: total length 516 ft
Description: Bit, shock sub, 12" monel DC, IBS, 1-11" DC, IBS, 1-11" DC, 7-10" DC, IBS, 6-5" heavy weight drill pipe, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	5886'	2^o	150^o	0.940 deg/100ft
	5962	2-1/4	150	0.33

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled from 5903' with BHA designed to drop some of the angle built up in the last two days. Angle decreased from 2.5^o to 2^o but rate of penetration was very slow - under 5 ft/hr for most of the interval. Increased WOB to approximately 40 Klb to improve drilling rate.

Cuttings sample from 5920' and 5930' contained high percentages of what appeared to be basement rock, but by 5970' the dominant lithology is again Bishop Tuff. Temperature readings during surveys continue to be around 140^{0}F.

At 0530 drill string lost 600 psi pump pressure and 30,000 lb weight; appears to be twisted off between the 10" and 11" drill collars. Have called fishing company.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-28-91 | Time of Report 0600 | Days since spud: 25 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6031 ft | Depth Yesterday 6031 ft | Progress - 0 ft | Rotating Hours 0

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6031					

Lithology:	Interval	Description

No new lithology this report

Drilling Fluid:

Mud Wt. 9.3 lb/gal | Vis 37 cp | PV 9 cp | YP 5 lb/100ft^2 | pH 11.5 | Returns temp N/A
Flow rate --- gpm | Pump pressure ---- psi, strokes/min -- | Lost circulation: N/A
Composition: bentonite, lignite,
Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 181
Drill Collars: 6-8" | DC wt (in air) 22,500 lb | DC length 130 ft
Bottom Hole Assembly: total length 206 ft
Description: Overshot, bumper sub, jars, 6-8" DC, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot				

SUMMARY OF YESTERDAY'S OPERATIONS

Chained out of hole. Fish left is: bit, shock sub, 12" monel, IBS, 11" DC, IBS, 11" DC for a total length of 112'. Pin was broken on the lowermost 10" drill collar. Ran in hole with overshot and washed over the top 11" collar. Chained out of hole and recovered 100% of fish. Broke out fishing tools, laid down drill collars, and began inspection of all bottom hole tools. Found cracked pin on the shock sub. Will finish inspection of BHA and go into hole for a 30' core run with an Eastman 8-3/4" x 4" core bit.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-29-91 | Time of Report 0600 | Days since spud: 26 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6045 ft | Depth Yesterday 6031 ft | Progress - 14 ft | Rotating Hours 7.5

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6031					

Lithology:	Interval	Description
	6031-6045	White to dk grey tuff

Sample quality is poor because coring produces small volume of cuttings. Most of sample probably comes from above the cored interval. Average sample is 65% white to med grey tuff, 35% dark grey tuff breccia. White tuff is firm to hard and contains quartz/feldspar phenocrysts. The tuff breccia is dark grey with common white (altered feldspar and/or pieces of tuff) and black (metasediment xenoliths) inclusions.

Drilling Fluid:
Mud Wt. 9.3 lb/gal | Vis 35 cp | PV 9 cp | YP 4 lb/100ft^2 | pH 11.5 | Returns temp 111^{O}F
Flow rate 335 gpm | Pump pressure 670 psi, strokes/min 31 | Lost circulation: 0
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 183
Drill Collars: 3-10" | DC wt (in air) 22,000 lb | DC length 89 ft
Bottom Hole Assembly: total length 260 ft
Description: 8-1/2" x 4" core bit, 1-10" DC, IBS, 2-10" DC, crossover, 4-5" HW DP, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	No survey this report			

SUMMARY OF YESTERDAY'S OPERATIONS

Completed inspection of drilling tools. Total tools rejected: shock sub (pin cracked when making up tool after inspection), two joints heavy weight drill pipe, two crossovers (top and bottom of HW drill pipe). Picked up coring assembly, ran in hole. Core bit was very slow to get started drilling; started cutting core at approximately 0100. Coring ahead at approximately 1.5-2 ft/hr.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-30-91 | Time of Report 0600 | Days since spud: 27 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6061 ft | Depth Yesterday 6045 ft | Progress 16 ft | Rotating Hours 8/core,2/ream

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822						

Lithology:	Interval	Description
	6031-6061	Core: Dark grey clastic-rich ash

Competent dark grey clastic-rich ash commonly showing layering often perpendicular to core axis. Clasts vary from sand grain size to granule size (very few pebble size) and range from angular to occasionally rounded. The clasts are white (pyroclastics) and black (metasediments).

Drilling Fluid:
Mud Wt. 9.3 lb/gal | Vis 39 cp | PV 16 cp | YP 3 lb/100ft^2 | pH 11.2 | Returns temp 118^{0}F
Flow rate 712 gpm | Pump pressure 1850 psi, strokes/min 66 | Lost circulation: 0
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 183
Drill Collars: 1-12",1-11", 7-10" | DC wt (in air) 63,500 lb | DC length 275 ft
Bottom Hole Assembly: total length 440 ft
Description: Bit, IBS, shock sub, IBS, monel, IBS, 11" DC, IBS, 7-10" DC, IBS, crossover, 4-5" HW drill pipe, crossover,

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	No survey this report			

SUMMARY OF YESTERDAY'S OPERATIONS

Completed coring from 6031' to 6061'. Excellent core recovery - 29+ ft core in 30 ft core barrel. Cored formation is a competent ash with heavy inclusions of what appears to be the basement rock (see lithology report). Laid down coring tools and picked new drilling assembly. New BHA is stiffer than those used previously, to keep hole as straight as possible while opening core hole. Ran in hole and reamed from 5941' to 6031'; opened core hole from 6031' to 6035'.

Completed installation of catalytic converter for diesel engines.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 8-31-91 | Time of Report 0600 | Days since spud: 28 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6182 ft | Depth Yesterday 6061 ft | Progress 121 ft | Rotating Hours 22

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822						

Lithology: Predominantly a med-dk grey tuff breccia with the onset of glassy silicic intrusives at approx 6130'. The tuff breccia is mostly med grey overall, with localized color averaging from lt med grey to dk grey, with hornfels clasts being almost black. The rock is typically hard with localized friable zones, especially when the size of the clasts increases. The predominant texture is an aphanitic to microcrystalline groundmass with clast and crystals up to about 1.5 mm. Locally, the overall texture becomes more phaneritic with a minimum of groundmass and mostly clasts/crystals 1.5 larger than the cuttings size of about 6mm max. Alteration is mostly restricted to the felsic constituents. At approximately 6130', sporadic torque increases accompanied glassy, silicic intrusives. The overall alteration of the breccia (country rock) increased to about a maximum of 50% when associated with these intrusives. Alteration includes clay dissolution of felsics and overall bleaching of sample. Minor chloritization and pyritization is also observed.

Drilling Fluid:
Mud Wt. 9.4 lb/gal | Vis 34 cp | PV 9 cp | YP 5 lb/100ft^2 | pH 11.5 | Returns temp 134^{0}F
Flow rate 971 gpm | Pump pressure 1985 psi, strokes/min 90 | Lost circulation: 200 bbl
Composition: bentonite, lignite, Other: Low lime, Kwik-Seal for minor lost circulation

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 182
Drill Collars: 1-12",1-11", 7-10" | DC wt (in air) 63,500 lb | DC length 275 ft
Bottom Hole Assembly: total length 440 ft
Description: Bit, IBS, shock sub, IBS, monel, IBS, 11" DC, IBS, 7-10" DC, IBS, crossover, 4-5" HW drill pipe, crossover,

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	6030'	2^o	145^o	0.35 deg/100 ft
	6121	1-3/4	148	0.30

SUMMARY OF YESTERDAY'S OPERATIONS

Completed opening core hole to 6061' and drilled ahead to 6182'. Drilling is fairly slow, with ROP averaging 5.4 ft/hr for this report day. Lost about 200 bbl fluid between 6140' and 6170'; this interval coincides with torque spikes and glassy, silicic intrusive cuttings. Added small amounts of LCM, loss seems to be under control.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-1-91 | Time of Report 0600 | Days since spud: 29 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6270 ft | Depth Yesterday 6182 ft | Progress 88 ft | Rotating Hours 15.5

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205						

Lithology: Predominantly tuff breccia with hornfels, phyllite, and quartzite and/or glassy intrusives. All rocks are moderately to moderately heavily altered, with as much as 20% clay alteration product. The rocks encountered over the last 24 hours are mostly similar to the previous, but alteration has made distinct separation of lithologies difficult. Most rocks are moderately to heavily chloritized, with associated iron oxides, and minor amounts of pyrite. Calcification has decreased from the prior alteration zone before the trip. Quartzite and/or glassy intrusives have increased, but also exhibit signs of chlorite wash and other alteration staining. Greyish purple red aphanitic rock fragments may be a new rhyolite that has not been seen before.

Drilling Fluid:
Mud Wt. 9.3 lb/gal | Vis 40 cp | PV 14 cp | YP 7 lb/100ft^2 | pH 11.5 | Returns temp 143^{0}F
Flow rate 971 gpm | Pump pressure 2100 psi, strokes/min 90 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 185
Drill Collars: 1-12",1-11", 7-10" | DC wt (in air) 63,500 lb | DC length 275 ft
Bottom Hole Assembly: total length 440 ft
Description: Bit, IBS, shock sub, IBS, monel, IBS, 11" DC, IBS, 7-10" DC, IBS, crossover, 4-5" HW drill pipe, crossover,

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	6156'	1-3/4^o	147^o	0.09 deg/100 ft

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled from 6182' to 6205', when ROP dropped to about 3 ft/hr. Surveyed and pulled out of hole. Bit was worn (graded 6-6-1/4) and was 50% balled with blue clay. Ran in hole with new bit to 6160' and washed down to 6205'. Drilled to 6270' with ROP averaging 6.2 ft/hr.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-2-91 | Time of Report 0600 | Days since spud: 30 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6455 ft | Depth Yesterday 6270 ft | Progress 185 ft | Rotating Hours 22

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
									Open Hole	
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205						

Lithology: Predominantly tuff breccia with hornfels and quartzite. The overall alteration is very pervasive, masking the original structure and composition of the rock, except for scattered relict structures.

The rocks encountered over the last 24 hours are mostly similar to the previous, but alteration has made distinct separation of lithologies difficult. Most rocks are heavily chloritized, and calcite has permeated most of the samples. Increased fracturing likely accounts for the relative increase in rate of penetration. Visible signs of drusy vug and fracture fillings, along with a general increase in cuttings size, appear to confirm this.

Drilling Fluid:
Mud Wt. 9.1+ lb/gal | Vis 47 cp | PV 17 cp | YP 7 lb/100ft^2 | pH 11.0 | Returns temp 146^{o}F
Flow rate 971 gpm | Pump pressure 2100 psi, strokes/min 90 | Lost circulation: 100 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 190
Drill Collars: 1-12",1-11", 7-10" | DC wt (in air) 63,500 lb | DC length 275 ft
Bottom Hole Assembly: total length 440 ft
Description: Bit, IBS, shock sub, IBS, monel, IBS, 11" DC, IBS, 7-10" DC, IBS, crossover, 4-5" HW drill pipe, crossover,

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	6251'	2-1/4^{o}	152^{o}	0.56 deg/100 ft
	6343	2-1/4	154	0.09

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled from 6270' to 6455'. ROP averaged 8.4 ft/hr, possibly because of fractured formation (see lithology report). Minor lost circulation. Mud cleaning centrifuge down again; service man is on site.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL — DAILY DRILLIING REPORT

Date: 9-3-91 | Time of Report 0600 | Days since spud: 31 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6678 ft | Depth Yesterday 6455 ft | Progress 223 ft | Rotating Hours 21

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205						

Lithology: The dominant altered tuff breccia and hornfels with abundant chloritization and calcite has continued to approximately 6610'. Pyrite, calcite, and epidote veins become common near 6610'. At that point an increasing amount of quartzite occurs, becoming the dominant lithology by 6635'. The quartzite is white, hard, brittle to slightly friable with some noted disaggregation, ranging from predominantly fresh to containing abundant disseminated pyrite crystals. The quartzite seems to be mostly unaffected by chloritization. By 6645' black to dark grey, unaltered hornfels appears and becomes dominant (70% of sample) by 6670'. The hornfels is dominantly black with lesser dark grey, aphanitic, dense, very hard but probably brittle, has thin pyrite veins, and occasional white, translucent crystals (probably porphyroblasts).

Drilling Fluid:

Mud Wt. 9.2 lb/gal | Vis 39 cp | PV 12 cp | YP 7 lb/100ft^2 | pH 11.5 | Returns temp 148^{o}F
Flow rate 971 gpm | Pump pressure 2100 psi, strokes/min 90 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 197
Drill Collars: 1-12",1-11", 7-10" | DC wt (in air) 63,500 lb | DC length 275 ft
Bottom Hole Assembly: total length 440 ft
Description: Bit, IBS, shock sub, IBS, monel, IBS, 11" DC, IBS, 7-10" DC, IBS, crossover, 4-5" HW drill pipe, crossover,

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	6441'	2-1/4^o	165^o	0.44 deg/100 ft
	6548	2	153	0.48
	6643	2	160	0.38

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled from 6455' to 6678'. ROP increased to 10.6 ft/hr for the last 24 hours, caused in large part by the fast drilling in the fractured zone encountered for most of the last day. Cutting samples from 6645' have a predominance of unaltered hornfels, which is indicative of the basement rock. Drillstring has torque and drag, and there was 30' fill after survey at 6548'; all these facts point to unconsolidated formation. Bottomhole temperature has increased to approximately 156^{o}F.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-4-91 | Time of Report 0600 | Days since spud: 32 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6771 ft | Depth Yesterday 6678 ft | Progress 93 ft | Rotating Hours 6

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60

Lithology: The dominant lithology is hornfels with minor quartzite. The hornfels is black to dark grey; predominantly very hard yet likely brittle; blacky-hackly irregular shaped cuttings; predominantly fresh with common discordant quartz and pyrite veins.

Drilling Fluid:
Mud Wt. 9.3 lb/gal | Vis 40 cp | PV 13 cp | YP 7 lb/100ft^2 | pH 11.5 | Returns temp 148^{0}F
Flow rate 971 gpm | Pump pressure 2100 psi, strokes/min 90 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 201
Drill Collars: 1-12",1-11", 7-10" | DC wt (in air) 63,500 lb | DC length 275 ft
Bottom Hole Assembly: total length 440 ft
Description: Bit, IBS, shock sub, IBS, monel, IBS, 11" DC, IBS, 7-10" DC, IBS, crossover, 4-5" HW drill pipe, crossover,

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Single Shot	6643	2-1/4^o	160^o	0.38
	6723	1-3/4	150	0.76

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled from 6678' to 6771' with high rates of penetration (average over 15 ft/hr). Formation appears to be very hard and abrasive, but brittle. When we took the survey at 6691', there was 30' fill in the hole when running back to bottom.

Circulated a high-viscosity sweep to clean hole, continued to circulate for cuttings collection, and pulled out of hole to inspect tools. Laid down shock sub (cracked pin), 2 IBS (1 washed out, 1 under gauge), 12" monel (washed - joint next to IBS), 1-10" DC (cracked pin), 2 HW drill pipe (cracked pin), and bit (worn out).

Received final shipment of 13-3/8" casing; it has all been inspected and is OK.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-5-91 | Time of Report 0600 | Days since spud: 33 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6910 ft | Depth Yesterday 6771 ft | Progress 139 ft | Rotating Hours 20.5

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771						

Lithology: The dominant lithology is hornfels with a substantial bed of metaquartzite from 6790' to 6830'. The hornfels is black to dark grey; predominantly very hard, less brittle than previous; blacky-hackly irregular shaped cuttings; predominantly fresh with common discordant quartz and pyrite veins, and minor calcite veining which incorporates both quartz and pyrite. The quartzite is light to medium grey; very hard but brittle; angular to subangular; commonly fractures conchoidally; containing fine to meduum quartz grains from prior deposition; the entire quartzite appears welded with clear silica; few pyrite veinlets were noted.

Drilling Fluid:
Mud Wt. 9.1 lb/gal | Vis 42 cp | PV 15 cp | YP 10 lb/100ft^2 | pH 11.5 | Returns temp 149^{O}F
Flow rate 971 gpm | Pump pressure 2300 psi, strokes/min 90 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 205
Drill Collars: 2-11", 7-10" | DC wt (in air) 68,000 lb | DC length 264 ft
Bottom Hole Assembly: total length 447 ft
Description: Bit, 3-pt reamer, shock sub, IBS, bit sub, 11" DC, IBS, 11" DC, IBS, 7-10" DC, IBS, crossover, 4-5" HW drill pipe, crossover,

Directional Survey | Measurement Depth | Angle | Azimuth | Dog Leg Severity

No survey this report

SUMMARY OF YESTERDAY'S OPERATIONS

Ran in hole with new bit; washed and reamed from 6709' to 6771'. Drilled from 6771' to 6910' with full returns but fairly low ROP (6-8 ft/hr). Drilling with new BHA because of lack of monel drill collar. Will pull out of hole, lay down tools, run temperature log, and pick up new drilling assembly with new 10" shock subs and 10" monel drill collars.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-6-91 | Time of Report 0600 | Days since spud: 34 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6918 ft | Depth Yesterday 6910 ft | Progress 8 ft | Rotating Hours 1.5

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918						

Lithology: The dominant lithology is pelitic hornfels with minor amounts of calcite fracture filling. The hornfels is black to dark grey; predominantly very hard, less brittle than previous; blacky-hackly irregular shaped cuttings; predominantly fresh with common discordant quartz and pyrite veins, and minor calcite veining which incorporates both quartz and pyrite; pelitic in nature due to its composition of almost exclusively clay-sized particles. Occasionally, the rock shows weak fissility, possibly relict bedding. As a result, the cuttings occasionally look "phyllitic".

Drilling Fluid:
Mud Wt. 9.25 lb/gal | Vis 41 cp | PV 18 cp | YP 11 lb/100ft^2 | pH 11.5 | Returns temp 138^{0}F
Flow rate 971 gpm | Pump pressure 2100 psi, strokes/min 90 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 205
Drill Collars: 9-10" | DC wt (in air) 66,000 lb | DC length 270 ft
Bottom Hole Assembly: total length 445 ft
Description: Bit, 3-pt reamer, 10" shock sub, IBS, 10" monel DC, IBS, 10" DC, IBS, 7-10" DC, IBS, crossover, 4-5" HW drill pipe, crossover,

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
	6858'	2-1/2^o	165^o	0.69 deg/100 ft

SUMMARY OF YESTERDAY'S OPERATIONS

Pulled out of hole to lay down shock sub and pick up new drilling assembly. Bit was not seriously out of gauge, but had quite a few broken teeth on the heel row; this sometimes indicates too much weight on bit, but 60,000 lb is well under normal capacity for this size (17-1/2") bit. Other tools were close to gauge and were retained in the new assembly.

Ran temperature log after tools were out of hole. Bottomhole temperature was approximately 200^{0}F at 6900' with a sharp increase in thermal gradient between 6000' and 6900'.

Ran in hole with new bit. Washed and reamed from 6858' to 6918'. Found 25' fill in hole.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-7-91 | Time of Report 0600 | Days since spud: 35 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 7044 ft | Depth Yesterday 6918 ft | Progress 126 ft | Rotating Hours 23

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918						

Lithology: The dominant lithology is pelitic hornfels with an increase of quartzite and slight increase in alteration. The hornfels is black to dark grey; predominantly very hard; blacky-hackly irregular shaped cuttings; noticeable increase in fissility, causing an increased "phyllitic" appearance; continued pyrite, quartz, and calcite veining; continued pellitic in nature; predominantly massive.

Drilling Fluid:

Mud Wt. 9.2 lb/gal | Vis 42 cp | PV 16 cp | YP 11 lb/100ft^2 | pH 11.5 | Returns temp 149^{0}F
Flow rate 971 gpm | Pump pressure 2200 psi, strokes/min 90 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 205
Drill Collars: 9-10" | DC wt (in air) 66,000 lb | DC length 270 ft
Bottom Hole Assembly: total length 445 ft
Description: Bit, 3-pt reamer, 10" shock sub, IBS, 10" monel DC, IBS, 10" DC, IBS, 7-10" DC, IBS, crossover, 4-5" HW drill pipe, crossover,

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
	6951'	4-1/4^o	170^o	1.91 deg/100 ft
	7006	4-1/4	173	0.40

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled from 6918' to 6997' and surveyed. Inclination showed 4-1/4^o, but this may be misleading because previous survey was no good (dogleg severity may not be as high as calculated). Reduced WOB from 50K to 30K, and increased rotary speed from 55 rpm to 75 rpm. Drilled to 7044' and surveyed; inclination still at 4-1/4^o. Will pull out of hole to modify BHA into a dropping assembly.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-8-91 | Time of Report 0600 | Days since spud: 36 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 7044 ft | Depth Yesterday 7044 ft | Progress 0 ft | Rotating Hours 1/2 (reaming)

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88							

Lithology: No new lithology this report

Drilling Fluid:
Mud Wt. 9.35 lb/gal | Vis 43 cp | PV 18 cp | YP 14 lb/100ft^2 | pH 11.5 | Returns temp 145^{0}F
Flow rate 777 gpm | Pump pressure 2500 psi, strokes/min 72 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 205
Drill Collars: 12-10" | DC wt (in air) 86,600 lb | DC length 361 ft
Bottom Hole Assembly: total length 506 ft
Description: Bit, 10" monel DC, IBS, 10" DC, IBS, 10-10" DC, IBS, crossover, 4-5" HW drill pipe, crossover,

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
Survey Re-cap:	6643'	2-1/4^o	160^o	0.38 deg/100 ft
	6723	1-3/4	150	0.76
	6813	3-3/4	160	2.29
	6855	2-3/4	160	2.38
	6951	4-1/4	170	1.69
	7006	4-1/4	173	0.40

SUMMARY OF YESTERDAY'S OPERATIONS

Pulled out of hole and changed out BHA. Ran in hole and re-surveyed lower part of hole (see directional surveys). Tight hole at 6855'. Pulled up kelly to ream and stuck pipe at 6855'. Worked pipe free and reamed from 6855' to 6870'. Picked up and stuck pipe at 6843'; unable to free pipe. Based on hole geometry and BHA, pipe is probably stuck above lower IBS. Called Dia-Log (free-point survey and back-off charge) and Midway (fishing). Plan is to find stuck point, back off drill string there, and fish remainder of drill string with jars.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-9-91 | Time of Report 0600 | Days since spud: 37 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 7044 ft | Depth Yesterday 7044 ft | Progress 0 ft | Rotating Hours 0

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

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Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88							

Lithology: No new lithology this report

Drilling Fluid:

Mud Wt. 9.3 lb/gal | Vis 50 cp | PV 23 cp | YP 14 lb/100ft^2 | pH 11.0 | Returns temp 145^{0}F
Flow rate --- gpm | Pump pressure ---- psi, strokes/min -- | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 205
Drill Collars: 12-10" | DC wt (in air) 86,600 lb | DC length 361 ft
Bottom Hole Assembly: total length 506 ft
Description: Fishing assembly - screw-in sub, crossover, bumper sub, jars, 6-8" DC, crossover - 203', 29 Klb

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Directional Survey | Measurement Depth | Angle | Azimuth | Dog Leg Severity

No new survey this report

SUMMARY OF YESTERDAY'S OPERATIONS

Ran Dia-Log free point survey. Saw no relative movement in the drill collars, but that may caused by the much greater wall area of the drill collars compared to the drill pipe. It is likely that the stuck point is low in the drill collars, but the back-off attempt is at the bottom of the top collar. First back-off charge does not work, but second one does. Pull out of hole with drill string, and find separation point at the top of the collars. Run into hole with fishing assembly, screw into top of collars, and jar. Fish comes loose on sixth jar, come out of hole for one stand of pipe, and circulate for an hour. Continue coming out of hole. Will pick up a stiff assembly with a 6-point reamer and go back in hole to straighten and ream lower part of hole.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-10-91 | Time of Report 0600 | Days since spud: 38 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 7051 ft | Depth Yesterday 7044 ft | Progress 7 ft | Rotating Hours 6.5 rm, 1.5 drl

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044						

Lithology: No new lithology this report

Drilling Fluid:
Mud Wt. 9.3 lb/gal | Vis 44 cp | PV 14 cp | YP 11 lb/100ft^2 | pH 11.3 | Returns temp 137^{0}F
Flow rate 896 gpm | Pump pressure 2065 psi, strokes/min 83 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210
Drill Collars: 9-10", 3-8" | DC wt (in air) 78,000 lb | DC length 364 ft
Bottom Hole Assembly: total length 421 ft
Description: bit, 6-pt reamer, bumper sub, 1-10" DC, IBS, 1-10" DC, IBS, 7-10" DC, crossover, jars, 3-8" DC, crossover

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
These surveys measured inclination only; azimuths are estimated, no monel drill collar				
	6899	3-1/2^o	165	1.42 degrees/100 ft
	7025	4-1/4	170	0.65

SUMMARY OF YESTERDAY'S OPERATIONS

Pulled out of hole with 100% of fish. Laid down fish, fishing tools, monel drill collar, and the two 10" drill collars where the back-off charge was fired. Picked up 6-point reamer and drilling jars, and three 8" drill collars. Reamed from 6394' to 7044' with no excessive torque. Drilled ahead at 7044'.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL — DAILY DRILLIING REPORT

Date: 9-11-91 | Time of Report 0600 | Days since spud: 39 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 7089 ft | Depth Yesterday 7051 ft | Progress 38 ft | Rotating Hours 8

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

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Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60

Lithology: Lithology is predominantly hornfels changing to quartzite. Hornfels is as previously described. Quartzite is light to medium grey; very hard; moderately brittle; with irregular, angular, sub-blocky to thin bladed cuttings; internal grains and grain boundaries are visible; the grains being mostly quartz and feldspar; the grains are welded together with a competent clear to slightly opaque silica cement.

Drilling Fluid:

Mud Wt. 9.3 lb/gal | Vis 45 cp | PV 15 cp | YP 10 lb/100ft^2 | pH 11.2 | Returns temp 142^{0}F

Flow rate 892 gpm | Pump pressure 2100 psi, strokes/min 85 | Lost circulation: 0 bbl

Composition: bentonite, lignite, Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210

Drill Collars: 9-10", 3-8" | DC wt (in air) 78,000 lb | DC length 364 ft

Bottom Hole Assembly: total length 421 ft

Description: bit, 6-pt reamer, bumper sub, 1-10" DC, IBS, 1-10" DC, IBS, 7-10" DC, crossover, jars, 3-8" DC, crossover

Fishing assembly: 14" magnet, junk sub, bumper sub, 4-8" DC, crossover

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Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
	7088'	4-1/2^o	175	0.72 degrees/100 ft

This survey measured inclination only; azimuth estimated, no monel drill collar

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SUMMARY OF YESTERDAY'S OPERATIONS

After resumption of drilling at 7044', rate of penetration declined steadily from about 10-11 ft/hr to less than 3 ft/hr. Cuttings indicated a quartzite bed, but change in lithology is not enough to account for change in drilling rate. Pulled out of hole to inspect tools. Upper part of BHA (stabilizers and 6-point reamer) were in good condition, but bit was nearly destroyed. It was extremely worn (approximately 3" under gauge) with exposed bearing races and many missing teeth. All shirttails were very thin; we were lucky not to leave a cone in the hole. The contrast with the good condition of the reamer indicates that the bit was drilling in a significant amount of junk. Have sent for a magnet to fish for possible junk.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-12-91 | Time of Report 0600 | Days since spud: 40 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 7089 ft | Depth Yesterday 7089 ft | Progress 0 ft | Rotating Hours 0

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60

Lithology: No new lithology this report

Drilling Fluid:
Mud Wt. 9.4 lb/gal | Vis 47 cp | PV 17 cp | YP 11 lb/100ft^2 | pH 11.2 | Returns temp --
Flow rate --- gpm | Pump pressure ---- psi, strokes/min -- | Lost circulation: 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210
Drill Collars: xxxxxxxxx | DC wt (in air) xxxxxx lb | DC length xxx ft
Bottom Hole Assembly: total length 75 ft
Description: Fishing assembly: 14" magnet, junk sub, bumper sub, 4-8" DC, crossover

Directional Survey | Measurement Depth | Angle | Azimuth | Dog Leg Severity

No new survey this report

SUMMARY OF YESTERDAY'S OPERATIONS

Chained out of hole from 7089' with magnet and junk basket. Brought up ball bearings, bearing retainers, steel fragments, and other assorted junk. Made two more junk runs, with decreasing amounts of metal on successive trips. Are making up pendulum-type drilling assembly with used bit and reamer to run in hole. Will try drilling to make sure that there is no significant junk left in hole and that hole conditions are not destructive to bit. BHA also has monel drill collar, and we will use an Eastman electronic multi-shot tool for an accurate survey of the hole as we run in for attempted drilling.

Completed monthly BOP test required by drilling permit. All equipment met BLM requirements.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-13-91 | Time of Report 0600 | Days since spud: 41 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 7130 ft | Depth Yesterday 7089 ft | Progress 41 ft | Rotating Hours 6

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - 17-1/2" Hole

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Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60
2RR	17-1/2	Sec	S-88	7089	7130	41	6	6.8	50/60	40/60

Lithology: Lithology begins predominantly as quartzite and grades into mostly hornfels. The quartzite is light to medium grey with common colorless, translucent cuttings; very hard and abrasive; very angular, conchoidal-like fracture; irregularly shaped cuttings; internal structure is very faint, if present; overall sample has a greasy to sub-vitreous luster; wet samples appear to be predominantly quartz, both in grain content and welding matrix; rare pyrite and calcite veins are noted. The hornfels is as described earlier.

Drilling Fluid:

Mud Wt. 9.3 lb/gal | Vis 42 cp | PV 11 cp | YP 10 lb/100ft^2 | pH 11.5 | Returns temp --
Flow rate 840 gpm | Pump pressure 2200 psi, strokes/min 80 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210
Drill Collars: 10-10",3-8" | DC wt (in air) 91,000 lb | DC length 388 ft
Bottom Hole Assembly: total length 546 ft
Description: bit, Monel DC, 3-pt reamer, shock sub, IBS, 10" DC, IBS, 8-10" DC, crossover, jars, 3-8" DC, crossover, 3-HW drillpipe, crossover

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Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
	7115'	4-3/4+	148°	

SUMMARY OF YESTERDAY'S OPERATIONS

Ran in hole with new drilling assembly to bottom of casing. Cut and slipped drilling line. Continued running in hole with Eastman electronic multi-shot survey tool. Took survey every 90' down to 6700' and every 30' below that. Retrieved survey tool; results confirmed that single-shot surveys had been reasonably accurate and that maximum dog-leg severity was almost 3 degrees/100 ft. Drilled from 7089' to 7130' and took another single-shot survey; deviation was a full 4-3/4° if not 5°. Pulled out of hole; broke tongs trying to lay down top IBS.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-14-91 | Time of Report 0600 | Days since spud: 42 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6825 ft (plug back) | Depth Yesterday 7130 ft | Progress 0 ft | Rotating Hours 0

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - xxxx Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
									Open Hole	
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60
2RR	17-1/2	Sec	S-88	7089	7130	41	6	6.8	50/60	40/60

Lithology: No new lithology this report

Drilling Fluid:
Mud Wt. 9.3 lb/gal | Vis 42 cp | PV 13 cp | YP 10 lb/100ft^2 | pH 11.5 | Returns temp --
Flow rate --- gpm | Pump pressure ---- psi, strokes/min -- | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210
Drill Collars: xxxxxxxxx | DC wt (in air) xxxxxx lb | DC length xxx ft
Bottom Hole Assembly: xxxxxxxx

Directional Survey | Measurement Depth | Angle | Azimuth | Dog Leg Severity

No new survey this report

SUMMARY OF YESTERDAY'S OPERATIONS

Called Halliburton to cement bottom of hole back to approximately 6800' (where deviation began to build well above 2-1/2°). After extensive discussion of re-drilling the hole with directional tools and MWD, we decided to set casing at 6800'. During the Phase II coring operation, we will attempt to core to original TD of 7500'. This proposed plan received a favorable consensus from drilling and scientific participants.

Called for all logging and casing tools to be mobilized. Released mud-loggers and backhoe service. Called tool companies to pick up bits and tools. Pumped 551 ft^3 cement plug at 1700 hrs. Schlumberger arrived 2100 hrs for wireline logging; will do caliper, dual induction, gamma, and sonic logs.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-15-91 | Time of Report 0600 | Days since spud: 43 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6826 ft (polished off plug) | Depth Yesterday 6825 ft |

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - xxxx Hole

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Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60
2RR	17-1/2	Sec	S-88	7089	7130	41	6	6.8	50/60	40/60

Lithology: No new lithology this report

Drilling Fluid:

Mud Wt. 9.3 lb/gal | Vis 43 cp | PV 11 cp | YP 11 lb/100ft^2 | pH 11.0 | Returns temp --
Flow rate 840 gpm | Pump pressure 2000 psi, strokes/min 80 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:

Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210
Drill Collars: xxxxxxxxx | DC wt (in air) xxxxxx lb | DC length xxx ft
Bottom Hole Assembly: xxxxxxxx

Directional Survey | Measurement Depth | Angle | Azimuth | Dog Leg Severity

No new survey this report

SUMMARY OF YESTERDAY'S OPERATIONS

Completed wireline logging - dual induction, gamma ray, oriented caliper, and sonic. All logs appeared successful and presented no surprises on well condition. Rigged down Schlumberger. Ran in hole with 17-1/2" re-run tools to 6825' and cleaned out to solid cement at 6826'. Circulated 4-1/2 hours. Strapped out of hole. Laid down 4-10" drill collars. Picked up 10 stands of 5" drill pipe that will be used to run casing liner.

Waiting on Schlumberger sidewall coring tool and Stanford televiewer.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-16-91 | Time of Report 0600 | Days since spud: 44 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6826 ft | Depth Yesterday 6826 ft |

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - xxxx Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60
2RR	17-1/2	Sec	S-88	7089	7130	41	6	6.8	50/60	40/60

Lithology: | Interval | Description

No new lithology this report

Drilling Fluid:
Mud Wt. 9.3 lb/gal | Vis 45 cp | PV 14 cp | YP 12 lb/100ft^2 | pH 11.5 | Returns temp --
Flow rate 648 gpm | Pump pressure 1850 psi, strokes/min 60 | Lost circulation: 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210
Drill Collars: 3-8" | DC wt (in air) 22,000 lb | DC length xxx ft
Bottom Hole Assembly: 198 ft

Directional Survey | Measurement Depth | Angle | Azimuth | Dog Leg Severity

No new survey this report

SUMMARY OF YESTERDAY'S OPERATIONS

Televiewer arrived approximately 2300 hours. Began assembly and checkout. Backup wireline truck arrives 0300 hours. Some problems with memory unit in wireline truck; swap unit from original truck. Began running in sidewall coring tool approximately 0530 hours. Televiewer is disassembled for repair.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-17-91 | Time of Report 0600 | Days since spud: 45 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6826 ft | Depth Yesterday 6826 ft |

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - xxxx Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60
2RR	17-1/2	Sec	S-88	7089	7130	41	6	6.8	50/60	40/60

Lithology: No new lithology this report

Drilling Fluid:
Mud Wt. 9.2+ lb/gal | Vis 42 cp | PV 14 cp | YP 10 lb/100ft^2 | pH 10.5 | Returns temp --
Flow rate 840 gpm | Pump pressure 1100 psi, strokes/min 80 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210
Drill Collars: 3-8" | DC wt (in air) 22,000 lb | DC length 91 ft
Bottom Hole Assembly: 198 ft
Description: Bit, bit sub, crossover, 3-8" DC, crossover, 3-HW drill pipe

Directional Survey | Measurement Depth | Angle | Azimuth | Dog Leg Severity
No new survey this report

SUMMARY OF YESTERDAY'S OPERATIONS

Ran sidewall coring tool 3 trips; recovered total of 25 cores. Some of the formation is competent enough to produce excellent cores, but sections of the Bishop Tuff are apparently crumbly enough to let the core fall out of the tool before it can be stored. The coring tool de-centralizer also limits it to a maximum wellbore diameter of approximately 21", so it could not take any cores in washed-out sections.

Made wiper run to 6826'; had no fill or tight hole. Circulated and worked pipe in preparation for televiewer run.

Televiewer into the hole at 0400 hours. Getting good pictures, will log from approximately 6820' to the 20" casing point at 2558'.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-18-91 | Time of Report 0600 | Days since spud: 46 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6826 ft | Depth Yesterday 6826 ft |

Size and Depth of Last Casing: 20" at 2559 ft | Now Drilling - xxxx Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60
2RR	17-1/2	Sec	S-88	7089	7130	41	6	6.8	50/60	40/60

Lithology: No new lithology this report

Drilling Fluid:
Mud Wt. 9.3+ lb/gal | Vis 45 cp | PV 16 cp | YP 12 lb/100ft^2 | pH 11.4 | Returns temp --
Flow rate 840 gpm | Pump pressure 1100 psi, strokes/min 80 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210
Drill Collars: 3-8" | DC wt (in air) 22,000 lb | DC length 91 ft
Bottom Hole Assembly: 198 ft
Description: Bit, bit sub, crossover, 3-8" DC, crossover, 3-HW drill pipe

Directional Survey | Measurement Depth | Angle | Azimuth | Dog Leg Severity

No new survey this report

SUMMARY OF YESTERDAY'S OPERATIONS

Ran Stanford borehole televiewer log from approximately 0400 hours to 2400. Logged from 6820' to 2558' (bottom of 20" casing) at 5'/min. Appeared to be getting good data, except for severely washed-out spots where there was little return signal.

Ran in hole with re-run bit and circulated 4 hours. Pumped high-viscosity sweep and saw no signs of fill or other material.

Halliburton, casing tong service, and casing stabber (Okie-Yoke) rigged up.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-19-91 | Time of Report 0600 | Days since spud: 47 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6825 ft (casing shoe) | Depth Yesterday 6826 ft |

Size and Depth of Last Casing: 13-3/8" at 6825 ft | Now Drilling - xxxx Hole

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
								Open Hole		
1	17-1/2	Sec	S3SJ	2528	2688	160	6			
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60
2RR	17-1/2	Sec	S-88	7089	7130	41	6	6.8	50/60	40/60

Lithology: | Interval | Description

No new lithology this report

Drilling Fluid:
Mud Wt. 9.3 lb/gal | Vis 45 cp | PV 16 cp | YP 13 lb/100ft^2 | pH 11.2 | Returns temp --
Flow rate --- gpm | Pump pressure ---- psi, strokes/min -- | Lost circulation: 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210
Drill Collars: 3-8" | DC wt (in air) 22,000 lb | DC length 91 ft
Bottom Hole Assembly: 198 ft
Description: Bit, bit sub, crossover, 3-8" DC, crossover, 3-HW drill pipe

Directional Survey | Measurement Depth | Angle | Azimuth | Dog Leg Severity

No new survey this report

SUMMARY OF YESTERDAY'S OPERATIONS

Ran 121 joints of 72 lb/ft, 13-3/8" casing to 6825'. Total casing length is 5212'. No problems with running casing; total time to run = 11 hours. Set liner hanger at 1600'. Began pumping cement (approximately 8 bbl/min) at 0600 hours.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-20-91 | Time of Report 0600 | Days since spud: 48 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6825 ft (casing shoe) | Depth Yesterday 6826 ft |

Size and Depth of Last Casing: 13-3/8" at 6825 ft | Now Drilling - clean cement in casing

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60
2RR	17-1/2	Sec	S-88	7089	7130	41	6	6.8	50/60	40/60
10	12-1/4	Sec	M4NJ	Clean out cement in casing						

Drilling Fluid:
Mud Wt. 9.2 lb/gal | Vis 40 cp | PV 15 cp | YP 8 lb/100ft^2 | pH 12 | Returns temp 120^{0}F
Flow rate 863 gpm | Pump pressure 800 psi, strokes/min 80 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210
Drill Collars: 6-8" | DC wt (in air) 44,000 lb | DC length 181 ft
Bottom Hole Assembly: 288 ft
Description: Bit, IBS, bit sub, 6-8" DC, crossover, 3-HW drill pipe, crossover

SUMMARY OF YESTERDAY'S OPERATIONS

Pumped 5000 ft^3 of premium cement, mixed 1:1 perlite and 40% silica flour (13.45 Lb/gal) and 500 ft^3 of premium cement with 40% silica flour (15.5 lb/gal). Released the dart that is designed to go down the drill pipe and close the cementing plug on the bottom of the liner hanger. There was no pressure spike that should have been seen when the shear pins holding the plug broke. This probably means that the plug went down the casing sooner than it should have and thereby prevented all the cement from being displaced up the outside the casing. This was confirmed when the pumping pressure suddenly went up to 3000 psi before the calculated amount of displacement fluid was pumped. Summary of this situation is that much of the cement is left inside the casing and not enough is on the outside.

Began drilling out the cement left in the casing at 2100 hours; top of cement is at 2800', but is not competent. Top of firm cement is at approximately 4200'. When cement is cleaned from inside of pipe, we will do a temperature log and find the top of cement in the annulus. At that point, we will be able to decide on next activity.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-21-91 | Time of Report 0600 | Days since spud: 49 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6825 ft (casing shoe) | Depth Yesterday 6826 ft |

Size and Depth of Last Casing: 13-3/8" at 6825 ft | Now Drilling - clean cement in casing

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60
2RR	17-1/2	Sec	S-88	7089	7130	41	6	6.8	50/60	40/60
10	12-1/4	Sec	M4NJ	Clean out cement in casing						

Drilling Fluid:
Mud Wt. 9.2 lb/gal | Vis 58 cp | PV 17 cp | YP 14 lb/100ft^2 | pH 12.5 | Returns temp 115^{0}F
Flow rate 1050 gpm | Pump pressure 1050 psi, strokes/min 100 | Lost circulation: 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210
Drill Collars: 6-8" | DC wt (in air) 44,000 lb | DC length 181 ft
Bottom Hole Assembly: 288 ft
Description: Bit, IBS, bit sub, 6-8" DC, crossover, 3-HW drill pipe, crossover

SUMMARY OF YESTERDAY'S OPERATIONS

Drilled cement in casing from 4058' to 4367' at a penetration rate of about 75 ft/hr. Pulled out of hole to do a temperature log - an attempt to locate the top of the cement in the annulus. Temperature log was almost featureless down to approximately 3300'; that is, there was little variation from a very smooth, gradual increase. Below 3300', there is a clear correlation between the variations in the temperature log and the washouts shown in the caliper log. Based on this, we believe the top of the cement is at about 3300', or 800' below the shoe of the 20" casing.

Rigged down logging truck; ran in hole and drilled cement from 4367' to 5010'.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-22-91 | Time of Report 0600 | Days since spud: 50 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6825 ft (casing shoe) | Depth Yesterday 6826 ft |

Size and Depth of Last Casing: 13-3/8" at 6825 ft | Now Drilling - clean cement in casing

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60
2RR	17-1/2	Sec	S-88	7089	7130	41	6	6.8	50/60	40/60
10	12-1/4	Sec	M4NJ	Clean out cement in casing						

Drilling Fluid:
Mud Wt. 9.0 lb/gal | Vis 40 cp | PV 11 cp | YP 6 lb/100ft^2 | pH 12.5 | Returns temp 120^{0}F
Flow rate 1165 gpm | Pump pressure 1200 psi, strokes/min 108 | Lost circulation: 0 bbl
Composition: bentonite, lignite, Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210
Drill Collars: 6-8" | DC wt (in air) 44,000 lb | DC length 181 ft
Bottom Hole Assembly: 288 ft
Description: Bit, IBS, bit sub, 6-8" DC, crossover, 3-HW drill pipe, crossover

SUMMARY OF YESTERDAY'S OPERATIONS

Continued drilling out cement in casing from 5010' to 6680'.

Strapped all ODP drillpipe in preparation for hanging the bushing string in the hole. Proposed sequence of operations is to drill out float collar and shoe in 13-3/8" casing; drill enough additional 12-1/4" hole to let the ODP pipe hang in tension; taper the bottom of the 12-1/4" hole with a mill; drill approximately 50' of 6-1/8" hole below that; and hang the ODP pipe with a kick-off wedge attached to it and extending into the 6-1/8" hole. The wedge will be oriented so that the core hole will be inclined away from the plugged 17-1/2" hole, thus assuring that the core hole will be in virgin rock, not cement.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-23-91 | Time of Report 0600 | Days since spud: 51 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6840 ft | Depth Yesterday 6826 ft |

Size and Depth of Last Casing: 13-3/8" at 6825 ft | Now Drilling - clean cement in casing

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60
2RR	17-1/2	Sec	S-88	7089	7130	41	6	6.8	50/60	40/60
10	12-1/4	Sec	M4NJ	Clean out cement in casing						

Drilling Fluid:
Mud Wt. 9.0 lb/gal | Vis 39 cp | PV 11 cp | YP 5 lb/100ft^2 | pH 13.0 | Returns temp 120^{0}F
Flow rate 1100 gpm | Pump pressure 1200 psi, strokes/min 100 | Lost circulation: 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:
Drill Pipe OD/weight: 5-1/2"/21.9 lb/ft | Connection: 5-1/2 FH | Grade E | No. joints 210
Drill Collars: 6-8" | DC wt (in air) 44,000 lb | DC length 181 ft
Bottom Hole Assembly: 288 ft
Description: Bit, IBS, bit sub, 6-8" DC, crossover, 3-HW drill pipe, crossover

SUMMARY OF YESTERDAY'S OPERATIONS

Completed drilling out cement in casing at 6826'. When bit reached float collar at 6736', pieces of rubber from the plug dart and the wiper plug came up together, indicating that the dart somehow released early and sealed the wiper plug. It is, however, difficult to see how this could have happened since the dart is held in place with a very sturdy retaining pin which has to be unscrewed to release the dart.

After drilling out the casing shoe, we drilled approximately 10' with the 12-1/4" bit; tripped out that bit; ran in the hole with a 12-1/4" taper mill; and bored about 4' with it. Pulled out of hole with the taper mill, laying down contractor's drill pipe, heavy weight drill pipe, and 8" drill collars. Made up BHA with 6-1/8" bit and 4-3/4" drill collars; began running in hole, picking up ODP drill pipe.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-24-91 | Time of Report 0600 | Days since spud: 52 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6880 ft | Depth Yesterday 6840 ft |

Size and Depth of Last Casing: 13-3/8" at 6825 ft | Now Drilling - clean cement in casing

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60
2RR	17-1/2	Sec	S-88	7089	7130	41	6	6.8	50/60	40/60
10	12-1/4	Sec	M4NJ	Clean out cement in casing						
11	6-1/8	Sec	S4J	6840	6880	40	1	40	60	5

Drilling Fluid:
Mud Wt. 9.0 lb/gal | Vis 39 cp | PV 11 cp | YP 5 lb/100ft^2 | pH 13.0 | Returns temp 120^{O}F
Flow rate 1100 gpm | Pump pressure 1200 psi, strokes/min 100 | Lost circulation: 0 bbl
Composition: bentonite, lignite,
Other: Low lime

Drill String:
Drill Pipe OD/weight: 5"/19.5 lb/ft | Connection: 5-1/2 FH | Grade 2^{+} | No. joints 216
Drill Collars: 4 ea 4-3/4" | DC wt (in air) 4930 lb | DC length 120 ft
Bottom Hole Assembly: 128 ft
Description: Bit, bit sub, 4-4 3/4" DC, crossover, crossover

SUMMARY OF YESTERDAY'S OPERATIONS

Ran in hole with 6-1/8" bit and 4-3/4" drill collars; drilled 6-1/8" hole from 6840' to 6880'. Pulled to shoe and circulated while waiting for corrosion inhibitor. Mixed inhibitor in pill tank and displaced 480 bbl of mud in hole with inhibitor. Rigged up mud-cleaning system to begin cleaning sumps.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL DAILY DRILLIING REPORT

Date: 9-25-91 | Time of Report 0600 | Days since spud: 53 |

Well Number: LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Depth Today 6880 ft | Depth Yesterday 6880 ft |

Size and Depth of Last Casing: 13-3/8" at 6825 ft | Now Drilling - N/A

Bit Data: Number	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB, K-lb
1	17-1/2	Sec	S3SJ	2528	2688	160	6	Open Hole		
2	17-1/2	Sec	S-88	2688	4121	1433	77.5	18.5	65/70	40/55
3	17-1/2	Sec	M-84	4121	4854RR	733	55	13.3	60	45/55
4	17-1/2	HTC	X-33	4854	5428	574	50.5	11.4	60	50/55
3RR	17-1/2	Sec	M-84	5428	5822	1127	99	11.4	60/70	35/59
5	17-1/2	STC	3JS	5822	6205	383	56.5	6.8	60/65	55/60
6	17-1/2	HTC	EP1084	6205	6771	566	59.5	9.5	50/75	50/60
7	17-1/2	RTC	S53AJ	6771	6918	147	22	6.7	55	65
8	17-1/2	Sec	M-84	6918	7044	126	23	5.5	50/75	30/50
9	17-1/2	Sec	H-88	7044	7089	45	9.5	4.7	45/60	20/60
2RR	17-1/2	Sec	S-88	7089	7130	41	6	6.8	50/60	40/60
10	12-1/4	Sec	M4NJ	Clean out cement in casing						
11	6-1/8	Sec	S4J	6840	6880	40	1	40	60	5

Drilling Fluid:

All mud has been circulated out of hole. Hole is now filled with water containing corrosion inhibitor and oxygen scavenger.

Drill String:

String of ODP drill pipe is hanging in hole. This string will serve as the bushing for the core rods used in the coring phase. Description - drill pipe OD/weight = 5"/19.5 lb/ft; connection = 5-1/2 FH; Grade = 2^{+}; number of joints = 219

SUMMARY OF YESTERDAY'S OPERATIONS

Completed circulating mud out of hole and replacing it with water and corrosion inhibitor. Strapped out of hole and dismounted BOP equipment.

Attached the wedge to the drill pipe and checked orientation tool at the surface. The window wedge will be oriented so that the core hole will incline away from the large diameter hole. This will direct the core hole into virgin rock instead of cement and will also mean that any tools stuck in the core hole will be out of the trajectory of the Phase III big hole. A gyro survey tool was used for the orientation, since magnetic tools would not work in the steel wedge.

Removed the 20" BOP stack; attached a 20" x 10" companion flange and a 10" master valve. The coring BOP will be attached above this valve.

Next activity will be the wire-line coring. Schedule for this depends on the availability of coring tools and personnel, and on interpretation of drilling restrictions by regulatory agencies. Most likely start date for coring is in October-November.

This is the final Daily Report until coring begins.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 1 Nov 91 | Time of Report - 1800 | Total days coring - 1

Depth today - 6868' | Depth yesterday - 6846' | Progress - 22 ft
Core recovered - N/A | Core size - N/A
Rotary speed - 100 rpm | WOB - 3000 lb | Rate of penetration - 11 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22	2

Drilling fluid - water | Lost circulation - no
Flow rate - 27 gal/min | Pressure - 300 psi | Returns temp - xxx ^{O}F |
Wt - 8.3 lb/gal | Vis - xx | PV - xx | YP - xx | pH - xx |

Directional Survey: Method - N/A

Lithology of today's core: N/A

Summary of today's events:

Used bull-nose bit to drill off of window wedge, that is, started the core hole at an inclination opposite the inclination of the big hole. This will get the core hole out of the cemented portion of the big hole as quickly as possible. Drilled approximately 20' below the orienting block in the window wedge, which is calculated to put the bottom of the small hole just at the cement/formation interface. Began tripping out core string to replace the bull-nose bit with a coring assembly. Even though the BLM has approved 24 hour operation for the coring, we stopped tripping at dark because one of the conditions for 24 hour operation is low lighting levels and we are not allowed to have lights high in the derrick.

Completed BOP test and notified BLM

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 : Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 2 Nov 91 | Time of Report - 1800 | Total days coring - 2

Depth today - 6874' | Depth yesterday - 6868' | Progress - 6 ft
Core recovered - core not retrieved this report period | Core size - HQ
Rotary speed - 100 rpm | WOB - 2000 lb | Rate of penetration - 3 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg	6868'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 27 gal/min | Pressure - 300 psi | Returns temp - xxx ^{O}F |
Wt - 8.4 lb/gal | Vis - 34 sec | PV - 5 cP | YP - 5 lb/100ft^2 | pH - 9.5 |
Lost circulation - no

Directional Survey: Method - N/A

Depth - xxxx ft | Inclination - xxx ^{O} | Azimuth - xxx ^{O}

Lithology of today's core: N/A

Summary of today's events:

Resumed tripping out core string at 0600. Laid down bull-nose bit and picked up core bit and 10' barrel. Tripped drilling assembly back into hole, washed and reamed to bottom, and began coring at 6868'. Cored approximately 6'.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County
Date - 3 Nov 91 | Time of Report - 1800 | Total days coring - 3

Depth today - 6896' | Depth yesterday - 6874' | Progress - 22 ft
Core recovered - 20' | Core size - HQ
Rotary speed - 100 rpm | WOB - 2000 lb | Rate of penetration - 3 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg	6868'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 25 gal/min | Pressure - 300 psi | Returns temp - 64^{0}F |
Wt - 8.4 lb/gal | Vis - 34 sec | PV - 5 cP | YP - 5 lb/100ft^{2} | pH - 9.5 |
Lost circulation - 75 bbl

Directional Survey: Method - N/A

Lithology of today's core: Metasediments (hornfels) with abundant inclined, calcium carbonate and pyrite filled fractures. Fractures are in several generations, intersecting each other at various angles, and are closely spaced - sometimes several fractures per inch.

Summary of today's events:

Core tube blocked, retrieved it with approximately 3' core. Core included the cement/formation interface, which is almost certainly what slipped and blocked the tube. Set new core tube, washed and reamed past window wedge to resume coring. Cored approximately 5' and twisted off core string just below the quill rod. Fortunately, the broken joint could be reached below the rotary table, so it was unscrewed from below and a mating joint was screwed in from above. Retrieved core tube. On top of the core we found a piece of rubber from the cementing wiper plug and several pieces of Early Rhyolite (which lies above the Bishop Tuff at approximately 2000'; i.e., it must have come out of the cement at the Phase I casing shoe and never circulated out of the wellbore.) This material apparently was suspended in the hole outside the ODP drillpipe and was drawn into the core hole when we lost circulation during today's coring. Spent considerable time today circulating high-viscosity sweeps to try and clean the hole (there was also a significant amount of sand and cement coming back in the returns, further confirming that material from outside the core bore was entering it.)

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 4 Nov 91 | Time of Report - 1800 | Total days coring - 4

Depth today - 6926' | Depth yesterday - 6896' | Progress - 30 ft
Core recovered - 29+' | Core size - HQ
Rotary speed - 100 rpm | WOB - 2000 lb | Rate of penetration - 3 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg	6868'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 20 gal/min | Pressure - 300 psi | Returns temp - 65^{0}F |
Wt - 8.4 lb/gal | Vis - 34 sec | PV - 5 cP | YP - 4 lb/100ft^{2} | pH - 9.5 |
Lost circulation - minor

Directional Survey: Method - magnetic single-shot

Depth - 6926 ft | Inclination - 1.75^{0} | Azimuth - 140^{0}

Lithology of today's core:

Metasediments (hornfels) with abundant inclined, calcium carbonate and pyrite filled fractures. Fractures are in several generations, intersecting each other at various angles, and are closely spaced - sometimes several fractures per inch.

Summary of today's events:

Set new core tube and reamed back to bottom at 6896'. Cored for approximately 1-1/2 hr when water swivel broke because of seized bearings. Repaired swivel and resumed coring to 6906'. Tripped core tube and retrieved core. Cored two more 10' tubes, to 6926', with excellent recovery on all cores.

Took inclination survey after last core.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 5 Nov 91 | Time of Report - 1800 | Total days coring - 5

Depth today - 6956' | Depth yesterday - 6926' | Progress - 30 ft
Core recovered - 29+' | Core size - HQ
Rotary speed - 150 rpm | WOB - 4000 lb | Rate of penetration - 1.5-2 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg	6868'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 20 gal/min | Pressure - 200 psi | Returns temp - 65^{0}F |
Wt - 8.5 lb/gal | Vis - 37 sec | PV - 7 cP | YP - 8 lb/100ft^{2} | pH - 9.4 |
Lost circulation - minor

Directional Survey: Method - No survey this report

Depth - xxxx ft | Inclination - xxxx^{0} | Azimuth - xxx^{0}

Lithology of today's core:

Metasediments (hornfels) with abundant inclined, calcium carbonate and pyrite filled fractures. Fractures are in several generations, intersecting each other at various angles, and are closely spaced - sometimes several fractures per inch.

Summary of today's events:

Set new core tube and reamed back to bottom at 6926'. Cored ahead to 6936', coring very slowly (about 1.5-2 ft/hr). Pulled core tube, retrieved core, and set new tube. Cored ahead, still at a low rate, to 6956'. No operational problems today.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 6 Nov 91 | Time of Report - 1800 | Total days coring - 6

Depth today - 6996' | Depth yesterday - 6956' | Progress - 40 ft
Core recovered - 39+' | Core size - HQ
Rotary speed - 150 rpm | WOB - 4000 lb | Rate of penetration - 2-3 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg	6868'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 20 gal/min | Pressure - 200 psi | Returns temp - $66^{O}F$ |
Wt - 8.5 lb/gal | Vis - 41 sec | PV - 8 cP | YP - 9 $lb/100ft^2$ | pH - 9.5 |
Lost circulation - minor

Directional Survey: Method - No survey this report

Depth - xxxx ft | Inclination - $xxxx^{O}$ | Azimuth - xxx^{O}

Lithology of today's core:

Metasediments (hornfels) with abundant inclined, calcium carbonate and pyrite filled fractures. Fractures are in several generations, intersecting each other at various angles, and are closely spaced - sometimes several fractures per inch. Fractures/bedding planes are more folded and perturbed than in previous cores.

Summary of today's events:

Cored from 6956', still very slowly (about 1.5-2 ft/hr) for the first part of the day. Rate of penetration picked up somewhat (to 2-3 ft/hr) in the later part of the day. Coring went smoothly, if slowly, with no operational problems. Received part of the core orientation hardware from Tonto; will evaluate this equipment when all of it arrives.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA
Date - 7 Nov 91 | Time of Report - 1800 | Total days coring - 7

Depth today - 7054' | Depth yesterday - 6996' | Progress - 58 ft
Core recovered - 57+' | Core size - HQ
Rotary speed - 150 rpm | WOB - 4000 lb | Rate of penetration - 2-3 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg	6868'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 20 gal/min | Pressure - 200 psi | Returns temp - 66^{0}F |
Wt - 8.6 lb/gal | Vis - 38 sec | PV - 8 cP | YP - 7 lb/100ft^{2} | pH - 9.3 |
Lost circulation - 15 bbl

Directional Survey:

Depth - 7010 ft | Inclination - 3.0^{0} | Azimuth - 134^{0}

Lithology of today's core: Metasediments (hornfels) with abundant inclined, calcium carbonate and pyrite filled fractures. Fractures are in several generations, intersecting each other at various angles, and are closely spaced - sometimes several fractures per inch. Fractures/bedding planes are more folded and perturbed than in previous cores.

Summary of today's events:

Cored from 6996', generally at a higher rate than before (over 3 ft/hr). Core today has been about the same as previous core.

We are currently considering two methods of orienting the core: one uses a camera in the core tube to orient the core with respect to the hole inclination and then combines a separate measurement of the inclination's azimuth to give the azimuth of the core; the other uses a multi-shot camera in a non-magnetic core string to measure the core orientation directly. The latter method may be more reliable, but requires two trips to install and remove the non-magnetic hardware. Either of these methods requires the core to be scribed, so today we mounted the Tonto core scribing unit on the core tube for one 10' section; unit scribed about the first foot of core, but the scribe points broke off and the core catcher broke into several pieces. This was apparently caused by the hardness of the rock and by the fact that the interval to be scribed started with a stick-up from the previous run, i.e., the core catcher scribe probably came down on the stick-up fairly fast and could have broken then. Since scribing is essential for either method, it's important to have consistent scribe lines. Current plan is to send a piece of core back to the Salt Lake City machine shop so they can use actual core to check the core scriber design.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 8 Nov 91 | Time of Report - 1800 | Total days coring - 8

Depth today - 7074' | Depth yesterday - 7054' | Progress - 20 ft
Core recovered - 18' | Core size - HQ
Rotary speed - 150 rpm | WOB - 4000 lb | Rate of penetration - 1 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg	6868'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 20 gal/min | Pressure - 200 psi | Returns temp - $66^{O}F$ |
Wt - 8.6 lb/gal | Vis - 38 sec | PV - 9 cP | YP - 9 $lb/100ft^2$ | pH - 9.3 |
Lost circulation - 15 bbl

Directional Survey: Method - No survey this report

Depth - xxxx ft | Inclination - xxx^{O} | Azimuth - xxx^{O}

Lithology of today's core:

Fine- to very fine-grained quartzite. Very hard drilling. Mosaic fracturing, reconstruction at surface is questionable. Some calcium-carbonate-filled fractures.

Summary of today's events:

Cored from 7054' to 7074' at a very low penetration rate (about 1 ft/hr). Entire interval today was quartzite, highly fractured when retrieved to surface, and very hard drilling.

Hardware for two types of core orientation is headed this way, although slowdown in drilling rate means that first orientation attempt will probably not come before 11 Nov.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 9 Nov 91 | Time of Report - 1800 | Total days coring - 9

Depth today - 7079' | Depth yesterday - 7074' | Progress - 5 ft
Core recovered - none | Core size - HQ
Rotary speed - 150 rpm | WOB - 4000 lb | Rate of penetration - 2-3 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 20 gal/min | Pressure - 200 psi | Returns temp - 68^{0}F |
Wt - 8.6 lb/gal | Vis - 41 sec | PV - 10 cP | YP - 10 lb/100ft^{2} | pH - 9.4 |
Lost circulation - 65 bbl

Directional Survey: Method - No survey this report

Depth - xxxx ft | Inclination - xxx^{0} | Azimuth - xxx^{0}

Lithology of today's core:

No core recovered this report

Summary of today's events:

After retrieving the quartzite core from 7074', drilled about 5 more feet and saw pressure/torque indications that bit was wearing out. Also appeared that core inner tube might not have latched properly. Tripped core tube, which contained only one small piece of core; i.e., inner tube had mis-latched and rest of core drilled in this interval was in the core barrel, preventing the core inner tube from re-latching. Since we cannot trip at night because we are not allowed to have lights high in the derrick, we rigged to circulate for the rest of the night.

Began tripping at dawn, returned the old core bit (which was worn down to the carbides) to the surface, picked up a new (softer) core bit, and picked up a 20' core barrel. Ran back in hole and resumed drilling at approximately 1800.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 10 Nov 91 | Time of Report - 1800 | Total days coring - 10

Depth today - 7127' | Depth yesterday - 7079' | Progress - 48 ft
Core recovered - 47+ ft | Core size - HQ
Rotary speed - 150 rpm | WOB - 4000 lb | Rate of penetration - 2-6 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 20 gal/min | Pressure - 200 psi | Returns temp - 68^{0}F |
Wt - 8.6 lb/gal | Vis - 44 sec | PV - 10 cP | YP - 10 lb/100ft^{2} | pH - 9.3 |
Lost circulation - 22 bbl

Directional Survey: Method - Magnetic single-shot

Depth - 7100 ft | Inclination - 3.25 deg | Azimuth - 134 deg

Lithology of today's core:

Began today's interval at 7079' still in the fine-grained, highly-fractured quartzite previously described. Contact with the metamorphic hornfels was at 7098', and this formation was also very similar to the previous hornfels.

Summary of today's events:

Resumed drilling at 7079' and continued through the day. The quartzite interval ended at 7098' and the drilling rate increased, possibly also due to the new bit. Interval from 7107' to 7127' drilled much faster than the earlier hornfels, with penetration rates up to 6-7 ft/hr.

Surveyed hole deviation at 7100'; inclination was 3.25 deg, and azimuth was 134 deg (inclination and azimuth are holding almost constant from the previous survey). Used maximum-reading-thermometers in the camera sub to get a bottomhole temperature reading of 244F.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 11 Nov 91 | Time of Report - 1800 | Total days coring - 11

Depth today - 7184' | Depth yesterday - 7127' | Progress - 57 ft
Core recovered - approx 56 ft, including considerable rubble | Core size - HQ
Rotary speed - 150 rpm | WOB - 4000 lb | Rate of penetration - 4-6 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 20 gal/min | Pressure - 300 psi | Returns temp - 68^{0}F |
Wt - 8.6 lb/gal | Vis - 44 sec | PV - 10 cP | YP - 10 lb/100ft^{2} | pH - 9.3 |
Lost circulation - minor

Directional Survey: Method - No survey this report

Depth - xxxx ft | Inclination - xxxx deg | Azimuth - xxx deg

Lithology of today's core:

Primarily the same hornfels previously described, but with several unconsolidated ash/clay zones. These intervals drilled rapidly, and were almost completely fragmented when retrieved from the core tube.

Summary of today's events:

Continued coring from 7127' at a relatively good rate of 5-6 ft/hr. Got generally good core recovery, although not all the core tubes were drilled for the full 20 feet because of blocks, and some of the core came out in small fragments.

Directional driller and some of the hardware for the core orientation are on site. We still need crossover subs to allow a large reamer shell, because the directional bits are smaller diameter than the bits we have been using for the conventional coring. With the crossovers, we will be able to ream the hole to the previous diameter as we drill the oriented core. Remaining hardware will be in Reno tonight; we plan to trip out the core string tomorrow, pick up the orientation assembly, run back in hole, and begin taking oriented core tomorrow night.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 12 Nov 91 | Time of Report - 1800 | Total days coring - 12

Depth today - 7190' | Depth yesterday - 7184' | Progress - 6 ft
Core recovered - approx 6 ft, including considerable rubble | Core size - HQ
Rotary speed - 150 rpm | WOB - 4000 lb | Rate of penetration - 4-6 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'	7190'	111'	34.5
4	HQ Impreg Gold	7190"			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 20 gal/min | Pressure - 300 psi | Returns temp - 68^{0}F |
Wt - 8.5 lb/gal | Vis - 53 sec | PV - 10 cP | YP - 10 lb/100ft^{2} | pH - 9.4 |
Lost circulation - 75 bbl

Directional Survey: Method - No survey this report

Depth - xxxx ft | Inclination - xxxx deg | Azimuth - xxx deg

Lithology of today's core:

Primarily the same hornfels previously described, but with approximately 3' of sticky, silicified clay. The clay zone led into what appears to be a fault gouge area. These intervals drilled rapidly, and were almost completely fragmented when retrieved from the core tube.

Summary of today's events:

Cored from 7184' to 7190'; tripped core tube for block. Ran new core tube to bottom with water ways taped shut; when pump pressure applied, it rose to 600 psi and dropped sharply to 150 psi after original pressure pulse. Lowered a plugged core tube, pumped against its resistance, and could develop no back-pressure. This indicates either a hole in the pipe, or loss of the lower part of the drilling assembly. Pulled back into casing (four stands pipe) and circulated for the rest of the night.

Started tripping out core string at first light, and found that the pipe was split in the 31st stand (approximately 2800' deep). Laid down the bad section of pipe and pulled rest of string to attach non-magnetic BHA for core orientation. Tripped back in and resumed coring at 7190' using the bit and core scribe which go with the orientation system. First 10' run will not be oriented, but will show rate of penetration with this bit (necessary to set timing of the multi-shot camera) and will show how well the knives scribe the core.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 13 Nov 91 | Time of Report - 1800 | Total days coring - 13

Depth today - 7198' | Depth yesterday - 7190' | Progress - 8 ft
Core recovered - 7+ ft, including considerable rubble | Core size - HQ
Rotary speed - 150 rpm | WOB - 4000 lb | Rate of penetration - 4-6 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'	7190'	111'	34.5
4	HQ Impreg Gold	7190"			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 20 gal/min | Pressure - 300 psi | Returns temp - 68^{O}F |
Wt - 8.5 lb/gal | Vis - 53 sec | PV - 10 cP | YP - 10 lb/100ft^{2} | pH - 9.4 |
Lost circulation - 15 bbl

Directional Survey: Method - No survey this report

Depth - xxxx ft | Inclination - xxxx deg | Azimuth - xxx deg

Lithology of today's core:

Primarily the same hornfels previously described, but with approximately 1' of sticky, silicified clay. The clay zone drilled rapidly; approximately 30% of the rock was almost completely fragmented when retrieved from the core tube.

Summary of today's events:

Resumed coring at 7190' with the non-magnetic coring assembly. Cored to 7198' and tried to pull core tube; it was stuck. Pulled wireline out and worked the pipe, rotating and circulating. Tried wireline again, but tube was still stuck. Pulled back one stand of drill string, and rigged to circulate because, once again, we could not trip pipe at night.

Began pulling out of the hole at daylight; when we got the coring assembly to the surface, we found that the core catcher shoe on the non-magnetic assembly was larger than the one on the previous inner tube and would not fit through a stabilizer in the reamer shell. Removed the stabilizer, pulled the core tube through the remaining BHA to check for fit, and ran back in the hole. Resumed coring at 7198'.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 14 Nov 91 | Time of Report - 1800 | Total days coring - 14

Depth today - 7248' | Depth yesterday - 7198' | Progress - 50 ft
Core recovered -49+ ft, predominantly competent | Core size - HQ
Rotary speed - 150 rpm | WOB - 4000 lb | Rate of penetration - 4-6 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'	7190'	111'	34.5
4	HQ Impreg Gold	7190"			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 20 gal/min | Pressure - 300 psi | Returns temp - 68^{O}F |
Wt - 8.5 lb/gal | Vis - 43 sec | PV - 10 cP | YP - 10 lb/100ft^{2} | pH - 9.4 |
Lost circulation - 30 bbl

Directional Survey: Method - Continuous survey with core orientation; film has not been read yet.

Depth - xxxx ft | Inclination - xxxx deg | Azimuth - xxx deg

Lithology of today's core:

Primarily the same hornfels previously described, but with approximately 12' of marble. The marble zone drilled rapidly, indicating at the time that it might not be competent, but was well structured without significant fractures when retrieved to the surface.

Summary of today's events:

Cored from 7198' to 7208' with the full core orientation assembly (including camera). Results were very good; core was well scribed, rock was competent and in long sections, and multi-shot camera film indicated good resolution on the orientation. As soon as core was unloaded and camera reloaded, pumped core tube down to resume drilling. Got two more 10' runs before 0600; rate of penetration was 4-5 ft/hr. Made 20' more during day, but required 3 runs because of core blocks. Still coring ahead at 1800; plan is to drill oriented core through the night and start tripping out the orientation tools in the morning.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 15 Nov 91 | Time of Report - 1800 | Total days coring - 15

Depth today - 7278' | Depth yesterday - 7248' | Progress - 30 ft
Core recovered -29+ ft, predominantly competent | Core size - HQ
Rotary speed - 150 rpm | WOB - 4000 lb | Rate of penetration - 4-6 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'	7190'	111'	34.5
4	HQ Impreg Gold	7190"	7278'	88'	26
5	HQ Lngyr Spec	7278'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 20 gal/min | Pressure - 300 psi | Returns temp - 68F |
Wt - 8.5 lb/gal | Vis - 43 sec | PV - 10 cP | YP - 10 lb/100ft^2 | pH - 9.4 |
Lost circulation - 37 bbl

Directional Survey: Method - Continuous survey with core orientation; film has not been read yet.

Depth - xxxx ft | Inclination - xxxx deg | Azimuth - xxx deg

Lithology of today's core:

Primarily the same hornfels previously described, but less fractured than some recent samples.

Summary of today's events:

Continued oriented coring from 7248' to 7278'. Began tripping out orientation tools at 0800; will lay them down and pick up standard tools with 20' core barrel. Trip back in; resume standard coring at 1800.

Report by: John Finger

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 16 Nov 91 | Time of Report - 1800 | Total days coring - 16

Depth today - 7329' | Depth yesterday - 7278' | Progress - 51 ft
Core recovered - 51 ft, predominantly competent | Core size - HQ
Rotary speed - 150 rpm | WOB - 4000 lb | Rate of penetration - 4-5 ft/hr

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Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'	7190'	111'	34.5
4	HQ Impreg Gold	7190"	7278'	88'	26
5	HQ Lngyr Spec	7278'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 20 gal/min | Pressure - 300 psi | Returns temp - 59F |
Wt - 8.5 lb/gal | Vis - 39 sec | PV - 11 cP | YP - 7 lb/100ft^2 | pH - 9.4 |
Lost circulation - 97 bbl

Directional Survey: Method - Continuous survey with core orientation.

Depth - 7200 ft 7278	Inclination - 3-3/4 deg 4-1/2	Azimuth - 132 deg 126

Lithology of today's core:

Average strike of oriented core is trending NNW with a dip of 50 deg at N70W. Primarily the same hornfels previously described, but less fractured than some recent samples. The bands defining the metasediment are becoming more claystone and less carboniferous

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Summary of today's events:

Finished tripping in standard 20' coring tools. Spent 2 hours thawing mud lines. Pumped 56 bbl to break circulation and reamed 30' of 3.75" hole to bottom. Started coring at 0100 hrs. Got one 20' run and 4 blocked runs.

Report by: Ron Jacobson

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 17 Nov 91 | Time of Report - 1800 | Total days coring - 17

Depth today - 7365' | Depth yesterday - 7329' | Progress - 36 ft
Core recovered - 36 ft, predominantly competent | Core size - HQ
Rotary speed - 150 rpm | WOB - 4000 lb | Rate of penetration - 4-5 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'	7190'	111'	34.5
4	HQ Impreg Gold	7190"	7278'	88'	26
5	HQ Lngyr Spec	7278'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 21 gal/min | Pressure - 300 psi | Returns temp - 57F |
Wt - 8.4+ lb/gal | Vis - 50 sec | PV - 9 cP | YP - 10 lb/100ft^2 | pH - 9.4 |
Lost circulation - 77 bbl

Directional Survey: Method - Magnetic single shot

Depth - 7265 ft | Inclination - 4-3/4 deg | Azimuth - 118 deg

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Lithology of today's core:

Primarily the same hornfels previously described. High-angle fractures tend to block core barrel.

Summary of today's events:

Coring ahead last 24 hours. Having some problems with chuck slipping, holding back 4000 to 6000 lb with big rig is helping.

Ran BHT with thermometer in pressure housing. This corrected pressure errors in temperature measurements. BHT now reads 210F, not 243F as previously measured.

Report by: Ron Jacobson

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 18 Nov 91 | Time of Report - 1800 | Total days coring - 18

Depth today - 7443' | Depth yesterday - 7365' | Progress - 78 ft
Core recovered - 78 ft, predominantly competent | Core size - HQ
Rotary speed - 160 rpm | WOB - 5000 lb | Rate of penetration - 5-6 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'	7190'	111'	34.5
4	HQ Impreg Gold	7190"	7278'	88'	26
5	HQ Lngyr Spec	7278'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 21 gal/min | Pressure - 300 psi | Returns temp - 57F |
Wt - 8.4+ lb/gal | Vis - 40 sec | PV - 9 cP | YP - 10 lb/100ft^2 | pH - 9.4 |
Lost circulation - 20 bbl

Directional Survey: Method - No survey this report

Lithology of today's core:

Primarily the same hornfels previously described.

Summary of today's events:

Coring ahead last 24 hours. Hole not taking much fluid. Setting up for low-side core orienting test with new scribing sub.

Report by: Ron Jacobson

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 19 Nov 91 | Time of Report - 1800 | Total days coring - 19

Depth today - 7456' | Depth yesterday - 7443' | Progress - 13 ft
Core recovered - 13 ft, predominantly competent | Core size - HQ
Rotary speed - 160 rpm | WOB - 5000 lb | Rate of penetration - 5 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'	7190'	111'	34.5
4	HQ Impreg Gold	7190"	7278'	88'	26
5	HQ Lngyr Spec	7278'	7456'	178'	47.5
6	HQ Lngyr H10Sp	7456'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 21 gal/min | Pressure - 300 psi | Returns temp - 57F |
Wt - 8.4+ lb/gal | Vis - 50 sec | PV - 9 cP | YP - 10 lb/100ft^2 | pH - 9.4 |
Lost circulation - 14 bbl

Directional Survey: Method - Magnetic single shot

Depth - 7441 ft | Inclination - 5-1/4 deg | Azimuth - 119 deg

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Lithology of today's core:

Continuing in banded metasediments (pelitic hornfels) intercalated with lenses of siliceous mudstone.

Summary of today's events:

Bit worn out at 2300 hours. Ran three single-shot surveys to check repeatability for low-side hole orientation. Start tripping for bit change at daylight. BHT = 215F. Dropped inner tube at three different depths to provide signal for acoustic attenuation measurements; this is for SNL drill string telemetry experiment. Bit on bottom again at shift change.

Report by: Ron Jacobson

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 20 Nov 91 | Time of Report - 1800 | Total days coring - 20

Depth today - 7506' | Depth yesterday - 7456' | Progress - 50 ft
Core recovered - 50 ft, blocky, but predominantly competent | Core size - HQ
Rotary speed - 160 rpm | WOB - 5000 lb | Rate of penetration - 5 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'	7190'	111'	34.5
4	HQ Impreg Gold	7190"	7278'	88'	26
5	HQ Lngyr Spec	7278'	7456'	178'	47.5
6	HQ Lngyr H10Sp	7456'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 21 gal/min | Pressure - 300 psi | Returns temp - 57F |
Wt - 8.5 lb/gal | Vis - 34 sec | PV - 5 cP | YP - 4 lb/100ft^2 | pH - 9.4 |
Lost circulation - 14 bbl

Directional Survey: No survey this report

Lithology of today's core:

Siliceous mudstone becoming metaquartzite for 7' - contacting banded pelitic hornfels. Hornfels contains frequent discontinuous lenses of massive pyrite up to 5 cm long.

Summary of today's events:

Continue coring ahead last 24 hours. Core very blocky, resulting in short runs but still recovering it all. Oriented a 7' run using the low-side system.

Report by: Ron Jacobson

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 21 Nov 91 | Time of Report - 1800 | Total days coring - 21

Depth today - 7578' | Depth yesterday - 7506' | Progress - 72 ft
Core recovered - 72 ft, predominantly competent | Core size - HQ
Rotary speed - 160 rpm | WOB - 5000 lb | Rate of penetration - 5 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'	7190'	111'	34.5
4	HQ Impreg Gold	7190"	7278'	88'	26
5	HQ Lngyr Spec	7278'	7456'	178'	47.5
6	HQ Lngyr H10Sp	7456'			

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 21 gal/min | Pressure - 300 psi | Returns temp - 57F |
Wt - 8.6 lb/gal | Vis - 37 sec | PV - 7 cP | YP - 7 lb/100ft^2 | pH - 9.2 |
Lost circulation - 14 bbl

Directional Survey: No survey this report

Lithology of today's core:

22' of mineralized and highly altered limestone or claystone; then more of the banded metapelite of the Mount Morrison roof pendant.

Summary of today's events:

Finished coring at 1530 hours. Tripped back into casing in preparation for a temperature log.

Report by: Ron Jacobson

LONG VALLEY EXPLORATORY WELL - DAILY CORING REPORT

LVF 51-20 | Location: NW 1/4, NE 1/4, Section 20, T3S, R28E, Mono County CA

Date - 22 Nov 91 | Time of Report - 1800 | Total days coring - 22

Depth today - 7588' | Depth yesterday - 7578' | Progress - 10 ft
Core recovered - 10 ft, predominantly competent | Core size - HQ
Rotary speed - 160 rpm | WOB - 5000 lb | Rate of penetration - 5 ft/hr

---

Bit number	Type	Depth in	Depth out	Footage	Hours
1	Bullnose	6846'	6868'	22'	2
2	HQ Impreg H-6	6868'	7079'	211'	89
3	HQ Impreg H-10	7079'	7190'	111'	34.5
4	HQ Impreg Gold	7190"	7278'	88'	26
5	HQ Lngyr Spec	7278'	7456'	178'	47.5
6	HQ Lngyr H10Sp	7456'	7588	132'	33

Drilling fluid - water, soda ash, Kwik-ben, Intervis, Torq-ease
Flow rate - 21 gal/min | Pressure - 300 psi | Returns temp - 57F |
Wt - 8.6 lb/gal | Vis - 37 sec | PV - 7 cP | YP - 7 lb/100ft^2 | pH - 9.2 |

Directional Survey: Magnetic single-shot

Depth - 7568' | Inclination 6 deg | Azimuth - 123 deg

Lithology of today's core:

More of the banded metapelite of the Mount Morrison roof pendant.

Summary of today's events:

Ran temperature log to 7520'; BHT = 217^{0}F. Had some trouble lowering logging tool through the orienting wedge, but hole is clean to bottom and no problems coming out. Cleaned mud tanks and displaced hole with 180 bbl of clear water traced with fluorescein dye while coring 10'. Phase 2 coring complete with 720' cored and 99.2% recovered. Tripping out and laying down core rods at shift change. This is the last Daily Report of Phase 2 drilling operations. Signing off until Phase 3.

Report by: Ron Jacobson

DISTRIBUTION

David N. Anderson
Geothermal Resources Council
PO Box 1350
Davis, CA 95617

Roger Anderson
Lamont-Doherty Geo. Obs.
Borehole Research Group
Palisades, NY 10964

Jim Horn
Santa Fe Geothermal
2 Galleria Tower
13455 Noel Rd., Suite 1100
Dallas, TX 75240

Don Ash
5376 Sharon Ct.
Santa Rosa, CA 95405

Roy A. Bailey
USGS
345 Middlefield Rd, MS-910
Menlo Park, CA 94025

Bureau of Land Management (2)
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300 Federal Building
800 Truxton Ave.
Bakersfield CA 93301

Bureau of Land Management (2)
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Calif. Regional Water Quality
Control Board
15371 Bonanza Road
Victorville, CA 92392

Neal Davis
Chevron Service Co.
Drilling Technology Center
PO Box 4450
Houston, TX 77073

Mike Campbell
4517 Trumbull Drive
Bakersfield, CA 93311

Robert Deputy
ARCO Oil and Gas Co.
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Plano, TX 75075

Epoch Well Logging (2)
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Doug Milham
1884 Eastman Ave., #104
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Charles George
Halliburton Services
Drawer 1431
Duncan, OK 73536

Ocean Drilling Program (2)
Attn: Barry Harding
Gene Pollard
Texas A&M University
1000 Discovery Drive
College Station, TX 77840

Charlena Harrel
Okie-Yoke
PO Box 105
Lindsay, OK 73052

John F. Hermance
Brown University
Dept. of Geol. Sciences
Providence, RI 02912

David P. Hill
USGS
345 Middlefield Road, MS-977
Menlo Park, CA 94025

Terry Brittenham
Southern International, Inc
4401 NW 4th, Suite 121
Oklahoma City, OK 73107

Paul Kasameyer
Earth Sciences Dept.
LLNL, PO Box 808
Livermore, CA 94550

Jim Langford
Security Division
PO Box 210600
Dallas, TX 75211

B. J. Livesay
126 Countrywood Lane
Encinitas CA 92024

William Lyons
Dept of Petrol. Engineering
NMIMT
Socorro, NM 87801

Daniel Lyster
Mono County Energy Mgmt.
PO Box 8060
Mammoth Lakes, CA 93546

Desert Drilling Fluids (4)
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Dave Donald
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Bob Brown
3316 Girard Blvd NE
Albuquerque NM 87107

Gary Shinabarker
Halliburton Services
PO Box 80118
Bakersfield, CA 93380

Nic Nickels
Eastman Christensen
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Santa Rosa, CA 95403

J. J. Papike
Dept. of Geology
University of New Mexico
Albuquerque, NM 87131

Steve Pye
Unocal Geothermal
PO Box 7600
Los Angeles, CA 90017

Ted Reeves
Chaffey High School
1245 N. Euclid Ave.
Ontario, CA 91762

Bill Rintoul
2721 Beech St.
Bakersfield, CA 93301

John Rundle
Earth Science Dept
LLNL, L-201
Livermore, CA 94550

John Sass
USGS
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Flagstaff, AZ 86001

L. T. Silver
Div. of Geol and Plan. Sciences
California Institute of Technology
Pasadena, CA 91125

California Energy Commission (3)
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PO Box 418
Bakersfield, CA 93302

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USGS
345 Middlefield Road, MS-439
Menlo Park, CA 94025

Unocal Geothermal (2)
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University of Wisconsin
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Madison, WI 53706

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Amoco Production Center
PO Box 3385
Tulsa, OK 74102

US Department of Energy (2)
Geothermal Division
Attn: Ted Mock
Gladys Hooper
Forrestal Bldg., CE-324
1000 Independence Ave. SW
Washington, DC 20585

US Department of Energy
Office of Basic Energy Sciences
Attn: Bill Luth
Forrestal Bldg., MS J-309
1000 Independence Ave. SW
Washington, DC 20585

US Forest Service (2)
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Geophysical Institute
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