

6101027

Completion Report  
New Well PRO-318

Field BEOWAVE

Property: ROSSI

Well No. 21-19

Sec. 19 T. 31N R. 48E MD B.&M.

Location 375.09'S 824.96'NW Cor Sec. 19 (Final)

Lander County, Nevada

Elevation 4973' (Est) Derrick Floor

D.F. is 15.5 ' above mat.

Date 11-13-78

Chevron Resources Company

B.D. Garrett/R.B.Murray

(For Operations Manager, Producing Dept.)

Drilled By Big Chief Drilling Co. #12

Date Commenced Drilling 10-5-76

Date Completed Drilling 12-7-76

Date of Initial Production \_\_\_\_\_

Production:	Daily Average, 1st _____ Days	Gravity _____ °API	Pump _____
	Oil _____ Bbls.	T.P. _____ PSI	Flowing _____
	Water _____ Bbls.	C.P. _____ PSI	Gas Lift _____
	Gas _____ Mcf.	Bean _____ /64"	

Summary

Total Depth : 5680'

Casing : 30" Conductor CMTD @ 19'  
 : 20" 90# K-40 Socket Welded CMTD @ 198'  
 : 13 5/8" 54.5# K-55 R-3 Buttress CMTD @ 1996'  
 : 9 5/8" 40# K-55 Buttress Hung @ 4369' Top @ 1791'

Tubing : 2 7/8" GST Tubing @ 5597' Top @ 16.41'

Logs : Dil, Sonic, CNL, FDC - Gamma, Dip

Prior to moving in 30" conductor pipe was cemented at 19' below ground level.

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Drilled by Big Chief Drilling Co. Rig #12, KB datum 15.5' above ground.

10-5-76 Spud and drill 17½' hole to 200'.

10-6-78 Opened hole to 26" to 198'.  
Ran 20" casing to 198'. Using BJ Cementers, cemented with 530 cu-ft Class G cement w/2% CaCl through 2-7/8" tubing hung at 155'. Preceded cement w/50 cu-ft water and displaced with 40 cu-ft mud and 18 cu-ft. water. Good circulation throughout w/50 cu-ft cmt to surface.

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#### Casing Detail

8 joints 20" - 90# H-40 socket weld casing of unknown brand.

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10-7-76 Removed 2-7/8" tubing leaving two joints in hole.

10-8-76 Installed 20" Class II BOP. Ran 17½" bit and located top of fish at 88'. Ran O.E. tubing and located cmt at 136'. Attempted to screw into fish - no good. Ran overshot w/17" skirt and engaged fish at 88'. Pulled 20000# over weight for 14', then came free. Recovered all tubing.

10-9-76 Completed installation of BOP. Ran 17½" bit and drilled cmt 130'-160'.

10-10-76 D.O.C. to 202'. Bit locked up and steel cuttings were noted in mud returns. P.O.H. Noted gouges on bottom stabilizer and one broken tooth on bit. RIH w/17½" bit and junk sub. Drilled rough for 1' then smooth. Drilled ahead to 321'. Lost 8 hours for repairs to swivel.

10-11-76 Drill 17½" hole to 620'. Lost 230 bbl mud. Add L.C.M.

10-12-76 Drill 17½" hole to 754'.

10-13-76 Drill 17½" hole to 984'.

- 10-14-76 Drill 17½" hole to 1396.
- 10-15-76 Drill 17½" hole to 1612.
- 10-16-76 Drill 17½" hole to 1825.
- 10-17-76 Drilled 17½" hole to 1953'. Lost 150 bbl mud while drilling 1940-1953. Pulled to shoe and mixed mud w/LCM. Total loss to regain circulation was 500 bbl. Drilled w/full returns 1953-1988.
- 10-18-76 Drilled 17½" hole to 2000'. Ran Welex logs. (Induction, Compensated Acoustic Velocity, Dipmeter).
- 10-19-76 Ran reamer & C.O. 45' fill. Circulate hole clean. Ran 13-3/8 casing. Stopped at 1914. Circulated casing to 1963 using mud. Lost 180 bbl.
- 10-20-76 Lost returns at 1963; unable to regain circulation. Pulled casing to 1738' and circulated with mud and LCM. Staged in hole to 1996' with full returns.
- 10-21-76 Using B.J. Cementers, pumped 100 cu-ft water followed by 2492 cu-ft 1:1 Class G cmt and Pozzalan w/33#/sk cmt of silica flour; followed with 200 cu-ft Class G cmt w/35% silica flour. Displaced with 1728 cu ft and bumped plug. After 1420 cu-ft displacement had cmt returns to surface. After 1650 cu-ft lost returns. Estimate 230 cu-ft to surface. Cmt fell back in annulus to 50'. To do top job, ran 1" pipe to 65' and pumped 150 sx Class G cmt w/35% silica flour. Good returns throughout.

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Casing Detail

Bottom 21 jt (860.28') 13-3/8" 61# K-55 Buttress. U.S. Steel brand.

Next 27 jt (1107.10') 13-3/8" 54.5# K-55 R-3 Buttress. U.S. Steel.

Top 1 jt (28.52') 13-3/8 61# K-55 Buttress. U.S. Steel. Halliburton Super Seal float shoe on bottom and Super Seal float collar on top of first joint.

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10-22-76 Installed Gray tubing head w/12" 3000# API top flange.

10-23-76 Installed Class III BOP and attempted to test. Picked up and rubbered drill pipe. Wait on BOP repairs.

- 10-24-76 Completed BOP repairs and tested to 1500 psi. Drill out shoe and drilled 12 $\frac{1}{4}$ " hole to 2176.
- 10-25-76 Drill 12 $\frac{1}{4}$ " hole to 2288.
- 10-26-76 Drill 12 $\frac{1}{4}$ " hole to 2473.
- 10-27-76 Drilled 12 $\frac{1}{4}$ " hole to 2705. POH.
- 10-28-76 RIH w/OEDP to 574'. Spot 16 bbl thick gel pill. Equalized 76 SX Class G cmt @ 474. WOC. Rigged up for air drilling. Located cmt at 400'. Disconnected BOP and lowered to make room for rotating head.
- 10-29-76 Installed rotating head and tested BOP to 2000#. Discovered 12 $\frac{1}{4}$ ' bit and rotating head would not pass through 17 $\frac{1}{2}$ " rotary table. Removed rotating head and using mud, drilled cement 400-482 and drilled ahead to 2715.
- 10-30-76 Drilled 12 $\frac{1}{4}$ " hole to 2908.
- 10-31-76 Installed 27" rotary table, rotating head, and air equipment. RIH  
and unloaded mud from hole w/air in stages at 1005 and 2040. RIH and  
11-1-76 hit bridge at 2100'. Worked pipe to 2146. Hole making water while holding 85-100# back pressure on air returns. Changed to foam and cleaned out to 2869. Increased back pressure to 160# but hole continued making water.
- 11-2-76 Continued reaming to 2900'. Had difficulty making connections due to fill. Drilled ahead to 2941 when back pressure dropped from 160# to 0#. Could not make hole. Attempted to pick up pipe but stuck at 2941. No circulation with 1400# air pressure on standpipe. Spotted soap pill with no success. Stopped air/foam circulation and filled pipe with mud. No returns at 2500#. Well flowed water intermittently at estimated rate of 200 bbl/hr. Filled annulus with 60 bbl mud. Backed off kelly, removed rotating head and rigged flow line for mud circulation.
- 11-3-76 Ran Go-International collar locator and string shot. Worked through float valve on first single below kelly. Backed off at bottom of second single. Recovered 2 joints and float sub. Left in hole sinker bar, collar locator, and 16' of wire line.  
Note: Shock of back-off caused float valve to slam shut and shear the line.  
Ran in rope spear on wire line and recovered tools.  
Ran sinker bar to knock out seat and dart of float valve at 374' (this was recorded as a poppet valve). Could not pull back through valve. Sheared line leaving sinker bar, collar locator, and bumper sub. Ran string shot and backed off at 344' P.O.H.

- 11-4-76 Ran Baash Ross outside cutter on 80' of 9 5/8" wash pipe. Attempted to cut at 426'. Cutter failed.
- 11-5-76 Ran cutter and made cut at 432'. Recovered two singles 5" D.P. and float sub. Ran Bowen overshot and engaged fish at 432'. Jarred and fish came free. Recovered drill pipe and collars to 2852, leaving 89' of fish consisting of 12 1/4" bit, driltrol, shock sub, driltrol crossover, monel collar, driltrol 30' D.C., and driltrop on top. RIH to 2316 and cleaned out fill to 2580.
- 11-6-76 Cleaned out fill 2580 to 2852. Circulated out gravel. Made wiper run and cleaned out bridge at 2844. P.O.H. Ran screw-in-sub and attempted to engage fish. No success. P.O.H. Ran 41' of 8-5/8" wash pipe. Milled on driltrol blades 2852-53.
- 11-7-76 Continued milling to 2854 1/2. Ran mill #2 and milled past blades at 2855. Cleaned out to 2888. P.O.H. Added 80' wash pipe and cleaned out to 2889. Milled on driltrol blades 2889 to 2891. POH.
- 11-8-76 Ran mill #3 and milled 2891-95. P.O.H. Mill showed iron in annulus. Ran mill #4 and milled on iron 2895-98 P.O.H. Ran mill #5 and started milling at 2898. Pipe torqued and stuck. Pulled loose w/150000#. Could not work below 2896.
- 11-9-76 Ran Baash Ross overshot and engaged fish at 2852. Jarred at 250000# and worked fish up 5' when overshot came loose. Could not reengage fish POH. Reran overshot, engaged fish at 2847. Jarred and pulled fish for 600' when it came free. POH.
- 11-10-76 Ran 12 1/4" bit and cleaned out bridge at 2662. Slid to 2941 and drilled ahead to 2956.
- 11-11-76 Drill 12 1/4" 2956-3110'.
- 11-12-76 Drill 12 1/4" 3110' - 3388'.
- 11-13-76 Drill 12 1/4" 3388'-3488' POH. RIH, while reaming last 30', DP torqued up @ 3467'. Driller kicked out rotary and partially unscrewed string. PU to 150000# and parted string @ 707'.
- 11-14-76 RIH w/Bowen overshot w/6 1/2" x 6-1/8" grapple and caught fish @ 727' and pulled up 15'. Pull to 200000# and lost fish - could not reset. POH to replace grapple. RIH and caught fish @ 727' POH w/fish. RIH, reamed 3460' to 3488', drilled 3488'-3526'.
- 11-15-76 Drill 3526-3811'.
- 11-16-76 Drill 3811-3902'. Survey and POH. RIH w/12 1/4" bit, ream 3840' to 3902'. Drill ahead 3902-2975'.

- 11-17-76 Drill 3975-4136 POH to repair leak in top D.C.
- 11-18-76 RIH to 3041' and broke cir. reamed 3045'-3580' w/bridge @ 3190 reamed 4100-4136. Drilled 12 $\frac{1}{2}$ " hole 4136'-4200'.
- 11-19-76 Drill 4200-4357' P.O.H.
- 11-20-76 Rigged up Schlumberger - T.D. = 4373' by wireline.
- |                 |           |
|-----------------|-----------|
| ran DIL         | 1998-4366 |
| Sonic           | 2000-4370 |
| CML-FDC & Gamma | 20-4371   |
| DIP             | 1998-4371 |
- 11-21-76 Meas. in hole, found 20' error in tools, Ran 62 JTS of 9-5/8" x 40# K-55 Buttress Casing to 2578'.
- 11-22-76 Makup Burns 13-3/8" x 9-7/8" Liner Hanger. RIH to meas 4370 Hung intermediate 9-5/8" x 40# K-55 Buttress 1' off Bttm @ 4369'. Cemented w/1251 ft<sup>3</sup> type G Cement incl 450 ft<sup>3</sup> DIAMIX, 37 $\frac{1}{2}$ #/SX Silica flour, 0.2% D-31 frict.reducer, 4% R-11 Retarder. Preceeded CMT w/200 ft<sup>3</sup> H<sub>2</sub>O and displaced w/1296 ft<sup>3</sup> mud. Did not bump plug. Run in & CO CMT 1450-1791.

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CSG DETAIL

62 JTS 9-5/8" x 40# K-55 Buttress of unknown mfg. W/HOWCO super seal float shoe on bottom and float collar on 1st jt. CSG hung @ 4369' top @ 1791'.

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- 11-23-76 Drill cement in liner 1791'-1836'.
- 11-24-76 C.O. cement 4152-4321 Drill float collar @ CO CMT 4321-4369'. Drill out shoe @ 4369 C.O. CMT to 4370'. Drill ahead 4370-4385. POH installed Grant HP rotating head tested BOPE.
- 11-25-76 Drilled 8-3/4" hole w/foam 4370-4915.
- 11-26-76 Foam drilled 8-3/4" hole 4915-4950. Bit torqued up. POH leaving all cones and bearings in hole. Pumped in 75 bbl cold H<sub>2</sub>O thru DP to cool hole. Reamed hole 4737-4921.
- 11-27-76 Reamed to 4950' POH to shoe. RIH w/magnet found fill 4925'-4950' POH recovered 1 cone in 4 PCS and 2 addtl pieces and bearings.

- 11-28-76 POH. Recovered one cone in 4 pieces and some bit bearings. RIH w/flat bottom mill. Hit bridge at 4400. Rotated and slid to 4950 w/o circulation. Unloaded well @ 4950 and mill to 4952.
- 11-29-76 POH. RIH w/8-3/4" bit. Ream 4900-4951 and change to foam. Drill 8-3/4 hole to 5237.
- 11-30-76 Drill 5237-5260. POH lost one cone in hole. RIH w/7" magnet. POH. Recovered cone and bearings. RIH ream 5060-5260.
- 12-1-76 Using foam, drilled 8-3/4" hole 5260-5405'. Pumped 65 bbls sump H<sub>2</sub>O down DP and 50 bbls in annulus POH. RIH unload well @ 5095' reamed to 5405 drilled ahead to 5506.
- 12-2-76 POH. RIH to 5367 and unload well. Ream hole 5412-5506. Drill 8-3/4 hole w/new bit 5506-5686'.
- 12-3-76 Cooled well w/65 bbls sump H<sub>2</sub>O down DP and 50 bbls down annulus. Removed rotating head - pulled three Stands DP. Well started flowing. P.U. Kelley & pumped 100 bbls down D.P. POH to shoe and pumped 100 bbls down D.P. POH (meas 5680"). Rigged up Schlumberger. Ran DIL log 4974-5678. Cooled well w/720 bbls 62° H<sub>2</sub>O. Ran DIP 4375-5680. Pumped 213 bbls to cool. Ran Sonic 4374-5682 and CNL & FDC 4374-5680. Rig down Schlumberger.
- 12-4-76 Rig up Johnston pressure-temperature recorder on open end drill pipe. RIH to 5000'. Unloaded well by circulating air down D.P. Returns up annulus. Flowed well from 6:30 P.M. to 4:30 A.M. Shut in for build up at 4:30 A.M.
- 12-5-76 POH to lay down test tools RIH to 5670'-10' fill on bottom. POH. Rig up and run 2-7/8" GST tubing.

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Tubing Detail

2.33' 2 7/8" 8rS EUE closed slotted shop made nipple  
.90' 2 7/8" EUE Baker Float  
.66' 2 7/8" EUE 8rd Pin x 2 7/8 GST BOX  
5573.88'(173 jts)of 2 7/8 Atlas Bradford GST Tubing  
1.66' 2 7/8" EUE 8rd Fatuge nipple  
.60' Donut

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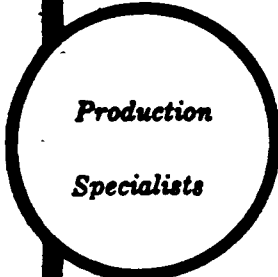
- 12-6-76 Finish running tubing - landed at 5597'. Removed BOPE, installed Xmas tree.
- 12-7-76 Release rig @ 1:00 A.M. 12/7/76.

ROSSI 21-19

<u>Depth</u>	<u>Inclination</u>	<u>Direction</u>
315'	1° 45'	N - 37 ½ - E
500'	2° 30'	N - 49 ½ - E
664'	3° 45'	N - 67 ½ - E
732'	4° 30'	N - 63 ½ - E
1002'	3° 30'	N - 78 ½ - E
1219'	3° 30'	S - 86 ½ - E
1596'	1° 30'	S - 64 ½ - E
2000'	1° 30'	S - 68 ½ - E
2510'	3° 15'	N - 71 ½ - E
2957'	3° 15'	-
3207'	2° 15'	-
3488'	2° 45'	-
3842'	1° 45'	-

Data collected from envelopes containing Drift/Inclin  
Shot Samples.

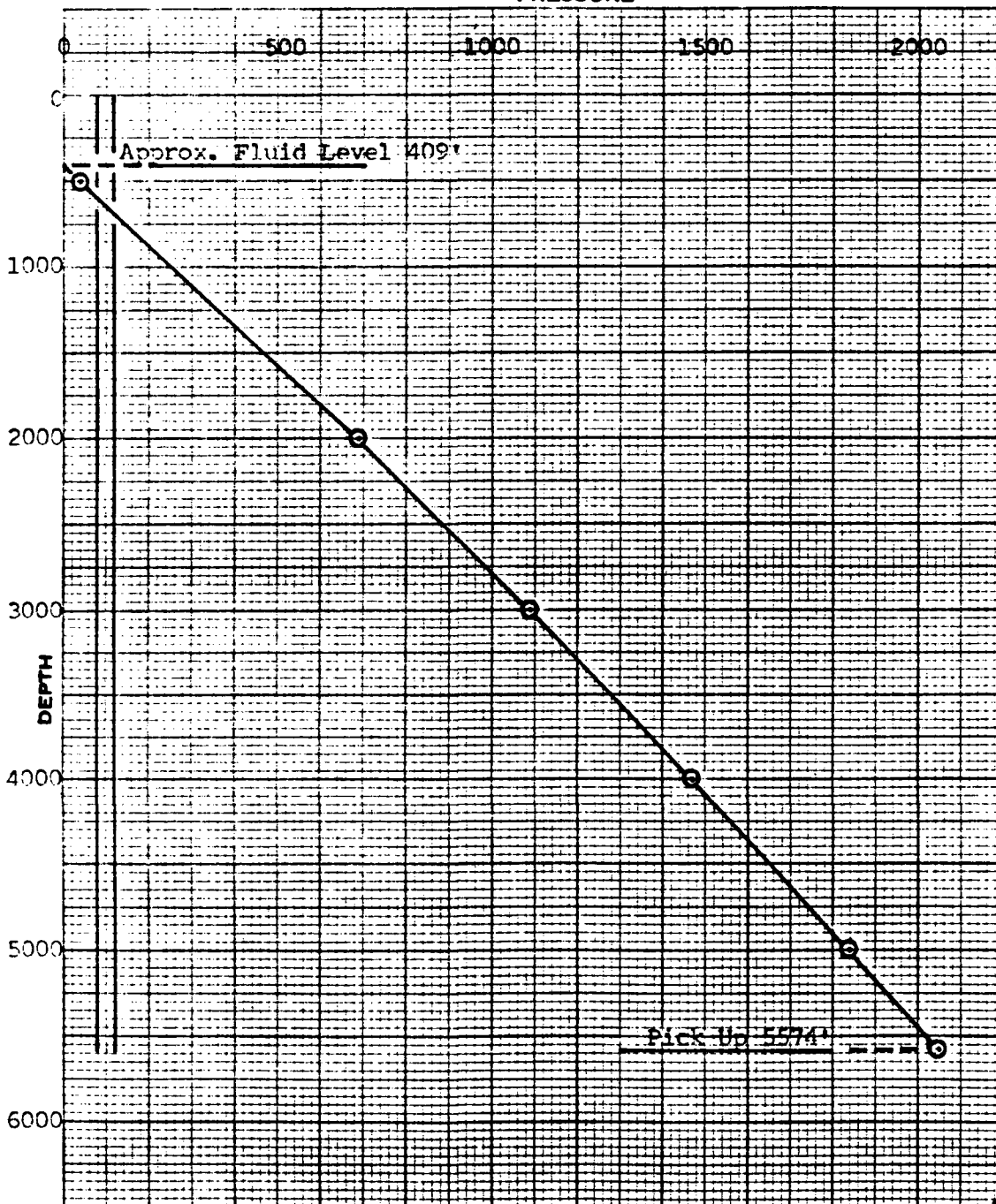




**SUBSURFACE PRESSURE SURVEY**

OWNER CHEVRON OIL COMPANY FIELD GAN-B-1110 WELL NAME ROSSIE BEOWAVE 21-1  
 CASING \_\_\_\_\_ ELEV. \_\_\_\_\_ DATE: March 28, 1977  
 LINER DESCRIPTION: \_\_\_\_\_ ZERO POINT Tbg. Head + 6'  
 \_\_\_\_\_ DEPTH \_\_\_\_\_  
 \_\_\_\_\_ ZONE \_\_\_\_\_  
 TUBING DETAIL: 2-7/8" to 5594' INSTRUMENT 3800 PSI  
 SERIAL NO. 3923N  
 PUMP SHOE \_\_\_\_\_ GAS ANCHOR \_\_\_\_\_ INTAKE: 12 hour 7 1/2 turn  
 PURPOSE STATIC PRESSURE GRADIENT SURVEY MAX. TEMP. 392.5 °F @ 4800'  
 REMARKS: \_\_\_\_\_

**PRESSURE**

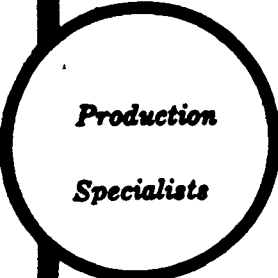


STABILIZATION PERIOD \_\_\_\_\_  
 GROSS OIL RATE B/D \_\_\_\_\_  
 NET OIL RATE B/D \_\_\_\_\_  
 FORMATION GAS MCF/D \_\_\_\_\_  
 GOR CFT/RBL \_\_\_\_\_  
 CIRCULATED GAS MCF/D \_\_\_\_\_  
 OIL DRY GRAVITY °API \_\_\_\_\_  
 PRESSURES: OBS COR  
 CASING, PSI no gauge no way  
 TUBING, PSI vacuum vacuum

DEPTH	PRESSURE	GRADIENT
0		
500	40	.080
2000	693	.435
3000	1087	.394
4000	1469	.382
5000	1842	.373
5574	2053	.368

Time on bottom 3:59 pm  
 Time off bottom 4:09 pm

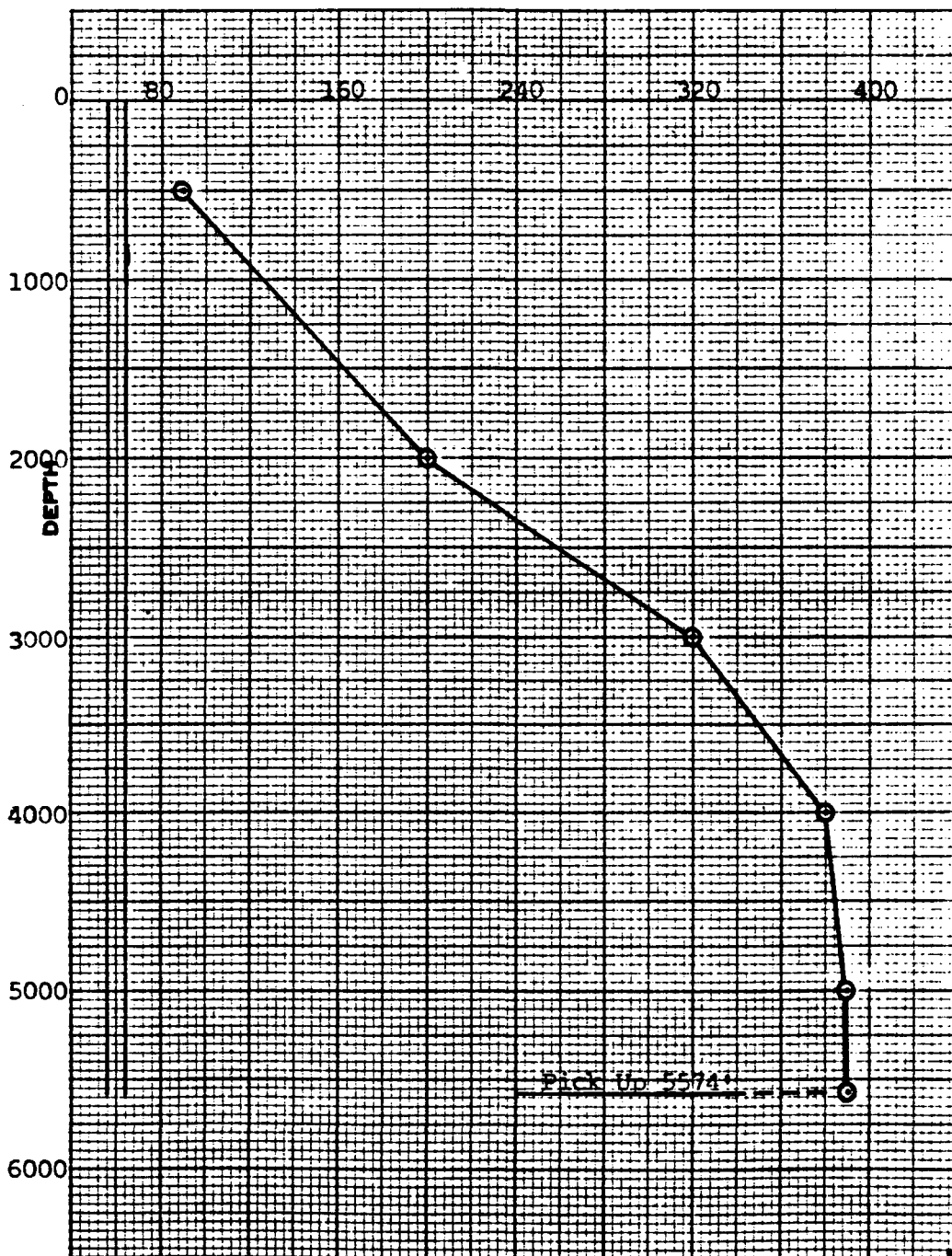
BY: NEVE & CONNELL



**SUBSURFACE TEMPERATURE SURVEY**

OWNER CHEVRON OIL COMPANY FIELD                      WELL NAME ROSSIE BEOWAWE 21-  
 CASING                      ELEV.                      DATE March 28, 1977  
 LINER DESCRIPTION:                      ZERO POINT Tbg. Head + 6'  
 DEPTH                       
 ZONE                       
 TUBING DETAIL: 2-7/8" to 5594' INSTRUMENT 84 - 650 ° FAH  
 SERIAL NO. 10005  
 PUMP SHOE                      GAS ANCHOR                      INTAKE: 12 hour 15 turn  
 PURPOSE STATIC TEMPERATURE SURVEY MAX. TEMP. 392.5 °F @ 4800'  
 REMARKS:                     

**TEMPERATURE**



**STABILIZATION PERIOD**

GROSS OIL RATE B/D                       
 NET OIL RATE B/D                       
 FORMATION GAS MCF/D                       
 GOR CFT BBL                       
 CIRCULATED GAS MCF/D                       
 OIL DRY GRAVITY °API                       
 PRESSURES: OBS                      COR                       
 CASING. PSIG no gauge no way  
 TUBING. PSIG vacuum vacuum

DEPTH	TEMP.	DEPTH	TEMP.
0	--		
500	88.0		
2000	196.4		
3000	317.0		
4000	380.3		
5000	389.6		
5574	389.1		

Time on bottom 1:38 pm  
 Time off bottom 2:00 pm

BY: NEVE & CONNELL

NU- Beowawe  
Rosse #21-19  
General

ROSSI 21-19  
FLOW TEST  
12/4/76

test interval 9 5/8 shoe to TD, 4369' - 5686' in 8 3/4" hole  
using drill pipe to unload hole using air w/foam and mud pumps to  
assist. No packer.

TIME

1:09 PM From drillers report R.I.H. started slowly.  
Pressure bombs 15' Perf. pipe below drill pipe +2'  
22.30' from top of 1st sub to bottom of recorder  
28.30' same 34.30' 3rd overall 35.03'.

17:20 PM N-Pit 5.2 ropes down (RD) or knots. 1 Knot = 0.5' as measured on  
S-Pit 6.3 ropes down (RD) <sup>start 700 psi stuck in each pit</sup>  
Observed real difference in a <sup>ELVE</sup> location 1.2 ft. estimated.

6:30 PM Started air pressure to stand pipe trying for 600 psi.  
Then start mud pumps - suction tanks empty trying to  
transfer water from water tank to pits to be able to pump.  
Trying to unload well.

6:30 PM 300 psi stand pipe.

6:50 PM 500 psi stand pipe  
~~Johnson Tools~~  
Length of Johnson Tools ~~recorders~~ <sup>started</sup> temp clock 11:45 AM  
Pressure <sup>recorders</sup> 10:15 AM  
1.30' (4-1/2 box to union to <sup>0</sup> 1 pen  
(4 union tool box to 3-1/2 full hole pen  
4,959' of Drill Pipe + (HOLDERS FIGURES)  
15.00' Perforated anchor  
6.00' Bomb Hanger Press  
6.00' Bomb Hanger Press  
6.00' Bomb Hanger Temp  
6.00' Bull Plug  
4,959 + 35.93' Total Test Tools  
+ 5' Kelly = 5,000 feet

7:08 PM 820 psi on stand pipe.

7:10 PM 5,000.02' drill pipe + 35.03 Johnson tools from drillers report  
5,000.00 feet of D.P & Johnston tools.

7:14 PM 910 psi stand pipe.

7:17 PM 1,000 psi stand pipe - opened by pass valve shut-in pressure  
to Kelly.

7:28 PM Johnson man pointed out a 35.18 discrepancy in tool length  
between Driller's figures and Holder's figures - Holder's  
are correct. AS NOTED ABOVE

7:43 PM Turned on mud pumps, pumps leaking.

TIME

7:45 PM Turned them off, 960<sup>#</sup> stand pipe.

7:50 PM Turned on pumps again to drive first shot of air down.

8:00 PM Finally started mud pumps, they had not been primed.  
Pumps 56 strokes/min.

8:10 PM Shut mud pump off, 210 psi stand pipe.

8:11 PM Flow from blooie line N-Pit 5.2 knots  
S-Pit 6.5 knots

8:15 PM Injecting foaming solution 20 gpm 1.5% foaming agent by  
vol. Su/fatex-RIF, corrosion inhibitor. 750 ml. Calgon X100

8:25 PM 580 psi stand pipe.

8:25 PM Circulated pipe 5 ft. to be sure free.

8:30 PM 640 psi stand pipe.

8:33 PM Heavier flow to surface getting heavier rapidly.

8:34 PM 680 psi stand pipe.

8:34 PM Blowing-stand pipe pressure holding at 680.

8:37 PM Little water.

8:40 PM 4.6 N-Pit Net .6 Knots = .3 ft.

8:40 PM Returns stopped 8<sup>x</sup>30 psi stand pipe.

8:42 PM No change in S-Pit 6.3 due to pumping of water into the  
mud tanks

8:48 PM Bleeding off air and turning on pumps → 750 psi<sub>x</sub> STANDPIPE

8:54 PM 450 psi<sup>or</sup> pumps and dropping.

8:58 PM 230 psi<sup>or</sup> pumps at stand pipe.

9:00 PM 280 psi on air at stand pipe.

9:03 PM 3.80 psi on air at stand pipe.

TIME	
9:04 PM	Flowing soapy water 85°F on blooie line.
9:06 PM	90°F
9:07 PM	105°F 130 steam 150 heavy violent blow.
9:10 PM	180 very violent.
9:11 PM	183 high, 180 blow reducing.
9:12 PM	N-Pit 4.0
9:12 PM	Blow reducing little water 175°F.
9:13 PM	Dying - Dead.
9:13 PM	450 psi stand pipe on air.
9:15 PM	Circulated pipe 7 ft.
9:18 PM	500 psi stand pipe.
9:15 PM	Stand pipe <del>800</del> 800 psi.
9:32 PM	Stand Pipe <del>580</del> 580 psi.
9:34 PM	Moderate blow 130°F
9:37 PM	Better Blow 150°F
9:39 PM	Very Violent Blow 175°F
9:39 PM	Very Violent Blow 212°F
9:40 PM	Very Violent Blow 212°F
9:41 PM	Very Violent Blow 225°F
9:43 PM	Flow Test #1 Sample 225°F
9:52 PM	202°F Blowing mostly steam w/ 1/2 water, considerable foam.
9:55 PM	N-Pit 4.8 Heavy Faom.
9:59 PM	S-Pit 4.6
10:01 PM	200 psi stand pipe.

TIME

10:06 PM 190°F Steady blow overall w/some fluid pulses.

10:10 PM Circulated pipe 8'. Call start of steady state at 10:15 PM.

9:50 PM Two air compressors going <sup>1920</sup>~~2,400~~ cfm @ 275 psi S.P. <sup>2400 X .8 eff.</sup>

9:51 PM One compressor taken off <sup>960</sup>~~1,200~~ cfm @ 235 psi S.P. <sup>1200 X .8 eff.</sup>

10:00 PM Foam pump ran dry, psi dropped to 195.

10:12 PM 195 psi S.P. with foam pump running again for 5 min.

10:15 PM Blow down considerably, does not blow to edge of <sup>delta</sup>~~data~~.

10:15 PM Starting 10 hr. test now.

10:15 PM Blow reviving very vigorous again, drop problem due to failure of foam pump. Steady state started @ 10:15 PM.

10:20 PM 200 psi S.P. pressure.

10:32 PM 190°F - Blow.

10:47 PM 180°F - reduced somewhat

10:48 PM 200 psi S.P.

10:50 PM Flow Test #2, 185°F.

11:00 PM Shut foam pump off, air rate 1,000 5 cfm +

11:05 PM 192°F Blow irregular 5.0 Knots N-Pit

11:10 PM 200 psi S.P.

11:28 PM N-Pit 4.8 Knots (1 Knot - 0.5 feet).

11:45 PM 191°F Flow Test Sample #3, still soapy but less so.

11:55 PM 175 psi S.P.

12:00 AM 191°F Steady Blow.

12:01 AM N-Pit 4.8 Knots. UNCHANGED

12:08 AM 4.1 Knots in S-Pit,  $4.6 + 4.1 = .2.5$  ft., <sup>from measurements of pits</sup> assume <sup>58</sup>~~58~~ bbl./0.1 ft in S-Pit <sup>76</sup>~~125~~ bbl/2 hr. 10 min. = <sup>190</sup>83 BBL/HR.

TIME

12:20 AM Circulate Pipe 8'.

12:45 AM Flowing Test Sample #4 191°F.

1:05 AM S-Pit 4.0 Knots N-Pit 4.8

1:10 AM 170 Psi S.P. Blow-Steady.

1:37 AM 191°F N-Pit 4.5

2:27 AM N-Pit 4.3, 4.5 - 4.3 = 0.2 Knots = 0.1 ft./50 min. = 124 bbl./50 = 149 bbl./hr.

2:30 AM 191°F Flowing Test #5

2:31 AM 170 psi S.P.

2:45 AM S-Pit 3.8 Knots, 4.0 - 3.8 = 0.2 knots = 0.1 ft./100 min. or 76 bbl./ ~~3~~ 100 min. = 45.6 bbl./hr.

2:45 AM Blow holding steady.

3:50 AM N-Pit 4.0, S-Pit 3.6

3:58 AM 160 psi S.P. Blow steady.

4.02 AM 191°F

4:10 AM Flowing Test Sample #6.

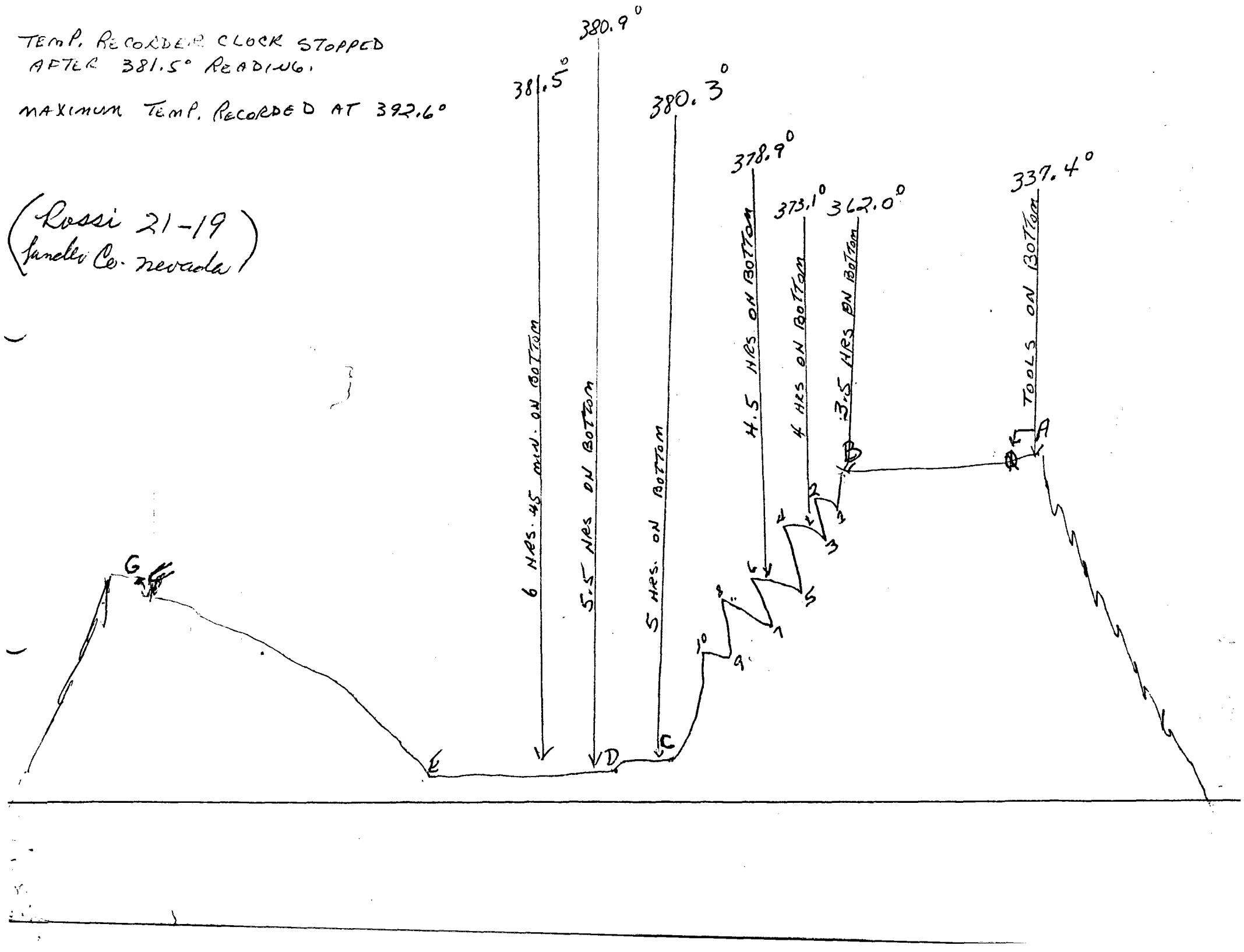
4:30 AM Shut off air closed pipe rams have leaks. Closed blooie line valve - stopped leaks - opened pipe rams SI for final build-up.

8:30 AM Cooled well - started pulling.

TEMP. RECORDER CLOCK STOPPED  
AFTER 381.5° READING.

MAXIMUM TEMP. RECORDED AT 392.6°

(Rossi 21-19)  
Lundell Co. Nevada





Pressure Readings between points  
A to B using Point A as zero starting  
Point:

0 (Point A) - 2087.2

15 min. - 2063.0

30 min - 2046.9

45 min - 2041.2

60 min - 2033.9

75 min. - 2018.2

90 min. - 2016.9

105 min - 2002.4

120 min - 1993.9

135 min - 1989.1

150 min - 1974.5

165 min - 1974.5

180 min - 1972.5

195 min - 1968.5

210 min - 1966.1

Pressure Readings at Points  
1 through 10

1. - 1413.7

2. - 1439.2

3. - 1074.6

4. - 1258.7

5. - 922.0

6. - 1006.7

7. - 643.4

8. - 820.2

9. - 696.7

10. - 723.3

# Pressure Readings between

## Points E - F

0 (Point E) - 58.3	23 min - 238.8
1 min - 131.0	24 " - 244.9
2 " - 132.7	25 " - 250.9
3 " - 140.0	26 " - 253.3
4 " - 144.3	27 " - 261.8
5 " - 144.3	28 " - 264.2
6 " - 144.3	29 " - 270.3
7 " - 152.8	30 " - 276.4
8 " - 152.8	45 " - 376.9
9 " - 154.0	60 " - 492.0
10 " - 155.2	90 " - 766.9
11 " - 156.4	120 " - 989.8
12 " - 158.9	150 " - 1257.5
13 " - 167.3	<del>180</del> " - 1324.1
14 " - 177.0	<del>210</del> " - 1345.9
15 " - 183.1	240 " - 1524.0 (Point F)
16 " - 185.5	
17 " - 191.6	
18 " - 201.3	
19 " - 207.3	
20 " - 212.2	
21 " - 218.2	
22 " - 225.5	

Reading at Point G just before  
starting out of hole = 1629.9

Production

Specialists

# AGNEW and SWEET

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Bakersfield, California 93308

24-Hour Phone: 327-2267

## SUBSURFACE SURVEY

### Field Work Sheet

OWNER	1041	FIELD		WELL NAME	
CASING		ELEV.		DATE:	
LINER DESCRIPTION:				ZERO POINT	
				DEPTH	
TUBING DETAIL:				ZONE	
PUMP SHOE		GAS ANCHOR		INTAKE	
PURPOSE					
REMARKS:					
ELEMENT	SERIAL NO.	CLOCK	TURN	STABILIZATION PERIOD	
ENGAGE STYLUS		DISENGAGE STYLUS		GROSS OIL RATE B/D	
OBS. TBG. PRESS.		OBS. CSG. PRESS.		NET OIL RATE B/D	
COR. TBG. PRESS.		COR. CSG. PRESS.		FORMATION GAS MCF/D	
PICKUP @	TIME ON BOTTOM	MAX. °F		GOR CFT/BBL.	
WELL STATUS				CIRCULATED GAS MCF/D	
SHUT IN:	ON PRODUCTION:			OIL DRY GRAVITY °API	
				BEAN SIZE	

TIME	DEPTH	DEFL.	FT	GRAD.	/D	TIME	DEPTH	DEFL.	FT	GRAD.	/D	TIME	DEPTH	DEFL.	FT	GRAD.	/D	
0		—				← LOADED RECORDER - CLOCK STARTED 11:45 AM												
1/2 HR		—				← TOOLS MADE UP - 12:45 A.M.												
1 1/2 HR		—																
2 1/2		—																
2 1/2		.022	87.2															
3		.078	106.4															
3 1/2		.242	159.0															
4 HR		.561	256.3															
4 1/2		.826	334.5															
5 HR		.836	337.4			← REACHED BOTTOM →												
5 1/2 HR		.842	339.1															
6 HR		.850	341.5															
6 1/2		.853	342.3															
7 HR		.857	343.5															
7 1/2		.860	344.4															
8 HR		.810	329.9															
8 1/2 HR		.921	362.0															
9 HR		.959	373.1															
9 1/2		.979	378.9															
10 HR		.984	380.3															
10 1/2 HR		.986	381.9															
10 HR 45M		.988	381.5			← 10 HRS - 45 MIN - CLOCK STOPPED												
						MAXIMUM TEMP. WAS 392.6°												

COMMENTS:

BY:

Pressure Reading at Point C - 138.3  
" " Point D - 112.8

Points D-E - 15 min Intervals

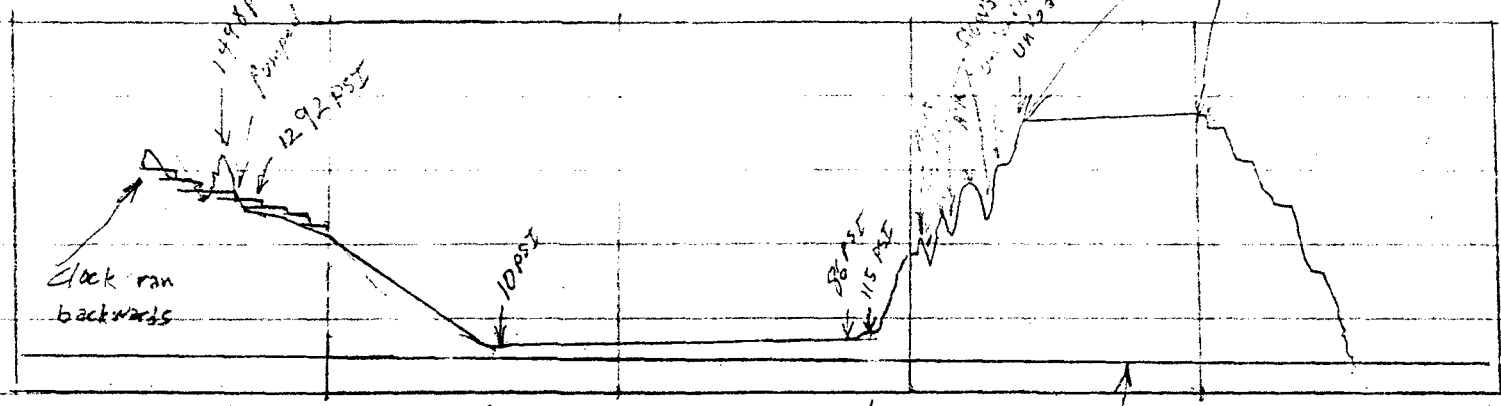
0 (Point D) - 112.8	210 min. - 62.0
15 min. - 131.0	225 " - 60.7
30 " - 122.5	240 " - 60.7
45 " - 118.9	285 " - 60.7
60 " - 122.5	300 " - 60.7
75 " - 128.6	315 " - 58.3
90 " - 114.0	330 " - 58.3
105 " - 80.1	345 " - 58.3
120 " - 72.9	360 " - 58.3
135 " - 68.0	
150 " - 66.8	
165 " - 66.8	
180 " - 64.4	
195 " - 62.0	

Pressure in well at 5000'

cycle  
top recorder

Top recorder

T 837



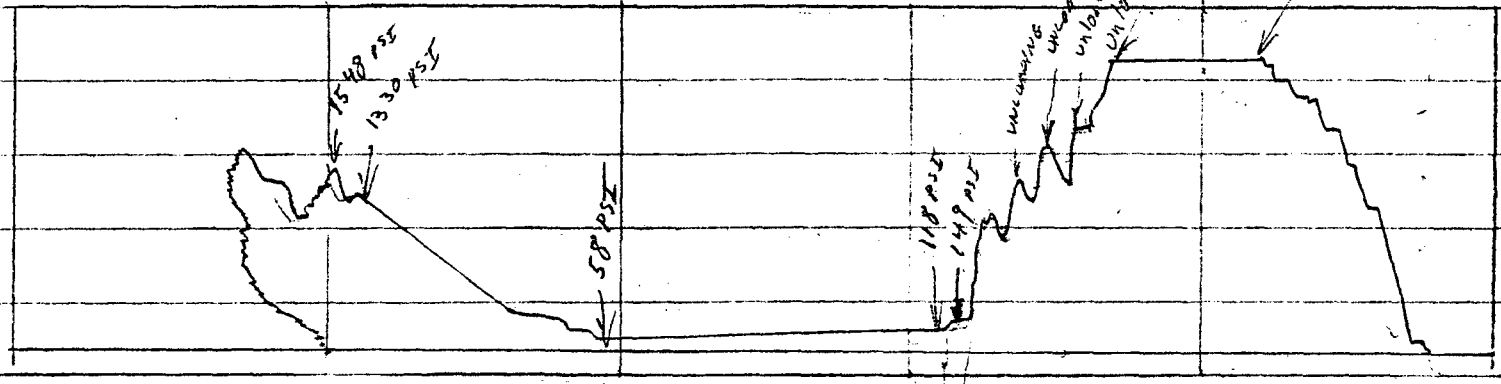
Shut in

Flow test w/ air and foam

Base line

T 948

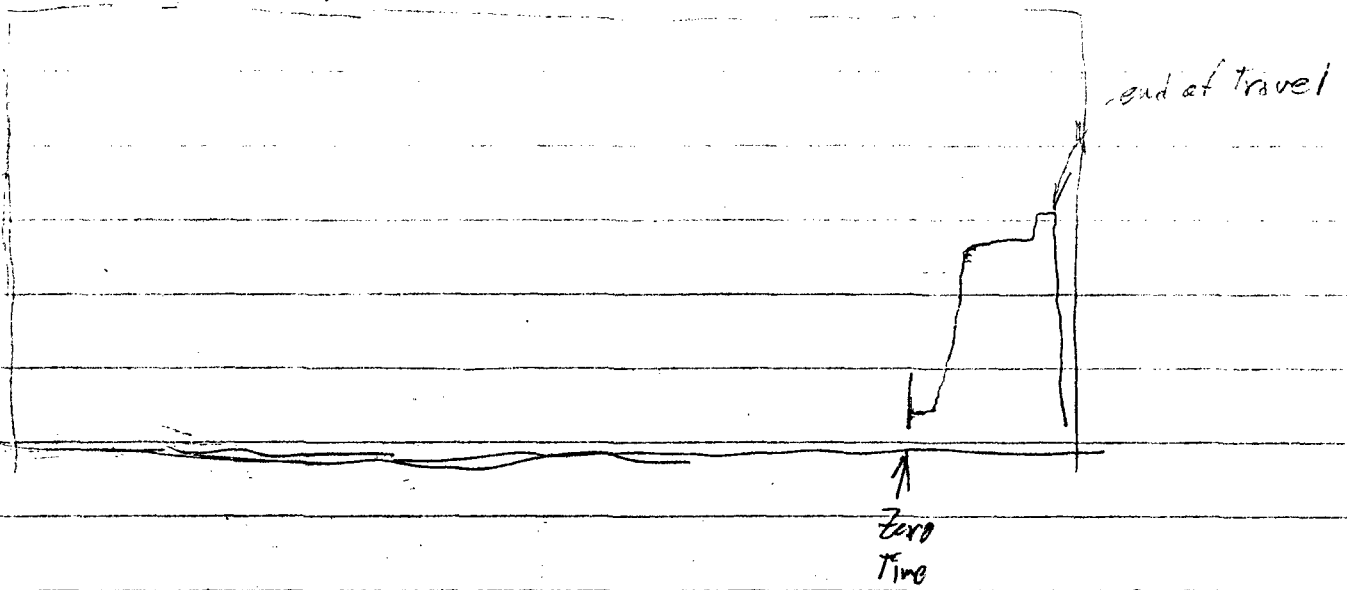
Second recorder



air only

foaming

# Temp chart



Started the ~~chart~~ chart near the bottom of  
the travel only partial coverage

No base line scribed for temp.

SKYLINE LABS, INC.

SPECIALISTS IN EXPLORATION GEOCHEMISTRY

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*Bona fide*  
*Well Rossi 21-17*

REPORT OF ANALYSIS

Job No. 120366  
Shipment No. 1  
January 15, 1977

Chevron Oil Company  
Minerals Staff  
Attention: Roger Allmendinger  
P.O. Box 3722  
San Francisco, California 94119

Analysis of 12 Water Samples

Item	Sample Number	Na (mg/l)	K (mg/l)	Ca (mg/l)	Mg (mg/l)	Al (mg/l)
1.	#1	460	52	79.	18.	59.
2.	#2	370	41	24.	6.1	17.
3.	#3	350	42	13.	6.3	18.
4.	#4	330	42	11.	7.0	19.
5.	#5	330	40	7.1	3.7	12.
6.	#6	320	39	6.9	4.0	11.
7.	Sump Water	460	60	72.	74.	220.
8.	2908 Feet	220	22	24.	12.	5.0
9.	Flow Test A	180	18	30.	8.9	<.1
10.	12/1/76 @12:55	360	60	52.	30.	70.

Item	Sample Number	Li (mg/l)	Mn (mg/l)	Fe (mg/l)	U (ppb)	As (mg/l)
1.	#1	2.6	.34	18.	2	<.05
2.	#2	2.2	.06	5.3	<2	<.05
3.	#3	2.4	.05	6.0	<2	<.05
4.	#4	2.4	.06	6.5	<2	<.05
5.	#5	2.3	.04	3.8	<2	<.05
6.	#6	2.3	.05	4.0	<2	<.05
7.	Sump Water	2.4	.41	78.	8	.05
8.	2908 Feet	1.4	.05	4.5	<2	.09
9.	Flow Test A	1.1	.09	2.0	<2	<.05
10.	12/1/76 @12:55	2.2	.23	18.	2	<.05



Item	Sample Number	B (mg/l)	F (mg/l)	Cl (mg/l)	CO <sub>3</sub> (mg/l)	HCO <sub>3</sub> (mg/l)
1.	#1	2.8	10.	740	50	70
2.	#2	2.2	14.	140	65	36
3.	#3	1.9	15.	85	85	42
4.	#4	2.1	15.	110	95	32
5.	#5	2.1	16.	100	80	80
6.	#6	1.8	16.	110	55	16
7.	Sump Water	.8	14.	140	6	305
8.	2908 Feet	1.6	3.7	36	<2	355
9.	Flow Test A	1.1	3.5	32	<2	180
10.	12/1/76 @12:55	1.8	15.	140	26	24

Item	Sample Number	pH	TDS (mg/l)	Specific Conductance (micromhos/cm)	SO <sub>4</sub> (mg/l)
1.	#1	8.7	1,400	2,190	350
2.	#2	9.3	1,050	1,620	500
3.	#3	9.4	970	1,490	450
4.	#4	9.5	960	1,480	450
5.	#5	9.4	900	1,390	400
6.	#6	9.5	880	1,360	400
7.	Sump Water	8.3	1,100	1,710	350
8.	2908 Feet	7.5	640	991	100
9.	Flow Test A	8.1	570	878	35
10.	12/1/76 @12:55	9.0	970	1,490	150

Item	Sample No.	Cu (mg/l)	Pb (mg/l)	Zn (mg/l)	Ag (mg/l)	Ba (mg/l)	Br (ppm)	I (ppm)
1.	#1	.06	<.005	7.4	<.01	.4	<.1	14.
2.	#2	.02	<.005	3.5	<.01	<.1	<.1	9.8
3.	#3	.01	<.005	.70	<.01	<.1	<.1	1.5
4.	#4	.01	<.005	.70	<.01	<.1	<.1	1.0
5.	#5	.01	<.005	.66	<.01	<.1	<.1	1.3
6.	#6	<.01	<.005	.61	<.01	<.1	<.1	.9
9.	Flow Test A	<.01	<.005	.06	<.01	<.1	<.1	.2
10.	12/1/76 @12:55	.03	<.005	4.5	<.01	.6	<.1	8.8

Item	Sample Number	SiO <sub>2</sub> (mg/l)
1.	#1	65.
2.	#2	42.
3.	#3	42.
4.	#4	95.
5.	#5	45.
6.	#6	46.
7.	Sump Water	110.
8.	2908 Feet	17.
9.	Flow Test A	13.
10.	12/1/76 @12:55	47.
11.	Distilled A	<.5
12.	Rossi #1 Distilled	<.5

*Charles E. Thompson*  
 Charles E. Thompson  
 Chief Chemist

NU - Beowawe  
 Rossi #21-19  
 12-8-76

WELLSITE GEOLOGIST  
 ROSSI 21-19 DRILLING RECORD

Date	Bit # Type		Watson/Parnow
10/4	#1 12½ 2JS Smith	Mousehole (15') & Rat Hole (30')	
10/5	#2 17½ 2JS Smith	Spud 200' downing	
10/6		Reaming 26" hole 20" casing to 200'	200'
10/7		Cement casing	
10/8		Nippling up; Tested casing w/30 PSI: Tagged cement @135'; Removed two joints of tubing from being cemented in hole; stab into fish	
10/9	#2	Fishing; Pull fish out w/overshot; Test BOP to 200 PSI	
10/10		Drilling out cement - hit formation	
10/11		Drilling	549
10/12	#2 17½ 585 Sec	Drilling; Direction Survey (664'): 3½° N67½E Drilling - pulled out to change bit Survey (732') 4½° N63½E	
10/13		Drilling	924'
10/14		Drilling; Survey (1002'): 3½° N78½E ① Survey (1219): 3½° S86½E	
10/15		Drilling	1576'
10/16	#3	Drilling; Survey (1596') 1½° S64½E	
	#2	Bit change @1688'	1714'
10/17		Drilling; lost circulation (1930-1953') pulled out; lost 50 barrels in 30 minutes Lost 30" of fluid in one hr (?)	
10/18		Raise viscosity - mixed lost circulation material set up for logging; Welox logged	2000'
10/19		Started to run 13 3/8" casing	
10/20		Fighting lost circulation with 13 3/8" casing in hole → casing to 1870'	
10/21		Casing to 2000; cement; clean cellar	
10/22		Welding on well head; nippling up	
10/23		Nippling up: Test BOP 2000 PSI	
10/24	#1	✓ Test casing to 1500 PSI Hit cement @1947' Tagging cement	
10/25		Drilling out cement; Total footage	2239
10/26		Drilling	2368
10/27		Survey @2510' 3 1/4° N71½E 2510' pulled out of hole	
10/28	#4 12½" 586 Sec	Drilling; Tripped @2705' because of change to air. Put in cement plug @ 474' (100 linear ft) Tagged cement @400'	2585
10/29		✓ Nippling up ; Test BOP 2000 PSI Drilling cement @400'; (Went back to mud because they couldn't get through the rotating head with bit or the rotating table w/rotating head	

WELLSITE GEOLOGIST  
ROSSI 21-19 DRILLING RECORD (Cont'd)

<u>Date</u>	<u>Bit # Type</u>		<u>Watson/Parnow</u>
10/30	#4	Trip to unplug bit Drilling to 2865'	2865
10/31		Drilled to 2908' - tripped due to plugged bit again → back in ← 3 stands in hole → pulled out; switching to air changed table to 27"	2908
11/1	#5 12½ 3JS Smith	Nippling up for air Hooking up air equipment Hit bridge going in (2100' - 2146') Reamed hole to 2908' Drilling with foam to 2941' → STUCK Waiting for fishing tool (Note: Making considerable water while drilling)	2941
11/2		Back to mud for fishing Mixing mud to fill 13 3/8" casing w/mud since drilling w/air	
11/3		Backed off top float & 3 joints Shoot pipe off above 2nd float	
11/4		Pulled 11 joints off of 2nd float which left 345' off the fish (waiting on wash pipe to come up) Cut on the fish w/outside cutter to get second float Broke the cutter	
11/5	#6 12½ M4N6S Sec	Waiting for new tools & outside cutter Cutter arrives - cut pipe @ 432 - Jarred on fish - got all but 90' - (left top stabilizer down in hole ≈ 90' of it)	
11/6		Top of fish = 2852' 2316' - 2852' reaming hole Tried to screw into fish	
11/7		Ran in hole with wash over pipe milling to stabilizers Changed mills	
11/8		Milling; change shoe on wash pipe In & out of hole	

WELLSITE GEOLOGIST  
ROSSI 21-19 DRILLING RECORD (Cont'd)

<u>Date</u>	<u>Bit</u>		<u>Dep.</u>
11-9	#6	Top of fish @ 2852 Milling on Junk @ 2898; P.O.H.; RIH; Work over top of fish; Milling; Circulate; POH; lay down lots wash pipe; lay down jars & pick up jars - Run in hole w/overshot; Fishing POH, chain out of hole; Overshote came unjacked 1/2 POH Running in hole; jaring up on fish	
11-10		Jar on fish; chain out of hole - wet - tight break Lay down fish - D.C. - MC - S.sub Lay down fishing tools S.sub-4 stab XO's Bumper sub - Jars Make up B.H.A. RIH; RIH to shoe & circulate 2382 circ. Run to 2662 1/2 circ & C.O. bridge; circ 1/2 RIH to 2947 w/Junk basket; circ Drill; circulate - survey 3-1/4° Lagtime	2957
		5" x 12-1/4 annulus = .1215 bbl/ft  .1215 x 2957 ft = 359.28 bbl  Pumping 400 gal min ÷ 42 gal/bbl = 9.52 bbl/min  $\frac{359.28 \text{ bbl}}{9.52 \text{ bbl/min}} = 37.7 \approx 38 \text{ min up time}$	
11-11	#7 12-1/4 S-86 SEC	New bit 2957; POH & change bit Make up drilling assembly; RIH; cut drill line; RIH; Rubber D.P; Reaming getting iron from under bit; Drilling; work on Kelly; new gasket on Gods neck; Drilling; Drilling; circulate; Fix mud lines; Drill; Fix Pump #1; Drill.	3070
		3488 <u>2957</u> 531 ft. → #7	
11-12	#7	Drill; at 12:00 noon pulled 2 stands - Repaired Swivel Survey @ 4:00 p.m.; Drill Weight on bit 40,000 Pump pressure 1000	3308
11-13		Drill; Drill Break @ 3415; Drill; Circulate & Run survey - 2°45'; P.O.H; Change Bum Subs; Fix float & handling bottom hole A99 R.I.H & Pull rubbers off of pipe	3488
11-14	2957- 3488	R.I.H. Reaming to 3488. took weight at 3463. Tourqued up and backed off at 704. Pulled 7-1/3 stands of D.P. waiting on fishing tools. Pick up fishing tools; make up fishing tools. R.I.H; RIH 1/2 overshot into fish. P.O.H. 1/2 change overshot 1/2 P.O.H. 1/4; change overshot 1/4, R.I.H. 1/4 screw into fish 1/4 change overshot 3/4 R.I.H. 1/4 Screw into fish; Jar on fish 1/2; P.O.H 1/2 Break down fishing tools; Lay down fishing tools; P.O.H. (chain out)	
	#8 12-1/4 S-88 SEC	P.O.H w/chain; Change Bits; Lay 4 sts HW & Laving down; Bent drill pipe	3488

<u>Date</u>	<u>Bit</u>		<u>Dep.</u>
11-15	233 ft/24 hr	Pick up drill pipe; RIH; Fill pipe; Reaming to bottom; drilling 10'/hr.	3488 3721
11-16	#8 #9 12-1/2 S-88 SEC	Drill; Survey @ 3842 1°45'; P.O.H. Change bit; Run-in-hole; Ream 3800 + 3902 #8 total + 233 ft.	3902
11-17	#9	Drill 3902 to 4126 Weight or Bit 1000# 45	4126
11-18	#9 12-1/4 SEC S-88 #10 12-1/4 SEC S-88	Drill; P.O.H.; Mag Flux D.C. & H.W. Lay Down Change bit; Magna Flux, R.I.H.; Tight Place @ 3045; Ream to 3175; R.I.H. to 3480 Tight. Ream 3480; R.I.H. to 4100 - Ream to Bottom; Drill Total on #9 4136 3902 = 234 ft total	4136
		W = 68; V = 55; L = 53	
11-19		Drill & Rig; V = 53; W = 69	4343
11-20	Total on #10 221'	Drill; Circ. for trip; P.O.H.; waiting on Slumberger; Logging: Dual Induction, Sonic, Gamma Caliper; Dip meter; (Hole stayed full)	4357
11-21	R.R. 9 12-1/4 SEC	Dip meter log; Lay out tools; Make-up B.H.A. R.I.H. Strap in 1/2; Circ. & condition mud; Condition & Build volume to 60 vis; P.O.H. w/plugged bit; slip & cut drill line; R.I.H.; ream to bottom; No fill 1/2 circ. to run pipe; circ; P.O.H. Pull to shoe - measure csq. Rig up to run csq. R.I.H. P.O.H.	
11-22		Rig up to run casing; Run casing; Make-up cement tools; Run 9-5/8" liner & hang same @ 1791'; Cement liner; P.O.H.; Cond. mud; Hang 9-5/8" intermediate string - top 1971; bottom 4369; 1251 cubic ft. of slurry as per program Pressure tested lap @ 1500 PSI; Laid down drill collars; 12-1/4" hole - 8" collars. Run in hole w/12-1/4" bit; Tag cement @ 1450'; C.O. Cmt; unplug flow line; Lay down D.P. out of Drk.	
11-23	#11 8-3/4" SEC M-88	Depth: 4370; Drilling Setup: 8-3/4" Bit, Bit Sub 3- 6-1/4" DC's = 88', XO, 13 Ks Huy wt DP, 5" D.P. Drilling fluid = IMCO Gel Water Cmt Cut  Finished lay down 8" D.C.'s & wait on contractors 6-3/4" D.C.'s. SOCO Air Crew Set in Air Buster. Start in Hole w/D.P. Unplug Bit. Drill out cement in liner 1791 - 1836' (45' Cmt. in top of liner) Change over to water. Dumped mud into sump. R.I.H. to 4152'	

11-24 #11 Depth = 4370. Drilling setup -8 3/4" Bit; Bit sub w/Float, 6-6 1/4" D.C.'s - 176', 382 HVY wt, 5" D.P. w/Top float sub.  
 Drilling fluid IMC water; cont. c/o cmt in 9-5/8" intermediate string 4152-4321'  
 Drill out float collar @ 4321', cmt 4321-4369'  
 Drill out shoe @ 4369', c/o cement 4369-4370'  
 Drill 8-3/4" hole with Bit #11, 4369-4385'  
 P.O.H. Removed Pitcher nipple & installed Grant High Pressure Rotating Head, Picked up additional 6-1/4" D.G.'s  
 Tested operation of BOP  
 RIH, Removed CSG Protector rubbers F/D.P. Displaced water in hole & attempt to dry up the hole  
 2:30 am 5:45 Hole would not dry up  
 Start Foam circ. Good returns @ 6:45 am  
 Reamed to bottom @ 7:00 am  
 Used 20 Bbls of soap solution w/20 gal soap std. Pipe press 100-320 PSI

11-25 #12 8-3/4" From 4370 to 4915: 545 ft. in 17-3/4 hrs.  
 SEC S-88 wt on bit 25 - 1000#, 40 RPM  
 Drilling setup - same  
 30.7'/hr. Foaming; Air Dlg. Started Dlg. 8-3/4" hole w/foam @ 7:45 am Drilled 8-3/4" hole 4370 - 4915 @ 7 am  
 Fluid rate @ 12 noon = 5 gal. in 8-1/2 sec = 4445'  
 Temp 170 F/Blooe line  
 Conductivity of foam solution in 2400 cm/ohms out 1200 cm/ohms  
 Make up water ----- 900 cm/ohms  
 Water in F/Gysers = 23 gpm  
 4529 Temp = 178°F  
 @ 4898 - 4905 Torque built up & temp increase water 5 gal. 4.9 sec = 61 gal/min

11-26 #12 From 4915 to 4951 35' in 2-1/4 hrs.  
 #11RR Drilling fluid - foaming Ado Foam BF-1  
 8-3/4" Temp. 190° while unloading hole  
 SEC M-88 182° @ 4921 while reaming hole  
 cont. foam Dlg. F/4915 - 4950' @ 9:15am  
 Bit torqued up. Pulled Bit #12 (565' in 12 hrs)  
 † Left all cones & bearings in hole  
 @ 850' cooled well down by pumping  
 75 bbls of cold water down D.P.  
 Ran in w/RR Bit #11 to 4750'  
 7pm start unloading w/800 PSI & Rig  
 Pump - Pump trying to freeze up. Foam lines froze & water line to rig burst  
 Circ w/air while working on water line & thawing out sump pump.  
 10 - 10:30pm fill pipe w/foam  
 Reamed out of gage hole 4737 - 4921 @ 7am (used sump water for foam solution)  
 Total on #12 545 ft  
 + 35 ft  
 580 ft in 20 hrs.

Date	Bit	Dep.
11-27	#11RR 8-3/4" SEC M-88	Drilling Setup: 7" magnet, 6-6 1/4" DC's, 13 Jts Hvy wt. 5" D.P.
	#7 Midway Fishtool magnet	Drilling Fluid: Soco Foamers 3 - 8-3/4" Bit cones in hole (Temp -10°) Cont Reaming 4921 - 4950' Pumped 50 Bbls cold sump water down D.P. w/soap pump. Pulled to shoe. Blew Kelly & Air lines dry. Pump cold water down D.P. Removed rotating head. Co. men chg. top & bottom seal rubbers. Pull D.P. till Rig Air lines froze up Thawed out air lines & added 2 gal alcohol to system (had been using 1/day) Finished P.O.H. RIH w/magnet Found 25' of fill 4925 - 4950' Pull 12 stds & pump 1000 PSI Air down well Well started unloading @ 7am
11-28	8-3/4" Midway Junk Mill	From 4950 - 4952 - 2ft. Drlg. Fluid Hutch's Foamers Unloaded well. RIH F/3834 - 4925' w/magnet c/o fill 4925 - 4950'. Circ. hole clean w/ Foam. P.O.H. Recover one cone in 4 pieces, 2 additional pieces & bit bearings RIH w/8-3/4" Flat Bottom Junk Mill Unload well @ 2922' Worked & reamed to bottom Hit Bridge @ 4400' & rotated & slid to 4950 w/out circ. Unload well @ 4950' w/Foam Mill F/4949 - 4952' Pump 50 Bbls sump water down D.P. Thaw out Tongs & Elevators POH @ 7:00am
11-29	#13 8-3/4" SEC S-88 11 hrs. 285'	From 4952 to 5237 → 285' in 11 hrs. 25# wt. on bit Drilling setup 8-3/4" Bit, Bit sub w/Float, 6 - 6-1/4 DC's, 13 Jts Hvy wt. Drilling Fluid: Soco Tech. Dev. Group Temp. @ 7am : 200° Stnd Pipe Press. 320 PSI w/20 Gpm Finish POH w/8-3/4" Flat bottom Junk mill. (Mill 9/16" undergage) RIH w/Bit #13 Install High Press. Circ. Head Unload hole @ 3650'. Reamed hole 4900 - 4951' Unload hole & chg. to Foam - Temp 212° Worked by Junk Drilled 8-3/4" hole 4952 - 5237' @ 7:00 am (5254' @ 8am) Worked on Grant HP while Plg. Steam leaking by strippers. Closed hydrill bag while making conc. Had 14' fill on con @ 5009'. None thereafter Dlg. in Fractures. Bit torques up then falls free up to 2'. Sump out flow 9:00 am 5 gal/18 sec = 16.6 gpm 11:30 pm 5 gal/28.5 sec = 10.5 gpm = 360 B/D Imput - 20 gal/min = 686 B/D



<u>Date</u>	<u>Bit</u>	<u>Dep.</u>
11-30	#13	#5237 - Weight on bit 25 (1000#) 45 RPM
	#7 Midway Magnet	5260' ft - 23 ft in 2 hrs Drlg. Fluid: Soco Tech Group
	#14 8-3/4" SEC S-88	Detail: Cont Dlg. 8-3/4" hole 5237 - 5260' Pumped 50 Bbls sump water down D.P. w/ soap pump, 50 bbls down csg. Removed Grant High Pressure Head. Overhauled same & replaced P.O.H. Shucked off 1 cone & left same in hole. Shucked off 1 cone & left same in hole Top & bottom seal rubbers RIH W/7" Magnet Circ down to junk, Rig pump now thawed out P.O.H. chained out. Recovered cone & bearings RIH w/bit #14 Unload Hole @ 5060', Tight spot. Used Air & Rig pump 5:15 am/ reamed 5060 - 5260' 7:30 start dlg. ahead bit #13 308' in 13 hrs. Dlg & run on junk Lost 1 cone POH Bearings out of 1, & 1 cone flat
12-1	#14	5260 weight on Bit 25000 45 RPM 5506 246 ft in 8 hrs.
	#15 8-3/4 Hughes V 33 Jets out	Drlg Fluid Soco Tech Div. Group Foam Temp. 195 - 200°F Drilled 8-3/4" hole 5260 - 5405 - 4 hr. rotating on bottom Pumped 65 Bbls of Sump Water down D.P. & 50 Bbls in ANNULUS to kill blowing steam P.O.H. Replaced Seal 'O' Ring in lower half of rotating head R.I.H. with Bit #15 Unloaded well at 5095' where bit took wt. w/air & rig pump Reamed 5095 - 5405' (1-1/2 hrs 304') Drilled 8-3/4" Hole 5405 - 5506 (101' in 4 hr. 10 min #15) @5500' Replaced Gray loc union bolt on rotating head 1 hr 20 min
	#14 4 hr. 145'	Drill 6' in 1/2 hr while unloading slug of water Rates of Fluid production measured at outflow from upper pit to lower 9am 5300' 25 gpm; 11am 5350' 50 gpm; 1pm 5400' 75 gpm;  12-2-76 12:30am 5410' 35 gpm; 3:20am 5470' 75 gpm

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Wellsite Geologist

Rossi 21-19 Drilling Record (Cont'd)

<u>Date</u>	<u>BIT</u>	<u>Depth</u>
	#15 reamed 304' - 1 1/2 hr. drilled 101' 4hr. 10 min.	
12-2-76	#16 Boiler working this morning Drilling with SOCO Tech. group foam P.O.A. w/Bit #15	5506
	Hughes - R.I.H. to 5367 and unloaded well	
	J33 Reamed Hole S412-5506	
	#2F871 - Drill 8 3/4 hole w/Bit #16 5506-5686 Jets Out	
12-3-76	#16 1:40 AM 5538' 190 psi st. p -190°F out 5 gal/5 sec = 60 gpm 180' - 6hr. 4:00 AM 5588' 180 psi st. p -202°F out 5 gal/4 sec = 75 gpm 5:15 AM 5631' 180 psi st. p -200°F out 5 gal/4 sec = 75 gpm 7:30 AM 5686' halted drilling - Quartz becoming less abundant and more milky - No Euhedral grains of quartz seen - conclusion we have drilled through the fault and are going into the foot wall. Probably little chance of encountering another fracture while this bit lasts. Can't afford to make another bit run to change bits. Bruce wants to pull this bit anyway.  Cooled down well pumped 65 Bbls sump water down D.P. & 50 Bbls. in annulus.  Pulled 3 Stands - well started to flow Accumulator would not work - flooded road  Picked up Kelley and pumped 100 Bbls down DP. P.O.H. Rigged up Schlumberger (measured out of hole 5680' depth - 6' diff. Ran Dil Log and Recorded 4974-5678' max temp 372°F Too hot for tool but got recording although burned off the fiberglass wrapping. Closed CSO and pumped 720 Bbls of 62°F. water down hole at 800 and 650 psi. Ran dip meter and recorded 4375-5680'-379°F, 379°F. Pumped 213 Bbls in hole to cool well	flow flow flow

12-3-76 (Cont'd)

Ran sonic log 4374 - 5682' 381°F, approx. 425°F,  
(second therm. offscale). *ONLY RAN TWO*  
Ran CNL & FDC 4374 - 5680' 393°F, 381°F, 382°F.  
Temperature damaged DIL, DIP Meter, sonic, CNL and  
gamma. FDC OK. Gamma log only partial recording.

12-4-76

Loaded out schlumberger  
Worked on accumulator  
3 hr. to lay down 6 6" D.C.  
Make up Johnston test tools on 5" D.P.  
R.I.H. to 5000'  
Unload hole w/air and rig pump @ 6:30 PM  
See detailed notes on test.  
Foam 1 hr. then went to air  
10:15 PM well stabilized

12-5-76

4:30 PM Shut well in for 4 hr. F.S.I. till 8:30 AM  
Test interval 4369' to 5686' in 8 3/4 hole  
Temp. recorder chart was assembled backwards  
resulting in incomplete temp. recording  
RIH 10' of fill  
Rig up and lay down 5" DP.  
Rig up and ran 2 7/8 GST tubing.

12-6-76

Ran 173 Jts of tubing  
Landed @ 5594' Rechecked meas. = 5597'  
Removed grant high pressure head and DLG spool  
Removed Class III BOPE  
Installed X-mast tree  
12" - 3000# studded adaptor FLG, 3" steam  
gate w/Bull plug.  
Released rig and crew @ 1:00 AM December 7, 1976.

## Temperature Information Written on Sample Bags

INTERVAL	IN	OUT	INDETERMINATE	INTERVAL	IN	OUT	INDETERMINATE
240 - 254	88	90		1845-1877	$\frac{110}{110}$	$\frac{112}{114}$	
254 - 285	86	90		1877-1909	$\frac{113}{114}$	$\frac{115}{116}$	
285 - 315	90	94		1909-1939			117
315 - 343	90	94		2175-2180			102
478 - 497			99				105
505 - 520	162	107		2305-2335			110
535 - 549		105		2476-2491			118
667 - 691	92	102		2491-2510		118	
775 - 805			115				
805 - 835			118				
835 - 863			118				
865 - 895			116				
1225 - 1255	111	111					
1255 - 1285			110				
1285 - 1315			110				
1315 - 1345			110				
1420 - 1438	$\frac{104}{106}$	$\frac{110}{110}$					
1452 - 1469	$\frac{106}{108}$	$\frac{106}{110}$					
1485 - 1501	110	112					
1501 - 1531			111				
1531 - 1561			118				
1610 - 1625	108	110					
1625 - 1659	-	106					

ROSSI 21-19  
AIR IN AND OUT TEMPERATURES

<u>Grab Interval</u>	<u>Temp. In</u>	<u>Temp. Out</u>	<u>Grab Interval</u>	<u>Temp. In</u>	<u>Temp. Out</u>
4403	51	150	5058		190
4418	51	160	5073		190
4433	51	178	5080		180
4448	51	182	5097		195
4463	51	182	5116		207
4478	51	185	5127		195
4493			5142		200
4500			5158		200
4525			5173		195
4553	50	172	5189		200
4561	50	170	5205		205
4576	50	169	5223		210
4591	50	170	5236		198
4607	51	171	5251		200
4622	51	171	5260		203
4637	51	171	5285		200
4655	50	170	5300		198
4670	50	170	5330		198
4685	55	171	5346		195
4693	55	180 (?)	5361		189
4719	55	175	5376		190
4734	55	180	5391		190
4751	55	180	5404		193
4765	55	179	5420		195
4804		180	5438		201
4813		180	5453		190
4827		180	5469		190
4840		180	5484		190
4855		180	5500		190
4889		180	5515		195
4915		185	5530		190
4930		182	5545		200
4940		185	5560		195
4951		185	5575		195
4953	50 (?)	194	5590		190
4969		200	5605		190
4984		205	5620		195
4999		205	5635		195
5013		205	5650		195
5028		205	5686		190
5043		203			

DESCRIPTION OF CUTTINGS

<u>Interval</u>	<u>%</u>	<u>Description</u>
34 - 42	42	Dark grey to brown Volcanics with some vesicles (Basalt? - Andesite?)
	42	Red stained (Iron?) - weathered versions of above.
	2	Magnetic grains usually subrounded
	2	Quartz angular to subangular
	10	CaCO <sub>3</sub> cemented grains of caliche
	1	Subrounded (heavy minerals?) black grains
	1	Chert
		Above very fine to med sand size frags
		Angular unless otherwise noted. The less than angular fraction may be sluff from up the hole where no casing has been set.
	42 - 52	
52 - 62		Same as 34-42 with minor silica cemented Breccia of same rock types Some CaCO <sub>3</sub> on other rock types
62 - 72		Same as 34-42
72 - 82		Same as 52-62
82 - 91		Same as 52-62 but fragments are distinctly larger running up to very coarse sand size. This is the first sample with the sample catcher. Up until now the samples have been off of the screen.
91 - 101	45	Angular dark grey to brown volcanics
	50	Subangular to subrounded fragments of above
	5	Caliche fragments
		All fragments coarse sand sized to fine sand sized
101 - 118	55	Dark grey to brown either siltstone or volcanic (see 148-163) with abundant microscopic heavy minerals or a volcanic with microscopic dark minerals, probably an andesite.
	35	Dark gray vesicular andesite with silicious inclusions
	2	Micro-vesicular basalt
	Minor	Off-white tuff granules Silica cement on some grains
	8	Red stained (weathered?) dark gray to brown siltstone or andesite.
118 - 126		Same as 101-118
126 - 136	55	(
	5	(
	2	( Same lithologies as 101-118
	Minor	(
	10	(
	28	Plus silica cemented breccia of the other lithologies magnetite present
136 - 148	Same	Same as 126 - 136
148 - 163	80	Same lithologies as 126 - 136
	15	Vesicular andesite
	3	Vesicular basalt
	0	Tuff
	0	Red stained phase absent
	2	Silica cemented micro-breccia of the other lithologies Some chips of the possible siltstone phase of 101-118 show vesicles therefore all of it is probably volcanic. SiO <sub>2</sub> coatings still present about 20% of the grains are rounded indicating some transport by water. These probably are from interformational gravels.

163 - 178	60	Dark gray to brown andesite with abundant microscopic dark minerals
	30	Very vesicular basalt with a pale green, amorphous infilling in some of the vesicles - possibly a clay alteration.
	5	SiO <sub>2</sub> cemented micro-breccia of the above
	5	Red phase of the dark gray to brown andesite fragment size in this sample is generally coarse sand size. 20% rounded grains
178 - 193	Same	Same lithologies as 163-178 Almost all fragments are angular One grain has a secondary black botryoidal "growth" on it.
193 - 201	85	Brown andesite with mafics
	15	Black vesicular basalt All grains appear weathered. Some grains show secondary SiO <sub>2</sub> deposition as well as a pale green coating. There is secondary growth of a black metallic on some grains. Almost all of the grains are angular.
201 - 230	90	Volcanic (andesite) - aggregate - <u>Well weathered, poorly sorted, angular pieces.</u> Range in size from fine sand grain to approximately 2-1/2 ml in length
	10	Rounded grains of above and light gray siltstone? Sand sized, poorly rounded to rounded, light colored (quartz) trace clumps of clay & rotten alteration material does not react with HCl. Clumps of cement present due to drilling through casing. Should also be noted that this interval had some problems due to Tappy's inexperience, the derrick's inexperience, the hassles of the rig. The sample is most diagnostic of the bottom of the interval.
230 - 240	99	Angular. Similar to above. Size range about the same. Well weathered. Tanish-greyish, brownish in color. A few bk fragments.
	1	Sand sized. Very fine grained sand on up. Not as many quartz grains as in the last interval. Clay & alteration prod. not observed. Minor dark fragments Iron filings from bit present Does not react w/HCl. Minor Fe staining
240 - 254	100	Same as above except sorting is better. Size of angular fragments reduced in size Derrick man washed sample so fine grained sand etc. was lost. No reaction with HCl - Note one green mineral.
254 - 285	65	Same as above. Again - sample washed by derrick man & therefore no fine portion.
	35	Vesicular basalt vesicles are both spherical & Ovoid. Some amygdules present. (filling: chalcedony? Opal?) again - green mineral.
285 - 315	99	Moderately sorted (volcanic) gravel. Again very angular, very weathered. Some fragments contain vesicles & amygdules filled with chlorite(?) trace of magnetite
	1	Basalt cuttings Sample collected by the same derrick man - .'. washed [the reason this continued for 3 intervals is that this was the 11pm - 7am shift.] Coating of silica on some fragments

Interval	Z	Description
315 - 343	46	Angular, weathered volcanics similar to the above. Not containing as many of the amygdules as the previous interval. Some Fe stained
	5	sand size fine to medium grain - poorly rounded
	46	Volcanic cuttings - black - basaltic - hard, dense
	3	alteration product - some very soft & rotten Sample on the whole poorly sorted. Basalt has few amygdules or vesicles Gravels - minor iron stained no reaction with HCl
343 - 373	98	Volcanics - dark 48 basalt - dense - angular Reddish 48 brown, 2 blue-gray - does not appear to be iron stained of the above.
	2	Alteration products - white, hard & soft yellow fragments - Some what rounded some pieces are banded - bright yellow minor iron staining Sizes range from very fine granules to $\approx .4$ mm.
373 - 403		Volcanics
	32	Black to gray - basalt - some with vesicles - some amygdules
	32	Brownish - red
	30	Tan & steel blue (check for siltstone & claystone?)
	5	Alteration material - fresh-white & rotten brown mustard colored
	1	minor iron staining on fragments size range - fine sand to .5 mm chips Very similar to last interval but more color range Silica filling vesicles
403 - 433		Very much the same as 373-403 do note some (heavy) very "black" fragments much darker than the black basalts white (hard) silica? fragments are larger size as above No reaction w/HCl Minor iron stains - limonite Yellow bright alteration material amt. of finer material more abundant than last interval
433 - 463	94	Volcanics - vesicular basalt? - black, light brown, reddish brown, tan & gray - amygdules altered alteration - to limonite, yellow banding, brown banding also white silica fillings
	Tr	dark "heavy" fragments - trace all angular fragments from fine sand size to $\approx .5$ mm
	1	limonite fragments
	5	alteration material - as described under Volcanics - rounded fragments as well as angular chips
463 - 497		Very similar to last interval Slight increase in amount of sand size fragments Increase in iron staining Amount of alteration product fairly constant as above interval
505 - 520	40	Gravels - Volcanic - poorly sorted - weathered Some are very poorly rounded - corners rounded off - large pieces; some well rounded
	2	limonite fragments
	40	Volcanic sands grains - small - angular alteration material - iron stained - silica deposits Sorting is poor - high content of small sand size material
520 - 549	94	Gravel - volcanic weathered - sub-angular - mostly 1-2 mm in size - not as much fine sand material as in previous intervals moderately sorted iron staining angular to poorly rounded
	2	Sand
	4	Volcanic chips - basalt






<u>Interval</u>	<u>%</u>	<u>Description</u>
549 - 578	48	Coarse sand sized cuttings - weathered volcanic material - angular
	48	Fine sand sized - volcanic material - angular slightly weathered, Fe stained, red, brown, black in color - Minor quartz fragments & alteration material Some of the material is partially sub-rounded
578 - 605	99	Volcanic Tuff Brownish-gray w/some iron staining abundant feldspar phenocrysts
	1	Very angular except for "bomb" which are very well rounded (glass?) Alteration products - limonite Minor vesiculation No reaction with HCl Abundant glass or biotite(?) coarse sand & smaller Minor black basalt
605 - 637	100	Welded tuff(?) Similar to last interval except that fragments are larger biotite iron staining alteration - iron oxide No reaction w/HCl
637 - 667		Tuff same as above
667 - 691	100	Volcanics, basalt - 50% weathered 50% fresh hard, dense black, dark grey Fe stain - weathering - brownish red in color Angular fragments Permeability - low Quartz - fragments minor Minor reaction w/HCl - could be from mud
691 - 724	80	Volcanics - andesite(?) could possibly be a tuff - contains grains of maxic minerals otherwise texturally similar to tuffs above. Ginn well discription calls this material volcanics without any other breakdown.
	20	Basalt poorly sorted No reaction with HCl Black to brownish red (Fe stained) Feldspar phenocrysts minor biotite alteration products - yellow stained Some fragments very dense - others not
724 - 747	90	Volcanics - andesite lavender and fe stained
	10	Iron stained basalts phenocrysts of feldspar Abundant sand size material sands present? - Fe stained quartz grains Minor fresh basalt fragments biotite minor
		The last two intervals resemble tuffs - there is such a variation in material size

<u>Interval</u>	<u>%</u>	<u>Description</u>
747 - 775	95	Volcanics - Fe stained - red in color hard, dense
	5	Basaltic andesite No reaction with HCl Biotite Xls - some fairly weathered away Some fragments where cut show fresh surface - dense & black Ground mass & fragments fairly constant in composition Interval very well baked
775 - 805	20	Very similar to last interval, but more weathering - Basalt fragments, Fe stained & fresh ground mass amount is much less than overall fragments Does not react with HCl Very dense material
	80	Andesite or tuffs heavily weathered but has similar texture to 691-724
805 - 835	25	Volcanics - Basalt, and andesites, fresh, black, red, abundant biotite Xls Minor sanidine phenocrysts angular fragments most of cuttings are weathered, iron stained red a green alteration product present in minor amounts weathered on the basalt fragments are dense, no reaction w/HCl amount of fragment material > amount of fine stuff
	75	Reddish andesite texturally similar to 691-724
835 - 865		Volcanics - similar to last interval except iron staining more predominate Sanidine phenocrysts Ground mass = fragments little fresh material; almost all altered -
	100	Iron stained
	50	Andesite or tuff as above
	20	Black vitreous obsidian(?) like volcanic
865 - 895	20	Volcanics - weathered, red, black, tan Common white alteration product, rotten soft breaks about easily. Chalky but no reaction w/HCl - Possibly a rotten vesicular basalt biotite (Basalt appears to have been vesicular and then extremely weathered & altered - silicified basalt, no tuffs?) (Possible tuffaceous material from further up in the hole)
	10	Secondary mineralization amorphous silica
	10	Black vitreous obsidian (?)
	30	Black micro xtlan basalt
	60	Red to orange andesite or tuff The andesite has the same textural features as the basalt may be a weathered version of the basalt
895 - 925		Similar to last interval Silification - weathered, iron stained nice mica - secondary? Tuffaceous material - possibly slough or may be getting into tuff bed green material - secondary alteration? Vesicular material w/secondary fillings - tuffaceous materials(?) sanidine phenocrysts biotite

<u>Interval</u>	<u>Z</u>	<u>Description</u>
925 - 955	95	Volcanics - basalt and andesite - fresh & weathered (Fe stained) Biotite Sanidine phenocrysts more iron stained than the last interval
	5	green alteration product(?) amorphous silica(?) No reaction w/HCl Tuffaceous material - (slough?)
955 - 985	100	Volcanics - basalt, fresh & iron stained not as badly stained as the previous interval minor more tuffaceous material lavender probably sluff biotite no reaction w/HCl
985 - 1015	10	Abundant quartz grains, angular, may be a crystalized tuff or a quartz sand lense.
	90	Fresh & iron stained basalt and andesite as above Yellow-greenish material which crumbles when you bit on it Sanidine phenocrysts Again, similar to the last interval except for minor tuffaceous material, fragment size decreased and more small findings.
1015 - 1045	100	Volcanics - Basalt fresh & iron stained Minor tuffaceous material Tea green alteration material on some of the black basalt Yellow - green alteration material which crumbles becoming more abundant, no reaction w/HCl Fe stained basalts not as prevelant as in last interval.
1045 - 1075	100	Volcanics - basalt - med.gray - fresh & weathered (iron stained) more of the green rotten stuff minor tuffaceous material no reaction w/HCl White fragments very soft & rotten Minor biotite Very similar to last interval Interval somewhat similar to Ginn 1420'
1075 - 1105	85	Volcanics - Basalt: fresh & iron stained clumps of formation clay tuffaceous material No reaction w/HCl
	15	rotten yellow-green material present Abundant white, soft, material (as mentioned in previous intervals) Minor secondary quartz? Should be noted that we are drilling 30 ft/hr during this interval biotite
1105 - 1135	60	Volcanics - weathered basalt & fresh stuff minor quartz - opaque white & iron stained clay
	10	altered tuff(?)
	30	rotten yellow-green stuff and other alteration products another 30'/hr interval minor biotite - fresh & weathered weathered basalt both Fe stained & corroded No reaction w/HCl

1135 - 1165	40	Volcanics - fresh & Iron stained basalt
	5	Silica product + chalcedony or opal abundant No reaction with HCl Another interval in which drilling 30'/hr
	15	tuffaceous material - lavender or light green "Sandy" ground mass
	40	White crumbly "crap" abundant interbedded clays biotite Xls in basalt outside of the black basalt everything else is pretty rotten
1165 - 1195	40	Basalt - fresh & weathered
	40	White to pale green silicious(?) fragments containing white round grains of siliceous material very similar to last interval drilling 30'/hr
	20	Lavender tuff no reaction w/HCl
1195 - 1225	70	Basalt, fresh (minor); fractured & iron stained
	20	Sand cemented with silica Minor tuffaceous material
	10	Rotten green & white opaque fragments 30'/hr drill rate Similar to last interval Chunky size basalt fragments $\approx$ /mm
1225 - 1255		Volcanics - basalt - good size corroded chunks - black - fractured - minor Fe staining No reaction w/HCl
	70	In basalt - biotite and olivine? weathering out rotten alteration products not as much sandy ground mass as in the last interval
	5	Lavender tuff
	25	Silicious material ranging from olive drab to white some is a breccia cemented together again
1255 - 1285		Very similar to the last interval Basalt-black & somewhat fractured minor <u>opal</u> [or chalcedony] not as much clay - not as much sand material as last interval no reaction w/HCl good size chunks of basalt clumpy white fragments - again - soft & grainy
1285 - 1315	100 Minor	Basalts - baked - iron stained Minor green stained opaque stuff - but this time some of it is hard - most of the basalt is weathered drilling rate slowed down to $\approx$ 10 ft/hr almost totally weathered baked basalt minor amounts of sand
1315 - 1345	100 Tr	Volcanics - Basalts - some baking but minor compared to the last interval . Abundant micro fractures in volcanics Feldspar phenocrysts green (chartruse) material again minor amounts of sand - probably sluff fragment size becoming more uniform
1345 - 1375	100	Volcanics - Basalt - black, fresh, hard, dense biotite Xls in basalt Sanidine phenocrysts(?) No reaction w/HCl apatite Xls (?) Minor chartruse fragments - poss. sluff looks to me like a healthy basalt. Minor light green secondary material

<u>Interval</u>	<u>%</u>	<u>Description</u>
1375 - 1405	50 50	Volcanics - basalt - fresh black & gray green secondary mineral and/or altered tuff  Polygorskite? fairly hard stuff 
Minor		chartruse alteration product minor iron staining - could be sluff maybe some apatite Xls? opal fragments altered material w/linear biotite Xls - looks almost like gneiss altered tuff(?) look at in the office 
1405 - 1438	60 10 30	Very similar to last interval fresh black basalt minor tuffaceous material minor clay material reacts w/HCl abundant green alteration tuff(?) chalcedony Interval is very altered Is it possible to have opal & chalcedony forming together If so - then opal present - if not I don't know?
1438 - 1469	50 5 45	Black basalt - minor green alteration opal chips - concoidal fracture - translucent basalt - dense slightly Xline - opal attached to basalt in some cases andesite - generally weathered minor other opaque white fragments - possibly chalcedony minor reaction w/HCl - but cannot determine what - possibly some reaction with the mud basalt very slightly Fe stained red - but only minor a few fragments are translucent w/opaque bandings of orange & mustard color some amygdules present fragments are fairly equal in size except for ground mass which is sand size no tuff apparent 
1469 - 1501	100	Volcanics - black basalt to gray andesite with some weathering & Fe staining I can hear some reaction with HCl but I can't see it - could be mud additive minor green alteration basalt material is dense crystalline minor white chalcedony or opal basalt has some amygdules biotite fragment size is overall small w/abundant ground mass. Sanidine phenocrysts(?) Siliceous deposits on basalt - white & green
1501 - 1531	100	Volcanics - basalt - black, dense crystalline, Fe staining present some of the basalt is riddled with opal biotite very similar to last interval but fragment size larger no reaction w/HCl banded iron staining on some of the vesicle fillings

<u>Interval</u>	<u>%</u>	<u>Description</u>
1531 - 1560	100	Volcanics - basalt - similar to last interval minor reaction w/HCl - due to mud again. I think the vesicles are filled with opal siliceous coating of some fragments sanidine phenocrysts similar to last interval some of the Fe stained material almost looks sedimentary in origin but appears to be volcanic also
1560 - 1590	100	Volcanics - black, dense botriodal quartz hard dense crystalline, minor Fe stains silica filling fractures similar to last interval same comment
1590 - 1610		Lost interval due to burning of derricks hand
1610 - 1625	95	Volcanics - black basalt & red iron stained basalt. Fragment size very much reduced from last described interval - all ground mass material sanidine phenocrysts siliceous material on & in basalt fragments abundant white siliceous material fragments - some tinged green mostly quartz and chalcedony
	5	mica Siliceous material more abundant than in previous intervals Iron staining also more prevalent Reaction w/HCl
1625 - 1659	95	Volcanics - black, dense; also red, iron stained basalt Also andesite w/black amygdules Realgar(?) Abundant ground mass Sanidine phenocrysts reaction w/HCl - (but from mud?) basalt somewhat vesicles filled - white
	5	siliceous material - chalcedony(?) and quartz biotite Xls (?) fragment size is overall ground mass size reacts w/HCl - caliche
1659 - 1688	90	Black, dense, crystalline basalt, some iron staining
	5	reacts w/HCl - caliche
	5	Opal or chalcedony fragment size larger than last interval silica filling fractures & vesicles biotite somewhat chewed up sanidine phenocrysts (?)
	Tr	Pyrite with (iron staining or limonite) (minor)
1688 - 1718	100	Basalt, fresh, black, dense, Xlline Very minor iron staining fragments are very small sand size or big & chunky Sand fraction > chunk fraction Some green alteration material some vesicles w/ fillings; siliceous very minor reaction w/HCl This is the interval during tripping & I think this may effect the sample. Very similar to 1625-1659

<u>Interval</u>	<u>%</u>	<u>Description</u>
1718 - 1748	95	Basalt - fresh black & iron stained red iron stained material appears to be more vesicular than the black stuff green (pale) partially translucent filling some vesicles fragment size more evenly distributed than last interval
	5	Caliche - reaction with HCl most of the weathered basalt is spotty weathered, but there are fragments (few) that are totally red
		silica material filling fractures
1748 - 1778	95	Basalt, dark grey → black, dense xline minor iron staining Some are vesicular black fillings as noted in previous interval
	5	Caliche - reacts w/HCl Very similar to last interval
1779 - 1809		Same as last interval but not as much Fe staining
1809 - 1842		Similar to previous three intervals except does not have reaction w/HCl more finer material minor green alteration material glass filling vesicles fragments of clear quartz - w/concoidal fracture Roger thinks the basalt is andesitic? Volcanics - hydrothermal, oxidation fragments are very vesicular abundant secondary siliceous material
1845 - 1877	95	Similar to the last several intervals Oxidized basaltic - andesites? w/vesicles botriodal opal or chalcedony abundant abundant glass (?)
	5	Calcite - reacts w/HCl vein filling - chalcedony abundant
1877 - 1909	95	Similar to last intervals - oxidized & fresh, dense, vesicular; xline (basaltic - andesite?) except that the fragment size is somewhat increased → layer
	5	Calcite material is extremely xline
1909 - 1939	95	Basaltic - andesite? - dense, xline, not as heavily oxidized as previous intervals not as much fracture filling material not as much vesicularization
	5	calcite % about the same small % of brecciated material In the next interval, circulation was lost.
1939 - 1969	90	Basalt - fresh w/glass vesicles in which partial Xlization has occurred reacts w/HCl abundant chalcedony or opal minor realgar(?) pyrite
	10	calcite

<u>Interval</u>	<u>%</u>	<u>Description</u>
1939 - 1969 (continued)		lost circulation - did not let cuttings run over Shaker so next sample was taken by hand using a collander held under mud-out pipe.
2000	85 10 5	<p>Fresh black basalt  reaction w/HCl calcite  abundant siliceous material - chalcedony or opal &amp; embedded in abundant pyrite - attached to quartz material minor green alteration of some soft material - does not react w/HCl  abundant sand size material  sandstone type material - CaCO<sub>3</sub> cement</p> <p>Circulation was lost @ 1969'. Shaker was therefore bypassed. A sample was collected @ 2000' by using a sieve due again to lost circulation zone - shakers were by passed until 2175. See chart for penetration rates of volcanics from 1969 to 2175.</p>
2175 - 2180	99 1	<p>Clay - bentonite? soft, creamy light beige color.  Small volcanic chips contained within.  Very <u>minor</u> reaction with HCl  low permeability - high porosity  clay is sticky &amp; globby  clay was probably formed from the decomposition of volcanic ash and looks as to be composed largely of montmorillonite has capacity to absorb water and therefore swell.  Most of the contained material is sand size and rounded but some angular chips are present  In this interval, the penetration rate dropped exceedingly to <math>\approx 7'</math>/hr.</p>



<u>interval</u>	<u>z</u>	<u>Description</u>
2180 - 2215	25	Light creamy clay
	75	Volcanic chips - basaltic andesite both fresh & oxidized minor green alteration material, also white & off-white easily broken with pointer light alteration material may be decomposing into bentonite most of the fragments are large angular chips but some is considerable ground mass sand size a few minor chips of orpiment-realgar? little or no reaction with HCl clay is a creamer white than last interval - most of the volcanic chips are fresh, black & dense
2215 - 2244	50	Off-white-grey, creamy clay, very soft
	50	Containing volcanic chips. Very similar to last two intervals minor reaction w/HCl There are a few clumps of clay that are a bit harder but still very easily mashed up Both clear white & opaque white fragments enclosed within the clay The volcanic chips - probably (basaltic-andesite?) or basalt - appear angular, dark black & dense. Difficult to see them because of clay background. The fragments are not well sorted but chips & ground mass again, as in previous intervals, there appears to be some realgar - (orange) fragments. Also, lost circulation material caught up in clay. Could not separate through washing.
2244 - 2274	20	Clay - creamy off-white to grey (from mud)
	40	Volcanic chips - basalt - dark black, dense reaction w/HCl
	30	Tuffaceous material
	10	Alteration products - both siliceous & possibly caliche fragment size is overall very large chips there is some ground mass which is sand size volcanic fragments - some have undergone minor oxidation It appears that we have left the clay zone & entered a tuffaceous interval We encountered two drilling breaks in this interval. Some of the alteration material is soft, some brittle, & some hard Chips of chalcedony or opal
2274 - 2305	90	Bentonite - grey clay -
	10	Volcanic chips - few large but mostly sand size material caught up in clay matrix reaction w/HCl Difficult to study volcanics because of clay Drilling rate decreased significantly in this interval
2305 - 2335	75	Creamy yellow white clay stained grey from mud
	5	Big volcanic chips - black dense subangular to rounded
	20	Silty-sand volcanic material minor reaction w/HCl but could be due to sluff
2337 - 2366	20	Black basalt?
	80	Siltstone to claystone White to gray in color with some green which generally grades into gray some fragments appear to be breccias of the white and green claystones Minor brown claystone fragments range from fine sand size to angular pebble size. White claystone could be a tuff? Minor pyrite

<u>Interval</u>	<u>%</u>	<u>Description</u>
2366 - 2400	10	Black basalt?
	30	White to gray with some brown claystone and siltstone
	50	Reddish brown andesite? With occasional vesicles
	5	Apple green to black massive material
	5	Cream white clay
2400 - 2431		Same as 2366 - 2400
	5	White to gray claystone and siltstone
2431 - 2461	95	Reddish brown andesite? Some grains have secondary coatings of the green material
	45	Reddish brown andesite?
	45	Dark gray to black andesite? texturally the reddish fraction appears to be a weathered version of this.
	5	Both show extensive secondary coatings of white (and green?) quartz.
	3	milky quartz
	2	brown siltstone probably sluff mud had distinctive reddish color
2476 - 2491	Same %	Same lithologies as 2431 - 2461 mud did <u>not</u> have reddish brown color. Minor laminated silica (but slight reaction to HCl)
2491 - 2510	Same %	Same lithologies as 2431 - 2461 slightly higher percentage of siltstone also another minor banded sediments.
2510 - 2540	50	Light to dark grey andesite with apple green secondarily filled vesicles
	15	Black basalt with secondarily filled fractures
	20	Metallic gray volcanic (possibly intrusive)
	5	Quartz angular grains Minor banded silica(?)
	10	Breccia fragments of first type Minor claystone all fragment sizes coarse sand or less
2540 - 2555	50	Black basalt w/2nd filled fractures
	15	dark brown basalt? with vesicles
	15	light gray to dark gray andesite with apple green 2nd filled vesicles
	5	Quartz some well rounded - apparently casts of vesicles
	15	Metallic gray volcanic or intrusive all fragments are angular and coarse sand sized or less
2555 - 2586	95	Metallic gray volcanic or intrusive
	5	Quartz Same sizes as above
2587 - 2619	70	Metallic gray volcanic
	25	light gray to dark gray andesite with apple green 2ndary vesicle infillings.
	5	Anhedral quartz fragment size very coarse sand and smaller
2619 - 2651	55	Same lithologies as above
	40	
	5	
2651 - 2682	Same	Same lithologies as 2587 - 2619 the possible intrusive is looking more coarse grained in this sample. One granule sized piece of quartz is in this sample.

<u>Interval</u>	<u>%</u>	<u>Description</u>
2682 - 2705	Same	Same lithologies as 2587 - 2619 1 fragment of a quartz arenite present. It has a CaCO <sub>3</sub> cement (may be sluff) Also several large quartz fragments
2705 - 2713	10 35 15 25 5 5 5	Black basalt Dark green coarse grained volcanic some grains showing secondary quartz vein fillings. Coatings and vesicle fillings of dark green material (polygorskite?) Red weathered version of above Gray massive non fissial claystone? very hard. no reaction to HCl red-brown and tan siltstone Anhedral quartz Calcite? clear but slight reaction to HCl
2713 - 2746	75 20 5	Green-gray volcanic (andesite?) few vesicles usually filled with dark green infilling and occasionally banded quartz. Also secondary fracture fillings on some grains. Xtal size is almost visible at 10 power in the volcanic Similar looking volcanic but brown in color Brown siltstone Minor anhedral quartz
2746 - 2775		Same lithologies as above except milky quartz and chalcedony are much more abundant 5% and up to small pebble in size all angular.
2775 - 2791	Same	Same lithologies as 2746 - 2775
2791 - 2806	Same	Same lithologies as 2746 - 2775 with minor amounts of soft gray siltstone with black stringers
2806 - 2840	Same	Same as 2791 - 2806 with minor very fine grained sandstone cemented with dark green material. Also minor crystal tuff possible sluff.
2840 - 2855		Missing
2855 - 2870	75 20 5	Green-gray andesite with few vesicles - usually filled with dark green material which also coats some grains. Xtas size almost visible at 10 power Similar looking in texture gray andesite with smaller xtal size Quartz and chalcedony from fracture fillings minor soft gray siltstone with black stringers
2870 - 2900	Same	Same lithologies with green-gray having quartz as fracture fillings on some grains
SWITCHED TO FOAM DRILLING		
2900 - 2931	20 25 25 5 5 10 10	Grain size fine sand to silt - well sorted Gray to tan claystone breaks under the probe no reaction to HCl Pale green translucent massive material that also breaks under the probe Green-gray andesite described above gray andesite described above clear Minor calcite Transparent white tuff? Quartz & chalcedony Reddish brown translucent calcite? Slight reaction to HCl 50% of the sample is angular; 40% is sub-angular to sub- rounded on a gross scale but angular on a fine scale 10% rounded

<u>Interval</u>	<u>%</u>	<u>Description</u>
2931 - 2941	60	Black to gray-green basalts and andesites
	10	Gray claystone
	5	Quartz and chalcedony
	15	White tuff? or claystone, soft
	10	Siltstone dark gray to cream
		Stuck in hole 11/2/76 .
		from sluff above fish (see next page)
		it appears that these last two samples
		may be more representative of the sluff than
		of what was drilled into.

170 pppCL  
x 1.65 NACA

ROSSI 21-19

Clean Out Run to Fish at 2851 Feet

30 ppm Ca

<u>Interval</u>	<u>%</u>	<u>Description</u>
2420 - 2550	10	White tuff
	45	Brown siltstone & claystone/some w/uhedral calcitic xflc in it.
	20	Gray siltstone & claystone
	20	Cream colored siltstone & claystones
	5	Calcite w/moderate general reaction to HCl among other grains
		Minor volcanics evident small pebble size and smaller
		60% angular, 35% sub-angular 5% subrounded
2562 - 2572		Similar to above in lithology except volcanics are present to about 15% of the sample Similar rounding also small pebble size and smaller mostly granule size and smaller
2590 - 2620		Similar to 2562 - 2572 volcanics still about 15% of the sample very coarse sand and smaller
2742 - 2778		Similar to 2562 - 2572 small pebble size and smaller
2810 - 2841		Similar to 2562 - 2572 granule size and smaller

Second clean out run after pulling up into the shoe and running in again. Same as 2420 - 2550 above with some very fine grained sandstone and basalt and andesite. Size ranges from coarse pebble and finer. The pebble sizes are dominately sub rounded with a few angular frags. Since this material "sluffed" in on top of the fish after it had been cleaned out by the previous clean out run there must be a zone above 3851 that is sluffing.

This material is generally similar to the sedimentary zone at 2337 - 2366 with the exception of having little of the greenish claystone present in the 2337 - 2366 zone. The grains in the "sluff" material are much better rounded than those of the 2337 - 2366 zone.

The sluff could very well have come from that zone, or it might have come from the lost circulation zone under the shoe.

ROSSI 21-19  
LITHOLOGIES

<u>Interval</u>	<u>%</u>	<u>Description</u>
2942		Mud out 113°F; Started drilling after fishing - mostly cement
2942 to 2957		123°F out; 100° mud in; $\frac{9'}{25\text{min}} \times \frac{60\text{min}}{1\text{hr}} = 216 \text{ ft/hr} \approx 22\text{ft/hr}$
	70%	Volcanics - basaltic andesite (?)
	3%	White tuff? or Claystone; soft
	10%	Siltstone - grey to cream color
	10%	Claystone
	5%	Quartz & Chalcedony
	2%	Calcite (reaction w/HCl)
		Volcanics are dark grey, dense, w/some amygdule fillings of silica. Angular - size is somewhat evenly distributed. Very minor small fraction - mostly small pebble size.
		Siltstone & claystone are moderately rounded again - somewhat of an even size distribution.
		Quartz or chalcedony fragments run from large sand size to small pebble size.
		There is an honest trace of metal filings, this interval is not sluff - drilling 22ft/hr w/40 weight @ 40 RPM. Survey taken 30 ft. up from Kelly down 2957 +30' = 2927 + 3-1/4°
		Mud weight = 66.5 V=60
		@ this pt. trip made to change bit from mill tooth to button type
		Also present is some cement.
2957 to 2988	20%	Siltstone - grey & Cream colored white & greenish - Some soft possibly cement not a strong reaction with HCl though
	10%	Tuff
	60%	Basaltic andesite
	7%	Opal, quartz and/or chalcedony
	3%	Caliche or calcite
		Volcanics have some amygdulation - fillings possibly of opal; angular chips; size ranges from lg sand size to small pebble size.
		Fragments of silicious material are angular w/concoidal fractures some opal - some transparent
		Siltstone (claystone?) varies from angular fragments to moderately well rounded
		Some are creamy orange color which I believe to be claystone there is some of the siltstone which is green in color
		Also present is some turquoise green material (it is minor) - fine grained - moderately rounded this same green color is staining some of the amygdule material - possible small round pees are out of this.
		Small sized fraction is minor compared to the overall sample size
		Abundant Iron filings possibly due to yesterdays milling

ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
2957 to 2988 (Cont'd)		A green stain is also present on some of the volcanics Minor amounts of very <u>red</u> (Fe stained) volcanics or could be very red andesites
2988 to 3018	10%	Volcanics - basaltic andesite - amygdules - red
	80%	Tuff - some of which is very soft
	5%	Siltstone - greyish green - soft - moderately rounded Note: It is possible that the siltstone is tuffaceous material. There is a difference in that the tuff is angular fragments & what I am calling siltstone is somewhat rounded. Some of the siltstone is angular. Whether silt- stone or tuff - I believe they are very closely related.
	3%	Quartz, chalcedony and/or opal - conchoidal fracture - some transparent; some opaque Again - green alteration material present. The whole interval appears to be a water-laid tuff except for minor content of andesite - [(red) - angular, hard] & basalt most of the tuffaceous material is soft & can easily be broken The basalt present is dense & black
	2%	Caliche or calcite - reacts w/HCl The amount of silt & sand size material has increased in this interval The tuffaceous material has silicious material filling voids
3018 to 3052	46%	Tuffaceous material similar to the above interval
	46%	Volcanics - basaltic andesite - black & minor red
	5%	Quartz or chalcedony - conchoidal fracture
	3%	Caliche & calcite The volcanics are dark-grey, hard, dense Present are minor amounts of red andesite again, as in the last interval. There is the siltstone like material but it is probably tuff. It is a size of fragments runs from sandsize to small pebbles. Most of the fragments are angular, except for the minor amount of siltstone looking material which is moderately well rounded. (also, it is soft). The green tuffaceous material is also present in this interval. I believe that most of the material that reacts w/HCl is caliche - it is soft, off-white & brittle. I think that this interval correlates well w/Ginn 3250 - 3300.
3052 to 3080	97%	Volcanics - Basalt mostly med-dark grey but some light colored fragments - hard, somewhat granular. Contains phenocrysts but I can't tell what they are using a binocular scope. Minor reaction w/HCl but it is probably from the mud. Minor silica veining
	3%	Quartz and/or chalcedony conchoidal fracture trace of tuffaceous material Minor amount of red andesite (?) Possibly some sulfides (?) Fragment size ranged from sand size to small pebble size fragments angular.

ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3080 to 3114	100%	Volcanics - basalts (?) Med to dark grey - somewhat granular - slight tinge of green on some Sulfides present in bands Some of the fragments can be poked into by applying pressure - possible that they are altered Quartz and/or chalcedony
	2%	Caliche and/or calcite - reacts w/HCl Minor amounts of red andesite(?) Fragment size ranges from silt size to small pebble size - fragments are angular lag time  $.1215 \times 3114 = 378.35 \text{ bbl}$ $\frac{400 \text{ gal min}}{42 \text{ gal/bbl}} = 9.52 \text{ bbl/min}$ $\frac{378.35}{9.52} = \underline{39.7} \text{ min}$ <p>There is a dark coating on some of the volcanic fragments - I'm not sure what it is - Very black though Minor amounts of quartz and/or chalcedony</p>
3114 to 3143	93%	Very similar to last interval Volcanics - dark grey, sometimes green tinge, red tinge somewhat granular Angular fragments - some very dense
	5% 2%	Tuff - off white & green - soft Caliche - reacts w/HCl Trace of quartz and/or chalcedony - the material has concoidal fracture & transparent trace of red andesite minor silica veining I think I saw some sulfide material but when I went back to study it, I couldn't find it fragment size the same as the last interval
3143 to 3174	50%	Tuffaceous material - light in color - cream white to green - somewhat granular, a little bit soft (can stick w/poker)
	45%	Volcanics basaltic andesite range from moderately dense to crystalline, med grey to dark grey - slight tinge of red & green minor magnetite
	1%	Pyrite or other sulfide green alteration product filling voids in tuff calcaceous - reaction w/HCl Basalt is somewhat weathered - minor amounts of red andesite
	2% 1-2%	Caliche and/or calcite overall fragment size is that of small pebble size Minor silica material - quartz and/or chalcedony



ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3174 to 3206	49%	Volcanics - basalts - hard, dense, but some are somewhat crystalline - light to dark grey & reddish some visible laths of feldspar
	49%	Tuff - somewhat hard - green tinge
	1%	Quartz or chalcedony - transparent - conchoidal fracture
	1%	Caliche and/or calcite - reacts w/HCl fragment size ranges from silt to sand size to that of small pebble size - fragments are angular - more sand size material than in previous interval
3206 to 3234	60%	Tuff - greenish in color - granular texture - hard but a hole can be somewhat drilled into it w/poker. Angular fragments
	35%	Pyrite(?) Sulfide on some of the tuffaceous material Volcanics - dark (basaltic andesite?) dense; angular fragments minor amounts of red andesite
	5%	Volcanics - some have reddish color & are sort of granular Pyrite w/quartz - sulfide content highest so far of any interval Abundant caliche material - sample has strong reaction w/HCl - calcareous
	Minor	Also present in that green alteration material - part of the tuff lithology Quartz - opaque fragments - minor amounts transparent flat sheet-like fragments of calcite abundant sand-size material I am having a difficult time deciding whether or not this material is a tuff or some other volcanic. It is not as hard as volcanics previously encountered. Color & texture reflect tuffs What I am distinguishing between tuffs & the volcanics is the color - what I am calling tuffs are green & the volcanics are dark grey most of the sulfide material is attached to fragments
3234 to 3264	67%	Tuff - light colored - green tinge - looks like a siltstone w/sulfides; angular fragments
	15%	Volcanics - basaltic(?) dark grey dense; some is reddish brown. Sulfides on basalt also overall sample reaction w/HCl due to large amount of fine size material
	15%	Abundant - caliche/calcite
	3%	Quartz and/or chalcedony both opaque & transparent flesh colored tuffaceous material also present in minor amounts
3264 to 3294	40%	Tuff - same as last interval
	2%	Minor amounts of clay material
	45%	Volcanics - dark grey, reddish color - hard, dense angular fragments - some is kind of brownish some is also kind of crystalline The tuffaceous material is more rounded than the volcanics but on the whole it is angular again - abundant fine sized material good amount of sulfide material - (Pyrite?)

ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3264 to 3294 (Cont'd)	3% 5-10%	Sample reacts strongly w/HCl - again probably do to the large amount of small sized material Quartz and/or chalcedony Abundant caliche Minor amounts of brown claystone like material could be part of the tuff formation Volcanics have minor veining of silicious material; also some sulfide veining
3294 to 3324	30% 60%  4% 5% 1%	Volcanics light/med to dark grey; angular fragments Tuff - soft - breaks apart under pressure - greenish, brownish, reddish in color clay like material - siltstone like fragments, might both be tuffaceous material Quartz - opaque & transparent; concoidal fracture Caliche and calcite; again calcite in flat plates Sulfides; sulfide & realgar - associated together overall fragment size is small compared to previous intervals size does range up to small pebble size This interval appears to be mostly tuffaceous material mixed with clay & minor volcanics
3324 to 3362	95  +P TR 5	Volcanics - (Basaltic ? andesite) w/vesicles filled w/silicious material and altered green-blue stuff. Volcanics are red & dark grey - somewhat granular. Tuffaceous material - crumbles easily under pressure <u>Clay - reddish/brown in color</u> abundant quartz and/or chalcedony abundant pyrite abundant Real orange material that looks like realgar I believe the volcanics <del>are</del> <sup>have</sup> weathered phenocrysts of feldspar (sandstone?) Sample has strong overall reaction w/HCl probably due to large fraction of sand/silt size material Dark grey volcanics are dense but somewhat granular Caliche abundant Abundant blue-green alteration material - as said before - closely associated w/red volcanics, I believe it was a vesicle of silicious material that has been altered This green material (same color, texture etc.) is also found associated w/tuffaceous material
3362 to 3392	100%	Volcanics - med to dark grey, hard & dense - moderately granular fragments are angular quartz/chalcedony magnetite Some red volcanic material similar to last interval but minor is this 301. minor claystone - flesh colored minor sulfides sand/silt fragment size much less abundant in this interval

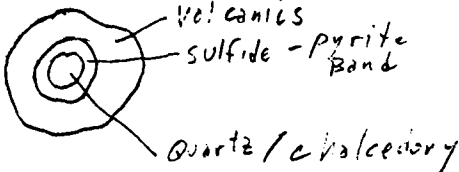
ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3362 to 3392 (Cont'd)		Sample reacts w/HCl but could be mud because caliche is minor green alteration product present but minor but again associated w/red volcanics & can be seen being altered from silicious material Minor quartz veining in volcanics Tuffaceous material appears to be absent Fragment size ranges from silt/sand size to small pebble size
3392 to 3423	95%	Volcanics - light to dark grey & brown - hard and moderately granular; angular fragments - some is tinged green
	4%	Quartz or chalcedony veining ) fragments of quartz and/or chalcedony ) Abundant concoidal fracture
		Sample has minor reaction w/HCl Volcanics similar to last interval but red volcanic material is very minor
	1%	Sulfides - pyrite associated w/volcanics & quartz sand-size fraction minor - mostly small pebble size chips
	Tr.	Very minor green tuffaceous material - <u>Note: drilling break 3414 9'7 min = 77 ft/hr lg time = 44 min</u>
3423 to 3455	100%	Volcanics - dark grey, dense, fragments angular and > 2X's as big as previous interval
	2-3%	Some fragments are granular very few vesicles (amygdules) but when present are large; $\approx 1/2$ size of fragment - filling quartz and/or chalcedony
	Tr.	trace of tuffaceous material - looks like claystone fragments of quartz/chalcedony are minor light brown - welded - silica filling fractures minor amounts of green (tuffaceous?) alteration material trace of realgar(?) - could be just oxidized sulfide material
	Tr.	sulfide - pyrite - minor drilling 7'/10 min = 42'/hr. lag 44 min sample has minor reaction w/HCl - could be mud. Minor sand-size fraction trace caliche/and or calcite
3455 to 3485	60%	Volcanics - similar to last interval
	27%	Tuffaceous material - green - some is easily broken w/poker - other is more durable but can be jabbed at - possible water laid
	10%	Clay - grey & brown in color - color could be stained by mud
	1%	Caliche/calcite - reacts w/HCl
	Tr.	Sulfides - pyrite - some oxidation (Fe staining) associated with it. Grey siltstone - possibly associated w/tuff some tuffaceous material is well rounded other is angular
	2%	Green alteration material as associated in previous intervals w/tuffs is also present in small amounts. I think this is the interval that the drilling break occurred in (considering lg time) Even though the amount of clay seems somewhat minor, it could be that it broke down under the temp. and the mud also present quartz/chalcedony associated w/volcanics

ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3485 to 3515		Should be noted <u>first</u> that we got stuck @ 3488. Fishing for $\approx$ 10 hrs. Consequently, interval could contain sluff etc.
	45%	Volcanics - greenish grey to dark grey - some w/amygdules. Angular fragments; dense to somewhat granular size ranges from sand size $\rightarrow$ small pebble size (Basaltic Andesite) some volcanics tinged red
	40%	Tuff - light cream color to light green - granular can be fractured w/probe. Some is welded tuff composed of small angular fragments
	5%	Abundant green alteration product - opaque - can be penetrated with probe.
	2%	Sulfides abundant - pyrite - associated w/volcanics
	5%	Quartz and/or chalcedony - conchoidal fracture
	3%	Caliche - reaction w/HCl
		Sample has strong reaction w/HCl
		minor quartz veining in volcanics
		large fragments of clay stone - pale orangy - flesh color - easily broken apart w/probe
	Orange - alteration material on sulfides - limonite(?)	
	fragment size of sample has wide distribution -	
	small sand size/silt $\rightarrow$ small pebble size - all materials range	
3515 to 3545		Very similar to last interval minus the abundant tuffaceous material, clay
	80%	Volcanics - Basalt - green tinge; light $\rightarrow$ dark grey crystalline
	5%	Abundant green alteration product associated with it
		Quartz and/or chalcedony - stained green
	4%	Caliche
	10%	Minor tuff fragments - mostly tinged green
		breaks easily under pressure of probe
Tr.	Chert(?) dense black - minor	
1%	Minor sulfides - most of which have been oxidized	
	sample has strong reaction w/HCl - fragment size varies from sand size to tiny pebble size	
3545 to 3575		Very similar to last interval
	100%	Volcanics - Basalt(?) - green, grey, dense to crystalline, no visible phenocrysts; fragment size is more evenly distributed than previously but abundant sand-size fraction
	sulfides - pyrite - associated w/volcanics	
	quartz and/or chalcedony - Quartz veining	
	Caliche	
	Sample has strong reaction w/HCl	
	Oxidation of some of the sulfides has occurred	
	trace of tuff & clay	
	magnetite	

ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3575 to 3593	75%	Volcanics - Basaltic - andesite - reddish brown, grey to dark grey, vesicular; amygdules; somewhat xilline - angular fragments
	5%	Abundant green alteration material as described in
	15%	Tuffaceous material - fractures under probe - granular - claystone (associated w/tuff)
	3%	Sulfides - pyrite - high amount
	2%	Caliche
Volcanics color is about 50% greenish grey & 50% reddish. Red volcanics appear to have more amygdules - quartz/chalcedony filling but grey basalt do have amygdules also fragment size ranges from sand-size to small pebble size.		
3593 to 3623	90%	Tuffaceous material - welded; green in color fractures under probe; angular fragments to poorly rounded - minor amounts of clay associated with it. Fragment size ranges considerably from silt/sand-size to small pebble size (good size chunks).
	10%	Volcanics - similar to last interval - sulfides associated w/ volcanics magnetite(?)
	Tr.	minor quartz veining in volcanics
	Tr.	Caliche Sample reacts well w/HCl
		
3623 to 3643		Drilling 16 ft/hr.
	95%	Tuffaceous material - similar to previous interval again minor amounts of clay associated with it, material is hard but w/fracture under probe. Sample has minor reaction w/HCl; tuff appears to be welded
	5%	Minor amount volcanics similar to 3575 to 3593
	Tr.	minor fragments of chert(?) black, dense - somewhat smooth.
	Tr.	Sulfides - pyrite - associated w/volcanics. Caliche ) Minor amounts - similar to Quartz/chalcedony ) previous intervals. Sample size varies from abundant sand/silt size to small pebble size Volcanics angular, tuff angular to poorly rounded
3643 to 3683	50%	Volcanics - medium to dark grey - dense - angular fragments w/minor phenocrysts - but I can't tell what they are. Some are mildly xilline - some have quartz veining quartz and/or chalcedony
	50%	Chert - dense - black - contact w/volcanics
	50%	Tuffaceous material similar to previous interval
	Tr.	Minor amounts of clay
	Tr.	Magnetite fragment size is overall small pebble size w/some sand-size fraction Sample has minor reaction w/HCl

ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3683 to 3713	70%	Volcanics - light grey, brown, dark grey and reddish - hard - dense - some are mildly (somewhat) Xlline angular fragments - w/some quartz veining
	30%	Tuff - green similar to previous intervals calcite/caliche
	Tr.	Sulfides
3713 to 3743	60%	Tuff - similar to previous intervals - hard, green
	5%	Minor amount of clay associated with it Some of tuff is white & welded
	35%	Volcanics - similar to previous intervals - slight oxidation (Fe staining) on some fragments - quartz fragments
	Tr.	Trace of sulfide (pyrite) associated w/it. Sample reacts strongly w/HCl Sample ranges from clay/silt/sand size to small pebble size Some green alteration (altered quartz) material present
3743 to 3773		Sample similar to last interval except more clay quartz fragments more common
	45%	Percentage of volcanics > in this interval otherwise much the same as 3713-3743
3773 to 3803	87%	Volcanics - basalt(?) greenish grey & dark grey - somewhat Xlline; dense, angular fragments
	3%	Several large clumps of clay - cream to grey in color
	8%	Tuff - white welded - minor amounts of green tuffaceous material
	2%	Calcite and/or caliche Volcanics have vesiculation - amygdulation in minor amounts Note: absence of pyrite (if present - in very minor amounts)
	Tr.	Fragments of quartz - minor penetration $\approx 15'$ /hr.
3809 to 3840	87%	Volcanics - basalt(?) med to dark grey, Xlline, angular fragments - minor pyrite veins. *No apparent vesiculation (Similar to previous intervals)
	10%	Caly - off white $\rightarrow$ grey (due to mud)
	3%	Tuffaceous material - minor amounts - green *One large fragment - (basaltic andesite) - reddish grey w/amygdule calcite and/or caliche
	Tr.	Minor fragments of pyrite which have a trace of oxidation
	Tr.	Minor calcite veining penetration $\approx 14$ ft/hr. correlates w/Ginn 4200? fragment size ranges from sand/silt size up to small pebble size ground mass fraction probably due to clay(?)

ROSSI 21-19  
LITHOLOGIES (Cont'd)


<u>Interval</u>	<u>%</u>	<u>Description</u>
3840 to 3869	95%	Volcanics - very similar to previous interval
	1%	Minor fragments tuffaceous material
	2%	Minor clumps of clay
		Sample has strong reaction w/HCl
	2%	Calcite fragments - opaque - some with green alteration material attached
		Minor sulfides - pyrite
		fragment size varies from silt/sand size up to small pebble size - > amount of fine material as previous interval
		penetration $\approx$ 12 ft/hr.; mud out temperature 160°F
3869 to 3902	87%	Volcanics - basalt/andesite(?) light to dark grey; to black; hard, mostly Xline $\rightarrow$ dense but occasionally angular fragments
		minor sulfide veining (pyrite)
	1%	Calcite - opaque
	10%	Minor tuffaceous material-green
		Tuff - fractures under probe but is hard - contains fragments of opaque calcite
		Very minor amounts of amygdules in volcanics
	1%	Greenish - white alteration material attached to volcanics which reacts w/HCl
2%	Minor amounts of clay	
		fragments size smaller than previous intervals but not as much groundmass material
		Several fragments of tan claystone
		Opaque fragments of calcite - minor penetration $\approx$ 17 ft/hr.
3902 to 3931	82%	Volcanics - basalt(?) dark grey to black hard, Xline -
		In contact w/sulfides - very similar to previous volcanics.
	10%	Clay - more abundant than in previous intervals - light brown in color, thick and goey
	5%	Green tuffaceous material as in previous intervals
	2%	Calcite and/or caliche
		minor amounts of Fe stained (oxidized) material - bright red.
	1%	Green opaque fragments that <u>do not</u> react w/HCl
		Some have sulfide veining - altered quartz
		Some of the volcanics have veining of this material - can be dug into w/probe
		few fragments of creamy beige silt - claystone(?)
	Some is very soft - some hard	
	fragments size similar to previous interval -	
	slightly more groundmass material - probably	
	due to > clay %	
	penetration -	

ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3931 to 3960	93%	Volcanics - basalt - similar to previous interval - minor oxidation
	2%	Minor clay clumps
	2%	Minor tuff fragments - pebble size
	3%	Abundant sand-size material (tuff fragments)
	Tr.	Trace calcite and/or caliche Abundant fine, sand-size material - volcanics & tuff penetration ≈
3960 to 3988	10%	Clay - creamy off-white
	7%	Tuff - white - breaks apart under pressure of probe also green tuff material
	80%	Volcanics - basalt(?) - similar to previous intervals (Claystone/Siltstone) - orange
	3%	Calcite - moderately rounded fragments/some angular - opaque
	Tr.	Not as much sand/silt size material as in previous interval Green alteration material - but reacts w/HCl not as much fine sized material as previous interval penetration =
3988 to 4020	45%	Tuff - light greenish grey - breaks apart under pressure of probe - poorly rounded - contains angular volcanic fragments some fragments look like light grey siltstone w/o inclusions
	5%	White clay
	45%	Volcanics - basalt(?) - similar to previous interval
	2%	Calcite/Caliche
	3%	White opaque quartz w/green-blue alteration material - this time does not react w/HCl as in previous interval (3960 to 3988) minor sulfides deep blue-green fragments - soft fragment size ranges from sand/silt size to small pebble large fragments > fine fraction (still abundant fine fraction)



<u>Interval</u>	<u>%</u>	<u>Description</u>
4020 - 4051	50	Volcanics - basalt/andesite-(?) similar to previous intervals
	40	Grey & brown siltstones - can be drilled into w/probe also light greenish grey
	5	Calcite and/or caliche common
	2	Abundant pyrite - usually associated w/volcanics Tuffs - greenish, somewhat massive & hard some of the tuffaceous material is welded violent sample reaction w/HCl
	3	Abundant sand size fraction present Minor amounts of clay penetration =
4051 - 4085	35	Tuff - light tan & greenish in color - Some welded - similar to previous interval
	25	Volcanics - same as previous intervals
	30	Chert - black, grey, off-white - some w/veins also brown
	10	Quartz and/or chalcedony Most of sample is sand-size material pyrite - common green alteration material present - minor amounts
4085 - 4115		Very similar to interval 4051 - 4085
	10	except not as much tuff
	30	Chert (white, off-white, brown, black, with pyrite veining - some has) green alteration product present
	50	Volcanics are lighter in color - light brown & grey - also not as xlline but still very dense, & angular
	3	Sulfides - pyrite common
	4	Minor amount of soft creamy yellow claystone
4115 - 4145	3	Minor amounts of clay - off-white in color the tuffaceous material has pyrite veins most of the sample is silt/sand size material even the larger fragments are smaller compared to what is usually returned
	25	Tuffs - (same as previous intervals)
	25	Clay - light brownish-grey in color (mud stained) Volcanics - basaltic andesite - medium to dark-grey, black
	5	Chert - as described in previous interval
	10	Volcanics - Basaltic/Andesite - dense, (moderately xlline) abundant sulfides - chert has sulfide veining
	10	Green alteration material - dark green - almost black - soapy - abundant Fe staining on some of the volcanics some of the welded tuff breaks apart very easily
	25	Abundant tuffaceous sediment - sand/silt size material Sample has mild reaction w/HCl
	4145 - 4175	95
5		Minor volcanics - dark grey, Fe stained; basalt/andesite some has green alteration material attached to it abundant calcite and caliche still minor amounts of chert present
4175 - 4208		Very much the same as last interval

<u>Interval</u>	<u>%</u>	<u>Description</u>	
4208 - 4241	7	Calcite fragments 1/4" (length) x 1/16" (width)  ; white, moderately massive, shows cleavage - (big chips)	
	65	Tuff - welded; mostly light to medium green but also brown, red, & off-white Large (1/2" length) fragments of light brown claystone, soft, easy to dig into w/probe.	
	5	Grey & reddish grey siltstone/sandstone - [part of tuff(?)] fragments are large & have very smooth faces, will fracture under pressure from probe some fragments show bedding	
	3	Creamy white clay; also some light brown clay	
	5	Abundant green alteration material soapy texture, dull luster, very soft	
	10	Volcanics - basalt/andesite(?) - Similar to previous intervals	
	3	Fragments of quartz/chalcedony - opaque - some w/ Fe staining	
	2	Sulfides - pyrite - very common	
	Tr	Magnetite	
			Figuring out % is difficult when there is so much diversity in sample - Volcanics ≈ 10% This calcite is probably the vein referred to in Ginn lithology @ 4200 (makes us even) The tuffs include some feldspar laths but I cannot discern any twinning penetration ≈ 10 ft/hr. fragment size ranges from very large to sand/silt size material. Abundant fine fraction
	4241 - 4271	30	Volcanics - Basalt(?) - dark grey to black - greenish tinge - reddish tinge; hard, dense; angular fragments - small pebble size but larger than what has previously been encountered minor amount of Fe staining => orangy/red some w/quartz veining
30		Tuffaceous material*: white, green, grey, reddish some appears to be welded(?)	
10		Clay - minor - some large moderately rounded clay stone material - light creamy white to yellow/orange. Minor amounts of clay material (globby) - stained mud grey	
5		Calcite-material similar (probably the same) as what was encountered @ 4208 to 4241. large plates. Pyrite - very common - both individual fragments and associated w/quartz	
5		Quartz and/or chalcedony	
15		Siltstone(?) grey, angular fragments minor reaction w/HCl - part of tuffaceous material (?) easily broken apart - fractures - with pressure from probe - some has black veining	
			Very similar to sedimentary material
5	(Abundant sand & silt size fraction - (Sample size: two extremes - 50 large or 50 small ((not an even size distribution) *Some of the volcanics are (sort of) Xline dark(green or black) alteration material(?) Soapy - can be dug into w/probe - In some cases it looks very similar to the volcanics except that it is lighter & can be dug into. Some pieces fracture upon pressure		

<u>Interval</u>	<u>%</u>	<u>Description</u>
4271 - 4301	30	Volcanics - black, dense
	10	Black (alteration material?) as described in the previous interval.
	5	Calcite plates as described previously
	Tr	Caliche - minor
	3	Abundant pyrite
	5	Minor tuffaceous fragments
	5	Quartz and/or chalcedony
		Abundant sand size material
	40	Chert - black, grey, white The material described in the previous interval as sandstone like material - granular now appears to be chert - it has lost all granularity, is smooth & veined with black material and pyrite.
	2	Sandstone - minor fragments w/bedding very similar to previous interval except for the change in the chert.
4301 - 4335	42	Meta quartzite - (white) & black (mixed) Xlline, very, very hard, angular fragments. Opaque white quartz filling fractures. The overall color is dark grey to black but white material can be seen under scope - metamorphism evident - <u>tight</u> welding(?) of grains.
	42	Chert - black, grey, & white w/black veining & pyrite veining
	3-5	Abundant pyrite - large individual fragments as well as associated w/chert; w/tuffaceous material
	5	Tuffaceous material - breaks very easily with pressure from probe - white to light green in color - somewhat soapy texture
		Abundant sand size fraction made up of pyrite, quartz, calcite, chert
	6	Minor fragments of basaltic/andesite(?) still present Just located fragment - shows fibrous characteristics (possibly glaucophane)?
	Tr	The dark green alteration product is missing but the light green tuffaceous material (at least that's what I'm calling it) has some of it's properties except that it is not as soft. There is some green alteration material.
4335 - 4357	85	Metaquartzite - as described in previous interval
	2	Minor amount of tuffaceous sediments & tuffs
		abundant pyrite
	3	Black or green alteration material as previously described but it is getting much softer
	Tr	Sandstone - moderately well rounded claystone - creamy yellow color (part of tuffaceous material?)
	10	Abundant quartz Abundant <u>sand</u> /(minor silt) size material & large fragments Drilling rate = 1 to 4 ft/hr - material completely ate away the bit.

ROSSI 21-19  
Lithologies

Interval  
4369-4385

	%	Description
	65	Light brown siltstone to claystone moderately well indurated - can be scraped easily with a probe - cream white on dry surface. tends to be platy. Fragments up to gravel size. Light colored fraction generally to fine-grained to be seen under microscope (clay) dark fragments are visible though. Moderate reaction to HCL
	35	Quartzite - dark color - impure quartzite
	TR	Pyrite
	TR	Fibrous mineral black, possibly glaucophane (?)

Grab Sample%Description

At ≈ 8:00 am, 11-25-76 we started to drill with foam. Due to the rig-up system of foam drilling, the most logical and appropriate way of catching samples was to take them @ 15' intervals. This was discussed with Slim Garrett. Our 1st objective is to make hole; 2nd is catching samples. The samples are "grabbed", caught in a sieve, by the air men every 15 feet. The foam in, foam out temperature is also recorded on the sample bag label along with the depth the sample is taken. Consequently, we are losing the "fine" fraction of the sample. If in the future we can come up with a more appropriate way of catching samples, adjustments will be made.

4390	45	Greyish-green material. Texture is very much like that of soap. Very soft. When dug into with probe, it is similar to digging into a bar of soap. It flakes up white. The fragments are moderately well-rounded. It is dense material and contains abundant sulfide material - probably pyrite. It does <u>not</u> react with HCl. It is possible that this material is an altered tuff(?) Some of the fragments are much greener than others and some are patchy green - Probably an alteration material filling fractures.
	45	Claystone - light brown (tan) microcrystalline but even at high magnification I cannot discern what the grains enclosed in the clay are even under high magnification. The fragments are poor to moderately well-rounded.
	10	Quartzite - as described in previous intervals
	Tr	Chert - dark grey - as described in previous intervals
	Tr	Few fragments of volcanics - probably sluff
		Quartz - associated with quartzite <u>abundant</u> pyrite - as previously stated in tuff(?) material
		<u>Note:</u> Absence of fine fraction due to the method of catching samples
4403	25	Alteration material as previously described but has even > amount of pyrite
	3-5	Claystone as described in last interval but fragments are harder.
	35-40	Metaquartzite, dense, hard, lt. black, & white highly fractured, abundant pyrite associated with it Pyrite filling fractures, also quartz filling fractures - Same material as previously described
	30	Shale, siliceous, dark black, fine grained cryptocrystalline, very smooth surfaces, fractures easily under pressure from probe - breaks smooth, some fragments have pyrite veining
	3-5	Pyrite abundant - some moderately well rounded fragments others angular of pyrite material - looks like alteration material (as described above) that has been replaced by pyrite. 1 long piece of what appears to be blue asbestos-? long fibrous hair-like material Quartz - opaque fragments Sample has minor reaction with HCl



<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
4463	50	Metaquartzite - as previously described
	9	Alteration material - as previously described
	40	Shale - greyish-green, aphanitic, moderately hard but can be dug into w/probe. Very fine fracture lines filled w/black veining Also dark black shale
	1	Claystone - tan - as previously described Abundant pyrite associated with everything Overall small fragment size
4478	90	Quartzite - large fragments - hard, dense, black (as described previously) - quartz veining
	3	Claystone, tan, soft - as described previously
	7	Shale - black & (light grey) - minor - as previously described Sample has minor reaction w/HCl Very minor amount of pyrite Sample size fragments - large
4493	100	Metaquartzite - as previously described fractured w/quartz veins
	Tr	Shale - black & grey
	Tr	Clay - very minor
	Tr	Claystone Sample has minor reaction w/HCl Sample size fragments large minor pyrite
4500	50	Claystone, brown, tan & green
	10	Metaquartzite -

ROSSI 21-19  
Lithologies

Interval	%	Description
4525	40	Light green alteration w/white blebs grading to white alteration w/green blebs
	25	Light gray shale or slate, highly indurated
	25	Black shale
	10	Chert w/black veins
	Minor	Pyrite
4553	50	Black shale
	30	Light gray shale or slate as in 4525
	10	Light brown siltstone w/vigorous reaction to HCL
	10	Light green alteration product w/white blebs
	Minor	Pyrite
4561	80	Black shale
	20	Light gray shale as in 4525
	Minor	Pyrite
4576	Major	Calcite
	Minor	Light brown siltstone
	40	Shale - black & grey light to med (with black veining) pyrite common fragment size large - angular sample has minor reaction w/HCl  Large fragment of asbestos-like material - very fibrous - dark blue in color
4591	85	Shale - light grey to black, dense, can be drilled into with probe, angular fragments Very light grey material is much smoother than the dark grey & black material. The light material is highly fractured & the fractures are filled in with black material. The black filling is harder than the shale. The black shale is fractured & filled with calcite. The sample has a violent reaction w/HCl. The light material shows bedding.
	15	Quartzite - dark grey - hard to distinguish from dark shale due to similar texture both quartz and calcite
	1	Pyrite - both individual fragments & associated w/shale & quartzite  Minor amount of claystone



ROSSI 21-19  
Lithologies

Grab Sample	%	Description
4607	100	Black shale
	Minor	Calcite
	Minor	Pyrite
	Minor	Light brown siltstone
	Minor	Alteration material light green w/white blebs
4622	85	Black shale
	15	Light green w/white blebs alteration material partially pyritized
	Minor	Pyrite
	Minor	Calcite
	4637	50
20		Alteration material as in 4622
25		Light gray shale or slate
5		Pyrite
Minor		Calcite
Minor		Light brown siltstone
4655	70	Black shale
	10	Light gray shale or slate
	15	Chert
	5	Alteration material as in 4622
	Minor	Calcite
	Minor	Pyrite

ROSSI 21-19  
Lithologies

Grab Sample	%	Description
4670	70	Black shale
	20	Alteration product as in 4622
	5	Chert
	5	Gray shale or slate
	Minor	Calcite
	Minor	Pyrite
4685	40	Black shale
	40	Chert
	10	Gray shale or slate possibly a gradational phase. with the chert (?)
	10	Alteration material as in 4622
4693	80	Gray chert - similar to the gray shale or slate from above but with strong conchoidal fract.
	20	Black shale
	Minor	Pyrite
	Minor	Light brown siltstone
	Minor	Alteration material as in 4622

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
4719	25	Shale - black to grey, hard, dense - does not break - Cannot cut w/probe - concoidal fracture(?)
	45	Chert - grey w/black veining - concoidal fracture dense - hard - highly fractured
	5	Claystone - tanish pink - microcrystalline claystone greyish green - or is the alteration material - difficult to discern (?)
	25	Quartzite - similar to previous intervals but significantly more dense
	Tr	Alteration(?) material replaced by pyrite pyrite pretty much associated w/all liths minor reaction w/HCl fragments angular and fairly even size distribution
4734		Very similar to last interval more alteration(?) material more of the material that I am calling Chert (grey w/black veins) than anything else caliche - reacts w/HCl
	85	chert
	5	alteration
	10	quartzite
4751	50	Quartzite - slight reaction to HCL
	30	Chert - gray
	20	Black slate - same as black shale up hole. The material has been getting better indurated up hole it could be dug into with the probe now it is hard enough to scratch metal off of the probe This has been a progressive thing not sharply delineated
	Tr	pyrite
	Tr	Calcite
	Tr	alteration material - now white - no green still pyratized metal fragments from screen used to catch the sample
4765		Same lithologies as 4751
	45	quartzite
	55	black slate
	Tr	chert
	Tr	pyrite
	Tr	calcite
4804	90	Quartzite w/pyrite & quartz veining The material I am calling Chert-like is associated with the quartzite. Is it possible to have chert filling voids & fractures in the quartzite(?) Yes. It is smooth & hard & breaks in somewhat of a concoidal fracture. Some pieces have what appear to be pyrite inclusions most of it is opaque grey w/black veining. Some of it gets very black.
	10	chert
	Tr	Clear quartz fragments
	Tr	Green alteration material - more brittle than soft abundant pyrite associated w/it.
	Tr	Black shale - dense - some is very hard - again pyrite common association. No sample reaction w/HCl fragments are all angular: size ranges from large sand size to medium pebble size

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
4813	85	Quartzite - as previously described I am beginning to believe that what I am calling chert (whatever it is) is in very close association to quartzite The "chert" is chert also chert in fractures and on metamorphosed quartz arenite (quartzite of valmey)
	15	chert
	*	Discuss with Phil
	Tr	Shale angular fragments pyrite common
4827	100	Quartzite abundant pyrite
	Tr	Shale

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
4840	70	Quartzite ) <i>100% Quartzite Breccia</i> ) Should they be put together
	30	Chert(?) ) Pyrite abundant
4855	90	Quartzite
	5	Chert(?)
	5	Shale Abundant Pyrite
	Tr	Caliche and/or Calcite angular fragments large sand size to small pebble size
	Tr	Green alteration(?) material
4889	100	Quartzite Caliche associated w/quartzite → reaction w/HCl
	Tr	Alteration(?) material Pyrite associated w/quartzite & individual fragments
	Tr	Black Shale Opaque quartz
4915	95	Quartzite w/veins of pyrite & quartz dark grey to black & white. Some fragments have transparent & black granules. Angular fragments, hard & dense.
	1	Siltstone/claystone - steel grey w/black veining and also pyrite veining. Can be dug into with probe, dense
	2	Green alteration(?) material - Very similar to material previously described but harder. Fractures easily w/pressure from probe
	1	Calcite vein on some of the quartzite fragments but minor
	1	Shale, black, dense, moderately hard fragment size varies from medium pebble size to large sand size fragments minor amounts of bit filings picked up by magnet. Getting extremely difficult to collect samples
4930	85	Quartzite - as described above
	2	Alteration material(?) has become much harder - somewhat beginning to resemble a claystone - fragments for angular than previously
	10	Chert(?) what I have been describing before as silt/claystone now has become very dense & hard & resembles chert. Highly fractured w/ black veining I haven't been able to see a good conchoidal fracture like I should if it is chert
	1	Shale - as previously described - black, dense, easily broken
	2	Calcite and/or caliche - reacts w/HCl. Breaks easily under pressure from probe
		Pyrite common - both as veining & as individual fragments - but not as much as Grab 4915
		Quartz fragments.

Grab SampleZDescription

4953

92

Quartzite - dark grey-black/white; pyrite & quartz veining; angular fragments; dense; hard.

3

Alteration material - green & white - soft; spotty - some w/pyrite, some w/Fe staining

2

Claystone - light tan - microcrystalline, breaks easily under pressure from probe some is kind of pinkish

1

Shale - black - dense, hard but can be drilled into w/probe - breaks into flakes sometimes - easily fractured up

2

Claystone - grey - hard w/pyrite - microcrystalline - shows some lineation of black lines pyrite associated w/all of the above all are very angular fragments except for the "alteration" material - poorly rounded

fragment size from large sand size to medium pebble size minor reaction w/HCl - Caliche on quartzite(?) associated w/

Abundant metal filing from mill job.

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
4969	25	Shale - grey to black, hard, dense w/associated pyrite
	50	Quartzite - grey, black & white - dense, hard, granular w/associated pyrite - calcareous
	25	Chert(?) light grey to dark grey - some w/black veins - sometimes associated w/quartzite
	Tr	Alteration material(?) - green & white Fe stained metal filings present from milling  Is it possible that some of the chert is somewhat transparent? fragment size fairly even distribution - All angular fragments except for alteration(?) material
4984	60	Shale - black - some w/silver mineral associated hard, dense - quartz veining - concoidal fractures
	20	Quartzite
	20	Claystone - (or alteration material) but I believe it is a claystone - greenish grey can be dug into by probe - angular fragments - somewhat hard abundant quartz associated w/quartzite & shale pyrite present but not as common as in previous intervals Chert(?) as in previous intervals - mostly opaque w/fractures filled w/black material

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
4999	80	dark gray to black shale (metasiltstone) can be dug into with the probe - can see grains at 10X
	15	quartz massive vein fillings
	5	calcite - massive
	minor	pyrite
5013		Same as 4999
5028		Same as 4999 dark gray has numerous grains with fractures filled with quartz and calcite
5043		Same as 4999
5058		Same as 5028 with minor aphanitic med. gray shale (metaclaystone) quite siliceous looking - w/pyrite on grains
5073		Same as 5058
5080	30	milky white quartz - massive with some banding indicating open fracture fillings
	40	chert - med. gray - may be secondary but has been fractured and fractures filled with mafic minerals
	30	black aphanetic shale (metamudstone) - no fissility
	minor	pyrite minor calcite present
5097		Same as 5080 except black fraction is coarser grained
5116		Same as 5080 except black fraction is partly the coarser grained material
	minor	fault gouge - pale green to white smeared texture along plane surfaces
5127	35	Black shale (meta-mudstone to meta-siltstone) Blocky fragments - fractures filled with quartz & calcite
	45	med gray chert - highly fractured and fractures filled with black minerals/calcareous cement
	10	free massive quartz
	5	calcite
	5	pyrite
	minor	soft gray material with white spots probably an alteration product
5142		Similar to 5127 med gray chert is more opaque here and seems to grade in to the black shale (meta-mudstones) the chert shows some tendency to fracture along parallel planes quartz reduced in percentage
5158		Same as 5142 no free quartz just chert calcite 10% calcite veining
5173	60	chert - highly fractured
	35	black shale (meta-siltstone - meta claystone) with calcarous cement which seems to grade into the chert
	5	calcite
	minor	other than chert no free quartz pyrite



<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
5189	10 70 20 minor minor	chert black shale (meta-siltstone) euhedral quartz in fracture fillings and free calcite pyrite
5205		Same as 5189 except no chert 10% alteration material
5223		Same as 5127 the chert is back no termination to the quartz
5236		Very small sample Same as 5223
5251		Same as 5223 some terminations on quartz
5260		Same as 5251
5285	90  minor 5 5	dark gray to black shale (meta-claystone to meta-siltstone) fragments are generally blocky but some have tendency to be platy. Calcite cement pale green meta-claystone to meta-siltstone pyrite quartz generally as fracture fillings on other grains or blocky fragments of massive quartz
5300	70 20 5 minor	first lith above med gray shale (meta-siltstone) can be scratched with probe quartz pyrite
5330		Similar to 5300 med gray shale (meta-siltstone) becoming coarser grained slight but pervasive reaction to HCL throughout sample
5346	60 10 10 20	med gray soft alteration product strongly pyratized quartz euhedral and anhedral probable an open fracture free pyrite dark gray to black meta quartzite (meta-claystone - meta-siltstone)
5361	20  15 35 20 10	light gray altered siltstone (alteration product?) highly pyratized generally well-rounded chert-fractured and rufilled with mafic materials probable an open fracture black shale (meta-siltstone to meta-claystone) no grains visible in the blocky fragments non fisial or friable quartz some clear some milky - some with xtal terminations sand-sized fragments free pyrite - euhedral up to fine sand-sized pyritohedrons
5376	85 15 very minor	med gray shale meta-siltstone with abundant quartz fracture fillings on grains. Cemented w/calcite quartz euhedral and anhedral pyrite
5391	95  5 minor	med gray to dark gray shale (meta-siltstone) with calcite cement also some fracture fillings filled with quartz quartz pyrite

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
5404	60	dark gray to black siltstone (soft) w/ calcite cement med. gray siltstone (hard) w/ calcite cement both show some grains with fractures filled w/quartz
	5	quartz - small grains
	minor	pyrite
5420	45	light gray altered siltstone (soft) lightly pyratized rock is somewhat soft probably from hydrothermal alteration. slight reaction to HCL - calcite cement? probable a fracture zone
	35	med gray shale (meta-siltstone or meta-claystone) blocky fragments some quartz filled fractures quite hard
	10	quartz, anhedral, milky
	10	free pyrite
	minor	pink siltstone
5438	100	med gray shale (meta-siltstone) w/fractures filled with dark minerals. occasionally they are filled with quartz
	minor	pyrite
	minor	free quartz anhedral
5453	65	med gray shale (meta-siltstone) described above
	25	dark gray to black shale (meta-siltstone) blocky fragments no fisility
	10	metaquartzite
	minor	pyrite
5469	50	med gray shale (meta-siltstone) described at 5438
	40	dark gray to black shale (meta-siltstone) described at 5453 w/pyrite in the matrix
	10	metaquartzite
	10	massive calcareous fragments probably vein fillings
5484	85	med gray shale (meta-siltstone) described at 5438
	10	dark gray to black siltstone described at 5453
	5	free quartz
	minor	pyrite
5500	50	med gray shale (meta-siltstone) described at 5438
	35	dark gray to black shale (meta-siltstone) described at 5453
	10	free quartz anhedral
	5	free pyrite
5515	25	med gray shale (meta-siltstone or possibly meta claystone) little xtal. structure seen highly fractured and fractures filled w/mafic minerals and quartz veins
	55	black shale (meta-siltstone) quartz veining
	10	free quartz all anhedral no xtal faces evident
	5	pyratized altered siltstone - soft w/white blobs (probably weathered feldspars) in a light gray matrix
	5	calcite
5530		Same as 5515 w/slightly more pyrite
5545		Same as 5515 med gray shale (meta-claystone) is tending to look like chert - translucent

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
5560	25	med gray shale (meta-claystone) to chert highly fractured
	35	black shale (meta-siltstone) highly fractured
	20	pyratized altered siltstone
	15	sandy claystone - hard - probably metamorphosed fault gouge - elongate grains that have been streaked out at the ends perhaps better called a mylonite
	5	quartz no xtal faces
minor	orange siltstone	
5575		Similar to 5560 less mylonite 10%
5590	60	med gray chert - translucent, highly fractured
	30	black shale (meta-siltstone)
	10	quartz anhedral from fracture fillings no mylonite
5605	85	black shale (meta-siltstone) highly fractured
	10	med gray shale (meta-claystone) or chert highly fractured
	5	quartz - milky
5620		Same as 5605
5635		Same as 5605 w/ a few clear grains of quartz
5650	45	med gray shale (meta-siltstone) or chert
	30	black shale (meta-siltstone)
	20	milky quartz from vein fillings - no euhedral
	5	altered siltstone
minor	pyrite	
5686		Same as 5650

NV - Blowdown  
 Rossi #21-19  
 12-8-76

WELLSITE GEOLOGIST  
 ROSSI 21-19 DRILLING RECORD

Date	Bit # Type		Watson/Parnow
10/4	#1 12½ 2JS Smith	Mousehole (15') & Rat Hole (30')	
10/5	#2 17½ 2JS Smith	Spud 200' downing	
10/6		Reaming 26" hole 20" casing to 200'	200'
10/7		Cement casing	
10/8		Nippling up; Tested casing w/30 PSI: Tagged cement @135'; Removed two joints of tubing from being cemented in hole; stab into fish	
10/9	#2	Fishing; Pull fish out w/overshot; Test BOP to 200 PSI	
10/10		Drilling out cement - hit formation	
10/11		Drilling	549
10/12	#2 17½ 585 Sec	Drilling; Direction Survey (664'): 3½° N67½E Drilling - pulled out to change bit Survey (732') 4½° N63½E	
10/13		Drilling	924'
10/14		Drilling: Survey (1002'): 3½° N78½E ① Survey (1219): 3½° S86½E	
10/15		Drilling	1576'
10/16	#3	Drilling; Survey (1596') 1½° S64½E	
	#2	Bit change @1688'	1714'
10/17		Drilling; lost circulation (1930-1953') pulled out; lost 50 barrels in 30 minutes Lost 30" of fluid in one hr (?)	
10/18		Raise viscosity - mixed lost circulation material set up for logging; Welox logged	2000'
10/19		Started to run 13 3/8" casing	
10/20		Fighting lost circulation with 13 3/8" casing in hole → casing to 1870'	
10/21		Casing to 2000; cement; clean cellar	
10/22		Welding on well head; nippling up	
10/23		Nippling up: Test BOP 2000 PSI	
10/24	#1	✓ Test casing to 1500 PSI Hit cement @1947' Tagging cement	2239
10/25		Drilling out cement; Total footage	2368
10/26		Drilling	
10/27	#4 12½" 586 Sec	Survey @2510' 3 1/4° N71½E 2510' pulled out of hole	2585
10/28		Drilling; Tripped @2705' because of change to air. Put in cement plug @ 474' (100 linear ft) Tagged cement @400'	
10/29		✓ Nippling up ; Test BOP 2000 PSI Drilling cement @400'; (Went back to mud because they couldn't get through the rotating head with bit or the rotating table w/rotating head	



WELLSITE GEOLOGIST  
ROSSI 21-19 DRILLING RECORD (Cont'd)

Date	Bit		Dep.
11-9	#6	Top of fish @ 2852 Milling on Junk @ 2898; P.O.H.; RIH; Work over top of fish; Milling; Circulate; POH; lay down lots wash pipe; lay down jars & pick up jars - Run in hole w/overshot; Fishing POH, chain out of hole; Overshote came unjacked 1/2 POH	
11-10		Running in hole; jaring up on fish Jar on fish; chain out of hole - wet - tight break Lay down fish - D.C. - MC - S.sub Lay down fishing tools S.sub-4 stab XO's Bumper sub - Jars Make up B.H.A. RIH; RIH to shoe & circulate 2382 circ. Run to 2662 1/2 circ & C.O. bridge; circ 1/2 RIH to 2947 w/Junk basket; circ Drill; circulate - survey 3-1/4° Lagtime	2957
		$5" \times 12-1/4 \text{ annulus} = .1215 \text{ bbl/ft}$ $.1215 \times 2957 \text{ ft} = 359.28 \text{ bbl}$ $\text{Pumping } 400 \text{ gal min} \div 42 \text{ gal/bbl} = 9.52 \text{ bbl/min}$ $\frac{359.28 \text{ bbl}}{9.52 \text{ bbl/min}} = 37.7 \approx 38 \text{ min up time}$	
11-11	#7 12-1/4 S-86 SEC	New bit 2957; POH & change bit Make up drilling assembly; RIH; cut drill line; RIH; Rubber D.P; Reaming getting iron from under bit; Drilling; work on Kelly; new gasket on Gods neck; Drilling; Drilling; circulate; Fix mud lines; Drill; Fix Pump #1; Drill.	3070
		$\begin{array}{r} 3488 \\ 2957 \\ \hline 531 \text{ ft. } \rightarrow \#7 \end{array}$	
11-12	#7	Drill; at 12:00 noon pulled 2 stands - Repaired Swivel Survey @ 4:00 p.m.; Drill Weight on bit 40,000 Pump pressure 1000	3308
11-13		Drill; Drill Break @ 3415; Drill; Circulate & Run survey - 2°45'; P.O.H; Change Bum Subs; Fix float & handling bottom hole A99 R.I.H & Pull rubbers off of pipe	3488
11-14	2957- 3488	R.I.H. Reaming to 3488. took weight at 3463. Tourqued up and backed off at 704. Pulled 7-1/3 stands of D.P. waiting on fishing tools. Pick up fishing tools; make up fishing tools. R.I.H; RIH 1/2 overshot into fish. P.O.H. 1/2 change overshot 1/2 P.O.H. 1/4; change overshot 1/4, R.I.H. 1/4 screw into fish 1/4 change overshot 3/4 R.I.H. 1/4 Screw into fish; Jar on fish 1/2; P.O.H 1/2 Break down fishing tools; Lay down fishing tools; P.O.H. (chain out)	
	#8 12-1/4 S-88 SEC	P.O.H w/chain; Change Bits; Lay 4 sts HW & Laving down; Bent drill pipe	3488

Date	Bit		Dep.
11-15	233 ft/24 hr	Pick up drill pipe; RIH; Fill pipe; Reaming to bottom; drilling 10'/hr.	3488 3721
11-16	#8 #9 12-1/2 S-88 SEC	Drill; Survey @ 3842 1°45'; P.O.H. Change bit; Run-in-hole; Ream 3800 + 3902 #8 total + 233 ft.	3902
11-17	#9	Drill 3902 to 4126 Weight or Bit 1000# 45	4126
11-18	#9 12-1/4 SEC S-88 #10 12-1/4 SEC S-88	Drill; P.O.H.; Mag Flux D.C. & H.W. Lay Down Change bit; Magna Flux, R.I.H.; Tight Place @ 3045; Ream to 3175; R.I.H. to 3480 Tight. Ream 3480; R.I.H. to 4100 - Ream to Bottom; Drill Total on #9 4136 3902 = 234 ft total W = 68; V = 55; L = 53	4136
11-19		Drill & Rig; V = 53; W = 69	4343
11-20	Total on #10 221'	Drill; Circ. for trip; P.O.H.; waiting on Slumberger; Logging: Dual Induction, Sonic, Gamma Caliper; Dip meter; (Hole stayed full)	4357
11-21	R.R. 9 12-1/4 SEC	Dip meter log; Lay out tools; Make-up B.H.A. R.I.H. Strap in 1/2; Circ. & condition mud; Condition & Build volume to 60 vis; P.O.H. w/plugged bit; slip & cut drill line; R.I.H.; ream to bottom; No fill 1/2 circ. to run pipe; circ; P.O.H. Pull to shoe - measure csq. Rig up to run csq. R.I.H. P.O.H.	
11-22		Rig up to run casing; Run casing; Make-up cement tools; Run 9-5/8" liner & hang same @ 1791'; Cement liner; P.O.H.; Cond. mud; Hang 9-5/8" intermediate string - top 1971; bottom 4369; 1251 cubic ft. of slurry as per program Pressure tested lap @ 1500 PSI; Laid down drill collars; 12-1/4" hole - 8" collars. Run in hole w/12-1/4" bit; Tag cement @ 1450'; C.O. Cmt; unplug flow line; Lay down D.P. out of Drk.	
11-23	#11 8-3/4" SEC M-88	Depth: 4370; Drilling Setup: 8-3/4" Bit, Bit Sub 3- 6-1/4" DC's = 88', XO, 13 Ks Huy wt DP, 5" D.P. Drilling fluid = IMCO Gel Water Cmt Cut  Finished lay down 8" D.C.'s & wait on contractors 6-3/4" D.C.'s. SOCO Air Crew Set in Air Buster. Start in Hole w/D.P. Unplug Bit. Drill out cement in liner 1791 - 1836' (45' Cmt. in top of liner) Change over to water. Dumped mud into sump. R.I.H. to 4152'	





Date	Bit	Dep.
11-27	#11RR 8-3/4" SEC M-88	Drilling Setup: 7" magnet, 6-6 1/4" DC's, 13 Jts Hvy wt. 5" D.P.
	#7 Midway Fishtool magnet	Drilling Fluid: Soco Foamers 3 - 8-3/4" Bit cones in hole (Temp -10°) Cont Reaming 4921 - 4950' Pumped 50 Bbls cold sump water down D.P. w/soap pump. Pulled to shoe. Blew Kelly & Air lines dry. Pump cold water down D.P. Removed rotating head. Co. men chg. top & bottom seal rubbers. Pull D.P. till Rig Air lines froze up Thawed out air lines & added 2 gal alcohol to system (had been using 1/day) Finished P.O.H. RIH w/magnet Found 25' of fill 4925 - 4950' Pull 12 stds & pump 1000 PSI Air down well Well started unloading @ 7am
11-28	8-3/4" Midway Junk Mill	From 4950 - 4952 - 2ft. Drlg. Fluid Hutch's Foamers Unloaded well. RIH F/3834 - 4925' w/magnet c/o fill 4925 - 4950'. Circ. hole clean w/ Foam. P.O.H. Recover one cone in 4 pieces, 2 additional pieces & bit bearings RIH w/8-3/4" Flat Bottom Junk Mill Unload well @ 2922' Worked & reamed to bottom Hit Bridge @ 4400' & rotated & slid to 4950 w/out circ. Unload well @ 4950' w/Foam Mill F/4949 - 4952' Pump 50 Bbls sump water down D.P. Thaw out Tongs & Elevators POH @ 7:00am
11-29	#13 8-3/4" SEC S-88 11 hrs. 285'	From 4952 to 5237 → 285' in 11 hrs. 25# wt. on bit Drilling setup 8-3/4" Bit, Bit sub w/Float, 6 - 6-1/4 DC's, 13 Jts Hvy wt. Drilling Fluid: Soco Tech. Dev. Group Temp. @ 7am : 200° Stnd Pipe Press. 320 PSI w/20 Gpm Finish POH w/8-3/4" Flat bottom Junk mill. (Mill 9/16" undergage) RIH w/Bit #13 Install High Press. Circ. Head Unload hole @ 3650'. Reamed hole 4900 - 4951' Unload hole & chg. to Foam - Temp 212° Worked by Junk Drilled 8-3/4" hole 4952 - 5237' @ 7:00 am (5254' @ 8am) Worked on Grant HP while Plg. Steam leaking by strippers. Closed hydrill bag while making conc. Had 14' fill on con @ 5009'. None thereafter Dlq. in Fractures. Bit torques up then falls free up to 2'. Sump out flow 9:00 am 5 gal/18 sec = 16.6 gpm 11:30 pm 5 gal/28.5 sec = 10.5 gpm = 360 B/D Input - 20 gal/min = 686 B/D

Date	Bit	Dep.
11-30	#13	#5237 - Weight on bit 25 (1000#) 45 RPM
	#7 Midway Magnet	5260' ft - 23 ft in 2 hrs Drlg. Fluid: Soco Tech Group
	#14 8-3/4" SEC S-88	Detail: Cont Dlg. 8-3/4" hole 5237 - 5260' Pumped 50 Bbls sump water down D.P. w/ soap pump, 50 bbls down csg. Removed Grant High Pressure Head. Overhauled same & replaced P.O.H. Shucked off 1 cone & left same in hole. Shucked off 1 cone & left same in hole Top & bottom seal rubbers RIH W/7" Magnet Circ down to junk, Rig pump now thawed out P.O.H. chained out. Recovered cone & bearings RIH w/bit #14 Unload Hole @ 5060', Tight spot. Used Air & Rig pump 5:15 am/ reamed 5060 - 5260' 7:30 start dlg. ahead bit #13 308' in 13 hrs. Dlg & run on junk Lost 1 cone POH Bearings out of 1, & 1 cone flat
12-1	#14	5260 weight on Bit 25000 45 RPM 5506 246 ft in 8 hrs.
	#15 8-3/4 Hughes V 33 Jets out	Drlg Fluid Soco Tech Div. Group Foam Temp. 195 - 200°F Drilled 8-3/4" hole 5260 - 5405 - 4 hr. rotating on bottom Pumped 65 Bbls of Sump Water down D.P. & 50 Bbls in ANNULUS to kill blowing steam P.O.H. Replaced Seal 'O' Ring in lower half of rotating head R.I.H. with Bit #15 Unloaded well at 5095' where bit took wt. w/air & rig pump Reamed 5095 - 5405' (1-1/2 hrs 304') Drilled 8-3/4" Hole 5405 - 5506 (101' in 4 hr. 10 min #15) @5500' Replaced Gray loc union bolt on rotating head 1 hr 20 min
	#14 4 hr. 145'	Drill 6' in 1/2 hr while unloading slug of water Rates of Fluid production measured at outflow from upper pit to lower 9am 5300' 25 gpm; 11am 5350' 50 gpm; 1pm 5400' 75 gpm;  12-2-76 12:30am 5410' 35 gpm; 3:20am 5470' 75 gpm

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Wellsite Geologist

Rossi 21-19 Drilling Record (Cont'd)

<u>Date</u>	<u>BIT</u>	<u>Depth</u>
	#15 reamed 304' - 1 1/2 hr. drilled 101' 4hr. 10 min.	
12-2-76	#16 Boiler working this morning Drilling with SOCO Tech. group foam P.O.A. w/Bit #15	5506
	Hughes - R.I.H. to 5367 and unloaded well	
	J33 Reamed Hole S412-5506	
	#2F871 - Drill 8 3/4 hole w/Bit #16 5506-5686 Jets Out	
12-3-76	#16 1:40 AM 5538' 190 psi st. p -190°F out 5 gal/5 sec = 60 gpm flow 180' - 6hr. 4:00 AM 5588' 180 psi st. p -202°F out 5 gal/4 sec = 75 gpm flow 5:15 AM 5631' 180 psi st. p -200°F out 5 gal/4 sec = 75 gpm flow 7:30 AM 5686' halted drilling - Quartz becoming less abundant and more milky - No Euhedral grains of quartz seen - conclusion we have drilled through the fault and are going into the foot wall. Probably little chance of encountering another fracture while this bit lasts. Can't afford to make another bit run to change bits. Bruce wants to pull this bit anyway.  Cooled down well pumped 65 Bbls sump water down D.P. & 50 Bbls. in annulus.  Pulled 3 Stands - well started to flow Accumulator would not work - flooded road  Picked up Kelley and pumped 100 Bbls down DP. P.O.H. Rigged up Schlumberger (measured out of hole 5680' depth - 6' diff. Ran Dil Log and Recorded 4974-5678' max temp 372°F Too hot for tool but got recording although burned off the fiberglass wrapping. Closed CSO and pumped 720 Bbls of 62°F. water down hole at 800 and 650 psi. Ran dip meter and recorded 4375-5680' -379°F, 379°F. Pumped 213 Bbls in hole to cool well	

12-3-76 (Cont'd)

Ran sonic log 4374 - 5682' 381°F, approx. 425°F,  
(second therm. offscale). *ONLY RAN TWO*  
Ran CNL & FDC 4374 - 5680' 393°F, 381°F, 382°F.  
Temperature damaged DIL, DIP Meter, sonic, CNL and  
gamma. FDC OK. Gamma log only partial recording.

12-4-76

Loaded out schlumberger  
Worked on accumulator  
3 hr. to lay down 6 6" D.C.  
Make up Johnston test tools on 5" D.P.  
R.I.H. to 5000'  
Unload hole w/air and rig pump @ 6:30 PM  
See detailed notes on test.  
Foam 1 hr. then went to air  
10:15 PM well stabilized

12-5-76

4:30 PM Shut well in for 4 hr. F.S.I. till 8:30 AM  
Test interval 4369' to 5686' in 8 3/4 hole  
Temp. recorder chart was assembled backwards  
resulting in incomplete temp. recording  
RIH 10' of fill  
Rig up and lay down 5" DP.  
Rig up and ran 2 7/8 GST tubing.

12-6-76

Ran 173 Jts of tubing  
Landed @ 5594' Rechecked meas. = 5597'  
Removed grant high pressure head and DLG spool  
Removed Class III BOPE  
Installed X-mast tree  
12" - 3000# studded adaptor FLG, 3" steam  
gate w/Bull plug.  
Released rig and crew @ 1:00 AM December 7, 1976.

ROSSI 21-19

Temperature Information Written on Sample Bags

INTERVAL	IN	OUT	INDETERMINATE	INTERVAL	IN	OUT	INDETERMINATE
240 - 254	88	90		1845-1877	<del>110</del> 110	<del>112</del> 114	
254 - 285	86	90		1877-1909	<del>113</del> 114	<del>115</del> 116	
285 - 315	90	94		1909-1939			117
315 - 343	90	94		2175-2180			102
478 - 497			99				105
505 - 520	162	107		2305-2335			110
535 - 549		105		2476-2491			118
667 - 691	92	102		2491-2510		118	
775 - 805			115				
805 - 835			118				
835 - 863			118				
865 - 895			116				
1225 - 1255	111	111					
1255 - 1285			110				
1285 - 1315			110				
1315 - 1345			110				
1420 - 1438	<del>104</del> 106	<del>110</del> 110					
1452 - 1469	<del>106</del> 108	<del>106</del> 110					
1485 - 1501	110	112					
1501 - 1531			111				
1531 - 1561			118				
1610 - 1625	108	110					
1625 - 1659	-	106					

ROSSI 21-19  
DESCRIPTION OF CUTTINGS

<u>Interval</u>	<u>%</u>	<u>Description</u>	
34 - 42	42	Dark grey to brown Volcanics with some vesicles (Basalt? - Andesite?)	
	42	Red stained (Iron?) - weathered versions of above.	
	2	Magnetic grains usually subrounded	
	2	Quartz angular to subangular	
	10	CaCO <sub>3</sub> cemented grains of caliche	
	1	Subrounded (heavy minerals?) black grains	
	1	Chert	
			Above very fine to med sand size frags
			Angular unless otherwise noted. The less than angular fraction may be sluff from up the hole where no casing has been set.
	42 - 52		Same as 34-42 with a smaller fraction of non-angular fragments
52 - 62		Same as 34-42 with minor silica cemented Breccia of same rock types	
		Some CaCO <sub>3</sub> on other rock types	
62 - 72		Same as 34-42	
72 - 82		Same as 52-62	
82 - 91		Same as 52-62 but fragments are distinctly larger running up to very coarse sand size. This is the first sample with the sample catcher. Up until now the samples have been off of the screen.	
91 - 101	45	Angular dark grey to brown volcanics	
	50	Subangular to subrounded fragments of above	
	5	Caliche fragments	
		All fragments coarse sand sized to fine sand sized	
101 - 118	55	Dark grey to brown either siltstone or volcanic (see 148-163) with abundant microscopic heavy minerals or a volcanic with microscopic dark minerals, probably an andesite.	
	35	Dark gray vesicular andesite with silicious infillings	
	2	Micro-vesicular basalt	
	Minor	Off-white tuff granules	
	8	Silica cement on some grains	
		Red stained (weathered?) dark gray to brown siltstone or andesite.	
118 - 126		Same as 101-118	
126 - 136	55	(	
	5	(	
	2	( Same lithologies as 101-118	
	Minor	(	
	10	(	
	28	Plus silica cemented breccia of the other lithologies magnetite present	
136 - 148	. Same	Same as 126 - 136	
148 - 163	80	Same lithologies as 126 - 136	
	15	Vesicular andesite	
	3	Vesicular basalt	
	0	Tuff	
	0	Red stained phase absent	
	2	Silica cemented micro-breccia of the other lithologies	
		Some chips of the possible siltstone phase of 101-118 show vesicles therefore all of it is probably volcanic.	
		SiO <sub>2</sub> coatings still present about 20% of the grains are rounded indicating some transport by water. These probably are from interformational gravels.	

<u>Interval</u>	<u>%</u>	<u>Description</u>
163 - 178	60	Dark gray to brown andesite with abundant microscopic dark minerals
	30	Very vesicular basalt with a pale green, amorphous infilling in some of the vesicles - possibly a clay alteration.
	5	SiO <sub>2</sub> cemented micro-breccia of the above
	5	Red <sup>2</sup> phase of the dark gray to brown andesite fragment size in this sample is generally coarse sand size. 20% rounded grains
178 - 193	Same	Same lithologies as 163-178 Almost all fragments are angular One grain has a secondary black botryoidal "growth" on it.
193 - 201	85	Brown andesite with mafics
	15	Black vesicular basalt All grains appear weathered. Some grains show secondary SiO <sub>2</sub> deposition as well as a pale green coating. There is secondary growth of a black metallic on some grains. Almost all of the grains are angular.
201 - 230	90	Volcanic (andesite) - aggregate - <u>Well weathered, poorly sorted, angular pieces</u> . Range in size from fine sand grain to approximately 2-1/2 ml in length
	10	Rounded grains of above and light gray siltstone? Sand sized, poorly rounded to rounded, light colored (quartz) trace clumps of clay & rotten alteration material does not react with HCl. Clumps of cement present due to drilling through casing. Should also be noted that this interval had some problems due to Tappy's inexperience, the derrick's inexperience, the hassles of the rig. The sample is most diagnostic of the bottom of the interval.
230 - 240	99	Angular. Similar to above. Size range about the same. Well weathered. Tanish-greyish, brownish in color. A few bk fragments.
	1	Sand sized. Very fine grained sand on up. Not as many quartz grains as in the last interval. Clay & alteration prod. not observed. Minor dark fragments Iron filings from bit present Does not react w/HCl. Minor Fe staining
240 - 254	100	Same as above except sorting is better. Size of angular fragments reduced in size Derrick man washed sample so fine grained sand etc. was lost. No reaction with HCl - Note one green mineral.
254 - 285	65	Same as above. Again - sample washed by derrick man & therefore no fine portion.
	35	Vesicular basalt vesicles are both spherical & Ovoid. Some amygdules present. (filling: chalcedony? Opal?) again - green mineral.
285 - 315	99	Moderately sorted (volcanic) gravel. Again very angular, very weathered. Some fragments contain vesicles & amygdules filled with chlorite(?) trace of magnetite
	1	Basalt cuttings Sample collected by the same derrick man - .'. washed [the reason this continued for 3 intervals is that this was the 11pm - 7am shift.] Coating of silica on some fragments

Interval	%	Description
315 - 343	46	Angular, weathered volcanics similar to the above. Not containing as many of the amygdules as the previous interval. Some Fe stained
	5	sand size fine to medium grain - poorly rounded
	46	Volcanic cuttings - black - basaltic - hard, dense
	3	alteration product - some very soft & rotten
		Sample on the whole poorly sorted. Basalt has few amygdules or vesicles Gravels - minor iron stained no reaction with HCl
343 - 373	98	Volcanics - dark 48 basalt - dense - angular Reddish 48 brown, 2 blue-gray - does not appear to be iron stained of the above.
	2	Alteration products - white, hard & soft yellow fragments - Some what rounded some pieces are banded - bright yellow minor iron staining Sizes range from very fine granules to $\approx .4$ mm.
373 - 403		Volcanics
	32	Black to gray - basalt - some with vesicles - some amygdules
	32	Brownish - red
	30	Tan & steel blue (check for siltstone & claystone?)
	5	Alteration material - fresh-white & rotten brown mustard colored
	1	minor iron staining on fragments size range - fine sand to .5 mm chips Very similar to last interval but more color range Silica filling vesicles
403 - 433		Very much the same as 373-403 do note some (heavy) very "black" fragments much darker than the black basalts white (hard) silica? fragments are larger size as above No reaction w/HCl Minor iron stains - limonite Yellow bright alteration material amt. of finer material more abundant than last interval
433 - 463	94	Volcanics - vesicular basalt? - black, light brown, reddish brown, tan & gray - amygdules altered alteration - to limonite, yellow banding, brown banding also white silica fillings
	Tr	dark "heavy" fragments - trace all angular fragments from fine sand size to $\approx .5$ mm
	1	limonite fragments
	5	alteration material - as described under Volcanics - rounded fragments as well as angular chips
463 - 497		Very similar to last interval Slight increase in amount of sand size fragments Increase in iron staining Amount of alteration product fairly constant as above interval
505 - 520	40	Gravels - Volcanic - poorly sorted - weathered Some are very poorly rounded - corners rounded off - large pieces; some well rounded
	2	limonite fragments
	40	Volcanic sands grains - small - angular alteration material - iron stained - silica deposits Sorting is poor - high content of small sand size material
520 - 549	94	Gravel - volcanic weathered - sub-angular - mostly 1-2 mm in size - not as much fine sand material as in previous intervals moderately sorted iron staining angular to poorly rounded
	2	Sand
	4	Volcanic chips - basalt




<u>Interval</u>	<u>%</u>	<u>Description</u>
549 - 578	48	Coarse sand sized cuttings - weathered volcanic material - angular
	48	Fine sand sized - volcanic material - angular slightly weathered, Fe stained, red, brown, black in color - Minor quartz fragments & alteration material Some of the material is partially sub-rounded
578 - 605	99	Volcanic Tuff Brownish-gray w/some iron staining abundant feldspar phenocrysts
	1	Very angular except for "bomb" which are very well rounded (glass?) Alteration products - limonite Minor vesiculation No reaction with HCl Abundant glass or biotite(?) coarse sand & smaller Minor black basalt
605 - 637	100	Welded tuff(?) Similar to last interval except that fragments are larger biotite iron staining alteration - iron oxide No reaction w/HCl
637 - 667		Tuff same as above
667 - 691	100	Volcanics, basalt - 50% weathered 50% fresh hard, dense black, dark grey Fe stain - weathering - brownish red in color Angular fragments Permeability - low Quartz - fragments minor Minor reaction w/HCl - could be from mud
691 - 724	80	Volcanics - andesite(?) could possibly be a tuff - contains grains of maxic minerals otherwise texturally similar to tuffs above. Ginn well discription calls this material volcanics without any other breakdown.
	20	Basalt poorly sorted No reaction with HCl Black to brownish red (Fe stained) Feldspar phenocrysts minor biotite alteration products - yellow stained Some fragments very dense - others not
724 - 747	90	Volcanics - andesite lavender and fe stained
	10	Iron stained basalts phenocrysts of feldspar Abundant sand size material sands present? - Fe stained quartz grains Minor fresh basalt fragments biotite minor
		The last two intervals resemble tuffs - there is such a variation in material size

<u>Interval</u>	<u>%</u>	<u>Description</u>
747 - 775	95	Volcanics - Fe stained - red in color hard, dense
	5	Basaltic andesite No reaction with HCl Biotite Xls - some fairly weathered away Some fragments where cut show fresh surface - dense & black Ground mass & fragments fairly constant in composition Interval very well baked
775 - 805	20	Very similar to last interval, but more weathering - Basalt fragments, Fe stained & fresh ground mass amount is much less than overall fragments Does not react with HCl Very dense material
	80	Andesite or tuffs heavily weathered but has similar texture to 691-724
805 - 835	25	Volcanics - Basalt, and andesites, fresh, black, red, abundant biotite Xls Minor sanidine phenocrysts angular fragments most of cuttings are weathered, iron stained red a green alteration product present in minor amounts weathered on the basalt fragments are dense, no reaction w/HCl amount of fragment material > amount of fine stuff
	75	Reddish andesite texturally similar to 691-724
835 - 865		Volcanics - similar to last interval except iron staining more predominate Sanidine phenocrysts Ground mass = fragments little fresh material; almost all altered - Iron stained
	100	
	50	Andesite or tuff as above
	20	Black vitreous obsidian(?) like volcanic
865 - 895	20	Volcanics - weathered, red, black, tan Common white alteration product, rotten soft breaks about easily. Chalky but no reaction w/HCl - Possibly a rotten vesicular basalt biotite (Basalt appears to have been vesicular and then extremely weathered & altered - silicified basalt, no tuffs?) (Possible tuffaceous material from further up in the hole)
	10	Secondary mineralization amorphous silica
	10	Black vitreous obsidian (?)
	30	Black micro xtlan basalt
	60	Red to orange andesite or tuff The andesite has the same textural features as the basalt may be a weathered version of the basalt
895 - 925		Similar to last interval Silification - weathered, iron stained nice mica - secondary? Tuffaceous material - possibly slough or may be getting into tuff bed green material - secondary alteration? Vesicular material w/secondary fillings - tuffaceous materials(?) sanidine phenocrysts biotite

<u>Interval</u>	<u>%</u>	<u>Description</u>
925 - 955	95	Volcanics - basalt and andesite - fresh & weathered (Fe stained) Biotite Sanidine phenocrysts more iron stained than the last interval
	5	green alteration product(?) amorphous silica(?) No reaction w/HCl Tuffaceous material - (slough?)
955 - 985	100	Volcanics - basalt, fresh & iron stained not as badly stained as the previous interval minor more tuffaceous material lavender probably sluff biotite no reaction w/HCl
985 - 1015	10	Abundant quartz grains, angular, may be a crystalized tuff or a quartz sand lense.
	90	Fresh & iron stained basalt and andesite as above Yellow-greenish material which crumbles when you bit on it Sanidine phenocrysts Again, similar to the last interval except for minor tuffaceous material, fragment size decreased and more small findings.
1015 - 1045	100	Volcanics - Basalt fresh & iron stained Minor tuffaceous material Tea green alteration material on some of the black basalt Yellow - green alteration material which crumbles becoming more abundant, no reaction w/HCl Fe stained basalts not as prevelant as in last interval.
1045 - 1075	100	Volcanics - basalt - med.gray - fresh & weathered (iron stained) more of the green rotten stuff minor tuffaceous material no reaction w/HCl White fragments very soft & rotten Minor biotite Very similar to last interval Interval somewhat similar to Ginn 1420'
1075 - 1105	85	Volcanics - Basalt: fresh & iron stained clumps of formation clay tuffaceous material No reaction w/HCl
	15	rotten yellow-green material present Abundant white, soft, material (as mentioned in previous intervals) Minor secondary quartz? Should be noted that we are drilling 30 ft/hr during this interval biotite
1105 - 1135	60	Volcanics - weathered basalt & fresh stuff minor quartz - opaque white & iron stained clay
	10	altered tuff(?)
	30	rotten yellow-green stuff and other alteration products another 30'/hr interval minor biotite - fresh & weathered weathered basalt both Fe stained & corroded No reaction w/HCl

<u>Interval</u>	<u>%</u>	<u>Description</u>
1135 - 1165	40	Volcanics - fresh & Iron stained basalt
	5	Silica product + chalcedony or opal abundant No reaction with HCl
	15	Another interval in which drilling 30'/hr tuffaceous material - lavender or light green "Sandy" ground mass
	40	White crumby "crap" abundant interbedded clays biotite Xls in basalt outside of the black basalt everything else is pretty rotten
1165 - 1195	40	Basalt - fresh & weathered
	40	White to pale green silicious(?) fragments containing white round grains of siliceous material very similar to last interval drilling 30'/hr
	20	Lavender tuff no reaction w/HCl
1195 - 1225	70	Basalt, fresh (minor); fractured & iron stained
	20	Sand cemented with silica Minor tuffaceous material
	10	Rotten green & white opaque fragments 30'/hr drill rate Similar to last interval Chunky size basalt fragments $\approx$ /mm
1225 - 1255		Volcanics - basalt - good size corroded chunks - black - fractured - minor Fe staining No reaction w/HCl
	70	In basalt - biotite and olivine? weathering out rotten alteration products not as much sandy ground mass as in the last interval
	5	Lavender tuff
	25	Silicious material ranging from olive drab to white some is a breccia cemented together again
1255 - 1285		Very similar to the last interval Basalt-black & somewhat fractured minor <u>opal</u> [or chalcedony] not as much clay - not as much sand material as last interval no reaction w/HCl good size chunks of basalt clumpy white fragments - again - soft & grainy
1285 - 1315	100 Minor	Basalts - baked - iron stained Minor green stained opaque stuff - but this time some of it is hard - most of the basalt is weathered drilling rate slowed down to $\approx$ 10 ft/hr almost totally weathered baked basalt minor amounts of sand
1315 - 1345	100 Tr	Volcanics - Basalts - some baking but minor compared to the last interval . Abundant micro fractures in volcanics Feldspar phenocrysts green (chartruse) material again minor amounts of sand - probably sluff fragment size becoming more uniform
1345 - 1375	100	Volcanics - Basalt - black, fresh, hard, dense biotite Xls in basalt Sanidine phenocrysts(?) No reaction w/HCl apatite Xls (?) Minor chartruse fragments - poss. sluff looks to me like a healthy basalt. Minor light green secondary material

<u>Interval</u>	<u>%</u>	<u>Description</u>
1375 - 1405	50 50	Volcanics - basalt - fresh black & gray green secondary mineral and/or altered tuff  Polygorskite? fairly hard stuff 
	Minor	chartruse alteration product minor iron staining - could be sluff maybe some apatite Xls? opal fragments altered material w/linear biotite Xls - looks almost like gneiss altered tuff(?) look at in the office
1405 - 1438	60 10 30	Very similar to last interval fresh black basalt minor tuffaceous material minor clay material reacts w/HCl abundant green alteration tuff(?) chalcedony Interval is very altered Is it possible to have opal & chalcedony forming together If so - then opal present - if not I don't know?
1438 - 1469	50 5 45	Black basalt - minor green alteration opal chips - concoidal fracture - translucent basalt - dense slightly Xline - opal attached to basalt in some cases andesite - generally weathered minor other opaque white fragments - possibly chalcedony minor reaction w/HCl - but cannot determine what - possibly some reaction with the mud basalt very slightly Fe stained red - but only minor a few fragments are translucent w/opaque bandings of orange & mustard color some amygdules present fragments are fairly equal in size except for ground mass  which is sand size no tuff apparent
1469 - 1501	100	Volcanics - black basalt to gray andesite with some weathering & Fe staining I can hear some reaction with HCl but I can't see it - could be mud additive minor green alteration basalt material is dense crystalline minor white chalcedony or opal basalt has some amygdules biotite fragment size is overall small w/abundant ground mass. Sanidine phenocrysts(?) Siliceous deposits on basalt - white & green
1501 - 1531	100	Volcanics - basalt - black, dense crystalline, Fe staining present some of the basalt is riddled with opal biotite very similar to last interval but fragment size larger no reaction w/HCl banded iron staining on some of the vesicle fillings

<u>Interval</u>	<u>%</u>	<u>Description</u>
1531 - 1560	100	Volcanics - basalt - similar to last interval minor reaction w/HCl - due to mud again. I think the vesicles are filled with opal siliceous coating of some fragments sanidine phenocrysts similar to last interval some of the Fe stained material almost looks sedimentary in origin but appears to be volcanic also
1560 - 1590	100	Volcanics - black, dense botriodal quartz hard dense crystalline, minor Fe stains silica filling fractures similar to last interval same comment
1590 - 1610		Lost interval due to burning of derricks hand
1610 - 1625	95	Volcanics - black basalt & red iron stained basalt. Fragment size very much reduced from last described interval - all ground mass material sanidine phenocrysts siliceous material on & in basalt fragments abundant white siliceous material fragments - some tinged green mostly quartz and chalcedony
	5	mica Siliceous material more abundant than in previous intervals Iron staining also more prevalent Reaction w/HCl
1625 - 1659	95	Volcanics - black, dense; also red, iron stained basalt Also andesite w/black amygdules Realgar(?) Abundant ground mass Sanidine phenocrysts reaction w/HCl - (but from mud?) basalt somewhat vesicles filled - white siliceous material - chalcedony(?) and quartz biotite Xls (?) fragment size is overall ground mass size reacts w/HCl - caliche
	5	
1659 - 1688	90	Black, dense, crystalline basalt, some iron staining
	5	reacts w/HCl - caliche
	5	Opal or chalcedony fragment size larger than last interval silica filling fractures & vesicles biotite somewhat chewed up sanidine phenocrysts (?)
	Tr	Pyrite with (iron staining or limonite) (minor)
1688 - 1718	100	Basalt, fresh, black, dense, Xlline Very minor iron staining fragments are very small sand size or big & chunky Sand fraction > chunk fraction Some green alteration material some vesicles w/ fillings; siliceous very minor reaction w/HCl This is the interval during tripping & I think this may effect the sample. Very similar to 1625-1659

<u>Interval</u>	<u>%</u>	<u>Description</u>
1718 - 1748	95	Basalt - fresh black & iron stained red iron stained material appears to be more vesicular than the black stuff green (pale) partially translucent filling some vesicles fragment size more evenly distributed than last interval
	5	Caliche - reaction with HCl most of the weathered basalt is spotty weathered, but there are fragments (few) that are totally red
		silica material filling fractures
1748 - 1778	95	Basalt, dark grey → black, dense xlline minor iron staining Some are vesicular black fillings as noted in previous interval
	5	Caliche - reacts w/HCl Very similar to last interval
1779 - 1809		Same as last interval but not as much Fe staining
1809 - 1842		Similar to previous three intervals except does not have reaction w/HCl more finer material minor green alteration material glass filling vesicles fragments of clear quartz - w/concoidal fracture Roger thinks the basalt is andesitic? Volcanics - hydrothermal, oxidation fragments are very vesicular abundant secondary siliceous material
1845 - 1877	95	Similar to the last several intervals Oxidized basaltic - andesites? w/vesicles botriodal opal or chalcedony abundant abundant glass (?)
	5	Calcite - reacts w/HCl vein filling - chalcedony abundant
1877 - 1909	95	Similar to last intervals - oxidized & fresh, dense, vesicular; xlline (basaltic - andesite?) except that the fragment size is somewhat increased → layer
	5	Calcite material is extremely xlline
1909 - 1939	95	Basaltic - andesite? - dense, xlline, not as heavily oxidized as previous intervals not as much fracture filling material not as much vesicularization
	5	calcite % about the same small % of brecciated material In the next interval, circulation was lost.
1939 - 1969	90	Basalt - fresh w/glass vesicles in which partial Xlization has occurred reacts w/HCl abundant chalcedony or opal minor realgar(?) pyrite
	10	calcite

<u>Interval</u>	<u>%</u>	<u>Description</u>
1939 - 1969 (continued)		lost circulation - did not let cuttings run over Shaker so next sample was taken by hand using a collander held under mud-out pipe.
2000	85 10 5	<p>Fresh black basalt            reaction w/HCl calcite            abundant siliceous material - chalcedony or opal &amp; embedded in abundant pyrite - attached to quartz material minor green alteration of some soft material - does not react w/HCl            abundant sand size material            sandstone type material - CaCO<sub>3</sub> cement</p> <p>Circulation was lost @ 1969'. Shaker was therefore bypassed. A sample was collected @ 2000' by using a sieve due again to lost circulation zone - shakers were by passed until 2175. See chart for penetration rates of volcanics from 1969 to 2175.</p>
2175 - 2180	99 1	<p>Clay - bentonite? soft, creamy light beige color.            Small volcanic chips contained within.            Very <u>minor</u> reaction with HCl            low permeability - high porosity            clay is sticky &amp; globby            clay was probably formed from the decomposition of volcanic ash and looks as to be composed largely of montmorillonite has capacity to absorb water and therefore swell.            Most of the contained material is sand size and rounded but some angular chips are present            In this interval, the penetration rate dropped exceedingly to <math>\approx 7'</math>/hr.</p>



<u>Interval</u>	<u>%</u>	<u>Description</u>
2180 - 2215	25	Light creamy clay
	75	Volcanic chips - basaltic andesite both fresh & oxidized minor green alteration material, also white & off-white easily broken with pointer light alteration material may be decomposing into bentonite most of the fragments are large angular chips but some is considerable ground mass sand size a few minor chips of orpiment-realgar? little or no reaction with HCl clay is a creamer white than last interval - most of the volcanic chips are fresh, black & dense
2215 - 2244	50	Off-white-grey, creamy clay, very soft
	50	Containing volcanic chips. Very similar to last two intervals minor reaction w/HCl There are a few clumps of clay that are a bit harder but still very easily mashed up Both clear white & opaque white fragments enclosed within the clay The volcanic chips - probably (basaltic-andesite?) or basalt - appear angular, dark black & dense. Difficult to see them because of clay background. The fragments are not well sorted but chips & ground mass again, as in previous intervals, there appears to be some realgar - (orange) fragments. Also, lost circulation material caught up in clay. Could not separate through washing.
2244 - 2274	20	Clay - creamy off-white to grey (from mud)
	40	Volcanic chips - basalt - dark black, dense reaction w/HCl
	30	Tuffaceous material
	10	Alteration products - both siliceous & possibly caliche fragment size is overall very large chips there is some ground mass which is sand size volcanic fragments - some have undergone minor oxidation It appears that we have left the clay zone & entered a tuffaceous interval We encountered two drilling breaks in this interval. Some of the alteration material is soft, some brittle, & some hard Chips of chalcedony or opal
2274 - 2305	90	Bentonite - grey clay -
	10	Volcanic chips - few large but mostly sand size material caught up in clay matrix reaction w/HCl Difficult to study volcanics because of clay Drilling rate decreased significantly in this interval
2305 - 2335	75	Creamy yellow white clay stained grey from mud
	5	Big volcanic chips - black dense subangular to rounded
	20	Silty-sand volcanic material minor reaction w/HCl but could be due to sluff
2337 - 2366	20	Black basalt?
	80	Siltstone to claystone White to gray in color with some green which generally grades into gray some fragments appear to be breccias of the white and green claystones Minor brown claystone fragments range from fine sand size to angular pebble size. White claystone could be a tuff? Minor pyrite

<u>Interval</u>	<u>%</u>	<u>Description</u>
2366 - 2400	10	Black basalt?
	30	White to gray with some brown claystone and siltstone
	50	Reddish brown andesite? With occasional vesicles
	5	Apple green to black massive material
	5	Cream white clay
2400 - 2431	5	White to gray claystone and siltstone
	95	Reddish brown andesite? Some grains have secondary coatings of the green material
2431 - 2461	45	Reddish brown andesite?
	45	Dark gray to black andesite? texturally the reddish fraction appears to be a weathered version of this.
	5	Both show extensive secondary coatings of white (and green?) quartz.
	3	milky quartz
	2	brown siltstone probably sluff mud had distinctive reddish color
2476 - 2491	Same %	Same lithologies as 2431 - 2461 mud did <u>not</u> have reddish brown color. Minor laminated silica (but slight reaction to HCl)
2491 - 2510	Same %	Same lithologies as 2431 - 2461 slightly higher percentage of siltstone also another minor banded sediments.
2510 - 2540	50	Light to dark grey andesite with apple green secondarily filled vesicles
	15	Black basalt with secondarily filled fractures
	20	Metallic gray volcanic (possibly intrusive)
	5	Quartz angular grains Minor banded silica(?)
	10	Breccia fragments of first type Minor claystone all fragment sizes coarse sand or less
2540 - 2555	50	Black basalt w/2nd filled fractures
	15	dark brown basalt? with vesicles
	15	light gray to dark gray andesite with apple green 2nd filled vesicles
	5	Quartz some well rounded - apparently casts of vesicles
	15	Metallic gray volcanic or intrusive all fragments are angular and coarse sand sized or less
2555 - 2586	95	Metallic gray volcanic or intrusive
	5	Quartz Same sizes as above
2587 - 2619	70	Metallic gray volcanic
	25	light gray to dark gray andesite with apple green 2ndary vesicle infillings.
	5	Anhedral quartz fragment size very coarse sand and smaller
2619 - 2651	55	Same lithologies as above
	40	
	5	
2651 - 2682	Same	Same lithologies as 2587 - 2619 the possible intrusive is looking more coarse grained in this sample. One granule sized piece of quartz is in this sample.

<u>Interval</u>	<u>%</u>	<u>Description</u>
2682 - 2705	Same	Same lithologies as 2587 - 2619 1 fragment of a quartz arenite present. It has a CaCO <sub>3</sub> cement (may be sluff) Also several large quartz fragments
2705 - 2713	10	Black basalt
	35	Dark green coarse grained volcanic some grains showing secondary quartz vein fillings. Coatings and vesicle fillings of dark green material (polygorskite?)
	15	Red weathered version of above
	25	Gray massive non fissial claystone? very hard. no reaction to HCl
	5	red-brown and tan siltstone
	5	Anhedral quartz
	5	Calcite? clear but slight reaction to HCl
2713 - 2746	75	Green-gray volcanic (andesite?) few vesicles usually filled with dark green infilling and occasionally banded quartz. Also secondary fracture fillings on some grains. Xtal size is almost visible at 10 power in the volcanic
	20	Similar looking volcanic but brown in color
	5	Brown siltstone Minor anhedral quartz
2746 - 2775		Same lithologies as above except milky quartz and chalcedony are much more abundant 5% and up to small pebble in size all angular.
2775 - 2791	Same	Same lithologies as 2746 - 2775
2791 - 2806	Same	Same lithologies as 2746 - 2775 with minor amounts of soft gray siltstone with black stringers
2806 - 2840	Same	Same as 2791 - 2806 with minor very fine grained sandstone cemented with dark green material. Also minor crystal tuff possible sluff.
2840 - 2855		Missing
2855 - 2870	75	Green-gray andesite with few vesicles - usually filled with dark green material which also coats some grains. Xtas size almost visible at 10 power
	20	Similar looking in texture gray andesite with smaller xtal size
	5	Quartz and chalcedony from fracture fillings minor soft gray siltstone with black stringers
2870 - 2900	Same	Same lithologies with green-gray having quartz as fracture fillings on some grains

SWITCHED TO FOAM DRILLING

2900 - 2931		Grain size fine sand to silt - well sorted
	20	Gray to tan claystone breaks under the probe no reaction to HCl
	25	Pale green translucent massive material that also breaks under the probe
	25	Green-gray andesite described above
	5	gray andesite described above clear Minor calcite
	5	Transparent white tuff?
	10	Quartz & chalcedony
	10	Reddish brown translucent calcite? Slight reaction to HCl 50% of the sample is angular; 40% is sub-angular to sub- rounded on a gross scale but angular on a fine scale 10% rounded

<u>Interval</u>	<u>%</u>	<u>Description</u>
2931 - 2941	60	Black to gray-green basalts and andesites
	10	Gray claystone
	5	Quartz and chalcedony
	15	White tuff? or claystone, soft
	10	Siltstone dark gray to cream
		Stuck in hole 11/2/76 from sluff above fish (see next page) it appears that these last two samples may be more representative of the sluff than of what was drilled into.

170 pppCL  
x 1.65 NACA

ROSSI 21-19

Clean Out Run to Fish at 2851 Feet

30 ppm Ca

<u>Interval</u>	<u>%</u>	<u>Description</u>
2420 - 2550	10	White tuff
	45	Brown siltstone & claystone/some w/uhedral calcitic xflc in it.
	20	Gray siltstone & claystone
	20	Cream colored siltstone & claystones
	5	Calcite w/moderate general reaction to HCl among other grains
		Minor volcanics evident small pebble size and smaller
		60% angular, 35% sub-angular 5% subrounded
2562 - 2572		Similar to above in lithology except volcanics are present to about 15% of the sample Similar rounding also small pebble size and smaller mostly granule size and smaller
2590 - 2620		Similar to 2562 - 2572 volcanics still about 15% of the sample very coarse sand and smaller
2742 - 2778		Similar to 2562 - 2572 small pebble size and smaller
2810 - 2841		Similar to 2562 - 2572 granule size and smaller

Second clean out run after pulling up into the shoe and running in again. Same as 2420 - 2550 above with some very fine grained sandstone and basalt and andesite  
Size ranges from coarse pebble and finer.  
The pebble sizes are dominately sub rounded with a few angular frags. Since this material "sluffed" in on top of the fish after it had been cleaned out by the previous clean out run there must be a zone above 3851 that is sluffing.

This material is generally similar to the sedimentary zone at 2337 - 2366 with the exception of having little of the greenish claystone present in the 2337 - 2366 zone. The grains in the "sluff" material are much better rounded than those of the 2337 - 2366 zone.

The sluff could very well have come from that zone, or it might have come from the lost circulation zone under the shoe.

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LITHOLOGIES

<u>Interval</u>	<u>%</u>	<u>Description</u>
2942		Mud out 113°F; Started drilling after fishing - mostly cement
2942 to 2957		123°F out; 100° mud in; $\frac{9'}{25\text{min}} \times \frac{60\text{min}}{1\text{hr}} = 216 \text{ ft/hr} \approx 22\text{ft/hr}$
	70%	Volcanics - basaltic andesite (?)
	3%	White tuff? or Claystone; soft
	10%	Siltstone - grey to cream color
	10%	Claystone
	5%	Quartz & Chalcedony
	2%	Calcite (reaction w/HCl)
		Volcanics are dark grey, dense, w/some amygdule fillings of silica. Angular - size is somewhat evenly distributed. Very minor small fraction - mostly small pebble size.
		Siltstone & claystone are moderately rounded again - somewhat of an even size distribution.
		Quartz or chalcedony fragments run from large sand size to small pebble size.
		There is an honest trace of metal filings, this interval is not sluff - drilling 22ft/hr w/40 weight @ 40 RPM. Survey taken 30 ft. up from Kelly down 2957 +30' = 2927 → 3-1/4°
		Mud weight = 66.5 V=60
		@ this pt. trip made to change bit from mill tooth to button type
		Also present is some cement.
2957 to 2988	20%	Siltstone - grey & Cream colored white & greenish - Some soft possibly cement not a strong reaction with HCl though
	10%	Tuff
	60%	Basaltic andesite
	7%	Opal, quartz and/or chalcedony
	3%	Caliche or calcite
		Volcanics have some amygdulation - fillings possibly of opal; angular chips; size ranges from lg sand size to small pebble size.
		Fragments of silicious material are angular w/concoidal fractures some opal - some transparent
		Siltstone (claystone?) varies from angular fragments to moderately well rounded
		Some are creamy orange color which I believe to be claystone there is some of the siltstone which is green in color
		Also present is some turquoise green material (It is minor) - fine grained - moderately rounded this same green color is staining some of the amygdule material - possible small round pees are out of this.
		Small sized fraction is minor compared to the overall sample size
		Abundant Iron filings possibly due to yesterdays milling

ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
2957 to 2988 (Cont'd)		A green stain is also present on some of the volcanics Minor amounts of very <u>red</u> (Fe stained) volcanics or could be very red andesites
2988 to 3018	10% 80% 5% 3% 2%	Volcanics - basaltic andesite - amygdules - red Tuff - some of which is very soft Siltstone - greyish green - soft - moderately rounded <u>Note:</u> It is possible that the siltstone is tuffaceous material. There is a difference in that the tuff is angular fragments & what I am calling siltstone is somewhat rounded. Some of the siltstone is angular. Whether silt- stone or tuff - I believe they are very closely related. Quartz, chalcedony and/or opal - conchoidal fracture - some transparent; some opaque Again - green alteration material present. The whole interval appears to be a water-laid tuff except for minor content of andesite - [(red) - angular, hard] & basalt most of the tuffaceous material is soft & can easily be broken The basalt present is dense & black Caliche or calcite - reacts w/HCl The amount of silt & sand size material has increased in this interval The tuffaceous material has silicious material filling voids
3018 to 3052	46% 46% 5% 3%	Tuffaceous material similar to the above interval Volcanics - basaltic andesite - black & minor red Quartz or chalcedony - conchoidal fracture Caliche & calcite The volcanics are dark-grey, hard, dense Present are minor amounts of red andesite again, as in the last interval. There is the siltstone like material but it is probably tuff. It is a size of fragments runs from sand size to small pebbles. Most of the fragments are angular, except for the minor amount of siltstone looking material which is moderately well rounded. (also, it is soft). The green tuffaceous material is also present in this interval. I believe that most of the material that reacts w/HCl is caliche - It is soft, off-white & brittle. I think that this interval correlates well w/Ginn 3250 - 3300.
3052 to 3080	97% 3%	Volcanics - Basalt mostly med-dark grey but some light colored fragments - hard, somewhat granular. Contains phenocrysts but I can't tell what they are using a binocular scope. Minor reaction w/HCl but it is probably from the mud. Minor silica veining Quartz and/or chalcedony conchoidal fracture trace of tuffaceous material Minor amount of red andesite (?) Possibly some sulfides (?) Fragment size ranged from sand size to small pebble size fragments angular.

ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3080 to 3114	100%	Volcanics - basalts (?) Med to dark grey - somewhat granular - slight tinge of green on some Sulfides present in bands Some of the fragments can be poked into by applying pressure - possible that they are altered Quartz and/or chalcedony
	2%	Caliche and/or calcite - reacts w/HCl Minor amounts of red andesite(?) Fragment size ranges from silt size to small pebble size - fragments are angular lag time  $.1215 \times 3114 = 378.35 \text{ bbl}$  $\frac{400 \text{ gal min}}{42 \text{ gal/bbl}} = 9.52 \text{ bbl/min}$  $\frac{378.35}{9.52} = \underline{39.7} \text{ min}$  There is a dark coating on some of the volcanic fragments - I'm not sure what it is - Very black though Minor amounts of quartz and/or chalcedony
3114 to 3143	93%	Very similar to last interval Volcanics - dark grey, sometimes green tinge, red tinge somewhat granular Angular fragments - some very dense
	5% 2%	Tuff - off white & green - soft Caliche - reacts w/HCl Trace of quartz and/or chalcedony - the material has concoidal fracture & transparent trace of red andesite minor silica veining I think I saw some sulfide material but when I went back to study it, I couldn't find it fragment size the same as the last interval
3143 to 3174	50%	Tuffaceous material - light in color - cream white to green - somewhat granular, a little bit soft (can stick w/poker)
	45%	Volcanics basaltic andesite range from moderately dense to crystalline, med grey to dark grey - slight tinge of red & green minor magnetite
	1%	Pyrite or other sulfide green alteration product filling voids in tuff calcaceous - reaction w/HCl Basalt is somewhat weathered - minor amounts of red andesite
	2% 1-2%	Caliche and/or calcite overall fragment size is that of small pebble size Minor silica material - quartz and/or chalcedony



ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3174 to 3206	49%	Volcanics - basalts - hard, dense, but some are somewhat crystalline - light to dark grey & reddish some visible laths of feldspar
	49%	Tuff - somewhat hard - green tinge
	1%	Quartz or chalcedony - transparent - conchoidal fracture
	1%	Caliche and/or calcite - reacts w/HCl fragment size ranges from silt to sand size to that of small pebble size - fragments are angular - more sand size material than in previous interval
3206 to 3234	60%	Tuff - greenish in color - granular texture - hard but a hole can be somewhat drilled into it w/poker. Angular fragments
	35%	Pyrite(?) Sulfide on some of the tuffaceous material Volcanics - dark (basaltic andesite?) dense; angular fragments minor amounts of red andesite
	5%	Volcanics - some have reddish color & are sort of granular Pyrite w/quartz - sulfide content highest so far of any interval Abundant caliche material - sample has strong reaction w/HCl - calcareous
		Also present in that green alteration material - part of the tuff lithology
	Minor	Quartz - opaque fragments - minor amounts transparent flat sheet-like fragments of calcite abundant sand-size material I am having a difficult time deciding whether or not this material is a tuff or some other volcanic. It is not as hard as volcanics previously encountered. Color & texture reflect tuffs What I am distinguishing between tuffs & the volcanics is the color - what I am calling tuffs are green & the volcanics are dark grey most of the sulfide material is attached to fragments
3234 to 3264	67%	Tuff - light colored - green tinge - looks like a siltstone w/sulfides; angular fragments
	15%	Volcanics - basaltic(?) dark grey dense; some is reddish brown. Sulfides on basalt also overall sample reaction w/HCl due to large amount of fine size material
	15%	Abundant - caliche/calcite
	3%	Quartz and/or chalcedony both opaque & transparent flesh colored tuffaceous material also present in minor amounts
3264 to 3294	40%	Tuff - same as last interval
	2%	Minor amounts of clay material
	45%	Volcanics - dark grey, reddish color - hard, dense angular fragments - some is kind of brownish some is also kind of crystalline The tuffaceous material is more rounded than the volcanics but on the whole it is angular again - abundant fine sized material good amount of sulfide material - (Pyrite?)

ROSSI 21-19  
LITHOLOGIES (Cont'd)

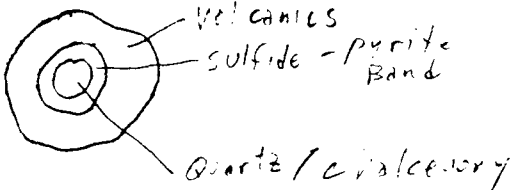
<u>Interval</u>	<u>%</u>	<u>Description</u>
3264 to 3294 (Cont'd)	3% 5-10%	Sample reacts strongly w/HCl - again probably do to the large amount of small sized material Quartz and/or chalcedony Abundant caliche Minor amounts of brown claystone like material could be part of the tuff formation Volcanics have minor veining of silicious material; also some sulfide veining
3294 to 3324	30% 60%  4% 5% 1%	Volcanics light/med to dark grey; angular fragments Tuff - soft - breaks apart under pressure - greenish, brownish, reddish in color clay like material - siltstone like fragments, might both be tuffaceous material Quartz - opaque & transparent; conchoidal fracture Caliche and calcite; again calcite in flat plates Sulfides; sulfide & realgar - associated together overall fragment size is small compared to previous intervals size does range up to small pebble size This interval appears to be mostly tuffaceous material mixed with clay & minor volcanics
3324 to 3362	95  + P TR 5	Volcanics - (Basaltic ? andesite) w/vesicles filled w/silicious material and altered green-blue stuff. Volcanics are red & dark grey - somewhat granular. Tuffaceous material - crumbles easily under pressure Clay - reddish/brown in color abundant quartz and/or chalcedony abundant pyrite abundant Real orange material that looks like realgar I believe the volcanics <del>are</del> weathered phenocrysts of feldspar (sandstone?) Sample has strong overall reaction w/HCl probably due to large fraction of sand/silt size material Dark grey volcanics are dense but somewhat granular Caliche abundant Abundant blue-green alteration material - as said before - closely associated w/red volcanics, I believe it was a vesicle of silicious material that has been altered This green material (same color, texture etc.) is also found associated w/tuffaceous material
3362 to 3392	100%	Volcanics - med to dark grey, hard & dense - moderately granular fragments are angular quartz/chalcedony magnetite Some red volcanic material similar to last interval but minor is this 301. minor claystone - flesh colored minor sulfides sand/silt fragment size much less abundant in this interval



ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3485 to 3515		Should be noted <u>first</u> that we got stuck @ 3488. Fishing for $\approx$ 10 hrs. Consequently, interval could contain sluff etc.
	45%	Volcanics - greenish grey to dark grey - some w/amygdules. Angular fragments; dense to somewhat granular size ranges from sand size $\rightarrow$ small pebble size (Basaltic Andesite) some volcanics tinged red
	40%	Tuff - light cream color to light green - granular can be fractured w/probe. Some is welded tuff composed of small angular fragments
	5%	Abundant green alteration product - opaque - can be penetrated with probe.
	2%	Sulfides abundant - pyrite - associated w/volcanics
	5%	Quartz and/or chalcedony - conchoidal fracture
	3%	Caliche - reaction w/HCl
		Sample has strong reaction w/HCl minor quartz veining in volcanics large fragments of clay stone - pale orangy - flesh color - easily broken apart w/probe Orange - alteration material on sulfides - limonite(?) fragment size of sample has wide distribution - small sand size/silt $\rightarrow$ small pebble size - all materials range
3515 to 3545		Very similar to last interval minus the abundant tuffaceous material, clay
	80%	Volcanics - Basalt - green tinge; light $\rightarrow$ dark grey crystalline
	5%	Abundant green alteration product associated with it Quartz and/or chalcedony - stained green
	4%	Caliche
	10%	Minor tuff fragments - mostly tinged green breaks easily under pressure of probe
	Tr.	Chert(?) dense black - minor
	1% Minor sulfides - most of which have been oxidized sample has strong reaction w/HCl - fragment size varies from sand size to tiny pebble size	
3545 to 3575	100%	Very similar to last interval Volcanics - Basalt(?) - green, grey, dense to crystalline, no visible phenocrysts; fragment size is more evenly distributed than previously but abundant sand-size fraction sulfides - pyrite - associated w/volcanics quartz and/or chalcedony - Quartz veining Chaliche Sample has strong reaction w/HCl Oxidation of some of the sulfides has occurred trace of tuff & clay magnetite

ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3575 to 3593	75%	Volcanics - Basaltic - andesite - reddish brown, grey to dark grey, vesicular; amygdules; somewhat xline - angular fragments
	5%	Abundant green alteration material as described in
	15%	Tuffaceous material - fractures under probe - granular - claystone (associated w/tuff)
	3%	Sulfides - pyrite - high amount
	2%	Caliche
		Volcanics color is about 50% greenish grey & 50% reddish. Red volcanics appear to have more amygdules - quartz/chalcedony filling but grey basalt do have amygdules also fragment size ranges from sand-size to small pebble size.
3593 to 3623	90%	Tuffaceous material - welded; green in color fractures under probe; angular fragments to poorly rounded - minor amounts of clay associated with it. Fragment size ranges considerably from silt/sand-size to small pebble size (good size chunks).
	10%	Volcanics - similar to last interval - sulfides associated w/volcanics magnetite(?)
		minor quartz veining in volcanics
	Tr.	Caliche Sample reacts well w/HCl
		
3623 to 3643		Drilling 16 ft/hr.
	95%	Tuffaceous material - similar to previous interval again minor amounts of clay associated with it, material is hard but w/fracture under probe. Sample has minor reaction w/HCl; tuff appears to be welded
	5%	Minor amount volcanics similar to 3575 to 3593 minor fragments of chert(?) black, dense - somewhat smooth.
	Tr.	Sulfides - pyrite - associated w/volcanics. Caliche ) Minor amounts - similar to Quartz/chalcedony ) previous intervals.
		Sample size varies from abundant sand/silt size to small pebble size Volcanics angular, tuff angular to poorly rounded
3643 to 3683	50%	Volcanics - medium to dark grey - dense - angular fragments w/minor phenocrysts - but I can't tell what they are. Some are mildly Xline - some have quartz veining quartz and/or chalcedony Chert - dense - black - contact w/volcanics
	50%	Tuffaceous material similar to previous interval
	Tr.	Minor amounts of clay
	Tr.	Magnetite
		fragment size is overall small pebble size w/some sand-size fraction Sample has minor reaction w/HCl

ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3683 to 3713	70%	Volcanics - light grey, brown, dark grey and reddish - hard - dense - some are mildly (somewhat) Xline angular fragments - w/some quartz veining
	30%	Tuff - green similar to previous intervals calcite/caliche
	Tr.	Sulfides
3713 to 3743	60%	Tuff - similar to previous intervals - hard, green
	5%	Minor amount of clay associated with it Some of tuff is white & welded
	35%	Volcanics - similar to previous intervals - slight oxidation (Fe staining) on some fragments - quartz fragments
	Tr.	Trace of sulfide (pyrite) associated w/it. Sample reacts strongly w/HCl Sample ranges from clay/silt/sand size to small pebble size Some green alteration (altered quartz) material present
3743 to 3773		Sample similar to last interval except more clay quartz fragments more common
	45%	Percentage of volcanics > in this interval otherwise much the same as 3713-3743
3773 to 3803	87%	Volcanics - basalt(?) greenish grey & dark grey - somewhat Xline; dense, angular fragments
	3%	Several large clumps of clay - cream to grey in color
	8%	Tuff - white welded - minor amounts of green tuffaceous material
	2%	Calcite and/or caliche
		Volcanics have vesiculation - amygdulation in minor amounts Note: absence of pyrite (if present - in very minor amounts)
	Tr.	Fragments of quartz - minor penetration $\approx$ 15'/hr.
3809 to 3840	87%	Volcanics - basalt(?) med to dark grey, Xline, angular fragments - minor pyrite veins. *No apparent vesiculation (Similar to previous intervals)
	10%	Caly - off white $\rightarrow$ grey (due to mud)
	3%	Tuffaceous material - minor amounts - green *One large fragment - (basaltic andesite) - reddish grey w/amygdule
		calcite and/or caliche
	Tr.	Minor fragments of pyrite which have a trace of oxidation
	Tr.	Minor calcite veining penetration $\approx$ 14 ft/hr. correlates w/Ginn 4200?
		fragment size ranges from sand/silt size up to small pebble size ground mass fraction probably due to clay(?)

ROSSI 21-19  
LITHOLOGIES (Cont'd)


<u>Interval</u>	<u>%</u>	<u>Description</u>
3840 to 3869	95%	Volcanics - very similar to previous interval
	1%	Minor fragments tuffaceous material
	2%	Minor clumps of clay
		Sample has strong reaction w/HCl
	2%	Calcite fragments - opaque - some with green alteration material attached Minor sulfides - pyrite fragment size varies from silt/sand size up to small pebble size - > amount of fine material as previous interval penetration $\approx$ 12 ft/hr.; mud out temperature 160°F
3869 to 3902	87%	Volcanics - basalt/andesite(?) light to dark grey; to black; hard, mostly Xlline $\rightarrow$ dense but occasionally angular fragments minor sulfide veining (pyrite)
	1%	Calcite - opaque
	10%	Minor tuffaceous material-green Tuff - fractures under probe but is hard - contains fragments of opaque calcite Very minor amounts of amygdules in volcanics
	1%	Greenish - white alteration material attached to volcanics which reacts w/HCl
	2%	Minor amounts of clay fragments size smaller than previous intervals but not as much groundmass material Several fragments of tan claystone Opaque fragments of calcite - minor penetration $\approx$ 17 ft/hr.
3902 to 3931	82%	Volcanics - basalt(?) dark grey to black hard, Xlline - in contact w/sulfides - very similar to previous volcanics.
	10%	Clay - more abundant than in previous intervals - light brown in color, thick and goey
	5%	Green tuffaceous material as in previous intervals
	2%	Calcite and/or caliche minor amounts of Fe stained (oxidized) material - bright red.
	1%	Green opaque fragments that <u>do not</u> react w/HCl Some have sulfide veining - altered quartz Some of the volcanics have veining of this material - can be dug into w/probe few fragments of creamy beige silt - claystone(?) Some is very soft - some hard fragments size similar to previous interval - slightly more groundmass material - probably due to > clay % penetration -

ROSSI 21-19  
LITHOLOGIES (Cont'd)

<u>Interval</u>	<u>%</u>	<u>Description</u>
3931 to 3960	93%	Volcanics - basalt - similar to previous interval - minor oxidation
	2%	Minor clay clumps
	2%	Minor tuff fragments - pebble size
	3%	Abundant sand-size material (tuff fragments)
	Tr.	Trace calcite and/or caliche Abundant fine, sand-size material - volcanics & tuff penetration ≈
3960 to 3988	10%	Clay - creamy off-white
	7%	Tuff - white - breaks apart under pressure of probe also green tuff material
	80%	Volcanics - basalt(?) - similar to previous intervals (Claystone/Siltstone) - orange
	3%	Calcite - moderately rounded fragments/some angular - opaque Not as much sand/silt size material as in previous interval
	Tr.	Green alteration material - but reacts w/HCl not as much fine sized material as previous interval penetration =
3988 to 4020	45%	Tuff - light greenish grey - breaks apart under pressure of probe - poorly rounded - contains angular volcanic fragments some fragments look like light grey siltstone w/o inclusions
	5%	White clay
	45%	Volcanics - basalt(?) - similar to previous interval
	2%	Calcite/Caliche
	3%	White opaque quartz w/green-blue alteration material - this time does not react w/HCl as in previous interval (3960 to 3988) minor sulfides deep blue-green fragments - soft fragment size ranges from sand/silt size to small pebble large fragments > fine fraction (still abundant fine fraction)



<u>Interval</u>	<u>%</u>	<u>Description</u>	
4020 - 4051	50	Volcanics - basalt/andesite-(?) similar to previous intervals	
	40	Grey & brown siltstones - can be drilled into w/probe also light greenish grey	
	5	Calcite and/or caliche common	
	2	Abundant pyrite - usually associated w/volcanics Tuffs - greenish, somewhat massive & hard some of the tuffaceous material is welded violent sample reaction w/HCl Abundant sand size fraction present	
	3	Minor amounts of clay penetration =	
4051 - 4085	35	Tuff - light tan & greenish in color - Some welded - similar to previous interval	
	25	Volcanics - same as previous intervals	
	30	Chert - black, grey, off-white - some w/veins also brown	
	10	Quartz and/or chalcedony Most of sample is sand-size material pyrite - common green alteration material present - minor amounts	
	4085 - 4115	Very similar to interval 4051 - 4085	
4085 - 4115	10	except not as much tuff	
	30	Chert (white, off-white, brown, black, with pyrite veining - some has) green alteration product present	
	50	Volcanics are lighter in color - light brown & grey - also not as xlline but still very dense, & angular	
	3	Sulfides - pyrite common	
	4	Minor amount of soft creamy yellow claystone	
	3	Minor amounts of clay - off-white in color the tuffaceous material has pyrite veins most of the sample is silt/sand size material even the larger fragments are smaller compared to what is usually returned	
	4115 - 4145	25	Tuffs - (same as previous intervals)
4115 - 4145	25	Clay - light brownish-grey in color (mud stained) Volcanics - basaltic andesite - medium to dark-grey, black	
	5	Chert - as described in previous interval	
	10	Volcanics - Basaltic/Andesite - dense, (moderately xlline) abundant sulfides - chert has sulfide veining	
	10	Green alteration material - dark green - almost black - soapy - abundant Fe staining on some of the volcanics some of the welded tuff breaks apart very easily	
	25	Abundant tuffaceous sediment - sand/silt size material Sample has mild reaction w/HCl	
	4145 - 4175	95	Tuffs & tuffaceous sediments green, white, reddish brown, beige - some are welded angular fragments - some are sedimentary-like fragments <u>Abundant</u> tuffaceous sands that react strongly w/HCl the sands are composed of tuffaceous material - calcite, pyrite, green alteration material silt/sand size, poorly rounded
	5	Minor volcanics - dark grey, Fe stained; basalt/andesite some has green alteration material attached to it abundant calcite and caliche still minor amounts of chert present	
4175 - 4208		Very much the same as last interval	

<u>Interval</u>	<u>%</u>	<u>Description</u>
4208 - 4241	7	Calcite fragments 1/4" (length) x 1/16" (width)  ; white, moderately massive, shows cleavage - (big chips)
	65	Tuff - welded; mostly light to medium green but also brown, red, & off-white Large (1/2" length) fragments of light brown claystone, soft, easy to dig into w/probe.
	5	Grey & reddish grey siltstone/sandstone - [part of tuff(?)] fragments are large & have very smooth faces, will fracture under pressure from probe some fragments show bedding
	3	Creamy white clay; also some light brown clay
	5	Abundant green alteration material soapy texture, dull luster, very soft
	10	Volcanics - basalt/andesite(?) - Similar to previous intervals
	3	Fragments of quartz/chalcedony - opaque - some w/ Fe staining
	2	Sulfides - pyrite - very common
	Tr	Magnetite
4241 - 4271	30	Volcanics - Basalt(?) - dark grey to black - greenish tinge - reddish tinge; hard, dense; angular fragments - small pebble size but larger than what has previously been encountered minor amount of Fe staining => orangy/red some w/quartz veining
	30	Tuffaceous material*: white, green, grey, reddish some appears to be welded(?)
	10	Clay - minor - some large moderately rounded clay stone material-light creamy white to yellow/orange. Minor amounts of clay material (globby) - stained mud grey
	5	Calcite-material similar (probably the same) as what was encountered @ 4208 to 4241. large plates. Pyrite - very common - both individual fragments and associated w/quartz
	5	Quartz and/or chalcedony
	15	Siltstone(?) grey, angular fragments minor reaction w/HCl - part of tuffaceous material (?) easily broken apart - fractures - with pressure from probe - some has black veining
Very similar to sedimentary material		

<u>Interval</u>	<u>%</u>	<u>Description</u>
4271 - 4301	30	Volcanics - black, dense
	10	Black (alteration material?) as described in the previous interval.
	5	Calcite plates as described previously
	Tr	Caliche - minor
	3	Abundant pyrite
	5	Minor tuffaceous fragments
	5	Quartz and/or chalcedony
		Abundant sand size material
	40	Chert - black, grey, white The material described in the previous interval as sandstone like material - granular now appears to be chert - it has lost all granularity, is smooth & veined with black material and pyrite.
	2	Sandstone - minor fragments w/bedding very similar to previous interval except for the change in the chert.
4301 - 4335	42	Meta quartzite - (white) & black (mixed) Xlline, very, very hard, angular fragments. Opaque white quartz filling fractures. The overall color is dark grey to black but white material can be seen under scope - metamorphism evident - <u>tight</u> welding(?) of grains.
	42	Chert - black, grey, & white w/black veining & pyrite veining
	3-5	Abundant pyrite - large individual fragments as well as associated w/chert; w/tuffaceous material
	5	Tuffaceous material - breaks very easily with pressure from probe - white to light green in color - somewhat soapy texture
		Abundant sand size fraction made up of pyrite, quartz, calcite, chert
	6	Minor fragments of basaltic/andesite(?) still present Just located fragment - shows fibrous characteristics (possibly glaucophane)?
	Tr	The dark green alteration product is missing but the light green tuffaceous material (at least that's what I'm calling it) has some of it's properties except that it is not as soft. There is some green alteration material.
4335 - 4357	85	Metaquartzite - as described in previous interval
	2	Minor amount of tuffaceous sediments & tuffs abundant pyrite
	3	Black or green alteration material as previously described but it is getting much softer
	Tr	Sandstone - moderately well rounded claystone - creamy yellow color (part of tuffaceous material?)
	10	Abundant quartz
		Abundant <u>sand</u> /(minor silt) size material & large fragments Drilling rate = 1 to 4 ft/hr - material completely ate away the bit.

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Interval	%	Description
4369-4385	65	Light brown siltstone to claystone moderately well indurated - can be scraped easily with a probe - cream white on dry surface tends to be platy. Fragments up to gravel size. Light colored fraction generally to fine-grained to be seen under microscope (clay) dark fragments are visible though. Moderate reaction to HCL
	35	Quartzite - dark color - impure quartzite
	TR	Pyrite
	TR	Fibrous mineral black, possibly glaucophane (?)

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
		At ~ 8:00 am, 11-25-76 we started to drill with foam. Due to the rig-up system of foam drilling, the most logical and appropriate way of catching samples was to take them @ 15' intervals. This was discussed with Slim Garrett. Our 1st objective is to make hole; 2nd is catching samples. The samples are "grabbed", caught in a sieve, by the air men every 15 feet. The foam in, foam out temperature is also recorded on the sample bag label along with the depth the sample is taken. Consequently, we are losing the "fine" fraction of the sample. If in the future we can come up with a more appropriate way of catching samples, adjustments will be made.
4390	45	Greyish-green material. Texture is very much like that of soap. Very soft. When dug into with probe, it is similar to digging into a bar of soap. It flakes up white. The fragments are moderately well-rounded. It is dense material and contains abundant sulfide material - probably pyrite. It does <u>not</u> react with HCl. It is possible that this material is an altered tuff(?) Some of the fragments are much greener than others and some are patchy green - Probably an alteration material filling fractures.
	45	Claystone - light brown (tan) microcrystalline but even at high magnification I cannot discern what the grains enclosed in the clay are even under high magnification. The fragments are poor to moderately well-rounded.
	10	Quartzite - as described in previous intervals
	Tr	Chert - dark grey - as described in previous intervals
	Tr	Few fragments of volcanics - probably sluff
		Quartz - associated with quartzite <u>abundant</u> pyrite - as previously stated in tuff(?) material
		<u>Note:</u> Absence of fine fraction due to the method of catching samples
4403	25	Alteration material as previously described but has even > amount of pyrite
	3-5	Claystone as described in last interval but fragments are harder.
	35-40	Metaquartzite, dense, hard, lt. black, & white highly fractured, abundant pyrite associated with it Pyrite filling fractures, also quartz filling fractures - Same material as previously described
	30	Shale, siliceous, dark black, fine grained cryptocrystalline, very smooth surfaces, fractures easily under pressure from probe - breaks smooth, some fragments have pyrite veining
	3-5	Pyrite abundant - some moderately well rounded fragments others angular of pyrite material - looks like alteration material (as described above) that has been replaced by pyrite. 1 long piece of what appears to be blue asbestos-? long fibrous hair-like material Quartz - opaque fragments Sample has minor reaction with HCl



<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
4463	50	Metaquartzite - as previously described
	9	Alteration material - as previously described
	40	Shale - greyish-green, aphanitic, moderately hard but can be dug into w/probe. Very fine fracture lines filled w/black veining Also dark black shale
	1	Claystone - tan - as previously described Abundant pyrite associated with everything Overall small fragment size
4478	90	Quartzite - large fragments - hard, dense, black (as described previously) - quartz veining
	3	Claystone, tan, soft - as described previously
	7	Shale - black & (light grey) - minor - as previously described Sample has minor reaction w/HCl Very minor amount of pyrite Sample size fragments - large
4493	100	Metaquartzite - as previously described fractured w/quartz veins
	Tr	Shale - black & grey
	Tr	Clay - very minor
	Tr	Claystone Sample has minor reaction w/HCl Sample size fragments large minor pyrite
4500	50	Claystone, brown, tan & green
	10	Metaquartzite -

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Interval	%	Description
4525	40	Light green alteration w/white blebs grading to white alteration w/green blebs
	25	Light gray shale or slate, highly indurated
	25	Black shale
	10	Chert w/black veins
	Minor	Pyrite
4553	50	Black shale
	30	Light gray shale or slate as in 4525
	10	Light brown siltstone w/vigorous reaction to HCL
	10	Light green alteration product w/white blebs
	Minor	Pyrite
4561	80	Black shale
	20	Light gray shale as in 4525
	Minor	Pyrite
	Major	Calcite
4576		Same as 4561
	Minor	Light brown siltstone
	40	Shale - black & grey light to med (with black veining) pyrite common fragment size large - angular sample has minor reaction w/HCL  Large fragment of asbestos-like material - very fibrous - dark blue in color
4591	85	Shale - light grey to black, dense, can be drilled into with probe, angular fragments Very light grey material is much smoother than the dark grey & black material. The light material is highly fractured & the fractures are filled in with black material. The black filling is harder than the shale. The black shale is fractured & filled with calcite. The sample has a violent reaction w/HCL. The light material shows bedding.
	15	Quartzite - dark grey - hard to distinguish from dark shale due to similar texture both quartz and calcite
	1	Pyrite - both individual fragments & associated w/shale & quartzite  Minor amount of claystone



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Grab Sample	%	Description
4607	100	Black shale
	Minor	Calcite
	Minor	Pyrite
	Minor	Light brown siltstone
	Minor	Alteration material light green w/white blebs
4622	85	Black shale
	15	Light green w/white blebs alteration material partially pyritized
	Minor	Pyrite
	Minor	Calcite
4637	50	Black shale
	20	Alteration material as in 4622
	25	Light gray shale or slate
	5	Pyrite
	Minor	Calcite
	Minor	Light brown siltstone
4655	70	Black shale
	10	Light gray shale or slate
	15	Chert
	5	Alteration material as in 4622
	Minor	Calcite
	Minor	Pyrite

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Grab Sample	%	Description
4670	70	Black shale
	20	Alteration product as in 4622
	5	Chert
	5	Gray shale or slate
	Minor	Calcite
	Minor	Pyrite
4685	40	Black shale
	40	Chert
	10	Gray shale or slate possibly a gradational phase with the chert (?)
	10	Alteration material as in 4622
4693	80	Gray chert - similar to the gray shale or slate from above but with strong conchoidal fract.
	20	Black shale
	Minor	Pyrite
	Minor	Light brown siltstone
	Minor	Alteration material as in 4622

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
4719	25	Shale - black to grey, hard, dense - does not break - Cannot cut w/probe - conchoidal fracture(?)
	45	Chert - grey w/black veining - conchoidal fracture dense - hard - highly fractured
	5	Claystone - tanish pink - microcrystalline claystone greyish green - or is the alteration material - difficult to discern (?)
	25	Quartzite - similar to previous intervals but significantly more dense
	Tr	Alteration(?) material replaced by pyrite pyrite pretty much associated w/all liths minor reaction w/HCl fragments angular and fairly even size distribution
4734		Very similar to last interval more alteration(?) material more of the material that I am calling Chert (grey w/black veins) than anything else caliche - reacts w/HCl
	85	chert
	5	alteration
	10	quartzite
4751	50	Quartzite - slight reaction to HCL
	30	Chert - gray
	20	Black slate - same as black shale up hole. The material has been getting better indurated up hole it could be dug into with the probe now it is hard enough to scratch metal off of the probe This has been a progressive thing not sharply delineated
	Tr	pyrite
	Tr	Calcite
	Tr	alteration material - now white - no green still pyratized metal fragments from screen used to catch the sample
		Same lithologies as 4751
	45	quartzite
	55	black slate
	Tr	chert
4804	90	Quartzite w/pyrite & quartz veining The material I am calling Chert-like is associated with the quartzite. Is it possible to have chert filling voids & fractures in the quartzite(?) Yes. It is smooth & hard & breaks in somewhat of a conchoidal fracture. Some pieces have what appear to be pyrite inclusions most of it is opaque grey w/black veining. Some of it gets very black.
	10	chert
	Tr	Clear quartz fragments
	Tr	Green alteration material - more brittle than soft abundant pyrite associated w/it.
	Tr	Black shale - dense - some is very hard - again pyrite common association. No sample reaction w/HCl fragments are all angular: size ranges from large sand size to medium pebble size

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
4813	85	Quartzite - as previously described I am beginning to believe that what I am calling chert (whatever it is) is in very close association to quartzite The "chert" is chert also chert in fractures and on metamorphosed quartz arenite (quartzite of valmey)
	15	chert
	*	Discuss with Phil
	Tr	Shale angular fragments pyrite common
4827	100	Quartzite abundant pyrite
	Tr	Shale

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
4840	70	Quartzite ) <i>100% Quartzite Breccia</i> ) Should they be put together
	30	Chert(?) ) Pyrite abundant
4855	90	Quartzite
	5	Chert(?)
	5	Shale Abundant Pyrite
	Tr	Caliche and/or Calcite angular fragments large sand size to small pebble size
	Tr	Green alteration(?) material
4889	100	Quartzite Caliche associated w/quartzite → reaction w/HCl
	Tr	Alteration(?) material Pyrite associated w/quartzite & individual fragments
	Tr	Black Shale Opaque quartz
4915	95	Quartzite w/veins of pyrite & quartz dark grey to black & white. Some fragments have transparent & black granules. Angular fragments, hard & dense.
	1	Siltstone/claystone - steel grey w/black veining and also pyrite veining. Can be dug into with probe, dense
	2	Green alteration(?) material - Very similar to material previously described but harder. Fractures easily w/pressure from probe
	1	Calcite vein on some of the quartzite fragments but minor
	1	Shale, black, dense, moderately hard fragment size varies from medium pebble size to large sand size fragments minor amounts of bit filings picked up by magnet. Getting extremely difficult to collect samples
4930	85	Quartzite - as described above
	2	Alteration material(?) has become much harder - somewhat beginning to resemble a claystone - fragments for angular than previously
	10	Chert(?) what I have been describing before as silt/claystone now has become very dense & hard & resembles chert. Highly fractured w/ black veining I haven't been able to see a good concoidal fracture like I should if it is chert
	1	Shale - as previously described - black, dense, easily broken
	2	Calcite and/or caliche - reacts w/HCl. Breaks easily under pressure from probe
		Pyrite common - both as veining & as individual fragments - but not as much as Grab 4915
		Quartz fragments

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
4953	92	Quartzite - dark grey-black/white; pyrite & quartz veining; angular fragments; dense; hard.
	3	Alteration material - green & white - soft; spotty - some w/pyrite, some w/Fe staining
	2	Claystone - light tan - microcrystalline, breaks easily under pressure from probe some is kind of pinkish
	1	Shale - black - dense, hard but can be drilled into w/probe - breaks into flakes sometimes - easily fractured up
	2	Claystone - grey - hard w/pyrite - microcrystalline - shows some lineation of black lines pyrite associated w/all of the above all are very angular fragments except for the "alteration" material - poorly rounded
		fragment size from large sand size to medium pebble size minor reaction w/HCl - Caliche on quartzite(?) associated w/ Abundant metal filing from mill job.

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
4969	25	Shale - grey to black, hard, dense w/associated pyrite
	50	Quartzite - grey, black & white - dense, hard, granular w/associated pyrite - calcareous
	25	Chert(?) light grey to dark grey - some w/black veins - sometimes associated w/quartzite
	Tr	Alteration material(?) - green & white Fe stained metal filings present from nilling
		Is it possible that some of the chert is somewhat transparent? fragment size fairly even distribution - All angular fragments except for alteration(?) material
4984	60	Shale - black - some w/silver mineral associated hard, dense - quartz veining - conchoidal fractures
	20	Quartzite
	20	Claystone - (or alteration material) but I believe it is a claystone - greenish grey can be dug into by probe - angular fragments - somewhat hard abundant quartz associated w/quartzite & shale pyrite present but not as common as in previous intervals Chert(?) as in previous intervals - mostly opaque w/fractures filled w/black material

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
4999	80	dark gray to black shale (metasiltstone) can be dug into with the probe - can see grains at 10X
	15	quartz massive vein fillings
	5	calcite - massive
	minor	pyrite
5013		Same as 4999
5028		Same as 4999 dark gray has numerous grains with fractures filled with quartz and calcite
5043		Same as 4999
5058		Same as 5028 with minor aphanitic med. gray shale (metaclaystone) quite siliceous looking - w/pyrite on grains
5073		Same as 5058
5080	30	milky white quartz - massive with some banding indicating open fracture fillings
	40	chert - med. gray - may be secondary but has been fractured and fractures filled with mafic minerals
	30	black aphanetic shale (metamudstone) - no fissility
	minor	pyrite minor calcite present
5097		Same as 5080 except black fraction is coarser grained
5116		Same as 5080 except black fraction is partly the coarser grained material
	minor	fault gouge - pale green to white smeared texture along plane surfaces
5127	35	Black shale (meta-mudstone to meta-siltstone) Blocky fragments - fractures filled with quartz & calcite
	45	med gray chert - highly fractured and fractures filled with black minerals/calcareous cement
	10	free massive quartz
	5	calcite
	5	pyrite
	minor	soft gray material with white spots probably an alteration product
5142		Similar to 5127 med gray chert is more opaque here and seems to grade in to the black shale (meta-mudstones) the chert shows some tendency to fracture along parallel planes quartz reduced in percentage
5158		Same as 5142 no free quartz just chert calcite 10% calcite veining
5173	60	chert - highly fractured
	35	black shale (meta-siltstone - meta claystone) with calcareous cement which seems to grade into the chert
	5	calcite
	minor	other than chert no free quartz pyrite



<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
5189	10	chert
	70	black shale (meta-siltstone)
	20	euhedral quartz in fracture fillings and free
	minor	calcite
	minor	pyrite
5205		Same as 5189 except no chert 10% alteration material
5223		Same as 5127 the chert is back no termination to the quartz
5236		Very small sample Same as 5223
5251		Same as 5223 some terminations on quartz
5260		Same as 5251
5285	90	dark gray to black shale (meta-claystone to meta-siltstone) fragments are generally blocky but some have tendency to be platy. Calcite cement
	minor	pale green meta-claystone to meta-siltstone
	5	pyrite
	5	quartz generally as fracture fillings on other grains or blocky fragments of massive quartz
5300	70	first lith above
	20	med gray shale (meta-siltstone) can be scratched with probe
	5	quartz
	minor	pyrite
5330		Similar to 5300 med gray shale (meta-siltstone) becoming coarser grained slight but pervasive reaction to HCL throughout sample
5346	60	med gray soft alteration product strongly pyratized
	10	quartz euhedral and anhedral probable an open fracture
	10	free pyrite
	20	dark gray to black meta quartzite (meta-claystone - meta-siltstone)
5361	20	light gray altered siltstone (alteration product?) highly pyratized generally well-rounded
	15	chert-fractured and rufilled with mafic materials probable an open fracture
	35	black shale (meta-siltstone to meta-claystone) no grains visible in the blocky fragments non ficial or friable
	20	quartz some clear some milky - some with xtal terminations sand-sized fragments
	10	free pyrite - euhedral up to fine sand-sized pyritohedrons
5376	85	med gray shale meta-siltstone with abundant quartz fracture fillings on grains. Cemented w/calcite
	15	quartz euhedral and anhedral
	very minor	pyrite
5391	95	med gray to dark gray shale (meta-siltstone) with calcite cement also some fracture fillings filled with quartz
	5	quartz
	minor	pyrite

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
5404	60	dark gray to black siltstone (soft) w/ calcite cement med. gray siltstone (hard) w/ calcite cement both show some grains with fractures filled w/quartz
	5	quartz - small grains
	minor	pyrite
5420	45	light gray altered siltstone (soft) lightly pyratized rock is somewhat soft probably from hydrothermal alteration. slight reaction to HCL - calcite cement? probable a fracture zone
	35	med gray shale (meta-siltstone or meta-claystone) blocky fragments some quartz filled fractures quite hard
	10	quartz, anhedral, milky
	10	free pyrite
	minor	pink siltstone
5438	100	med gray shale (meta-siltstone) w/fractures filled with dark minerals. occasionally they are filled with quartz
	minor	pyrite
	minor	free quartz anhedral
5453	65	med gray shale (meta-siltstone) described above
	25	dark gray to black shale (meta-siltstone) blocky fragments no fisility
	10	metaquartzite
	minor	pyrite
5469	50	med gray shale (meta-siltstone) described at 5438
	40	dark gray to black shale (meta-siltstone) described at 5453 w/pyrite in the matrix
	10	metaquartzite
	10	massive calcareous fragments probably vein fillings
5484	85	med gray shale (meta-siltstone) described at 5438
	10	dark gray to black siltstone described at 5453
	5	free quartz
	minor	pyrite
5500	50	med gray shale (meta-siltstone) described at 5438
	35	dark gray to black shale (meta-siltstone) described at 5453
	10	free quartz anhedral
	5	free pyrite
5515	25	med gray shale (meta-siltstone or possibly meta claystone) little xtal. structure seen highly fractured and fractures filled w/mafic minerals and quartz veins
	55	black shale (meta-siltstone) quartz veining
	10	free quartz all anhedral no xtal faces evident
	5	pyratized altered siltstone - soft w/white blobs (probably weathered feldspars) in a light gray matrix
	5	calcite
5530		Same as 5515 w/slightly more pyrite
5545		Same as 5515 med gray shale (meta-claystone) is tending to look like chert - translucent

<u>Grab Sample</u>	<u>%</u>	<u>Description</u>
5560	25	med gray shale (meta-claystone) to chert highly fractured
	35	black shale (meta-siltstone) highly fractured
	20	pyratized altered siltstone
	15	sandy claystone - hard - probably metamorphosed fault gouge - elongate grains that have been streaked out at the ends perhaps better called a mylonite
	5	quartz no xtal faces
minor	orange siltstone	
5575		Similar to 5560 less mylonite 10%
5590	60	med gray chert - translucent, highly fractured
	30	black shale (meta-siltstone)
	10	quartz anhedral from fracture fillings no mylonite
5605	85	black shale (meta-siltstone) highly fractured
	10	med gray shale (meta-claystone) or chert highly fractured
	5	quartz - milky
5620		Same as 5605
5635		Same as 5605 w/ a few clear grains of quartz
5650	45	med gray shale (meta-siltstone) or chert
	30	black shale (meta-siltstone)
	20	milky quartz from vein fillings - no euhedral
	5	altered siltstone
	minor	pyrite
5686		Same as 5650