

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor SKiles Report # 1

Location SW, NE, SE, 7, T3S, R9E Date 7-20-78

Well # 3/9 7 AAC Timberline Maintenance Area

Depth @ 6 ~~AM/PM~~

Log: 6 AM to Noon - Set-up
Noon to 2 PM Drilling.
Drilled 20', set 19' of
casing (in ground).

Formation: Mud flow,
gray andesitic sand and
boulders. (Very little red -
- Pelitic Mud flow?)

Formation

0 ft.

0 0 0
0 0 0
0 0 0
0 0 0

20'

Depth @ 2 ~~AM/PM~~

Total Footage

Drilling Fluid:

Mud - Additives _____

Air - Pressure 1000 cfm P.S.I. 100 Additives _____

Weather Report Clear

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor Skiles Report # 2
Location SW, NE, NE Sec 7, T33, R9E Date 7-24-79
Well # 3/9 7a2c

Depth @ 7:45 AM/PM

Log: Grey andesitic
sand and boulders, Mud
Flow debris. Hard
Boulder @ 57'

Formation

20 ft.

60

Depth @ _____ AM/PM

Total Footage _____

Drilling Fluid:

- Mud - Additives _____
- Air - Pressure 1000 cfm P.S.I. 100 Additives _____

Weather Report Fair

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor SKYLES Report # 3

Location SW, NE, NE Sec 7 T3S R9E Date 7-25-78

Well # 3/9 7000

Depth @ 7:45 (AM)/PM

Formation 60 ft.

Log: VOLCANIC MUDFLOW ~~DEBRIS~~ DEBRIS

LT GRAY ANDESITE 60-70' drilled fast
75' HARD & SLOW DRILLING

MUDFLOW CHANGED COMP. TO RED ORANGE
CLASTS & LT GRAY ANDESITE

87' VOLCANIC DEBRIS CHANGED BACK TO
LT GRAY ANDESITE CLASTS. few red-orange

89 1/2' ~~NOT MAKING SENSE~~ CONDUCTOR PIPE
NOT DRIVING - DRIVING VERY SLOWLY
6"/hr

AT 90' BROKE THROUGH BOULDER -
CORRECTION. CONDUCTOR PIPE
BROKE AT WELD 30' FROM TOP OF HOLE

Depth @ _____ AM/PM

Total Footage

90
30

Drilling Fluid:

- Mud - Additives _____
- Air - Pressure 1000 cfm P.S.I. 100 Additives foam


Weather Report NOT

8071-NS

Observer QM

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor Skyles Report # 4
 Location 35 9E 7aoc Date 7-26-78
 Well # 71-7

Depth @	AM/PM	Formation
8		90 ft.
Log: 90'-100' LT GRAY ANDESITE		
Fe-MAGS PRESENT ^{Hb+Px} CLEAR PC. SOME		
RED-ORANGE FRAGS. DRILLING RATE 10'/hr		
PROBABLY A MUD FLOW		
- AT 93 1/2' DRILL BROKE THROUGH		
BOULDER - AT 97' DRILL SLOWED DOWN		
AND HAS STAYED AT SAME RATE 4.5'/hr.		
100'-110' SAME MATERIAL AS DESCRIBED		
BEFORE		
110'- 110' LT GRAY ANDESITE: XTLS of px hb		
LARGE PC - VERY LITTLE RED ORANGE FRAGS		
FLOW RX & ANDESITE PORPHYRY - MORE Px THAN Hb		
113'-114' DRILLING RATE 1'/hr RETURNS ARE		
SILT SIZE		
NO CHANGE TO 116 1/2'		116 1/2'
Depth @	H:30 AM/PM	
Total Footage		26 1/2'

Drilling Fluid:

Mud - Additives _____
 Air - Pressure 1000 cfm P.S.I. 100 Additives foam

Weather Report RAIN

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor Skyles Report # 5
 Location 359E 7acc Date 7-27-78
 Well # 71-7

	Formation
Depth @ <u>8:30</u> <u>(AM)</u> PM	<u>116 1/2</u> ft.
Log: <u>RESUMED DRILLING P. ANDESITE</u>	
<u>VERY POOR CUTTING RETURN. AIR HAMMER</u>	
<u>DRILLING RATE IS 1'/hr CUTTING ARE SILT</u>	
<u>SIZE ~ 118 1/2' DRILLING RATE PICKED UP</u>	
<u>1' IN 10 MIN.</u>	
<u>TO 120' RK TYPE SAME: ODD BALL FRAGS</u>	
<u>TAN IN COLOR - RARE DRILLING RATE 3'/hr</u>	
<u>126' DRILLING RATE 1 1/2'/hr RK TYPE SAME</u>	
<u>Predom: PX ANDESITE. SOME RED-ORANGE FRAGS</u>	
<u>SOME TAN FRAGS.</u>	
<u>- 130' NO CHANGE NO CUTTINGS</u>	
<u>GROUND UP TO SILT SIZE</u>	
<u>- 134' NO CHG. 2'/hr</u>	
<u>- 135' " " 1'/hr.</u>	

Depth @ 5:30 (AM) PM 135
5:30 JWH Total Footage 18 1/2
9 Hrs

Drilling Fluid:
 Mud - Additives _____
 Air - Pressure 1000 cfm P.S.I. 100 Additives foam

Weather Report SUNNY - COOL

8071-NS Observer J Meyer

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor Skyles Report # 6
 Location 35-9E 7aac Date 7-28-78
 Well # 71-7

Time st. @	Formation
8:00	
Depth @ <u>8:30</u> AM/PM	<u>135</u> ft.
Log: <u>Work on air lines 7:30-8:50</u>	
<u>-134 1/40 min Andesite flow</u>	
<u>-137 1/25 min</u>	
<u>-138 1/12 min 157' NO CHG LW</u>	
<u>139 -20 min RK type</u>	
<u>140 -15 min MORE Red frags.</u>	
<u>141 -30 min SUSPECT SLOUGH MATERIAL</u>	
<u>142 8 "</u>	
<u>143 20 "</u>	
<u>144 20 "</u>	
<u>145 6 "</u>	
<u>146 6 "</u>	
<u>147 12 "</u>	
<u>148 17 "</u>	
<u>150 32 "</u>	

Depth @ 5:00 AM/PM (PM) 157
 Total Footage 22

Drilling Fluid:
 Mud - Additives _____
 Air - Pressure 1000 cfm P.S.I. 100 Additives foam

Weather Report CLEAR

8071-NS Observer J.W.H. J.M.

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor Skyles Report # 7

Location 359E 7aac Date 7/31/78

Well # 71-7 Bottom hole Temp. taken at ~ 11:30 am prior to drilling
 Time - 5 T°
0 7103 4.91
3 7111 4.89
6 7117 4.87
 Formation

Depth @ 12:00 noon AM/PM 157 ft.

Log: Additional air compressor 285 CFM also more foam (BAROLD "QUICK FOAM") added.

Drilling rate increased and cutting return improved

cuttings: light gray coarse grained andesite

Drilling times min/ft

<u>158-159</u>	<u>-</u>	<u>31</u>
<u>159-160</u>	<u>-</u>	<u>5</u>
<u>160-161</u>	<u>-</u>	<u>7</u>
<u>161-162</u>	<u>-</u>	<u>4</u>
<u>162-163</u>	<u>-</u>	<u>4</u>
<u>163-165</u>	<u>-</u>	<u>8</u>
<u>167-168</u>	<u>-</u>	<u>2 slowed down at ~ 170'</u>
<u>176-177</u>	<u>-</u>	<u>36</u>

Depth @ 9:00 AM/PM 182
 Total Footage 25

Drilling Fluid:

- Mud - Additives _____
- Air - Pressure _____ P.S.I. Additives Quick Foam

Weather Report Clear, Warm

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor SKYLES

Report # 8

Location TIMBERLUND LODGE 3S, 9E, 7 aac

Date Aug 1, 1978

Well # 71-7

Depth @ 8:30 (AM)/PM

Log: gray andesite as above

Temp 3:44 7712.6 3.01 °C

3:53 7714.0 3.01

air temp from annulus 42° F

Came out of hole to check bit for sharpness, it was dull and large fracture had developed at shoulder of bit. Further drilling would probably cause bit to fail

driller estimates hole is making 5 gpm SWL 135'

Rig released

Depth @ 3:30 (AM)/PM

SWL = STANDING WATER LEVEL / Total Footage

Drilling Fluid:

Mud - Additives

(Air) - Pressure

P.S.I.

Additives Quick Foam

Weather Report

8071-NS

Observer

RG Bowen

Formation

182 ft.

188

6

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor SKYLES

Report # 9

Location Timberline Lodge

Date 8/7/78

Well # 71-7

Depth @ 10:00 AM PM

Log:

9:45am 7732.2 - 2.95°C

Pumptest gives a flow of 6-7 gpm
Drilling rate at start 8'/ft

@ 195' flowing measured 50 gpm
drilling fast from 29' - (10' in 5 min)

Formation

188 ft.

T 40°F

200' cut 12:45

57°F

200-210 1:45

red oxidized zone @ 219'

47°F

210-220 cut 2:10

46°F

220-230 cut @ 2:15

42°F

230-240 cut @ 2:35

Depth @ 2:45 AM/PM

Total Footage

253

65'

Drilling Fluid:

Mud - Additives

Air - Pressure

P.S.I.

Additives QUICK FOAM

Weather Report

8071-NS

Observer

R. Bowser

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor AMERICAN Deep DRILLING Report # 10
 Location Timberline Lodge Date 8-8-78
 Well # 71-7

Depth @	AM/PM	Formation
		<u>253</u> ft.
Log: <u>270', 280', 290', 300'</u>		
<u>CINDER Bed OR flow breccia</u>		
<u>320' Temp 45°</u>		
<u>330' Temp 46°</u>		
<u>340' Temp 42°</u>		
<u>350' Temp 44°</u>		
<u>360' F CHG IN Rk TYPE TO ANDESITE</u>		
<u>370' Temp 42</u>		
<u>380 Temp 46</u>		
<u>390 Temp 47</u>		
<u>400 Temp 45</u>		
<u>SHUT DOWN RIG</u>		
Depth @ _____	AM/PM _____	<u>400</u>
Total Footage		<u>147</u>

Drilling Fluid:

- Mud - Additives _____
- Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

8071-KS(jm) Observer CRK = White

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor American Deep Drilling

Report # 11

Location Timberline Lodge

Date 8/17/78

Well # 71-7

Depth @ 3:30 AM/PM (PM)

Formation

400 ft.

Log: _____

Repaired draw motor and came out of hole with bit, apparently hole was in good shape as trip out was uneventful. Bit undamaged, all inserts in place.

Temperature measurements attempted but uncertain as to whether probe ever got to T.D., three tries resulted in tangled cable each time. All points showed 2.97-2.98°C. Could hear water cascading to lower levels

SWL 65M (213')

Depth @ 6:00 AM/PM (PM)

400

Total Footage

0

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report Cloudy, Cold

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor American Deep Drilling Report # 12
 Location Timberline Lodge Date Aug 18, 1978
 Well # 71-7

		Formation
Depth @ <u>8</u> AM/PM		<u>400</u> ft.
Log: <u>SET SURFACE CASING</u>		
<u>Report # 13</u> <u>8/19/78</u>		
<u>CEMENTED SURFACE CASING</u>		
<u>CEMENT DID NOT RETURN TO SURFACE</u>		
<u>Report # 14</u> <u>8/21/78</u>		
<u>CEMENTED ANNULAR SPACE BETWEEN CASING</u>		
<u>& HOLE TO SURFACE</u>		
<u>Report # 15</u> <u>8/22/78</u>		
<u>RETEST BOP FOR U.S.G.S.</u>		
Depth @ _____ AM/PM		
Total Footage		

Drilling Fluid:

- Mud - Additives _____
- Air - Pressure _____ P.S.I. _____ Additives _____

Weather Report _____

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor AMERICAN DEEP DRILLING Report # _____

Location TIMBERLINE LODGE Date 8/23

Well # _____

Depth @ _____ AM/PM	Formation	ft.
Log: <u>6:00 START UP - BEGIN DRILLING OUT</u>		
<u>CEMENT. 07:00 - BEGIN DRILLING ROCK</u>		
<u>AT 400'</u>		
<u>7:25 - 410' SAMPLE</u>		
<u>7:55 - 420' SAMPLE - FLOW</u>		
<u>8:20 - 430' - FLOW</u>		
<u>9:20 - 440' OXIDIZED FLOW BXA OR CINERS</u>		
<u>9:30 - 450'</u>		
<u>10:00 - 460</u>		
<u>10:10 - 470</u>		
<u>10:45 - HOLE FILLING IN - 3-5'</u>		
<u>11:30 - STOP CIRCULATION - STILL CAN'T</u>		
<u>REACH BOTTOM.</u>		
<u>16:30 - RESUME CIRCULATION - DRILLING</u>		
<u>AT 470. 17:00 480' 17:20 490'</u>		
Depth @ _____ AM/PM		
Total Footage		

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor AMERICAN DEEP DRILLING Report # _____
 Location TIMBERLUN? LODGE Date 8/24
 Well # _____

Depth @ _____ AM/PM	Formation	ft.
Log: <u>6:30 START UP - DRILLING 560'</u>		
<u>6:45 - 570'</u>		
<u>7:00 - 580'</u>		
<u>7:45 - 590 - SOAP T = 59°F</u>		
<u>8:05 - 600</u>		
<u>9:00 - 610 BEGIN PULLING OUT OF HOLE</u>		
<u>FOR BIT CHANGE</u>		
<u>12:00 - FINISH PULLING OUT</u>		
<u>TIME DEPTH(M) T°C R</u>		
<u>12:30 150 7.8 6282</u>		
<u>12:35 140 7.75 6289</u>		
<u>12:36 130 7.74 6292</u>		
<u>12:42 120 9.08 5947</u>		
<u>12:47 110 9.92 5741</u>		
<u>12:54 100 11.66 5340</u>		
<u>13:00 90 7.75 6290</u>		
<u>HOLE BLOCKED BELOW 150 METERS</u>		
Depth @ _____ AM/PM		
Total Footage		

Drilling Fluid:

Mud - Additives _____
 Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor AMERICAN DEEP DRILLING Report # _____

Location TIMBERLINE LODGE Date 8/05/78

Well # _____

Depth @ _____ AM/PM	Formation	ft.
Log: <u>6:00 START UP - DRILL OUT CEMENT</u>		
<u>10:00 - 465' BEGIN BRINGING UP</u>		
<u>ANDSITE - CEMENT DID NOT PENETRATE</u>		
<u>BELOW THIS LEVEL.</u>		
<u>11:00 - 490' ANDSITE</u>		
<u>11:45 - 510' ANDSITE</u>		
<u>12:00 - 530' OXIDIZED ROCK</u>		
<u>12:30 - 550'</u>		
<u>12:55 - 570'</u>		
<u>13:35 - 590'</u>		
<u>14:05 - 610' SAMPLE</u>		
<u>14:20 - 620' SAMPLE</u>		
<u>14:35 - 630'</u>		
<u>14:50 - 640'</u>		

Depth @ _____ AM/PM

Total Footage _____

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor AMERICAN Deep Drilling Report # _____
 Location Timberline Lodge Date 8/25/78
 Well # _____

Depth @ _____ AM/PM	Formation
	650 ft.
Log: @ 647' Rk type change to soft unit. Lt gray andesite phenos of PC drilled fast to 670' 20' in 20 min. 3:35 pm new connection 3:42 pm down another 20' 680' & 690' 70% of cuttings red- orange andesite 3:40 pm air return temp 58° 3:50 pm to 4 pm another 20' same material to 710' same drilling rate to 730' at 720' 40% of cuttings showed a yellow tan weathering rind? some Rk's yellow tan all the way through	
Depth @ _____ AM/PM	
Total Footage _____	

Drilling Fluid:

- Mud - Additives _____
- Air - Pressure _____ P.S.I. Additives quick form

Weather Report _____

Observer J Meyer

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor AMERICAN Deep DRILLING Report # _____

Location Timecine Lodge Date 8/25/78

Well # _____

Formation

Depth @ 5 AM/PM

750 ft.

Log: LOST TAN yellow frags at
730' 730 TO 740' drilled through
A welded? tuff. LT GRAY
740-750 BACK TO 40' D RED ORANGE
PORPHYRITIC ANDESITE & 60' DK GRAY (wet)
PORPHYRITIC ANDESITE.

DRILLING RATE STILL 20' / 10 MIN
5:18 pm CONNECTION

5:28 pm CONNECTION DOWN 20' / 10 MIN

750-760 SAME AS 740-750

760-770 RED-ORANGE fraction gone

TR of cavity filling MILKY QTZ.

DRILLER REPORTS THAT 765' HOLE STARTED

MAKING WATER 60-70 gal/min 53° F

"CRUMBLY FORMATION" 770' RK HARDENED

770-780 DK GRAY-BLACK ANDESITE
PHENOLIC PC.

Depth @ 6 AM/PM

785

Total Footage

35

Drilling Fluid:

Mud - Additives _____

Air - Pressure 15 P.S.I. 150 Additives quick foam

Weather Report SUNNY Temp 40°

8071-NS

Observer

J. Meyer

down 4:30 pm TO 4:55 pm

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor American Deep Drilling Report # _____

Location Timberline Lodge Date 8/25/78

Well # _____

Depth @ _____ AM/PM	Formation
6	685 ft.
Log: 790' RK dk gray BLACK AND. TR	
6:05 pm RETURN FORM-WATER TEMP	
46°F	
DRILLER STOPPED AS HOLE WAS	
CAVING. HOLE CAVES AT <u>771'</u>	
DRILLER ESTIMATE HOLE IS MAKING	
<u>100 gal/min @ 43°F</u>	
Depth @ _____ AM/PM	790
Total Footage	115'

Drilling Fluid:
 Mud - Additives _____
 Air - Pressure _____ P.S.I. 150 Additives gulk foam

Weather Report RAIN Temp 40

8071-NS Observer J Meyer

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor AMERICAN Deep DRILLING

Report # _____

Location TIMBERLINE Lodge

Date 8/31/78

Well # _____

Depth @ 4 AM/PM

Formation

870 ft.

Log: STARTED DRILLING OUT CEMENT AT
4pm
AT 670' DRILLED OUT OF CEMENT
↳ INTO ROCK DRILLED ROCK OF
THE SAME DESCRIPTION AS PREVIOUSLY
DRILLED UNTIL 755'. AT 755'
DRILL WENT BACK INTO HOLE. AT
770' IT APPEARS THAT THE CEMENT
NEVER GOT DOWN AS HOLE IS MAKING
AS MUCH WATER AS BEFORE

9-1-78

← 9/1/78

DRILL PIPE STUCK AT 750' WHILE
SQUEEZING WATER BEARING FORMATION AT
770'

Depth @ _____ AM/PM

Total Footage

Drilling Fluid:

- Mud - Additives _____
- Air - Pressure 175 P.S.I. Additives quick foam

Weather Report foggy 42°F

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor AMERICAN Deep DRILLING Report # _____

Location TIMBERLINE Date 9-13-78

Well # _____

Depth @ _____	Formation	
8 <u>(AM)</u> /PM		397 ft.
Log: <u>FOUND CEMENT AT 397'</u>		
<u>DRILLED OUT OF CEMENT & INTO</u>		
<u>NEW HOLE AT 477' LITHOLOGY</u>		
<u>AS DESCRIBED BEFORE</u>		
<u>Red oxidation @ 719' ± 159 PM</u>		
<u>Hard dark gray andesite</u>		
<u>starts @ 760. Few red</u>		
<u>fragments in cuttings.</u>		
<u>Drilling rate 5 min / ft.</u>		
<u>Water increase 820-840</u>		
<u>w/ red andesite cobbles blowing</u>		
<u>out of hole.</u>		
<u>Yellow firm @ 850</u>		
<u>shut down @ 860</u>		
<u>@ 7:30 PM, pulled</u>		
<u>tools till _____</u>		
Depth @ _____ AM/PM		860

11 1/2 hrs. Total Footage

Drilling Fluid:

- Mud - Additives _____
- Air - Pressure _____ P.S.I. Additives ONIR FERM

Weather Report RAIN 40°

8071-NS Observer J Meyer

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor American Deep Drilling Report # _____

Location Timberline Date 9-14-78

Well # _____

Depth @ _____ AM/PM	Formation
Log: <u>Cemented hole</u> <u>1 to 2 PM.</u>	
<u>Drilled out 8:30 to</u> <u>11 PM. Cement soft,</u> <u>started drilling w/ air</u> <u>@ 570.</u>	570 ft. Cement 690
<u>Kicked out of hole @</u> <u>690'</u> <u>pulled to 707'</u>	Rock 707
Depth @ <u>11</u> <u>AM</u> <u>PM</u>	707
<u>2 1/2 hrs.</u> Total Footage	

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives Foam

Weather Report Cold - fog w/ clearing periods.

Observer J. W. Hook

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor America Deep Drilling

Report # _____

Location Timberline

Date 9-15-78

Well # _____

Depth @ _____ (AM/PM)	Formation
7	207 ft.
<p>Log: _____</p> <p>Drilled to 770, 10' into hard black andesite. Hole was making about 40-50 gpm @ 760 in rubble zone. Shut down abt 10 AM to wait for cement (due @ 3 PM). cemented hole</p>	
Depth @ _____ AM/PM	770
3hr. Total Footage	

Drilling Fluid:

- Mud - Additives _____
- Air - Pressure _____ P.S.I. Additives _____

Weather Report Partly Cloudy, Cold.

8071-NS

Observer J W Hook

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor American Deep Drilling Report # _____

Location Timberline Lodge Date 9-20-78

Well # _____

Repaired rig 9-18 & 9-14-78

Depth @ _____ AM/PM

Formation _____ ft.

Log: FOUND CEMENT AT 690'

708' cement + Rk. 60%/40%

725 CEMENT + ROCK ~ 30%/70%

730 OUT OF CEMENT - 100% OXIDIZED

ANDESITE - FLOW BRECCIA ZONE -

WATER FLOW INCREASES HERE

Drilled to 770' - STILL MAKING WATER

CEMENTED - 20 BAG CEMENTS

BAGS (20 CU FT.) ZONOLITE

Depth @ _____ AM/PM

Total Footage _____

Drilling Fluid:

Mud - Additives _____

Air - Pressure 175 P.S.I. Additives Quik Form

Weather Report ~~S~~ FAIR - SNOW ON ground

8071-NS Observer J Meyer

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor AMERICAN Deep DRILLING Report # _____

Location TIMBERLINE Lodge Date 9-22-78

Well # _____

Depth @ _____ AM/PM	Formation	ft.
Log: <u>DRILLED OUT CEMENT</u>		
<u>FOUND CEMENT AT 800' DRILLED TO</u>		
<u>810' HIT WATER FOUND SOFT CEMENT</u>		
<u>AT 850' STOPPED DRILLING</u>		
<u>CEMENTED AGAIN 60 SACKS +</u>		
<u>ZONALITE</u>		

Depth @ _____ AM/PM
Total Footage _____

Drilling Fluid:
 Mud - Additives _____
 Air - Pressure _____ P.S.I. Additives _____

Weather Report RAINY COLD

8071-NS Observer J Meyer

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor American Deep Drilling Report # _____

Location Timberline Lodge Date 9-23-78

Well # _____

9/22/78

Depth @ _____ AM/PM

Log: FOUND TOP OF CEMENT PLUG AT 620'
BOTTOM AT 850'. STRINGER OF CEMENT
TO 880'

880-890 yellow tan altered breccia
as before

890-900 Rk same as before
some fresh med gray chips of
andesite formation hardened at 895'

making water at about 2-3 gal/min

900-910 same, breccia unit. chips
show oxidized rims. med gray green

porphyritic andesite. pieces of Pc in centers of boulders

10' / 7min drilling rate

910-920' same 50-50 tan + "fresh" Rk

andesite is altered to green gray

celadonite? water 10-15 gal/min

PROBABLY
1. BOULDER

Formation

ft.

Depth @ _____ AM/PM

Total Footage

Drilling Fluid:

Mud - Additives _____

Air - Pressure 190 P.S.I. Additives Drill Form

Weather Report cldy

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor American Deep Drilling

Report # _____

Location TIMBERLINE Lodge

Date 9/25/78

Well # _____

Depth @ 6 (AM) PM

Formation

940 ft.

Log: CEMENTED HOLE. 4 BARRELS

4 SACKS CEMENT 1 ZONOLITE / BARREL

CURING TIME 8 hrs

+ more cement

9/26/78

8:30 DRILLED OUT CEMENT TO 940'

MODERATE WATER FLOW

940'-950' FAST DRILLING THRU TOP OF

ANDESITE FLOW, ~953' RATE SLOWS

DOWN - HARD, DENSE, FLOW.

STOP FOR CEMENT AT 960'

9/27

CEMENT AGAIN - DRILL OUT PARTIALLY

IN LATE PM

9/28

DRILLING OUT CEMENT

Depth @ _____ AM/PM

Total Footage

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report FAIR

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor American Deep Drilling

Report # _____

Location TIMBERLINE Lodge

Date 10-3-78 **+10/4**

Well # /

Depth @ _____ AM/PM	Formation	ft.
Log: <u>CEMENTED HOLE AT 900' WITH 4 BARRELS</u> <u>of cement</u>		
<u>RESULTS of Temp survey of 10-2-78:</u>		
<u>STATOC LEVEL BETWEEN 225m + 250m</u>		
<u>250 m 12.14°C</u>		
<u>275 m 12.21°C</u>		
<u>984'</u> <u>300 m 12.54°C 117°F</u>		
<u>10-4-78</u>		
<u>DRILLED OUT CEMENT. NO CEMENT AT 900'</u>		
<u>Attempted Temp probe BRIDGE AT 960'</u>		
<u>was SUSPENDED TEMP SURVEY</u>		
<u>SWITCHED FROM AIR TO MUD</u>		

Depth @ _____ AM/PM
Total Footage _____

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report SUNNY

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor American Deep Drilling Report # _____

Location Timberline Lodge Date 10-5-78

Well # 1

Depth @ _____ AM/PM	Formation	_____ ft.
Log: ON BOTTOM 1140' AT 4 PM		
1150' LT GRAY ANDESITE 15% RES		
BROWN OXIDIZED ANDESITE		
5 PM - 1700 Mud 47°F		
1715 Drilling @ 1160'		
1726 Sample from 1160, Same as above.		
1800 Mud out 48°F		
1805 Drilling @ 1170'		
1816 Sample from 1170' similar with considerable calcite.		
? Sample from 1180 by driller,		
1900 Mud out 49°F		
1905 Drilling @ 1190'		
1916 Sample from 1190 - reddish		
Note: Driller holding back on pipe - could penetrate faster.		
Depth @ _____ AM/PM		
Total Footage _____		

Drilling Fluid:

- Mud - Additives _____
- Air - Pressure _____ P.S.I. Additives _____

Weather Report fair

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor American Deep Drilling

Report # _____

Location Imitation Lodge

Date 10-5-78

Well # 1

contd.

Depth @ _____ AM/PM	Formation	ft.
Log: <u>1923 drilling @ 1200</u>		
<u>1934 sample from 1200, gray & red (40%) andesite.</u>		
<u>Samples @ 1210 & 1220 by chiller - gray andesite, less than 10% red.</u>		
<u>2000 mud out 50°F</u>		
<u>2005 Drilling @ 1230'</u>		
<u>2016 sample from 1230' - same.</u>		
<u>2020 Drilling @ 1240'</u>		
<u>2032 sample from 1240'</u>		
<u>2225 DRILLING 1260</u>		
<u>2310 DRILLING 1280</u>		
<u>00:08 DRILLING 1300</u>		
<u>00:00 MUD OUT 50°F</u>		
<u>01:17 DRILLING 1320</u>		

Depth @ _____ AM/PM

Total Footage _____

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

LITHOLOGY LOG
NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor _____ Report # _____

Location TIMBERLINE HOLE #3 Date _____

Well # _____

Depth @ _____ AM/PM	Formation	0 ft.
Log: <u>PLAG - Px - AM DACITE. LARGE AM.</u>	Δ Δ	
<u>PHENOS INDICATE ROCK IS PROBABLY</u>	Δ Δ	
<u>FROM TIMBERLINE BLOCK + ASH FLOW</u>	Δ Δ Δ	
	Δ Δ	20
<u>DACITE - LARGE PERCENT OF</u>	Δ Δ Δ	
<u>2 PX BEARING ROCK W/ VERY SMALL</u>	Δ Δ	30
<u>AMPHIBOLES - CHARACTERISTIC OF</u>	Δ Δ Δ	
<u>POLLALI BLOCK + ASH FLOWS</u>	Δ Δ	40
<u>MIXTURE OF DACITE AND</u>	○ ○	
<u>ANDSITES - LARGE ANGULAR FRAGMENTS</u>	○ ○ ○	50
<u>IN RETURN, PROBABLY FROM</u>	○ ○ ○	
<u>HETEROGENEOUS MUD FLOW W/ LARGE</u>	○ ○ ○	60
<u>BOULDERS</u>	○ ○ ○	70
	~ ~	
<u>MIXTURE OF ANDSITES - LIGHT</u>	~ ~	
<u>GRAY, PLAG, 2 PX ANDSITZ PREDOMINATES</u>	~ ~	80
Depth @ _____ AM/PM		

Total Footage _____

Drilling Fluid:

- Mud - Additives _____
- Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor _____

Report # _____

Location TIMBERLINE #3

Date _____

Well # _____

Depth @ _____ AM/PM	Formation	ft.
Log: <u>LIGHT GRAY ANDESITE FLOW - LARGE</u>	~ ~	<u>80</u>
<u>PLAG PHINOS, ABUNDANT HONEY TO</u>	~	
<u>MEDIUM BROWN OPX PHINOS, LESS</u>	<u>FLOW</u>	<u>90</u>
<u>ABUNDANT GRISH-BROWN XTALS ARE</u>	<u>#1</u>	
<u>PROBABLY CPX. SUBARKY MATRIX IS</u>	~ ~	<u>100</u>
<u>GRAY W/ V. FINE BLACK XTALS -</u>	~	
<u>PROBABLY CPAGU2 ORZ.</u>	~ ~	<u>110</u>
	~	
	~ ~	<u>120</u>
	~	
	~ ~	<u>130</u>
	~	
	~ ~	<u>140</u>
	~	
	~ ~	<u>150</u>
	~	
<u>(HOMOGENEOUS SAMPLE FOR ANALYSIS) →</u>	~ ~	<u>160</u>
	~	
	~ ~	

Depth @ _____ AM/PM

Total Footage _____

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor _____ Report # _____

Location TIMBERLINE DH. #3 Date _____

Well # _____

Depth @ _____ AM/PM

Log: CONTINUED GRAY ANDESITE

BROWN ANDESITE, PORPHYRITIC W/
LARKS MEDIUM BROWN OPX, SOME
QUITE LARGE PHENOS OF GREEN CPX,
FINE GRAINED GRAY-BROWN MATRIX

LARGE % OXIDIZED ANDESITE

100% OXIDIZED - PROBABLY FLOW
BRICIA AT BASE OF FLOW #2

REDDISH BROWN ANDESITE, VESICULAR
W/ SMALL PHENOS OF PX + LARGE PLASD.

Formation

~ ~	160	ft.
~ ~	170	
Flow #1	180	
Flow #2		
~ ~	190	
Flow #2		
~ ~	200	
~ ~	210	
~ ~	220	
~ ~	230	
Flow #3		
~ ~	240	

Depth @ _____ AM/PM

Total Footage _____

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

Flow #1
Flow #2
Flow #3

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor _____ Report # _____

Location _____ Date _____

Well # _____

Depth @ _____ AM/PM

Log: CONTINUED FLOW #3

INCREASE IN % OF OXIDIZED
FRAGMENTS - FLOW BRICIA

LIGHT GRAY ANDSITE W/ LARGE
FLAG PHENOS, SMALL BROWN OPX,
RARE LARGE GREEN CPX. LIGHT
GRAY FINE GRAINED MATRIX

Depth @ _____ AM/PM

Total Footage _____

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

8071-NS Observer _____

Formation	Depth (ft.)
~ ~	240
~ ~	250
~ ~	260
~ ~	270
~ ~	280
~ ~	290
~ ~	300
~ ~	310
~ ~	320

FLOW 3
↓
FLOW 4
↑

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor _____ Report # _____

Location _____ Date _____

Well # _____

Depth @ _____ AM/PM	Formation	
		320 ft.
Log: <u>OXIDIZED ANDOSITE FLOW #4</u>	~ ~ ~ ~ ~	
<u>TYP1 IS MAJOR CONSTITUENT BUT</u>	~ ~ ~ ~ ~	330
<u>OTHER ANDOSITE TYPES ALSO OCCUR -</u>	~ ~ ~ ~ ~	
<u>MAY BE A LAMAR</u>	~ ~ ~ ~ ~	340
<u>HIGHLY OXIDIZED - LARGE % OF</u>	~ ~ ~ ~ ~	
<u>BLACK GLASSY ANDOSITE</u>	~ ~ ~ ~ ~	350
	~ ~ ~ ~ ~	
	~ ~ ~ ~ ~	360
	~ ~ ~ ~ ~	
	~ ~ ~ ~ ~	370
	~ ~ ~ ~ ~	
	~ ~ ~ ~ ~	380
<u>CONTINUED OXIDIZED ROCK - BUT</u>	<u>FLOW 5</u> ~ ~ ~ ~ ~	
<u>W/ HIGH % OF LIGHT GRAY ANDOSITE.</u>	~ ~ ~ ~ ~	390
	~ ~ ~ ~ ~	
	~ ~ ~ ~ ~	400
Depth @ _____ AM/PM		
Total Footage _____		

FLOW 4
 ↓
 LAMAR
 ↑
 FLOW 5

Drilling Fluid:
 Mud - Additives _____
 Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

8071-NS Observer _____

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor _____ Report # _____

Location _____ Date _____

Well # _____

Depth @ _____ AM/PM	Formation	ft.
Log: DENSE MEDIUM-LIGHT GRAY	~ ~	400
ANDESITE W/ LARGE PLAC PHENOS +	~	410
BROWN PX - 2 PX TYPES ARE NOT	Flow 5	
APPARENT. MATRIX IS GRAY W/ MODERD	~ ~	420
PINK OXIDIZED PORTIONS	~	
	~	430
FLOW BRICLIA	~ ~ ~	
	~	440
LAHAR OR INTERFLOW COLLUVIUM	~ ~ ~	
	~	450
VESICULAR MEDIUM GRAY-PINK		
ANDESITE - PLAC, BROWN OPX, GREEN CPX		460
PHENOS.		470
		480

Flow 5 ↓
BRICLIA + LAHAR
↑
Flow 6

Depth @ _____ AM/PM

Total Footage _____

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor _____ Report # _____

Location _____ Date _____

Well # _____

Depth @ _____ AM/PM	Formation	_____ ft.
Log: CONTINUED FLOW #6 - 1255	~ ~	480
VESICULAR, RECENTLY MORE OXIDIZED	~	490
~ 500'	~ ~	500
MIXTURE OF FLOW #6 AND	• • • •	510
BLACK-GLASSY LAPILLI - HIGHLY OXIDIZED	• • • •	520
100% OXIDIZED LAPILLI OR FLOW	• • • •	530
BRILLIA	~ ~	540
OXIDIZED ANDESITE - PROBABLY	~	550
TOP OF FLOW #7. GRADDS INTO	FLOW 7	560
DENSE LIGHT GRAY ANDESITE W/ LARGE PLAG PHINOS, SUBORAL	~ ~	570
MEDIUM BROWN PX PHINOS, SMALL	~ ~	580
HONEY COLORED PX IN GROUNDMASS	~ ~	590
Depth @ _____ AM/PM	~ ~	_____
Total Footage _____		

← FLOW 6

LAPILLI

↑ FLOW 7

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor _____ Report # _____

Location _____ Date _____

Well # _____

Depth @ _____ AM/PM	Formation	
Log: CONTINUED FLOW #7	~ ~	560 ft.
	~	570
	~ ~	580
FRESH GRAY ANDESITE FLOW #7	~ ~	590
	~ ~	600
	~ ~	610
	~ ~	620
	~ ~	630
	~	640

Depth @ _____ AM/PM

Total Footage _____

Drilling Fluid:

Mud - Additives _____
 Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor _____ Report # _____

Location _____ Date _____

Well # _____

Depth @ _____ AM/PM	Formation	_____ ft.
Log: CONTINUED FRESH GRAY ANDESITE FLOW #7	~ ~	640
SOME OXIDIZED GRAY FLOW IN RETURN FROM 650'	~ ~	650
MIXTURE OF GRAY FLOW, BLACK-BROWN GLASSY ANDESITE OXIDIZED ROCK, LAHAR OR INTERFLOW DEBRIS.	~ ~	660
	o o	670
	o o	680
	o o	690
	o o	700
ABUNDANT COARSELY PORPHYRITIC BLACK TO DARK GRAY ANDESITE W/ OXIDIZED FRAGMENTS	o o	710
	o o	720

Flow 7 ↓

LAHAR

Flow 8 ↑

Depth @ _____ AM/PM

Total Footage _____

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

NORTHWEST GEOTHERMAL CORPORATION

DRILLING LOG

Contractor _____ Report # _____

Location _____ Date _____

Well # _____

Depth @ _____ AM/PM	Formation	_____ ft.
Log: <u>CONTINUED FLOW W/ OXIDIZED</u>	~ ~	720
<u>ROCK - FLOW BRCCIA</u>	B ~ O	730
_____	~ O ~	_____
_____	O ~ O	740
_____	~ O ~	_____
_____	O ~ O	750
_____	~ O ~	_____
_____	_____	760
<u>FRESH DARK GRAY ANDZSITE,</u>	~ ~	_____
<u>LARGE PLAG CRYSTALS, INCONSPICUOUS</u>	~ ~	770
<u>DARK BROWN PX. PHENOS.</u>	~ ~	_____
_____	~ ~	780
_____	~ ~	_____
_____	~ ~	790
_____	~ ~	_____
_____	~ ~	800
Depth @ _____ AM/PM	_____	_____

Total Footage _____

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report _____

Flow 8

21-0-064 439
NORTHWEST GEOTHERMAL CORPORATION
DRILLING LOG

Contractor _____ Report # _____

Location TIMBERLINE HOLE #3 Date _____

Well # _____

Depth @ _____ AM/PM	Formation	
		800 ft.
Log: <u>MIXED SAMPLES W/ LARGE PROPORTION</u>	~ ~	
<u>OF GRAY ANDESITE - PROBABLY</u>	~ ~	810
<u>DRILLING OUT BACK FILL AS THIS</u>	~ ~	
<u>ROCK IS IDENTICAL TO FLOW 7</u>	~ ~	820
<u>LARGE PROPORTION OF FLOW</u>	~ ~	
<u># 8 - DRILLING ROCK AGAIN - SOME</u>	~ ~	830
<u>OXIDIZED ROCK - NEARING BASE OF</u>	~ ~	
<u>FLOW # 8</u>	~ ~	840
	~ ~	
	~ ~	850
<u>MIXTURE OF AT LEAST 3</u>		
<u>VARIETIES OF ANDESITE + OXIDIZED</u>		860
<u>ROCK - LAMAR</u>		
<u>LARGE PROPORTION OF VERY</u>		870
<u>LIGHT COLORED ANDESITE - ALTERED TO</u>		
<u>YELLOW IN GROUNDMASS -</u>		
Depth @ _____ AM/PM		

Total Footage _____

Drilling Fluid:

Mud - Additives _____

Air - Pressure _____ P.S.I. Additives _____

Weather Report _____