

6L01922
THERMAL POWER COMPANY

WELL NO. CTBH-1 AFE NO. _____
 REPORT NO. 77 DATE 4 SEPT 86
 TOTAL RIG DAYS 17 TIME FROM SPUD _____
 DEPTH @ 2400 HRS. 4800 FOOTAGE DRLD. _____
 HRS. DRILLED _____ HRS. TRIPPED _____
 HRS. OTHER _____ COOLING TOWER IN USE, YES NO
 MUD WT. 8.4 VIS. 32 W.L. _____ CK. _____ PH _____ CHL _____ YP _____
 P.V. _____ GELS _____ % SAND _____ % SOLIDS _____ % LOST CIRC. MTL. _____
 GALVONIC PROBE _____ CORRATOR _____ SULPHIDE _____ OXY. _____ AIR-H₂O RATIO 1
 FORM. DRLD. _____ FLOW LINE TEMP. _____ °F. SUCTION TEMP. _____ °F.
 MAX. TEMP. _____ °F. DEVIATION SURVEYS: _____

10^{3/4}" CSG. 35
 7" CSG. 488
 4.5" CSG. 526
 LINER 3.5 4205
 TIE-BACK _____

BIT #	SIZE	MAKE	TYPE	SER. NO.	JETS	IN	OUT	FT.	HRS.	WT.	RPM	COND
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	T B G
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	T B G
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	T B G

PUMP LINER STROKE SPM GPM PSI TOTAL GPM NOZZLE VEL. ANNULUS VEL.
 _____ _____ _____ 17 350 _____ _____ _____

AIR COMP. NO. _____ CFM _____ PSI _____ TEMP. °F _____ CHEM. _____ RATIO 1 RATE _____
 DRILLING ASSEMBLY, TOTAL LENGTH AND DESCRIPTION: _____

TOTAL STRING WT. _____ TOTAL PICKUP WT. _____ ROTARY TORQUE _____
 STEAM ENTRIES, DEPTH, LBS. _____

REMARKS FOR 24 HOUR PERIOD:

Completed 11 hrs of borehole geophysical logging: SP, Resistivity, Caliper, etc

13 hrs RTH Cooling Port for additional logs

Geohist DOBAME onsite first two days sampling the rock cores per his DOE contract

USFS rep. onsite stating Access Period site requirements including mulching/trenching

OPERATION @ 0800 HOURS FOLLOWING DAY:
Logging

COSTS	
TANGIBLES	
CASING	_____
VALVES	_____
FLANGES	_____
OTHER	_____
INTANGIBLE	
LOCATION	_____
RIG MOVES	_____
RIG	<u>\$ 3000</u>
ABATEMENT	_____
BITS	_____
DRILL EQUIP. MAIN.	_____
DRILL. EQUIP. RENTAL	<u>300</u>
FUEL, WATER POWER	_____
MUD	<u>100</u>
SUPERVISION & LABOR	<u>300</u>
CEMENT SERVICES	_____
TRANSPORTATION	_____
LOGGING SERVICES	_____
FISHING & DIRECTIONAL	_____
OTHER	<u>BOXES 250</u>
DAILY TOTAL	<u>3950</u>
FORWARD	<u>402,718</u>
ACCU. TOTAL	<u>406,668</u>
AFE	<u>80,000 4300.02</u>

INOPERATIVE EQUIPT. EXPLAIN _____ SUPERVISOR Bowden

DO 5 Sept 86

THERMAL POWER COMPANY

10^{3/4}" CSG. 35
 7" CSG. 488
 4.5" CSG. 526
 LINER 3.5" 4205
 TIE-BACK _____
 HRS. REPAIR _____ RIG NO. _____
 YES NO
 PH. _____ CHL. _____ YP. _____
 P.V. _____ GELS _____ % SAND _____ % SOLIDS _____ % LOST CIRC. MTL. _____
 GALVONIC PROBE _____ CORRATOR _____ SULPHIDE _____ OXY. _____ AIR-H₂O RATIO 1
 FORM. DRLD. _____ FLOW LINE TEMP. _____ °F. SUCTION TEMP. _____ °F.
 MAX. TEMP. _____ °F. DEVIATION SURVEYS: _____

BIT #	SIZE	MAKE	TYPE	SER. NO.	JETS	IN	OUT	FT.	HRS.	WT.	RPM	COND
												I B G
												I B G
												I B G

PUMP	LINER	STROKE	SPM	GPM	PSI	TOTAL GPM	NOZZLE VEL.	ANNULUS VEL.
<u>1</u>				<u>5-13</u>	<u>210</u>			

AIR COMP. NO. _____ CFM. _____ PSI. _____ TEMP. °F. _____ CHEM. _____ RATIO 1 RATE _____
 DRILLING ASSEMBLY, TOTAL LENGTH AND DESCRIPTION: _____

TOTAL STRING WT. _____ TOTAL PICKUP WT. _____ ROTARY TORQUE HIGH AVERAGE LOG _____
 STEAM ENTRIES, DEPTH, LBS. _____

REMARKS FOR 24 HOUR PERIOD:

POH, dropped NX bit from string

ROH with NCE rods open-ended to 4800' TD. Circulated light-drilling fluid and water for 8 hours to cool hole for logs.

POH logging up loggers at 2400 hrs

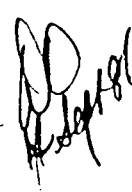
COSTS

TANGIBLES	
CASING	_____
VALVES	_____
FLANGES	_____
OTHER	_____
INTANGIBLE	
LOCATION	_____
RIG MOVES	_____
RIG	<u>\$ 3000</u>
ABATEMENT	_____
BITS	_____
DRILL EQUIP. MAIN.	_____
DRILL. EQUIP. RENTAL	_____
FUEL, WATER POWER	_____
MUD	<u>100</u>
SUPERVISION & LABOR	<u>300</u>
CEMENT SERVICES	_____
TRANSPORTATION	_____
LOGGING SERVICES	<u>4065</u>
FISHING & DIRECTIONAL	_____
OTHER	<u>BOXES 250</u>

OPERATION @ 0600 HOURS FOLLOWING DAY:

Logging corehole with final geophysical program

DAILY TOTAL	<u>167115</u>
FORWARD	<u>345,023</u>
ACCU. TOTAL	<u>402,178</u>
AFE	<u>10,400.4300 02</u>
SUPERVISOR	<u>BONDEN</u>

ARUETT
27 AUG 86


THERMAL POWER COMPANY

WELL NO. CTGH 1 AFE NO. _____
 REPORT NO. 75 DATE 2 SEPT 86
 TOTAL RIG DAYS 75 TIME FROM SPUD _____
 DEPTH @ 2400 HRS. 4800 FOOTAGE DRLD. _____
 HRS. DRILLED _____ HRS. TRIPPED _____
 HRS. OTHER _____ COOLING TOWER IN USE, YES NO
 MUD WT. _____ VIS. _____ W.L. _____ CK. _____
 P.V. _____ GELS _____ % SAND _____ % SOLIDS _____
 GALVONIC PROBE _____ CORRATOR _____ SULPHIDE _____
 FORM. DRLD. _____ FLOW LINE TEMP. _____ °F
 MAX TEMP. 204 °F. DEVIATION SURVEYS: _____
Three MRTs at 4800'

BIT #	SIZE	MAKE	TYPE	SER. NO.	JETS	IN	OUT

PUMP	LINER	STROKE	SPM	GPM	PSI	TOTAL I

AIR COMP. NO. _____ CFM _____ PSI _____ TEMP. °F _____ C
 DRILLING ASSEMBLY, TOTAL LENGTH AND DESCRIPTION: _____

TOTAL STRING WT. _____ TOTAL PICKUP WT. _____
 STEAM ENTRIES, DEPTH, LBS. _____

10 ^{3/4} " CSG.	35'
7" CSG.	488'
4.5" CSG.	526'
LINER	35' 4205
TIE-BACK	_____
HRS. REPAIR	_____ RIG NO. _____

Unsub plate
cool items
need confirmation
DO 3 Sept 86

REMARKS FOR 24 HOUR PERIOD:

First Service lifted Fire Precaution Class E on 8-30-86

Loggers crew arrived back on derrick site afternoon of 9-2-86. Started up rig at 2000 hrs. RHT with wireline; found water level at 50-foot depth.

RHT with NCC rods - NX bit from 4150' to 4800'. No problems and no fill on bottom. Ran three MRTs to 4800'; all recorded 204°F

	COSTS
TANGIBLES	
CASING	_____
VALVES	_____
FLANGES	_____
OTHER	_____
INTANGIBLE	
LOCATION	_____
RIG MOVES	_____
RIG	_____ ? Omission
ABATEMENT	_____
BITS	_____
DRILL EQUIP. MAIN.	_____
DRILL. EQUIP. RENTAL	4200 - ? Today & 2000
FUEL, WATER POWER	_____
MUD	_____
SUPERVISION & LABOR	_____
CEMENT SERVICES	_____
TRANSPORTATION	_____
LOGGING SERVICES	990 19, 20, 21 Aug P 330/86
FISHING & DIRECTIONAL	_____
OTHER	750
WATCHMAN	4000 Today 2000/86
DAILY TOTAL	_____
FORWARD	3385.263
ACCU. TOTAL	_____
AFE 86	5001.4300 02
SUPERVISOR	12-100-1

OPERATION @ 0600 HOURS FOLLOWING DAY:
RHT and removed NX bit. Going in hole with open ended NCC rods to circulate & cool hole for final GP
 INOPERATIVE EQUIPT. EXPLAIN: *Anchor loss.*

DO 2 Sept 86

UURI

EARTH SCIENCE LABORATORY
391 CHIPETA WAY, SUITE C
SALT LAKE CITY, UTAH 84108-1295
TELEPHONE 801-524-3422

M E M O R A N D U M

TO: P. M. Wright
Susan Prestwich (Telecopy)

FROM: Louise Orvin/Joseph Iovenetti

SUBJECT: Thermal Power Report given
verbally by Joseph Iovenetti

DATE: August 13, 1986

THERMAL POWER REPORT # 67

August 12, 1986

Depth at 2400 hours: 4371'

Report for 2400 hour period: During past 24 hours cored 92', from 4279' to 4371'. 100% core recovery. No fluid returns.

Operation 0600 hr. on August 13, drilling Nx at 4390' MRT reading at 4383' = 182°F.

Daily: \$2,550
Cumulative: \$343,311

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TELEPHONE 801-524-3422

M E M O R A N D U M

TO: P. M. Wright
Susan Prestwich (Telecopy)

FROM: Louise Orvin/Joseph Iovenetti

SUBJECT: Thermal Power Report given
verbally by Joseph Iovenetti

DATE: August 14, 1986

THERMAL POWER REPORT # 68

August 13, 1986

Depth at 2400 hours: 4450'

Report for 2400 hour period: Cored from 4371-4450'. 100% core recovery. No fluid returns.

Picked up torque at 4405-4407'. Attempt to improve mud system. Worked BOPE, (blow out prevention equipment).

Operation 0600 hr.: Coring at 4470'. Temperature at 4470' - 183°F.

Daily: \$9,095

Cumulative: \$352,406

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M E M O R A N D U M

TO: P. M. Wright
Susan Prestwich (Telecopy)

FROM: Louise Orvin/Joseph Iovenetti

SUBJECT: Thermal Power Report given
verbally by Joseph Iovenetti

DATE: August 15, 1986

THERMAL POWER REPORT # 69

August 14, 1986

Depth at 2400 hours: 4430'

Report for 2400 hour period: Cored 80' from 4450-4530' 100% core recovery.
No fluid returns.

Squirl creek water supply continues at an adequate field; enough to keep 500 barrel breaker tank full and to meet daily requirements. Forest Service visits drill site every two or three days to ensure water supply status and fire compliance.

Operation 0600 hr.: (On following day) Coring at 4550'. MRT Reading at 4550' - 182°F.

Daily: \$6,700
Cumulative: \$359,106

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TELEPHONE 801-524-3422

MEMORANDUM

TO: P. M. Wright
FROM: Louise Orvin/Joseph Iovenetti
SUBJECT: Thermal Power Report given
verbally by Joseph Iovenetti
DATE: August 1, 1986

THERMAL POWER REPORT # 53
For the 29th of July 1986:

Depth at 2400 hours: 3723'

Report for 2400 hour period: Cored only 2' from 3721-3723' with new core-head, Bit #7. Worked on BOP equipment.

As of 0600 hrs on the 30th of July: Coring at 3743'.

Daily: \$3,462
Cumulative: \$275,806

Daily Report No. #54:
Report on July 30, 1986

Total depth 3811' at 2400 hrs.
Cored 3723-3811'.
100 % core recovery. No fluid returns.
MRT meeting at 3763' 146°F.
Operation at 0600 hrs. on 31st of July: Coring at 3831'

Daily: \$6,101
Cumulative: \$281,907

Daily Report No. 55:
July 31, 1986

Depth at 2400 hour period: 3901'
Remarks for 2400 hr. period: Cored from 3811-3901'.
100% core recovery, no fluid returns.

As of 0600 hrs. coring on August 1, 1986 at 3921'
MRT reading at 3891' is 155°F.

Daily: \$6267
Cumulative: \$288,174

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M E M O R A N D U M

TO: P. M. Wright
FROM: Louise Orvin/Joseph Iovenetti
SUBJECT: Thermal Power Report given
verbally by Joseph Iovenetti
DATE: August 4, 1986

THERMAL POWER REPORT # 56

August 01, 1986

Depth at 2400 hours: 3982'
Report for 2400 hour period: cored 81' from 3901 to 3982' 100% core
recovery, no fluid returns.
Maximum Temperature Reported for Period: 3972' 162°F
Operation of 0600 hrs Coring at 4002'

Daily: \$6,360
Cumulative: \$294,534

Daily Report Number 57:

August 2, 1986

Depth at 2400 hours: 4062'
Report for 2400 hour period: Cored 80' from 3982'-4062' 100 % core recovery,
no fluid returns.
Maximum temperature reported for period: 4052' 167°F
Operations of 0600 hours: Coring at 4083'

Total: \$6,850
Cumulative: \$301,393

Daily Report No. #58

August 3, 1986

Depth at 2400 hours: 4143'
Report for 2400 hour period: Cored 81' from 4062-4143' 100 % core recovery.
No fluid returns.
Maximum Temperature Reported for Period: MRT at 4133-167°F
Operations of 0600 hours: Coring at 4163'

Daily: \$7,089
Cumulative: \$308,482

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M E M O R A N D U M

TO: P. M. Wright
Susan Prestwich (Telecopy)

FROM: Louise Orvin/Joseph Iovenetti

SUBJECT: Thermal Power Report given
verbally by Joseph Iovenetti

DATE: August 5, 1986

THERMAL POWER REPORT # 59

August 04, 1986

Depth at 2400 hours: 4203'

Report for 2400 hour period: cored 60' from 4143 to 4203' 100% core recovery, no fluid returns Sudden failure of Hx core rods while coring at 4203'. Core rod string weight suggest break at 1,000 to 1200'. MRT reading at 4173' 171°F.

Operation of 0600 hrs Waiting on NX rods for fishing run with spear.

Daily: \$5,667

Cumulative: \$314,149

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M E M O R A N D U M

TO: P. M. Wright
Susan Prestwich (Telecopy)

FROM: Louise Orvin/Joseph Iovenetti

SUBJECT: Thermal Power Report given
verbally by Joseph Iovenetti

DATE: August 6, 1986

THERMAL POWER REPORT # 60

August 05, 1986

Depth at 2400 hours: 4203'

Report for 2400 hour period:

Waiting on NX core rods and fishing spear.

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M E M O R A N D U M

TO: P. M. Wright
Susan Prestwich (Telecopy)

FROM: Louise Orvin/Joseph Iovenetti

SUBJECT: Thermal Power Report given
verbally by Joseph Iovenetti

DATE: August 7, 1986

THERMAL POWER REPORT # 61

August 06, 1986

Depth at 2400 hours: 4203'

Report for 2400 hour period:

Waiting on a report on the mechanical conditions of the hole based on the NX core rods into th hole.

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TELEPHONE 801-524-3422

M E M O R A N D U M

TO: P. M. Wright
Susan Prestwich (Telecopy)

FROM: Louise Orvin/Joseph Iovenetti

SUBJECT: Thermal Power Report given
verbally by Joseph Iovenetti

DATE: August 11, 1986

THERMAL POWER REPORT # 63

August 08, 1986

Depth at 2400 hours: 4203'

Report for 2400 hour period: Ran latching assembly on NCC rods to top of core barrell at 4193'. Questionable latching. Pulled out of hole no core barrell. Examined the latch assembly suspect relief of core barrell at 823'.

Operation 0600 hr.: Rig shut down latching assembly in machine shop for modification.

Daily: \$4,180
Cumulative: \$323,669

Daily Report No. 64

August 9, 1986

Depth at 2400' 4203'

Remarks: Start of rig up at noon. Ran in hole with new latch assembly. Core barrell found at 4193'. Latch to core barrell pulled out of hole slowly, core barrell recovered.

0600: Running in hole with new NX core head.

Daily: \$2,680
Cumulative: \$326,349

Daily Report No. 65

August 10, 1986

2400 hour: 4226'

Remarks: Milled out HX diamond core head with NX diamond core head and cored to 4226'. Recovery: 100% core. Full returns. Pulled out of hole to replace one bit. Bottom hole temperature at 4216': 177°-180°F.

Operation at 0600: Ran in hole with new NX diamond core head, new core barrell and coring.

Daily: \$4,487

Cumulative: \$330,836

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TELEPHONE 801-524-3422

MEMORANDUM

TO: P. M. Wright
FROM: Louise Orvin/Joseph Iovenetti
SUBJECT: Thermal Power Report given
verbally by Joseph Iovenetti (Jeff Hebein in Joe's absence)
DATE: July 23, 1986

THERMAL POWER REPORT # 46

For the 22th of July:

Total Rig Days: 46
At 2400 hours: 3173'
Time from spud : 45 plus 10 hours
Footage Drilled: 104'
Hours drilled: 24
Mud weight 8.4
Dicostity: 45
Deviation Survey: MRT at 3159' 124°F (3)
Bit: 6 Size: 3.937 Make: Christensen Type: NC
Serial No. 6S2460 In: 2336' Out: Incomplete Feet 837' Hours: 202.5
Weight: 1,000 RPM: 400
Pump-1
5-15 gal. per minute
PSI: 175

Remarks for 24 hour period: Water level at 80' Cored 3069' to 3173'.
No mud returns. 100% core recovery.

0600 hrs. Coring at 3189'

Daily Cost: \$6,918
Cumulative total: \$233,099

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TELEPHONE 801-524-3422

M E M O R A N D U M

TO: P. M. Wright
Susan Prestwich (Telecopy)

FROM: Louise Orvin/Joseph Iovenetti

SUBJECT: Thermal Power Report given
verbally by Joseph Iovenetti

DATE: August 8, 1986

THERMAL POWER REPORT # 62

August 07, 1986

Depth at 2400 hours: 4203'

Report for 2400 hour period:

Running hole with NX rods; found break at 823' at a connection. Pulled out of hole. Picked up latching assembling.

Operation 0600 hr.: Running in hole at 2500' with NX rods and latching assembly.

Daily Cost: \$2,680
Cumulative: \$319,489

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TELEPHONE 801-524-3422

M E M O R A N D U M

TO: P. M. Wright
FROM: L. E. Orvin
SUBJECT: Thermal Power Report given verbally
by Joseph Iovenetti
DATE: July 15, 1986

Thermal Power Report # 38

7/14/86

Depth at 2400 hrs. 2466'
Cored 2368-2466 with 100% core recovery.

No fluid returns.

As of 600 hrs. on 7/15/86, the core barrell jammed in core rods at approx.
500' depth. Pulling out of hole.

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M E M O R A N D U M

TO: P. M. Wright
FROM: L. E. Orvin
SUBJECT: Thermal Power Report given verbally
by Joseph Iovenetti
DATE: July 15, 1986

Thermal Power Report # 39

7/15/86

Depth at 2400 hrs. 2535' 5 hours tripping out of hole. Ran into hole to retrieve core at 2476.. Core barrell hung up inside tubing. Pull 17 stands out of hole. Layed down 1 joint of bad tubing. Ran into hole at 2476 and washed out bridge to 1776-1780 and 5' of fill on bottom.

Cored from 2466-2535, 69' with no mud returns and 100% core recovery.

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M E M O R A N D U M

TO: P. M. Wright
FROM: L. E. Orvin
SUBJECT: Thermal Power Report given verbally
by Joseph Iovenetti
DATE: July 17, 1986

Thermal Power Report # 40

WEDNESDAY, July 16, 1986

Depth at 2400 hours: 2594'

Record from 2535-2594 No mud returns, 100% core recovery.

Ran in hole wireline to retrieve core at 2584'. Core barrell stuck on way out at 2400'. Pulled wireline in two. Pulled tense bands. Retrieved core barrell. Layed down 1 bad joint of core tubing. Installed new wire lines. Ran hole tense bands to 2584'. Core 2594'.

0600 hrs. coring 2613'.

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TELEPHONE 801-524-3422

M E M O R A N D U M

TO: P. M. Wright
FROM: Louise Orvin/Joseph Iovenetti
SUBJECT: Thermal Power Report given
verbally by Joseph Iovenetti
DATE: July 18, 1986

THERMAL POWER REPORT # 41

For the 17th of July:

At 2400 hours: 2708'
Cored from 2594' to 2708'.

No fluid returns. 100% core recovery.

0600 hrs. coring 2733'.

	Bits #	Intervals	Footage	
	1	527-588	61'	→ 525' ave all Seven H-x bits
	651482	588-859	271	
	651492	859-1271	412	
	454930	1271-1775	504	
H-x	652461	1775-2336	561	
	652460	2336-3721	1385'	
	652958	3721-4203	482	
			3615' total	6 = 602.5 ave. 6 bits

N-x
 652302 4203-4226 23' milled through lost H-x bit
 65301 4226-4800 → shut down due to Forest fire hazard.
 → 574' 1. N-x bit

Coring	Down
11	2 broke off & fishing at 527'
31	1/2 sanded in core barrel
4	1/2 Wireline parted
7 1/2	1/2 tight hole problems, wash down
54 1/2 days	1 core barrel jammed in rods twice
ave 80' day	~6 days H-x rods broke off in hole, not recovered, wait on N-x rods, switch to N-x
ave 74' ft.	latch assembly problems.
	1/2 Forest Service shut down
	2 " "
	2 Geophysical logging
	2 Rig down - move off.

Bridges:
 1776-1780

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SALT LAKE CITY, UTAH 84108-1295
TELEPHONE 801-524-3422

M E M O R A N D U M

TO: P. M. Wright
FROM: Louise Orvin/Joseph Iovenetti
SUBJECT: Thermal Power Report given
verbally by Joseph Iovenetti
DATE: July 28, 1986

THERMAL POWER REPORT # 51

For the 27th of July:

Depth at 2400 hours: 3641'

Report for 2400 hour period: Cored from 79' from 3562' to 3641'.

100% core recovery. No fluid returns.

As of 600 hrs. 28 July: Coring at 3661.

Daily: \$62,243

Cumulative: \$266,043

THERMAL POWER COMPANY

DAILY GEOLOGIC REPORT FOR 25 July '86
(Date)

DRILLING DAY 48-49

WELL NAME CTAH-1

LOCATION Section 28, T8S, R8E, OREGON

PRESENT DEPTH @ 2200 3451 FT. PROPOSED DEPTH 5000 FT.

DEPTH FROM 3350 FT. TO 3451 FT. AVE. ^{CORING} DRILLING RATE 9.7 FT/HR.

CASING 10 3/4" AT 35' FT. AVE. CORE RECOVERY: 100%

7" AT 488 FT.

FOOTAGE CORES: 101'

4.5" AT 526 FT. (temporary)

DIRECTIONAL SURVEY _____

DETAILED LITHOLOGY 2965.6-3451: basaltic andesite

Alteration: ① Slight increase in silica in small venticles, vesicles and voids

② minor brown clay, ^{moderately pervasively} blue-green clays (paludonite(?))

③ Minor to trace native copper (wires and plates) on clay; trace silver(?)

④ Minor ~~gypsum~~ gypsum

⑤ Common zeolite

OTHER SIGNIFICANT DATA ① Water level @ 3400' = 70'

② MRT's @ 3400' = 128.5° F, @ 3450' = 127° F

③ Water use = 9000 gals. Increase in water use due to rod chatter. No significant change in the permeability of the core section.

REPORTED BY Angela McDaniel @ 0930 26 July '86 / JCT

CC: W. L. D'Olier: Thermal Power Co.
J. J. Hebeins: Thermal Power Co.
E. D. James: Chevron Resources Co.
D. Nielsen: University of Utah Research Institute

THERMAL POWER COMPANY

DAILY GEOLOGIC REPORT FOR 26 July '86
(Date)

DRILLING DAY 49-50

WELL NAME CT6H-1

LOCATION Section 28, T8S, R8E, OREGON

PRESENT DEPTH @ 2200h = 3552 FT. PROPOSED DEPTH 5000 FT.

DEPTH FROM 3451 FT. TO 3552 FT. AVE. ^{CORING} DRILLING RATE 8.5 FT/HR.

CASING 10 3/4" AT 35' FT. AVE. CORE RECOVERY: 100%

7" AT 488 FT. FOOTAGE CORED: 101'

4.5" AT 526 FT. (temporary)

DIRECTIONAL SURVEY _____

DETAILED LITHOLOGY 2965.6 - 3552': basaltic andesite, as above

Alteration: clay films, green and white; slightly-moderately pervasive;
zeolites common, as above; trace copper (native);
minor silica in vugs and voids

OTHER SIGNIFICANT DATA ① Water level @ 3491' = 90', @ 3542' = 70'
② MRT's @ 3491' = 129.5, 129.5, 130°F, @ 3542' = 131, 131, 131.5°F
③ Water use = 7500 gals

Waibel's site review of cores indicates not much water movement below 1500-
2000'. No significant thermal signature evident in rocks.

REPORTED BY Angela McDonald @ 0935 27 July '86 /SLI

cc: W. L. D'Olier: Thermal Power Co.
J. J. Hebeins: Thermal Power Co.
E. D. James: Chevron Resources Co.
D. Nielsen: University of Utah Research Institute

THERMAL POWER COMPANY

DAILY GEOLOGIC REPORT FOR 27 July '86
(Date)

DRILLING DAY 50-51

WELL NAME CTAH-1

LOCATION Section 28, T8N, R8E, OREGON

PRESENT DEPTH @ 2200h 3641 FT. PROPOSED DEPTH 5000 FT.

DEPTH FROM 3552 FT. TO 3641 FT. AVE. DRILLING RATE 7.8 FT/HR.
CORING

CASING 10 3/4" AT 35' FT. AVE. CORE RECOVERY: 100%

7" AT 488 FT. FOOTAGE CORES: 89'

4.5" AT 576 FT. (temporary)

DIRECTIONAL SURVEY _____

DETAILED LITHOLOGY 2965.6-3641: basaltic - andesite, as above

Alteration: Detecting slightly less clay last 2 days. Clay present as before (blue-green, brown and white); Silica, as before in voids and vialit, appears to be replacing clay; Rare Copper.

OTHER SIGNIFICANT DATA ① Water level @ 3592.5' = 90'

② MRT's @ 3592.5' = 132, 132.5°F; 3641' = 138°F

③ Water use = 9800 gals

REPORTED BY Angela McDaniel @ 0930, 28 July '86 / SLI

cc: W. L. D'Olier: Thermal Power Co.
J. J. Hebeins: Thermal Power Co.
E. D. James: Chevron Resources Co.
D. Nielsen: University of Utah Research Institute

THERMAL POWER COMPANY

WELL NO. CTG 1 AFE NO. _____
 REPORT NO. 52 DATE 28 JULY 1980
 TOTAL RIG DAYS 32 TIME FROM SPUD 510 + 10 hrs
 DEPTH @ 2400 HRS. 3721 FOOTAGE DRLD. 80
 HRS. DRILLED 23 HRS. TRIPPED _____
 HRS. OTHER 1 COOLING TOWER IN USE, YES NO
 MUD WT. 8.4 VIS. 45 W.L. _____ CK. _____ PH. _____ CHL. _____ YP. _____
 P.V. _____ GELS _____ % SAND _____ % SOLIDS _____ % LOST CIRC. MTL. _____
 GALVONIC PROBE _____ CORRATOR _____ SULPHIDE _____ OXY. _____ AIR-H₂O RATIO 1
 FORM. DRLD. _____ FLOW LINE TEMP. _____ °F. SUCTION TEMP. _____ °F.
 MAX. TEMP. 137 °F. DEVIATION SURVEYS: _____
 • MRT AT 3711

10" CSG. 35
 7" CSG. 488
 4.5" CSG. 526 temporary

BIT #	SIZE	MAKE	TYPE	SER. NO.	JETS	IN	OUT	FT.	HRS.	WT.	RPM	COND
<u>0</u>	<u>5937</u>	<u>CHRS</u>	<u>MC</u>	<u>652460</u>		<u>2336</u>	<u>3721</u>	<u>1355</u>	<u>370 1/2</u>	<u>1000</u>	<u>400</u>	<u>1/3 when</u>

PUMP	LINER	STROKE	SPM	GPM	PSI	TOTAL GPM	NOZZLE VEL.	ANNULUS VEL.
<u>1</u>				<u>5-15</u>	<u>350</u>			

AIR COMP. NO. _____ CFM _____ PSI _____ TEMP. °F _____ CHEM. _____ RATIO 1 RATE _____
 DRILLING ASSEMBLY, TOTAL LENGTH AND DESCRIPTION: _____

TOTAL STRING WT. _____ TOTAL PICKUP WT. _____ ROTARY TORQUE _____
 STEAM ENTRIES, DEPTH, LBS. _____

REMARKS FOR 24 HOUR PERIOD:

Crud 80 feet, from 3641 to 3721 feet.
Got 100% core recovery; no
drilling fluid returns

Water level in crot hole is 65 feet

OPERATION @ 0500 HOURS FOLLOWING DAY:
Sup for new diamond corehead
and new core barrel at 3721

COSTS	
TANGIBLES	
CASING	_____
VALVES	_____
FLANGES	_____
OTHER	_____
INTANGIBLE	
LOCATION	_____
RIG MOVES	_____
RIG	<u>\$ 4821</u>
ABATEMENT	_____
BITS	_____
DRILL EQUIP. MAIN.	_____
DRILL. EQUIP. RENTAL	<u>300</u>
FUEL, WATER POWER	_____
MUD	<u>380</u>
SUPERVISION & LABOR	<u>300</u>
CEMENT SERVICES	_____
TRANSPORTATION	_____
LOGGING SERVICES	<u>330</u>
FISHING & DIRECTIONAL	_____
OTHER	<u>INDEX 250</u>
DAILY TOTAL	<u>6301</u>
FORWARD	<u>266,043</u>
ACCU. TOTAL	<u>\$ 272,344</u>
AFE 80 801	<u>4300 02</u>

[Signature]
 29 July
 BOWDEN

THERMAL POWER COMPANY

DAILY GEOLOGIC REPORT FOR 28 July 1986
(Date)

DRILLING DAY 51-52

WELL NAME CTAH-1

LOCATION Section 28, T8S, R8E, OREGON

PRESENT DEPTH 3711' at 2200 hrs FT. PROPOSED DEPTH 5000 FT.

DEPTH FROM 3641 FT. TO 3711 FT. AVE. DRILLING RATE 7.7 FT/HR. ^{CONING}

CASING 10 3/4" AT 35' FT. AVE. CORE RECOVERY: 100%

7" AT 488 FT. FOOTAGE CORES: 70'

4.5" AT 526 FT. (temporary)

DIRECTIONAL SURVEY _____

DETAILED LITHOLOGY Basaltic andesite - same as previous day
Alteration same as previous day. Some clay-zeolite-
silica profiles, but NO copper evident

OTHER SIGNIFICANT DATA Water levels: 3671' depth 105' below ground

3711 65' below ground

Water use: 4800 gals.

MRTs at 3671' depth 140.5 - 140.5 - 140

at 3711' " 137 - 137.5 - broken

REPORTED BY Angela 0920 hrs 29 July 86 / NO

- cc: W. L. D'Olier: Thermal Power Co.
- J. J. Hebeins: Thermal Power Co.
- E. D. James: Chevron Resources Co.
- D. Nielsen: University of Utah Research Institute

Discussed possible SWANBERG and MARSHALL REED visits

THERMAL POWER COMPANY

WELL NO. CTGHT 1 AFE NO. _____
 REPORT NO. 53 DATE 29 July 1980
 TOTAL RIG DAYS 53 TIME FROM SPUD. 520+10 HRS
 DEPTH @ 2400 HRS. 3723 FOOTAGE DRLD. 2
 HRS. DRILLED 1 HRS. TRIPPED _____
 HRS. OTHER 23 COOLING TOWER IN USE. YES NO
 MUD WT. 8.4 VIS. 45 W.L. _____ CK. _____ PH. _____ CHL. _____ YP. _____
 P.V. _____ GELS _____ % SAND _____ % SOLIDS _____ % LOST CIRC. MTL. _____
 GALVONIC PROBE _____ CORRATOR _____ SULPHIDE _____ OXY. _____ AIR-H₂O RATIO 1
 FORM. DRLD. _____ FLOW LINE TEMP. _____ °F. SUCTION TEMP. _____ °F.
 MAX. TEMP. None °F. DEVIATION SURVEYS: _____

10³¹⁴ CSG 35
 CSG. 488
 4.5" CSG. 526 Temporary

BIT #	SIZE	MAKE	TYPE	SER. NO.	JETS	IN	OUT	FT.	HRS.	WT.	RPM	COND
<u>7</u>	<u>3.937</u>	<u>CHGS</u>	<u>MC</u>	<u>652958</u>		<u>3721</u>		<u>2</u>	<u>1</u>	<u>1000</u>	<u>400</u>	<u>I P G</u>
												<u>I P G</u>
												<u>I P G</u>

PUMP	LINER	STROKE	SPM	GPM	PSI	TOTAL GPM	NOZZLE VEL.	ANNULUS VEL.
<u>1</u>				<u>5-15</u>	<u>550</u>			

AIR COMP. NO. _____ CFM. _____ PSI. _____ TEMP. °F. _____ CHEM. _____ RATIO L RATE _____
 DRILLING ASSEMBLY, TOTAL LENGTH AND DESCRIPTION: _____

TOTAL STRING WT. _____ TOTAL PICKUP WT. _____ ROTARY TORQUE HIGH AVERAGE LG. _____
 STEAM ENTRIES, DEPTH, LBS. _____

REMARKS FOR 24 HOUR PERIOD:

Cored only 2' (3721-23) with
new 3.937" corehead
Ran new corehead - bit no. 7
corehead, latch couple and
runner shell
RTH Washed 800 to 965' interval
and chased couings to bottom
Worked BOP equipment

OPERATION @ 0600 HOURS FOLLOWING DAY:
Logging at 3743'

COSTS	
TANGIBLES	
CASING	_____
VALVES	_____
FLANGES	_____
OTHER	_____
INTANGIBLE	
LOCATION	_____
RIG MOVES	_____
RIG	<u>\$ 1982</u>
ABATEMENT	_____
BITS	_____
DRILL EQUIP. MAIN.	_____
DRILL. EQUIP. RENTAL	<u>300</u>
FUEL, WATER POWER	_____
MUD	<u>300</u>
SUPERVISION & LABOR	<u>300</u>
CEMENT SERVICES	_____
TRANSPORTATION	_____
LOGGING SERVICES	<u>330</u>
FISHING & DIRECTIONAL	_____
OTHER	<u>ENVLES 250</u>
DAILY TOTAL	<u>3462</u>
FORWARD	<u>\$ 272,304</u>
ACCU. TOTAL	<u>\$ 275,806</u>
AFE 8/6/80	<u>4300 02</u>

THERMAL POWER COMPANY

DAILY GEOLOGIC REPORT FOR 29 July 1986
(Date)

DRILLING DAY 52-53

WELL NAME CT6H-1

LOCATION Section 28, T8S, R8E, OREGON

PRESENT DEPTH 3721' at 2200 hours FT. PROPOSED DEPTH 5000 FT.

DEPTH FROM _____ FT. TO _____ FT. AVE. DRILLING RATE 6 FT/HR. CORING

CASING 10 3/4" AT 35' FT. AVE. CORE RECOVERY: 100%

7" AT 488 FT. FOOTAGE CORES:

4.5" AT 576 FT. (temporary)

DIRECTIONAL SURVEY _____

DETAILED LITHOLOGY Basaltic andesite. No silica. Fractures about barren of secondary minerals!

OTHER SIGNIFICANT DATA Water level at 3721' hole depth* 50' below ground

* no rods in corehole

When pulling bit 6 for replacement, corehole was tight in 200-foot interval, 800-1000' depths

REPORTED BY Doug Goodwin 1320 hrs 30 July 86 / DG

- CCI W. L. D'Olier: Thermal Power Co.
- J. J. Hebein: Thermal Power Co.
- E. D. James: Chevron Resources Co.
- D. Nielsen: University of Utah Research Institute

THERMAL POWER COMPANY

WELL NO. CTGH1 AFE NO. _____
 REPORT NO. 54 DATE 30 July 1986
 TOTAL RIG DAYS 54 TIME FROM SPUDS 30.510 hrs
 DEPTH @ 2400 HRS. 3811 FOOTAGE DRLD. 88
 MRS. DRILLED 23 1/2 MRS. TRIPPED _____
 MRS. OTHER 12 COOLING TOWER IN USE, YES NO
 MUD WT. 8.4 VIS. 45 W.L. _____ CK. _____ PH. _____ CHL. _____ YP. _____
 P.V. _____ GELS _____ % SAND _____ % SOLIDS _____ % LOST CIRC. MTL. _____
 GALVONIC PROBE _____ CORRATOR _____ SULPHIDE _____ OXY. _____ AIR-H₂O RATIO 1
 FORM. DRLD. _____ FLOW LINE TEMP. _____ °F. SUCTION TEMP. _____ °F.
 MAX TEMP. 146 °F. DEVIATION SURVEYS: _____
 MCL AT 3763'

10^{3/4}" CSG. 35
 7" CSG. 488
 4.5" CSG. 526 temporary

BIT #	SIZE	MAKE	TYPE	SER. NO.	JETS	IN	OUT	FT.	HRS.	WT.	RPM	COND
<u>7</u>	<u>3.951"</u>	<u>CHRS</u>	<u>MC</u>	<u>652958</u>		<u>3721</u>	<u>INC</u>	<u>90</u>	<u>24 1/2</u>	<u>1000</u>	<u>400</u>	<u>T P G</u>
												<u>T P G</u>
												<u>T P G</u>

PUMP	LINER	STROKE	SPM	GPM	PSI	TOTAL GPM	NOZZLE VEL.	ANNULUS VEL.
<u>T</u>				<u>5-15</u>	<u>350</u>			

AIR COMP. NO. _____ CFM _____ PSI _____ TEMP. °F _____ CHEM. _____ RATIO 1 RATE _____
 DRILLING ASSEMBLY, TOTAL LENGTH AND DESCRIPTION: _____

TOTAL STRING WT. _____ TOTAL PICKUP WT. _____ ROTARY TORQUE _____
 STEAM ENTRIES, DEPTH, LBS. _____

REMARKS FOR 24 HOUR PERIOD:

Core from 3723 to 3811 feet

Obtained 100% core recovery;

no drilling fluid returns

COSTS

TANGIBLES

CASING _____

VALVES _____

FLANGES _____

OTHER _____

INTANGIBLE

LOCATION _____

RIG MOVES _____

RIG \$ 4621

ABATEMENT _____

BITS _____

DRILL EQUIP. MAIN. _____

DRILL. EQUIP. RENTAL 300

FUEL, WATER POWER _____

MUD 300

SUPERVISION & LABOR 300

CEMENT SERVICES _____

TRANSPORTATION _____

LOGGING SERVICES 330

FISHING & DIRECTIONAL _____

OTHER PAVLES 250

OPERATION @ 0600 HOURS FOLLOWING DAY:

Coing at 3831 feet

DAILY TOTAL 6101
 FORWARD 825,806
 ACCU. TOTAL 281,907
 AFE 86,001 4300.02

NO. 31/100
BROWN

THERMAL POWER COMPANY

DAILY GEOLOGIC REPORT FOR 7-30th
(Date)

DRILLING DAY 53-54

WELL NAME CTAH-1

LOCATION Section 28, T8S, R8E, OREGON

PRESENT DEPTH 3801' (2200 hrs) FT. PROPOSED DEPTH 5000 FT.

DEPTH FROM 3721' FT. TO 3801 FT. AVE. DRILLING RATE 8.7 FT/HR.
CORING

CASING 10 3/4" AT 35' FT. AVE. CORE RECOVERY: 100%

7" AT 488 FT. FOOTAGE CORES: 80'

4.5" AT 576 FT. (temporary)

DIRECTIONAL SURVEY _____

DETAILED LITHOLOGY basaltic andesite; decrease in clay;
silica decreased; minor copper (trace); minor
zeolites; otherwise little alteration

OTHER SIGNIFICANT DATA water level @ 3721' - 50' @
@ 3763 - 80'

MRT @ 3763' - 145, 145, 146'

H₂O consumption = ?

REPORTED BY Angela McDaniel (G.J.H.)

- cc: W. L. D'Olier: Thermal Power Co.
- J. J. Hebein: Thermal Power Co.
- E. D. James: Chevron Resources Co.
- D. Nielsen: University of Utah Research Institute

THERMAL POWER COMPANY

WELL NO. CTGH-1 AFE NO. _____
 REPORT NO. 53 DATE 21 JULY 1986
 TOTAL RIG DAYS 53 TIME FROM SPUD 540 HOURS
 DEPTH @ 2400 HRS. 3901 FOOTAGE DRLD. 90
 HRS. DRILLED 23 HRS. TRIPPED _____
 HRS. OTHER 1 COOLING TOWER IN USE, YES NO
 MUD WT. _____ VIS. _____ W.L. _____ CK. _____ PH. _____ CHL. _____ YP. _____
 P.V. _____ GELS _____ % SAND _____ % SOLIDS _____ % LOST CIRC. MTL. _____
 GALVONIC PROBE _____ CORRATOR _____ SULPHIDE _____ OXY. _____ AIR-H₂O RATIO 1
 FORM. DRLD. _____ FLOW LINE TEMP. _____ °F. SUCTION TEMP. _____ °F.
 MAX. TEMP. 155 °F. DEVIATION SURVEYS: _____
MRT AT 3891'

10³/₄" CSG. 35
 7¹/₂" CSG. 480
 4¹/₂" CSG. 520 temporary
 LINER _____
 TIE-BACK _____
 HRS. REPAIR _____ RIG NO. _____

BIT #	SIZE	MAKE	TYPE	SER. NO.	JETS	IN	OUT	FT.	HRS.	WT.	RPM	COND
<u>7</u>	<u>3.951</u>	<u>CHES</u>	<u>MC</u>	<u>652958</u>		<u>3721</u>	<u>INC</u>	<u>180</u>	<u>47.5</u>	<u>1000</u>	<u>400</u>	<u>I R G</u>
												<u>I R G</u>
												<u>I R G</u>

PUMP	LINER	STROKE	SPM	GPM	PSI	TOTAL GPM	NOZZLE VEL.	ANNULUS VEL.
<u>1</u>								

AIR COMP. NO. _____ CFM _____ PSI _____ TEMP. °F _____ CHEM. _____ RATIO 1 RATE _____
 DRILLING ASSEMBLY, TOTAL LENGTH AND DESCRIPTION: _____

TOTAL STRING WT. _____ TOTAL PICKUP WT. _____ ROTARY TORQUE _____
 STEAM ENTRIES, DEPTH, LBS. _____

REMARKS FOR 24 HOUR PERIOD:

Core 90 feet from 3811 to 3901 feet
Got 100% core recovery; no
drilling fluid returns

COSTS

TANGIBLES	
CASING	_____
VALVES	_____
FLANGES	_____
OTHER	_____
INTANGIBLE	
LOCATION	_____
RIG MOVES	_____
RIG	<u>\$ 4787</u>
ABATEMENT	_____
BITS	_____
DRILL EQUIP. MAIN.	_____
DRILL. EQUIP. RENTAL	<u>300</u>
FUEL, WATER POWER	_____
MUD	<u>300</u>
SUPERVISION & LABOR	<u>300</u>
CEMENT SERVICES	_____
TRANSPORTATION	_____
LOGGING SERVICES	<u>350</u>
FISHING & DIRECTIONAL	_____
OTHER	<u>BYE 750</u>

OPERATION @ 0600 HOURS FOLLOWING DAY:
Coming at 3921'

DAILY TOTAL \$ 6267
 FORWARD 281,907
 ACCU. TOTAL 288,174
 AFE 86 801 4300-02

DD King
Lawson

THERMAL POWER COMPANY

DAILY GEOLOGIC REPORT FOR 31 July 1986
(Date)

CORING
DRILLING DAY 54-55

WELL NAME CTGH-1

LOCATION Section 28, T8S, R8E, OREGON

PRESENT DEPTH @ 2200h 3891 FT. PROPOSED DEPTH 5000 FT.

DEPTH FROM 3801 FT. TO 3891 FT. AVE. ^{CORING} DRILLING RATE 8.3 FT/HR.

CASING 10 3/4" AT 35' FT. AVE. CORE RECOVERY: 100%
7" AT 488 FT. FOOTAGE CORED: 90
4.5" AT 526 FT. (temporary)

DIRECTIONAL SURVEY _____

DETAILED LITHOLOGY 2965.5 - 3891': basaltic andesite

Attention: slight increase in clay and silica content
in zones of intense fracturing; minor zeolites

OTHER SIGNIFICANT DATA ① Water level @ 3841' = 85', @ 3891' = 80'

② MRT's @ 3841' = 148, 149.5, 150°F;
@ 3891 = 151*, 154.5, 155°F

③ Water use = 5700 gals

Water use for day 53-54 = 5600 gals

REPORTED BY Angela McDonnell @ 0945 1 Aug / JLT

* Mercury separated

- cc: W. L. D'Olier: Thermal Power Co.
- J. J. Hebein: Thermal Power Co.
- E. D. James: Chevron Resources Co.
- D. Nielsen: University of Utah Research Institute

THERMAL POWER COMPANY

WELL NO. CTG 11 AFE NO. _____
 REPORT NO. 58 DATE 3 Aug 86
 TOTAL RIG DAYS 58 TIME FROM SPUDS 570 + 10 hrs
 DEPTH @ 2400 HRS. 4143 FOOTAGE DRLD. 87
 HRS. DRILLED 23 HRS. TRIPPED _____
 HRS. OTHER _____ COOLING TOWER IN USE, YES NO
 MUD WT. 8.4 VIS. 45 W.L. _____ CK. _____ PH. _____ CHL. _____ YP. _____
 P.V. _____ GELS _____ % SAND _____ % SOLIDS _____ % LOST CIRC. MTL. _____
 GALVONIC PROBE _____ CORRATOR _____ SULPHIDE _____ OXY. _____ AIR-H₂O RATIO 1
 FORM. DRLD. _____ FLOW LINE TEMP. _____ °F. SUCTION TEMP. _____ °F.
 MAX. TEMP. 167 °F. DEVIATION SURVEYS: _____
MT AT 4133'

10^{3/4}" CSG _____ 35
 7^{1/2}" CSG. 488
 4^{1/2}" CSG. 526 Temporary
 LINER _____
 TIE-BACK _____

BIT - SIZE	MAKE	TYPE	SER. NO.	JETS	IN	OUT	FT.	HRS.	WT.	RPM	COND
<u>7</u>	<u>3937</u>	<u>CRBS</u>	<u>NC 652458</u>	<u>-</u>	<u>3721</u>	<u>-</u>	<u>422</u>	<u>116.5</u>	<u>1000</u>	<u>400</u>	<u>I P G</u>
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	<u>I P G</u>
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	<u>I P G</u>

PUMP	LINER	STROKE	SPM	GPM	PSI	TOTAL GPM	NOZZLE VEL.	ANNULUS VEL.
<u>1</u>	_____	_____	_____	<u>515</u>	<u>350</u>	_____	_____	_____

AIR COMP. NO. _____ CFM _____ PSI _____ TEMP. °F _____ CHEM. _____ RATIO 1 RATE _____
 DRILLING ASSEMBLY, TOTAL LENGTH AND DESCRIPTION: _____

TOTAL STRING WT. _____ TOTAL PICKUP WT. _____ ROTARY TORQUE _____
W/EN AVERAGE LOG

REMARKS FOR 24 HOUR PERIOD:

Drilled 87 feet, from 4062 to 4143
feet. Obtained 100% core recovery;
no mud returns
Water level in well at 75 feet
below ground surface

COSTS	
TANGIBLES	
CASING	_____
VALVES	_____
FLANGES	_____
OTHER	_____
INTANGIBLE	
LOCATION	_____
RIG MOVES	_____
RIG	<u>\$ 5609</u>
ABATEMENT	_____
BITS	_____
DRILL EQUIP. MAIN.	_____
DRILL. EQUIP. RENTAL	<u>300</u>
FUEL, WATER POWER	_____
MUD	<u>300</u>
SUPERVISION & LABOR	<u>300</u>
CEMENT SERVICES	_____
TRANSPORTATION	_____
LOGGING SERVICES	<u>380</u>
FISHING & DIRECTIONAL	_____
OTHER	<u>BOYLES 250</u>
DAILY TOTAL	<u>7089</u>
FORWARD	<u>301,393</u>
ACCU. TOTAL	<u># 308,482</u>
AFE	<u>80201 4300 02</u>

OPERATION @ 0600 HOURS FOLLOWING DAY:
Logging at 4163 feet

W. H. Lowery
 LOWERY

THERMAL POWER COMPANY

WELL NO. CTGH 1 AFE NO. _____
 REPORT NO. 57 DATE 2 AUG 86
 TOTAL RIG DAYS 57 TIME FROM SPUD 80 + 10 hrs
 DEPTH @ 2400 HRS. 4062 FOOTAGE DRLD. 80
 HRS. DRILLED 27 HRS. TRIPPED _____
 HRS. OTHER _____ COOLING TOWER IN USE, YES NO
 MUD WT. 8.4 VIS. 48 W.L. _____ CK. _____ PH. _____ CHL. _____ YP. _____
 P.V. _____ GELS _____ % SAND _____ % SOLIDS _____ % LOST CIRC. MTL. _____
 GALVONIC PROBE _____ CORRATOR _____ SULPHIDE _____ OXY. _____ AIR-H₂O RATIO 1
 FORM. DRLD. _____ FLOW LINE TEMP. _____ °F. SUCTION TEMP. _____ °F.
 MAX. TEMP. 167 °F. DEVIATION SURVEYS: _____
NRT AT 4052

10^{3/4}" CSG. 35
 7^{1/2}" CSG. 488
 4^{1/2}" CSG. 526 temporary
 LINER _____
 TIE-BACK _____
 HRS. REPAIR _____ RIG NO. _____

BIT #	SIZE	MAKE	TYPE	SER. NO.	JETS	IN	OUT	FT.	HRS.	WT.	RPM	COND
<u>7</u>	<u>2.937</u>	<u>CHRS</u>	<u>HP</u>	<u>1052058</u>	<u>-</u>	<u>3721</u>	<u>-</u>	<u>341</u>	<u>93</u>	<u>100</u>	<u>400</u>	<u>T P G</u>

PUMP	LINER	STROKE	SPM	GPM	PSI	TOTAL GPM	NOZZLE VEL.	ANNULUS VEL.
<u>1</u>				<u>575</u>	<u>352</u>			

AIR COMP. NO. _____ CFM _____ PSI _____ TEMP. °F _____ CHEM. _____ RATIO 1 RATE _____
 DRILLING ASSEMBLY, TOTAL LENGTH AND DESCRIPTION: _____

TOTAL STRING WT. _____ TOTAL PICKUP WT. _____ ROTARY TORQUE HIGH AVERAGE LBS _____
 STEAM ENTRIES, DEPTH, LBS. _____

REMARKS FOR 24 HOUR PERIOD:

Cored 80 feet, from 3982 to 4062 feet
Got 100% core recovery. No mud
returns
Water level at 70 feet below
surface

COSTS

TANGIBLES	
CASING	_____
VALVES	_____
FLANGES	_____
OTHER	_____
INTANGIBLE	
LOCATION	_____
RIG MOVES	_____
RIG	<u>\$ 5379</u>
ABATEMENT	_____
BITS	
DRILL EQUIP. MAIN.	_____
DRILL. EQUIP. RENTAL	<u>300</u>
FUEL, WATER POWER	_____
MUD	<u>300</u>
SUPERVISION & LABOR	<u>300</u>
CEMENT SERVICES	_____
TRANSPORTATION	_____
LOGGING SERVICES	<u>330</u>
FISHING & DIRECTIONAL	_____
OTHER	<u>TOOLS 250</u>

OPERATION @ 0600 HOURS FOLLOWING DAY:
Coming at 4083 feet

DAILY TOTAL	<u>\$ 6859</u>
FORWARD	<u>290,534</u>
ACCU. TOTAL	<u>301,393</u>
AFE 86201	<u>4300 02</u>

DO NOT
 HAWKERY

INTERNAL POWER COMPANY

WELL NO. CTGH AFE NO. _____
 REPORT NO. 50 DATE 1/16/80
 TOTAL RIG DAYS 50 TIME FROM SPUD SSD + 10 HRS
 DEPTH @ 2400 HRS. 3482 FOOTAGE DRLD. 81
 HRS. DRILLED 73 HRS. TRIPPED _____
 HRS. OTHER 1 COOLING TOWER IN USE, YES NO
 MUD WT. 8.4 VIS. 45 W.L. _____ CK. _____ PH. _____ CHL. _____ YP. _____
 P.V. _____ GELS _____ % SAND _____ % SOLIDS _____ % LOST CIRC. MTL. _____
 GALVONIC PROBE _____ CORRATOR _____ SULPHIDE _____ OXY. _____ AIR-H₂O RATIO 1
 FORM. DRLD. _____ FLOW LINE TEMP. _____ °F. SUCTION TEMP. _____ °F.
 MAX. TEMP. 162 °F. DEVIATION SURVEYS: _____
MRT AT 3972

10 3/4" CSG. 35
 7" CSG. 488
 4.5" CSG. 526 temporary
 LINER _____
 TIE-BACK _____

BIT #	SIZE	MAKE	TYPE	SER. NO.	JETS	IN	OUT	FT.	HRS.	WT.	RPM	COND.
<u>1</u>	<u>3 3/4"</u>	<u>CHRS</u>	<u>MC</u>	<u>152958</u>	<u>-</u>	<u>3721</u>	<u>-</u>	<u>761</u>	<u>10.5</u>	<u>1000</u>	<u>4000</u>	<u>P G</u>
<u>1</u>	<u>3.937</u>											<u>I R G</u>

PUMP	LINER	STROKE	SPM	GPM	PSI	TOTAL GPM	NOZZLE VEL.	ANNULUS VEL.
<u>1</u>				<u>5-15</u>	<u>350</u>			

AIR COMP. NO. _____ CFM. _____ PSI. _____ TEMP. °F. _____ CHEM. _____ RATIO 1 RATE _____
 DRILLING ASSEMBLY, TOTAL LENGTH AND DESCRIPTION: _____

TOTAL STRING WT. _____ TOTAL PICKUP WT. _____ ROTARY TORQUE _____
HIGH AVERAGE LOG

REMARKS FOR 24 HOUR PERIOD:

Cored 81 feet from 3001 to 3482 feet
Recovered 100%; no dulling fluid
Returns
Water level in corehole at 75'
below surface

COSTS	
TANGIBLES	
CASING	_____
VALVES	_____
FLANGES	_____
OTHER	_____
INTANGIBLE	
LOCATION	_____
RIG MOVES	_____
RIG	<u>\$ 4880</u>
ABATEMENT	_____
BITS	_____
DRILL EQUIP. MAIN.	_____
DRILL. EQUIP. RENTAL	<u>300</u>
FUEL, WATER POWER	_____
MUD	<u>300</u>
SUPERVISION & LABOR	<u>300</u>
CEMENT SERVICES	_____
TRANSPORTATION	_____
LOGGING SERVICES	<u>330</u>
FISHING & DIRECTIONAL	_____
OTHER	<u>FRYLES 250</u>
DAILY TOTAL	<u>\$ 16360</u>
FORWARD	<u>288174</u>
ACCU. TOTAL	<u>\$ 244,534</u>
AFE	<u>86101 4300 02</u>

OPERATION @ 0600 HOURS FOLLOWING DAY:
Crang at 4002 feet
 INOPERATIVE EQUIPMENT LIST: _____

PD-2 Aug
 LOWERY

THERMAL POWER COMPANY

DAILY GEOLOGIC REPORT FOR

3 Aug '86
(Date)

CORING
DRILLING DAY

57-58

WELL NAME

CTAH-1

LOCATION

Section 28, T8S, R8E, OREGON

PRESENT DEPTH

@ 2200h

4133

FT.

PROPOSED DEPTH

5000

FT.

DEPTH FROM

4052

FT. TO

4133

FT.

CORING
AVE. DRILLING RATE

7.8

FT/HR.

CASING

10 3/4"

AT

35'

FT.

AVE. CORE RECOVERY: 100%

FOOTAGE CORES: 81'

7"

AT

488

FT.

4.5"

AT

576

FT.

(temporary)

DIRECTIONAL SURVEY

DETAILED LITHOLOGY

Same lithology as before: basaltic andesite. Finding that

with depth the dense portions of the flows are becoming thicker while the

interflow horizons are thinning. Interpret drilling through flank of a pole-weld.

Alteration: dense flows generally more fractured than intra-flow horizon

and contain predominantly clay (green/blue-green) + silica, zeolite ±

whereas, the intra-flow breccia contain abundant zeolite, minor clay ± silica

Clay found to slightly effervesce with HCl. Clay identification is suspect.

OTHER SIGNIFICANT DATA

① Water level @ 4093' = 70' ; 4133' = 75'

② MRT's @ 4093' = 163, 166 , @ 4133' = 165*, 167.5°F

③ Water use = 6000 gals

REPORTED BY

Angela McDonald @ 0930h 4 Aug / JLI

cc: W. L. D'Olier: Thermal Power Co.
J. J. Hebein: Thermal Power Co.
E. D. James: Chevron Resources Co.
D. Nielsen: University of Utah Research Institute

THERMAL POWER COMPANY

DAILY GEOLOGIC REPORT FOR

1 Aug '86
(Date)

CORING
DRILLING DAY

SS-56

WELL NAME

CTAH-1

LOCATION

Section 28, T8S, R8E, OREGON

PRESENT DEPTH

@ 2200h 3972'

FT.

PROPOSED DEPTH

5000

FT.

DEPTH FROM

3891

FT. TO

3972

FT.

AVE. ^{CORING} DRILLING RATE

8.7

FT/HR.

CASING

10 3/4"

AT

35'

FT.

AVE. CORE RECOVERY: 100%

7"

AT

488

FT.

FOOTAGE CORES: 81'

4.5"

AT

576

FT.

(temporary)

DIRECTIONAL SURVEY

DETAILED LITHOLOGY

basaltic andesite as above

Alteration: common clay, predominantly green/green-blue type (Celadonite?);
two types of zeolites present, require XRD for identification; silica
common in dense portions of flows occurs as vug filling, in small
fractures and occasionally replacing clay; trace foliated
clear mineral (possibly anhydrite/gypsum)

OTHER SIGNIFICANT DATA

(1) Water level @ 3931.5 = 75', @ 3972' = 75'

(2) MRT's @ 3931.5 = 153, 154, 155°F, @ 3972' = 159, 162, 162°F

(3) Water use = 6800 gals

REPORTED BY

Angela McDaniel @ 0915h 2 Aug / JLI

cc: W. L. D'Olier: Thermal Power Co.
J. J. Hebein: Thermal Power Co.
E. D. James: Chevron Resources Co.
D. Nielsen: University of Utah Research Institute

THERMAL POWER COMPANY

DAILY GEOLOGIC REPORT FOR 2 Aug 86
(Date)

CORING
DRILLING DAY 56-57

WELL NAME CTAH-1

LOCATION Section 28, T8S, R8E, OREGON

PRESENT DEPTH @ 2200h 4052 FT. PROPOSED DEPTH 5000 FT.

DEPTH FROM 3972 FT. TO 4052 FT. AVE. ^{CORING} DRILLING RATE 7.8 FT/HR.

CASING 10 3/4" AT 35' FT. AVE. CORE RECOVERY: 100%

7" AT 488 FT. FOOTAGE CORES: 80'

4.5" AT 526 FT. (temporary)

DIRECTIONAL SURVEY _____

DETAILED LITHOLOGY Same as previous day

- OTHER SIGNIFICANT DATA
- ① Water level @ 4012 = 50', @ 4052 = 70'
 - ② MAT's @ 4012' = 156, 165, 166°F, @ 4052 = 162, 163.5, 167°F
 - ③ Water use = 4400 gals

REPORTED BY Angela McDaniel @ 0920h, 3 Aug / JLI

- CC:
- W. L. D'Olier: Thermal Power Co.
 - J. J. Hebein: Thermal Power Co.
 - E. D. James: Chevron Resources Co.
 - D. Nielsen: University of Utah Research Institute

THERMAL POWER COMPANY

DAILY GEOLOGIC REPORT FOR 4 Aug '86
(Date)

CORING
DRILLING DAY 58-59

WELL NAME CTAH-1

LOCATION Section 28, T8S, R8E, OREGON

PRESENT DEPTH @2200h 4203 FT. PROPOSED DEPTH 5000 FT.

DEPTH FROM 4133 FT. TO 4203 FT. AVE. ^{CORING} DRILLING RATE 6.8 FT/HR.

CASING 10 3/4" AT 35' FT. AVE. CORE RECOVERY: 100%

7" AT 488 FT.

4.5" AT 526 FT. (temporary)

DIRECTIONAL SURVEY _____

DETAILED LITHOLOGY Rock type and alteration the same as
yesterday

OTHER SIGNIFICANT DATA ① Water level @ 4175' = 60'

② MRT's @ 4173 = 165°, 171° F

③ Water consumption = 7000 gals

REPORTED BY Angela McDonnell @ 2930 3 Aug / JLI

* MRT not functioning properly.

cc: W. L. D'Olier: Thermal Power Co.
J. J. Hebein: Thermal Power Co.
E. D. James: Chevron Resources Co.
D. Nielsen: University of Utah Research Institute

THERMAL POWER COMPANY

WELL NO. CTGH 1 **AFE NO.** _____
REPORT NO. 59 **DATE** 4 AUG 56
TOTAL RIG DAYS 39 **TIME FROM SPUD** 580 + 10 hrs
DEPTH @ 2400 HRS. 4203 **FOOTAGE DRLD.** 60
HRS. DRILLED 13.5 **HRS. TRIPPED** _____
HRS. OTHER 10.5 **COOLING TOWER IN USE,** YES NO
MUD WT. 8.4 **VIS.** 45 **W.L.** _____ **CK.** _____ **PH** _____ **CHL** _____ **YP** _____
P.V. _____ **GELS** _____ **% SAND** _____ **% SOLIDS** _____ **% LOST CIRC. MTL.** _____
GALVONIC PROBE _____ **CORRATOR** _____ **SULPHIDE** _____ **OXY.** _____ **AIR-H₂O RATIO** 1
FORM. DRLD. _____ **FLOW LINE TEMP.** _____ °F. **SUCTION TEMP.** _____ °F.
MAX. TEMP. 171 °F. **DEVIATION SURVEYS:** _____
MRT at 4173'

10 1/4" CS.G. 35
 7" CS.G. 488
 4.5" CS.G. 526 temporary

BIT #	SIZE	MAKE	TYPE	SER. NO.	JETS	IN	OUT	FT.	HRS.	WT.	RPM	COND
<u>7</u>	<u>5.951</u>	<u>CHRIS</u>	<u>MC</u>	<u>657958</u>	<u>-</u>	<u>3721</u>	<u>-</u>	<u>482</u>	<u>130</u>	<u>1000</u>	<u>400</u>	<u>I P G</u>
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	<u>I P G</u>
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	<u>I P G</u>

PUMP	LINER	STROKE	SPM	GPM	PSI	TOTAL GPM	NOZZLE VEL.	ANNULUS VEL.
<u>1</u>	_____	_____	_____	<u>575</u>	<u>350</u>	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____

AIR COMP. NO. _____ **CFM** _____ **PSI** _____ **TEMP. °F** _____ **CHEM.** _____ **RATIO** 1 **RATE** _____
DRILLING ASSEMBLY, TOTAL LENGTH AND DESCRIPTION: _____

TOTAL STRING WT. _____ **TOTAL PICKUP WT.** _____ **ROTARY TORQUE** ^{HIGH AVERAGE LOG} _____
STEAM ENTRIES, DEPTH, LBS. _____

REMARKS FOR 24 HOUR PERIOD:

Cored 60 feet, from 4143 to 4203 feet
Recovered 100% cores; no mud returns
Sudden failure of IX core rods, while coring at 4203'
Core rod string weight suggests break at 1000-1200' depth range.

COSTS	
TANGIBLES	
CASING	_____
VALVES	_____
FLANGES	_____
OTHER	_____
INTANGIBLE	
LOCATION	_____
RIG MOVES	_____
RIG	<u>\$ 4187</u>
ABATEMENT	_____
BITS	_____
DRILL EQUIP. MAIN.	_____
DRILL. EQUIP. RENTAL	<u>300</u>
FUEL, WATER POWER	_____
MUD	<u>300</u>
SUPERVISION & LABOR	<u>300</u>
CEMENT SERVICES	_____
TRANSPORTATION	_____
LOGGING SERVICES	<u>330</u>
FISHING & DIRECTIONAL	_____
OTHER	<u>KEYES 250</u>

OPERATION @ 0600 HOURS FOLLOWING DAY:
Waiting on IX rods for fishing
Man with spear.

DAILY TOTAL \$ 5667
FORWARD 308 482
ACCU. TOTAL \$ 314,144
APR 60 91 4300 02

D. Stuy LOWERY

THERMAL POWER COMPANY

WELL NO. CTGH-1 AFE NO. _____
 REPORT NO. 61 DATE 12 Nov 86
 TOTAL RIG DAYS 61 TIME FROM SPUD 10 hrs
 DEPTH @ 2400 HRS. 4203' FOOTAGE DRLD. 0
 HRS. DRILLED _____ HRS. TRIPPED _____ HRS. REPAIR _____ RIG NO. _____
 HRS. OTHER 24 COOLING TOWER IN USE, YES NO
 MUD WT. _____ VIS. _____ W.L. _____ CK. _____ PH. _____ CHL. _____ YP. _____
 P.V. _____ GELS _____ % SAND _____ % SOLIDS _____ % LOST CIRC. MTL. _____
 GALVONIC PROBE _____ CORRATOR _____ SULPHIDE _____ OXY. _____ AIR-H₂O RATIO 1
 FORM. DRLD. _____ FLOW LINE TEMP. _____ °F. SUCTION TEMP. _____ °F.
 MAX. TEMP. _____ °F. DEVIATION SURVEYS: _____

10 3/4" CSG. 35
 " CSG. _____
 7.5" CSG. 488
 " CSG. 326 temporary

BIT #	SIZE	MAKE	TYPE	SER. NO.	JETS	IN	OUT	FT.	HRS.	WT.	RPM	COND
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	T P G
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	T P G
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	T P G

PUMP	LINER	STROKE	SPM	GPM	PSI	TOTAL GPM	NOZZLE VEL.	ANNULUS VEL.
_____	_____	_____	_____	_____	_____	_____	_____	_____

AIR COMP. NO. _____ CFM _____ PSI _____ TEMP. °F _____ CHEM. _____ RATIO 1 RATE _____
 DRILLING ASSEMBLY, TOTAL LENGTH AND DESCRIPTION: _____

TOTAL STRING WT. _____ TOTAL PICKUP WT. _____ ROTARY TORQUE HIGH AVERAGE LOG _____
 STEAM ENTRIES, DEPTH, LBS. _____

REMARKS FOR 24 HOUR PERIOD:

24 hrs shut down;
waiting on NK rods

OPERATION @ 0600 HOURS FOLLOWING DAY:
as above

COSTS	
TANGIBLES	
CASING	_____
VALVES	_____
FLANGES	_____
OTHER	_____
INTANGIBLE	
LOCATION	_____
RIG MOVES	_____
RIG	<u>\$ 0</u>
ABATEMENT	_____
SITS	_____
DRILL EQUIP. MAIN.	_____
DRILL. EQUIP. RENTAL	<u>800</u>
FUEL, WATER POWER	_____
MUD	_____
SUPERVISION & LABOR	<u>300</u>
CEMENT SERVICES	_____
TRANSPORTATION	_____
LOGGING SERVICES	<u>250</u>
FISHING & DIRECTIONAL	_____
OTHER	<u>Boyles 250</u>
DAILY TOTAL	<u>1180</u>
FORWARD	<u>345,629</u>
ACCU. TOTAL	<u>\$ 346,809</u>
AFE 86 001	<u>4300 02</u>

Handwritten signature:
 D.D. Thompson
 BOWDEN

THERMAL POWER COMPANY

WELL NO. CTG4-1 AFF NO. _____
 REPORT NO. 62 DATE 7/11/86
 TOTAL RIG DAYS 62 TIME FROM SPUD _____
 DEPTH @ 2400 HRS. 4203 FOOTAGE DRLD. _____
 HRS. DRILLED _____ HRS. TRIPPED 10
 HRS. OTHER 10+4 COOLING TOWER IN USE, YES NO
 MUD WT. _____ VIS. _____ W.L. _____ CK. _____ PH. _____ CHL. _____ YP. _____
 P.V. _____ GELS. _____ % SAND _____ % SOLIDS _____ % LOST CIRC. MTL. _____
 GALVONIC PROBE _____ CORRATOR _____ SULPHIDE _____ OXY. _____ AIR-H₂O RATIO 1
 FORM. DRLD. _____ FLOW LINE TEMP. _____ °F. SUCTION TEMP. _____ °F.
 MAX. TEMP. _____ °F. DEVIATION SURVEYS: _____

10th CSG. 35
 " CSG. _____
 4th CSG. 488
 " CSG. 526 temporary

BIT #	SIZE	MAKE	TYPE	SER. NO.	JETS	IN	OUT	FT.	HRS.	WT.	RPM	COND.
												I P G
												I P G
												I P G
PUMP	LINER	STROKE	SPM	GPM	PSI	TOTAL GPM	NOZZLE VEL.	ANNULUS VEL.				

AIR COMP. NO. _____ CFM _____ PSI _____ TEMP. °F _____ CHEM. _____ RATIO L RATE _____
 DRILLING ASSEMBLY, TOTAL LENGTH AND DESCRIPTION: _____

TOTAL STRING WT. _____ TOTAL PICKUP WT. _____ ROTARY TORQUE HIGH AVERAGE LOG _____
 STEAM ENTRIES, DEPTH, LBS. _____

REMARKS FOR 24 HOUR PERIOD:
12 hrs: Shut down, waiting
on NX rods
12 hrs Unloaded truck
Picked up NX rods; RTH open
ended. Found break in
NX rods at 823' depth and
at a connection per diller's
record
POA, picked up latching
assembly

COSTS	
TANGIBLES	
CASING	_____
VALVES	_____
FLANGES	_____
OTHER	_____
INTANGIBLE	
LOCATION	_____
RIG MOVES	_____
RIG	<u>1500</u>
ABATEMENT	_____
BITS	_____
DRILL EQUIP. MAINT.	_____
DRILL. EQUIP. RENTAL	<u>300</u>
FUEL, WATER POWER	_____
MUD	_____
SUPERVISION & LABOR	<u>300</u>
CEMENT SERVICES	_____
TRANSPORTATION	_____
LOGGING SERVICES	<u>350</u>
FISHING & DIRECTIONAL	_____
OTHER	<u>more 250</u>
DAILY TOTAL	<u>2650</u>
FORWARD	<u>316,809</u>
ACCU. TOTAL	<u>319,459</u>
APE	<u>86 Doc 4300 02</u>

OPERATION @ 0600 HOURS FOLLOWING DAY:
Remaining in hole at 2500' with
NX rods and latching assembly

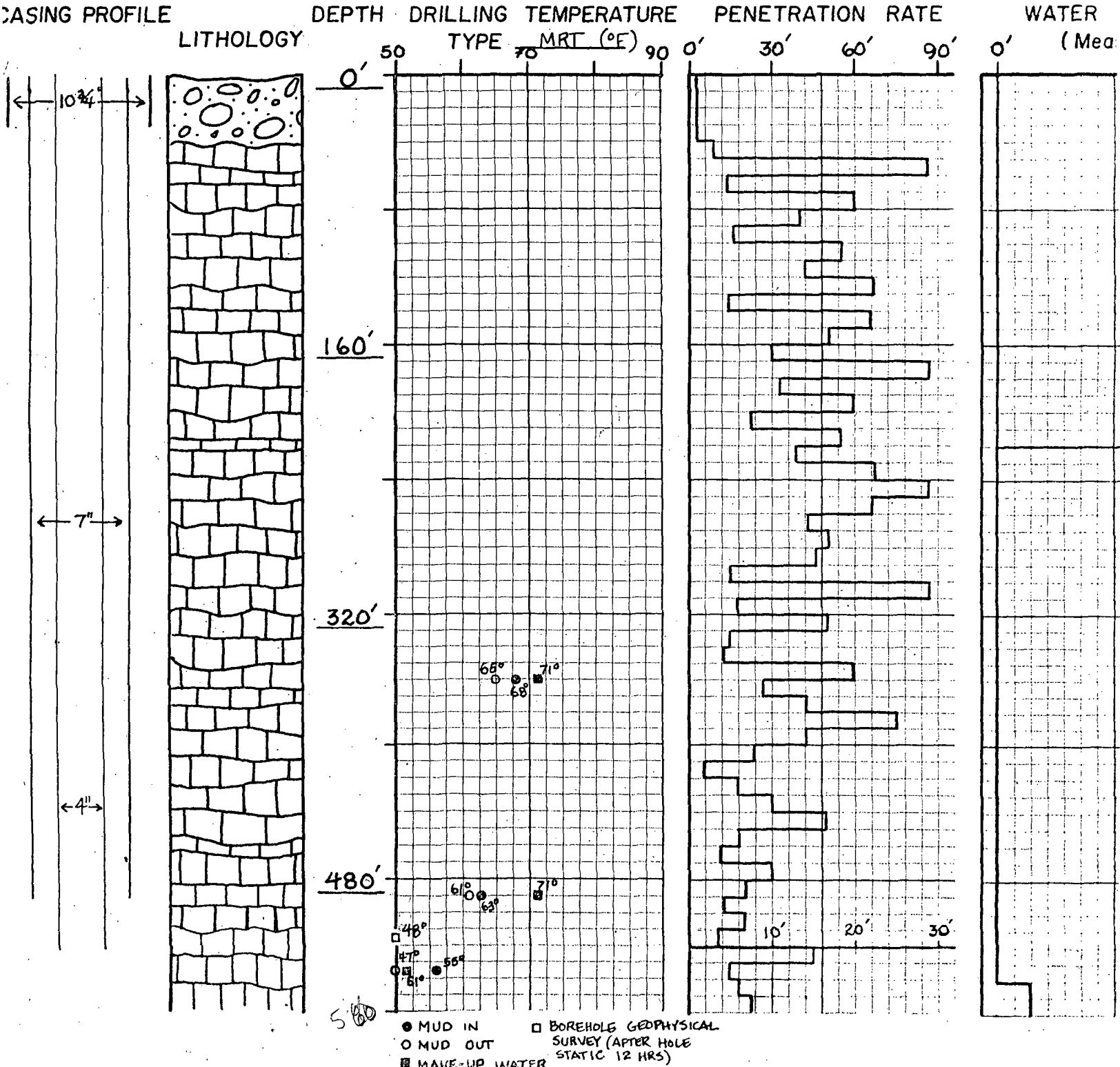
D.D. S. Camp
 BOWDEN



Diamond Shamrock Thermal Power Company

(Page 1)

HOLE CTGH-1 SPUD DATE 6/7/86 COI
 FIELD CASCADE/CLACKAMAS COUNTY MARION STA
 LOCATION T8S, R8E, SEC. 28 ELEVATION ~3840'
 CONTRACTOR / RIG BOYLES BROS. GEOLOGIST (S



COMPLETION DATE _____ TOTAL DEPTH _____

STATE OREGON TOTAL VERTICAL DEPTH _____

KB of _____ GL BOTTOM HOLE LOCATION _____

GEOLOGIST(S) GOODWIN, MCDANNEL DATE _____

WATER LEVEL (Measured)	LOST CIRCULATION ZONES	LITHOLOGIC DESCRIPTION	COMMENTS
	<p>220' (rods in hole) Fluid level 80' after 12 hours of no activity, ~300 gal. returned level to zero. 6/11. 7:30.</p> <p>400' - Partial loss (~10%) ~100 gpm. 3000 gal. loss LCM brought full returns. 6/11. 16:00- 17:00</p> <p>425' - Total loss. 100 gpm. 3000 gal. loss. LCM brought full returns. 6/11. 10:00. Decrease in mud viscosity suggests small H₂O entry @ 425'</p> <p>526' - Partial loss. ~50% 178 gpm = 450 gal. loss 5:10 am. 6/22</p> <p>540' - Total loss @ 25 gpm 6 a.m. 6/22. Static water level ~20 below surface</p>	<p>0'-40': Qal. Basaltic boulders and cobbles (till)</p> <p>40'- : BASALT/BASALTIC ANDESITE LAVAS dk-med gry. minor red-brn. Aphyric to sparsely porph: phenos of plag, ol, pyx</p> <p>Alteration: most of rock is fresh. Minor FeOx, clays; limonite, hematite 140'-150' tr. sulfide?</p>	<p>ROTARY DRILLING</p> <p>0'-35' 12 1/4" rock bit 10 3/4" casing</p> <p>35'-517' 8 3/4" button bit (Smith F3)</p> <p>150' inclination survey: 1/2° ±</p> <p>220' inclination survey: 1/2° ±</p> <p>527' completed rotary drilling. began coring inclination survey: 2° ±</p> <p>517' set 7" casing 0'-488' borehole geophysical survey: resistivity, temperature, density, caliper, deviation, sp. (ceme surh BOP + tes)</p>



Diamond Shamrock (Page 2)

Thermal Power Company

HOLE CTGH-1

SPUD DATE 6/7/86

FIELD CASCADE/CLACKAMAS

COUNTY MARION

LOCATION TBS, RBE, SEC. 28

ELEVATION ~3840'

CONTRACTOR / RIG BOYLES BROS.

GEOLOGIST

CASING PROFILE

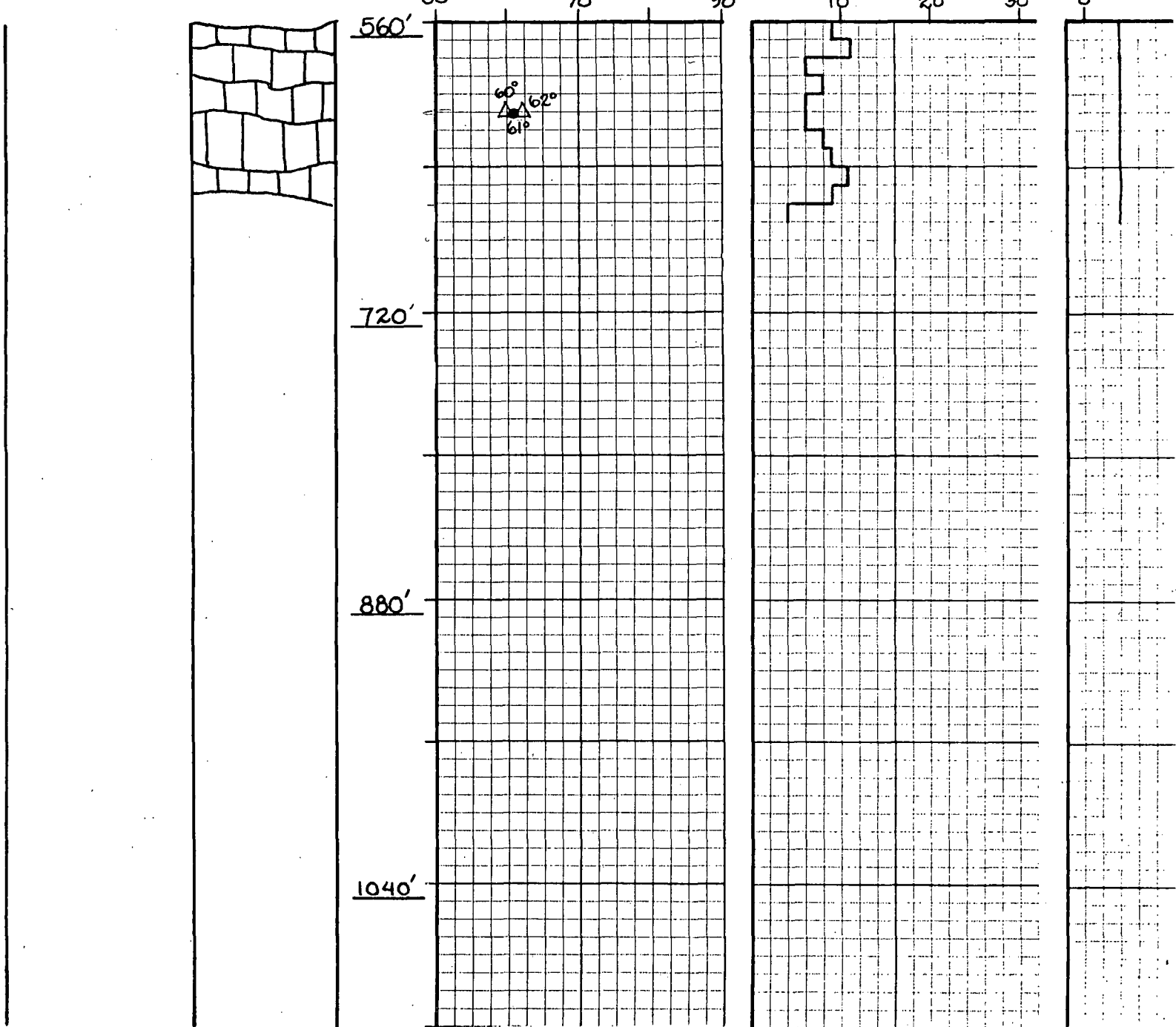
LITHOLOGY

DEPTH DRILLING TEMPERATURE

TYPE MRT (°F)

PENETRATION RATE

WATER



- O MUD OUT
- MUD IN
- MAKE-UP H₂O
- Δ MRT to BH.

COMPLETION DATE _____ TOTAL DEPTH _____
 STATE OREGON TOTAL VERTICAL DEPTH _____
 KB of _____ GL BOTTOM HOLE LOCATION _____
 GEOLOGIST(S) MCDANNEL, GOODWIN DATE _____

WATER LEVEL (Measured)	LOST CIRCULATION ZONES	LITHOLOGIC DESCRIPTION	COMMENTS
	<p>Total loss continues. (LCM added 545'-579') Static-water level ~ 20' below surface Pump rate varies 7- 18 gpm (400-1,000 gal/hr)</p>	<p>BASALT/BASALTIC ANDESITE (as above) Med lt gry - med gry, finely porphyritic ~10% phenos of plag, ol, pyx. Glomerocrysts com. Fractures common. White to pinkish clays coat fracture surfaces & fill vesicles. Zones of rubble, ash & scoria mark flow contacts @ 579', 604'</p>	<p>527'-589': HQ ^(3.937") core bit #1 Christensen impact (grey) 0-527': 4" casing core drilling w/ bentonite mud w/ polymers average recovery of core 100%-75%</p>



Diamond Shamrock

Thermal Power Company

HOLE CTGH-1
 FIELD CASCADES/CLACKAMAS
 LOCATION T85, R8E, SEC. 28
 CONTRACTOR / RIG BOYLES BROS.

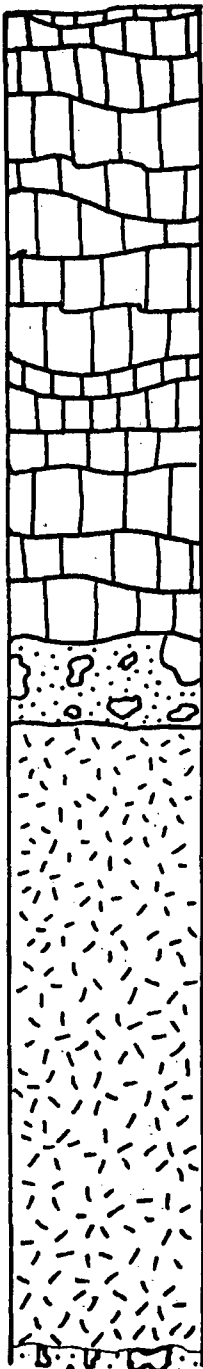
SPUD DATE 6/7/86
 COUNTY MARION
 ELEVATION ~3840'

CO.
 ST.

GEOLOGIST (S)

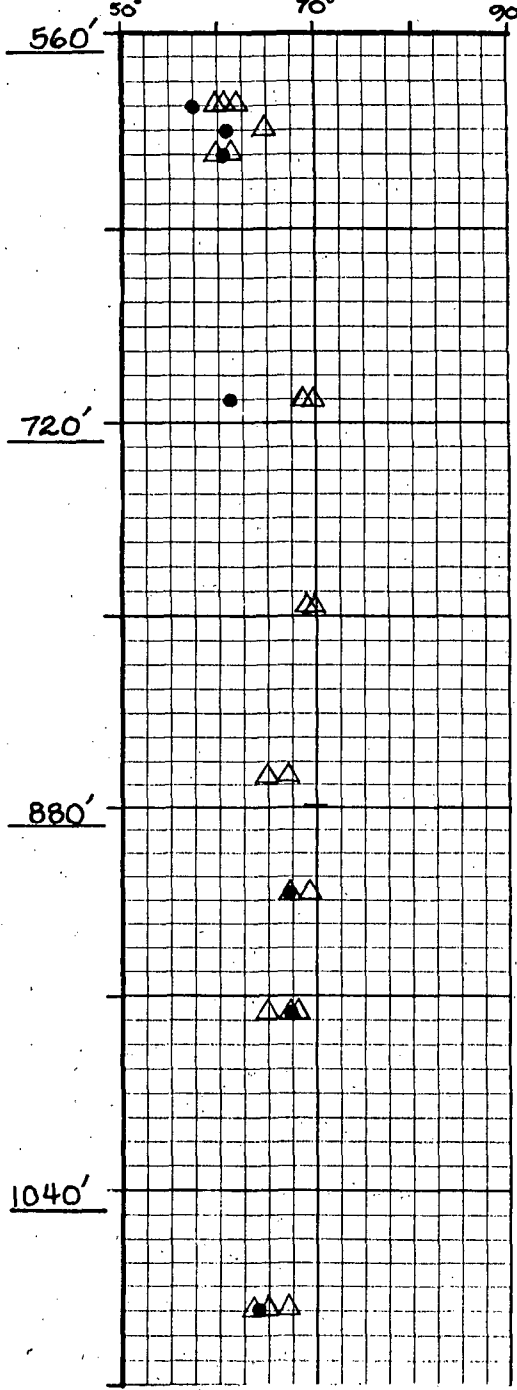
CASING PROFILE

LITHOLOGY

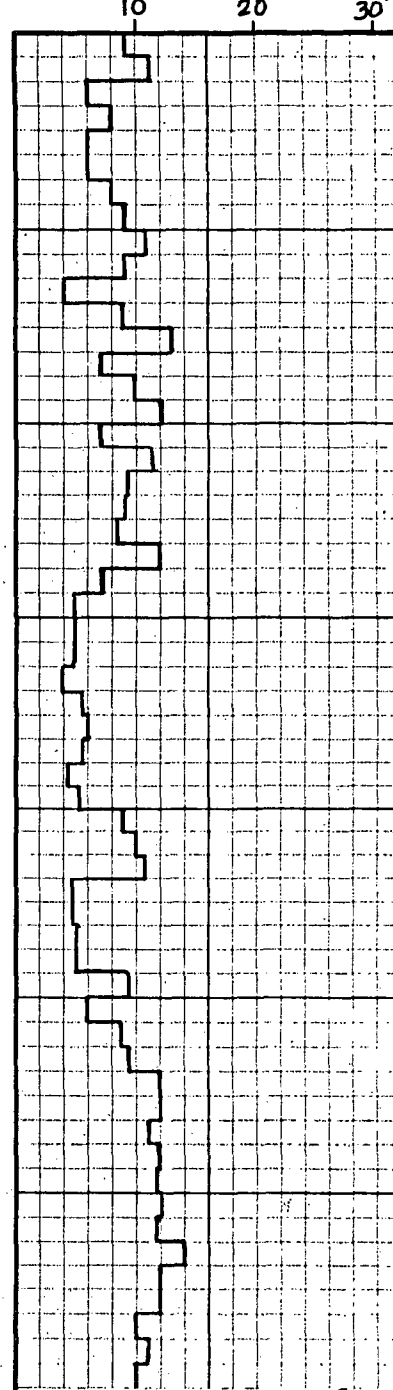


DEPTH DRILLING TEMPERATURE

TYPE

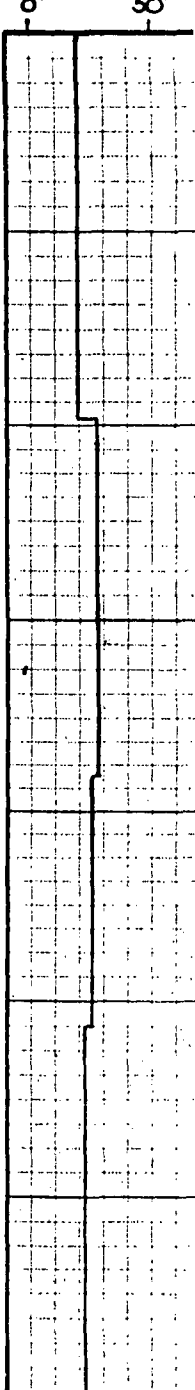


PENETRATION RATE



WATER

(Mpc)



○ MUD OUT △ MRT to B.H.
 ● MUD IN

COMPLETION DATE _____ TOTAL DEPTH _____
 STATE OREGON TOTAL VERTICAL DEPTH _____
 KB of _____ GL BOTTOM HOLE LOCATION _____
 LOGIST (S) GOODWIN/MCDANNEL DATE _____

WATER LEVEL (Measured)	LOST CIRCULATION ZONES	LITHOLOGIC DESCRIPTION	COMMENTS
	<p>Total loss continues. LCM added 545-579'. Pump rate varies: 7-15 gpm. (400-1,000 gal/hr)</p> <p>730' pulled up to 540' added LCM bomb. No returns.</p>	<p>BASALT / BASALTIC ANDESITE (as above) med lt gry - med gry finely porphyritic, 7-10% phenos & glomerocrysts: plag, ol, pyx. White & pink clays coat frac. surfaces & vesicles. Zones of rubble, scoria, ash mark flow boundaries @ 579', 604', 688', 707', 771', 792'</p> <p>815' - VOLCANIC DEBRIS FLOW / LAHAR, sub angular to sub-rounded pebbles & boulders of basalt/basaltic andesite & rare dacite in yellowish-brown clay matrix. Matrix is sandy & includes crystals of feldspar, cpx, opx, biotite. Matrix supported. Unsorted. Lt to med pink & brn clays, red FeOx, minor limonite.</p> <p>854' - DIORITE. shallow level (sub-volcanic) intrusive. Med lt gry fine gr. porphyritic. Phenos of plag, cpx, opx; groundmass of plag, pyx, black iron bearing minerals. Unit is intensely fractured. 76-80° vertical. Clay on fracture surfaces (pink, brn), locally heavy pyrolusite, red FeOx, mnr plag → clay, tr. limonite; localized tr. chlorite.</p> <p>1112' - VOLCANIC DEBRIS FLOW a/a @ 815', w/ porphyritic clay clasts.</p> <p>1138' - BASALT. med-med dk gry. 7-12% phenos: plag, cpx, olivine. Lt. orange & pinkish clay coat fracture surfaces, pyrolusite, hematite, rare limonite. Locally plag → clay.</p>	<p>527' - Bit #1. HQ core bit. Christensen gray impreg. (3.937")</p> <p>0-527' - 4" casing hung from 7" casing core drilling w/ bentonite + polymers</p> <p>589' - Bit #2 (same specs as #1) Bridge @ 575' on R.H.</p> <p>733' - Directional survey 2.5° S13E</p> <p>859' - Bit #3 (same specs as #1)</p> <p>947' - Tripped to grease rods to alleviate rod chatter. Bridge @ ~600' on R.H. Core barrel sanded in. Tripped rods. Bridge @ ~600' on R.H.</p>



Diamond Shamrock

Thermal Power Company

HOLE CTGH-1

SPUD DATE 6/7/86

CO

FIELD CASCADES/CLACKAMAS

COUNTY MARION

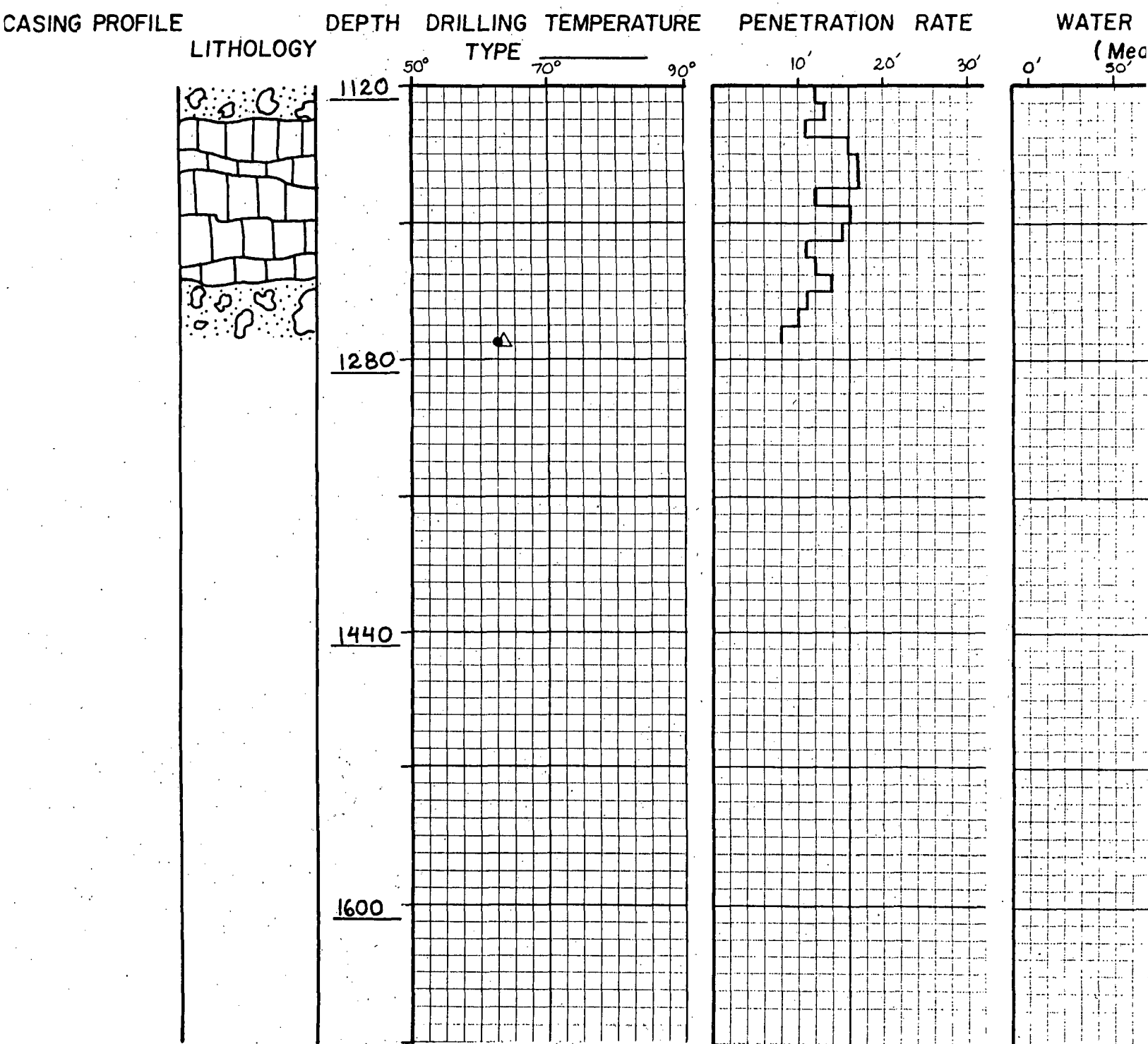
ST

LOCATION T 8 S, R 8 E, SEC. 28

ELEVATION ~3840'

CONTRACTOR / RIG BOYLES BROS

GEOLOGIST (S



COMPLETION DATE _____ TOTAL DEPTH _____

STATE OREGON TOTAL VERTICAL DEPTH _____

KB of _____ GL BOTTOM HOLE LOCATION _____

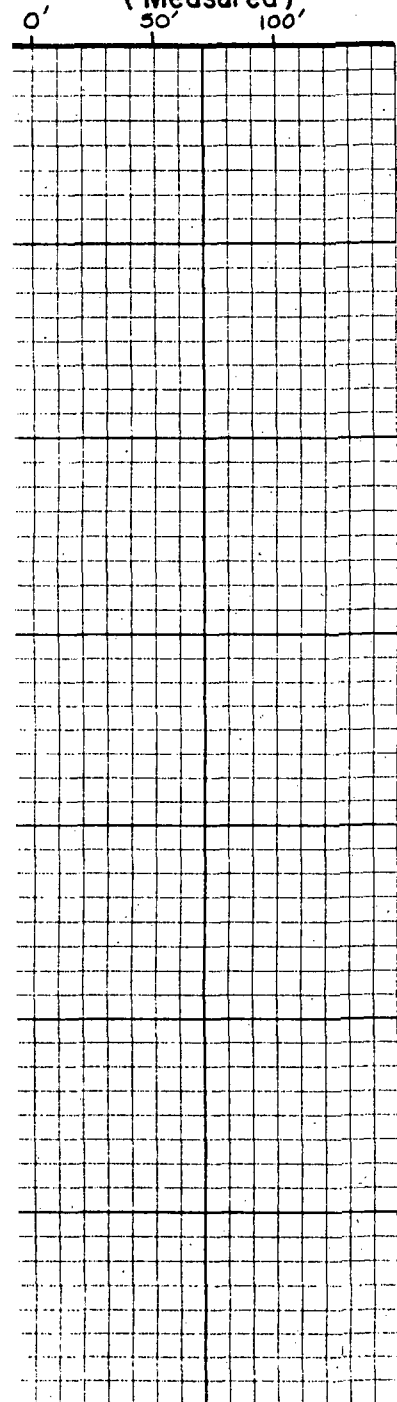
LOGIST (S) GOODWIN/MCDANNEL DATE _____

WATER LEVEL
(Measured)

LOST CIRCULATION
ZONES

LITHOLOGIC
DESCRIPTION

COMMENTS



1230' VOLCANIC DEBRIS FLOW
LAHAR. red-orange-brown.
Poorly sorted. Well indurated.
Subangular to subrounded
pebbles & boulders of basalt &
basaltic andesite, rare diorite,
in clay matrix. Sandy matrix
w/xtls of plag, pyx, & amphibole.
Predom. clast supported.
Pale orange-pink secondary
clay fills voids, locally heavy;
tr. pyrolusite.

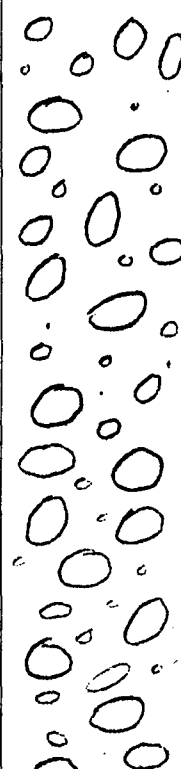
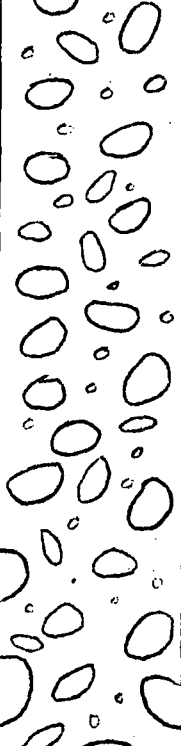
1271 - Bit #4 (same specs as
bit #1). Cave in hole from
following intervals: ~600', 880',
920'



CUTTING DESCRIPTION

HOLE CTGH-1
FIELD CASCADES / CLACKAMAS

GEOLOGIST (S) GOODWIN / MCDANNEL
BASIS _____ DATE 6/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION	
	LITHOLOGY	
0-20'		<p>Qal: BOULDERS & COBBLES OF BASALT (GLACIAL TILL) MED. GRAY → MD. LT. GRAY, MINOR REDDISH OXIDATION SPARSELY PORPHYRITIC TO APHYRIC. (PHENOS: PLAG, PYX, OL)</p> <p>ALTERATION: WEATHERING & SURFICIAL OXIDATION</p>
20'-40'		As Above



CUTTING DESCRIPTION

HOLE CTGH-1
FIELD CASCADE/CALKANAS

GEOLOGIST(S) McDANNEL/GOODWIN
BASIS _____ DATE 6/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION	
	LITHOLOGY	
40'-60'		<p>BASALT/BASALTIC ANDESITE: APHYRIC TO SPARSELY PORPHYRITIC MED. GRAY TO LT. MED. GRAY, MINOR REDDISH BRN. PHENOS TYPICALLY MICROSCOPIC: PLAG, OL, CPX.</p> <p>{ 50'-60' 75% OF INTERVAL IS CINDERY (FLOW BOUNDARY?)</p> <p>ALTERATION: MINOR BROWN CLAY, FeOx, MINOR WHIT CLAY (PLAG → CLAY)</p>
60'-80'		<p>BASALT/BASALTIC ANDESITE: AS ABOVE</p> <p>{ 70'-80' - 50% SMALL VESICLES</p> <p>ALTERATION: AS ABOVE + PELLUCITE (COMMON)</p>



CUTTING DESCRIPTION

HOLE CT611-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST(S) GOODWIN/MCDANNEL
BASIS _____ DATE 6/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION	
80'-100'		<p>BASALT/BASALTIC ANDESITE: MEDIUM GREY TO LT. MED. GRAY + MED. REDDISH BRN. APHYRIC TO SPARSELY PORPHYRITIC</p> <p>@ 80'-90': APHYRIC BASALT, 80% WEATHERED TO BROWN CLAYS, HEMATITIC ALTERATION ^{BASALTIC ANDESITE}</p> <p>@ 90'-100': 30% ^{RED} OXIDIZED (WEATHERED?), VESICULAR BASALT/BASALTIC ANDESITE; 40% LT. MED. GRAY MICROPORPHYRITIC BASALT/BASALTIC ANDESITE W/RESORBED CL PHENOS; 30% BLACK, APHYRIC BASALT/BASALTIC ANDESITE</p> <p>ALTERATION: WEATHERING, FeOx, MNR BRN-RED CLAY</p>
100'-120'		<p>BASALT/BASALTIC ANDESITE: SPARSE APHYRIC ^{TO} SPARSELY POR MED GREY TO DARK GREY, MINOR REDDISH GREY</p> <p>{ 100'-110': 70% LT. RED BRN + RED DUE TO WEATHERING + OXIDATION, 30% BLACK, DENSE, VESICULAR</p> <p>{ 110'-120': 60% OXIDIZED + VESICULAR, 40% DARK GREY + DENSE</p> <p>ALTERATION: ^{MINOR} FeOx + BROWN CLAY, MINOR WHITE, CLAY IN VESICLES</p>



CUTTING DESCRIPTION

HOLE CTGH 1
FIELD CAECADES/CLACKAMAS

GEOLOGIST (S) MCDANNEL/GOODWIN
BASIS _____ DATE 6/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION	
	LITHOLOGY	
120'-140'		<p>BASALT/BASALTIC ANDESITE: MED. GREY - DUSKY RED APHYRIC TO SPARSELY PORPHYRIC (CPX) ROCK IS DENSE & UNALTERED</p>
140'-160'		<p>BASALT/BASALTIC ANDESITE: AS ABOVE { 140' w/ RESORBING PLAG, OL 150'</p> <p>ALTERATION: TR. HEMATITE, CLAY, DISSEMINATED 140'-150' TR. SULFIDES(?)</p>



CUTTING DESCRIPTION

HOLE CTGH-1
FIELD CASCADES/CLACKANAS

GEOLOGIST(S) GOODWIN/MCDANIEL
BASIS _____ DATE 6/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION	
	LITHOLOGY	
160'-180'		<p>BASALT / BASALTIC ANDESITE AS ABOVE PALE GREY → REDDISH BROWN</p> <p>{ 170'-180' RARE BLACK PYX PHENOS, OL</p> <p>ALTERATION: (MODERATE) LIMONITE, PINKISH CLAY IN VUGS</p>
180'-200'		<p>BASALT / BASALTIC ANDESITE AS ABOVE</p> <p>{ 190'-200' ^{±15%} FRAGMENTS OF BLACK, GLASSY ROCK = CHILLED FLOW MARGIN?</p> <p>ALTERATION: AS ABOVE</p>



CUTTING DESCRIPTION

HOLE CTGH-1

GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS

BASIS _____ DATE 6/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION	
	LITHOLOGY	
200'-220'		<p>BASALT/BASALTIC ANDESITE: (AS ABOVE) APHYRIC TO SPARSELY PORPHYRIC MEDIUM DK GREY → DUSKY RED</p> <p>200'-210' { ≤ 1% RESORBING OLIVINE, ± 2% PLAG PHENOS, 210'-220' { 12 BROWN PYX BLACK, GLASSY FRAGMENTS = CHILLED FLOW MARGIN/TOP</p> <p>ALTERATION: MIN. HEMATITE MIN BROWN & WHITE CLAY IN VOIDS, (FILLING & COATING) WEATHERING</p>
220'-240'		<p>BASALT/BASALTIC ANDESITE: AS ABOVE</p> <p>ALTERATION: INCREASED FeOx (WEATHERING)</p>



CUTTING DESCRIPTION

HOLE CTGH-1

GEOLOGIST (S) Mc DANIEL / GOODWIN

FIELD CASCADES / CLACKAMAS

BASIS _____ DATE 6/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION	
	LITHOLOGY	
240' - 260'		<p>BASALT / BASALTIC ANDESITE (AS ABOVE) APHANTIC TO SPARSELY PORPHYRITIC. MED. DK GRAY → ^{MILK} RED</p> <p>{ 250'-260' - BLACK GLASSY FRAGMENTS - CHILLED MARGINS</p> <p>ALTERATION: MINOR FeOx, CLAYS IN SMALL VESICLES</p>
260' - 280'		<p>BASALT / BASALTIC ANDESITE: (AS ABOVE) (w/ ONLY MINOR DUSKY RED)</p> <p>{ 260'-270' - PREDOMINATELY MICROPORPHYRITIC SAMPLE 270'-280' - FRESHER, LESS VESICULAR & LESS WEATHERED THAN PREVIOUS 20'</p> <p>ALTERATION: <u>MINOR</u> FeOx</p>



CUTTING DESCRIPTION

HOLE CTBH-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST(S) GOODWIN/MCDANNEL
BASIS _____ DATE 6/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION	
	LITHOLOGY	
280'-300'		<p>BASALT/BASALTIC ANDESITE GREYISH BLACK TO BROWNISH GREY SPARSELY PERPHYRITIC - PHENOS OF FLAG + OL</p> <p>290'-300' - INCREASED VESICULARITY (CONTACT?)</p> <p>ALTERATION: MINOR CLAYS IN VESICLES V. RARE LIMONITE, Fe^{OX} METALLIC COATING ON CLAY (?) 280'-290'</p>
300'-320'		<p>BASALT/BASALTIC ANDESITE: (AS ABOVE)</p> <p>↑ MINOR BLACK, GLASSY FRAGS → CIVILLED CONTACT/MARGIN</p> <p>ALTERATION: TR → COMMON WHITE CLAY^(?) IN GROUNDMASS TR LIMONITE ON GLASSY FRAGS</p>



CUTTING DESCRIPTION

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST(S) MCDANNEL/GOODWIN
BASIS _____ DATE 6/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION	
320' - 340'	LITHOLOGY	<p>BASALT/BASALTIC ANDESITE:</p> <p>MED. GRAY → DUSKY RED</p> <p>APHYRIC TO SPARSELY PORPHYRITIC</p> <p>PHENOS OF PLAG, OL, PX</p> <p>GLASSY, BLACK, FRAGS = CHILLED CONTACT/MARGIN</p> <p>ALTERATION: CONCENTRATED IN SCORIAEZEUS FRAGS & VESICULAR FRAGS. COMMON EARLY HEMATITE, LIMONITE, FeOx. TR. WHITE CLAY(?) IN SMALL VEINLETS</p>
340' - 360'		<p>BASALT/BASALTIC ANDESITE: (AS ABOVE)</p> <p>INCREASE TO 50% DUSKY RED COLOR</p> <p>ALTERATION: AS ABOVE, + WHITE, AMORPHOUS (CLAY?) MAT'L^(FeOx) IN VESICLES</p>



CUTTING DESCRIPTION

HOLE CTGH-1

GEOLOGIST(S) GOODWIN / MCDANNEL

FIELD CASCADES / CLACKAMAS

BASIS _____ DATE 6/12/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION	
360' - 380'	LITHOLOGY	<p>BASALT / BASALTIC ANDESITE:</p> <p>PREDOM. APHYRIC, LESS COMMON SPARSELY PORPH. BRN GRY - DARK GREY, DUSKY RED (~20%) PHENOS. PLAG, OL, BLACK PYX</p> <p>ALTERATION: ^{370'-400'} PERVASIVE. FeOx, SERT, AMORPH. WHITE MAT'L (CLAY?). HEMATITE & LIMONITE COMMON TR. SULFIDE(?)</p>
380' - 400'		<p>BASALT / BASALTIC ANDESITE (AS ABOVE)</p> <p>ALTERATION: AS ABOVE</p>



CUTTING DESCRIPTION

HOLE CTG-H-1

GEOLOGIST(S) GOODWIN/MCDANNE

FIELD CASCADES/CLACKAMAS

BASIS _____ DATE 6/12/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION	
	LITHOLOGY	
400'-420'		<p>BASALT/BASALTIC ANDESITE: GRAYISH RED - APHERIC - SPARSULY PERPHYRITIC GRAYISH BRN VENS OF FE₂O₃ & OL</p> <p>ALTERATION: PERVASIVE FeOx. MINOR HEMATITE & CLAYS. TR, WHITE, SOFT, AMORPHOUS MAT'L (CLAY?) IN VEINLETS.</p>
420'-440'		<p>BASALT/BASALTIC ANDESITE: AS ABOVE MED. DK GREY - BROWNISH GREY</p> <p>ALTERATION: AS ABOVE, BUT LESS PERVASIVE</p>



CUTTING DESCRIPTION

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST(S) MCDANNEL/GOODWIN
BASIS _____ DATE 6/12/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION
440'-460'	<p>BASALT/BASALTIC ANDESITE; MED DK GREY TO BRICK RED FINELY PORPHYRITIC: PLAG & OL</p> <p>450-460' - PREDOM. RED OXIDIZED GROUNDMASS INCREASE IN PHENOCRYST CONTENT. (MAY BE ILLUSION DUE TO RED GM) FLOW BOUNDARY? PHENOS MAY APPEAR AS FREE CRYSTALS (<5%) → B</p> <p>ALTERATION: PERVASIVELY ^{Fe} OXIDIZED GROUNDMASS → MINOR CLAY, LIMONITE</p>
460'-480'	<p>BASALT/BASALTIC ANDESITE : { ^{460'-470'} 50% MED. DK. GREY MED. DK GREY → BRICK RED } 50% BRICK RED</p> <p>APHYRIC ^{TO} → SPARSELY PORPHYRITIC PLAG, OL MORE VESICULAR ^{MORE OXIDATION} THAN ABOVE → FLOW BOUNDARY?</p> <p>ALTERATION: PERVASIVE FeOx; LIMONITE, HEAVY TR. WHIT, AMORPHOUS, SOFT MATL (LAY?)</p>



CUTTING DESCRIPTION

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST(S) GOODWIN/McDANNEL
BASIS _____ DATE 6/12/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION	
480'-500'	LITHOLOGY	<p>BASALT / BASALTIC ANDESITE! MED. DK GREY to BRICK RED APHYRIC TO SPARSELY PORPHYRIC PHENOS: PLAG, OL, ± PYX</p> <p>{ 480'-490' - SLIGHTLY ^{Fe} MORE OXIDIZED THAN 490'-500' INTERVAL</p> <p>ALTERATION: FeOx $\frac{1}{2}$ MINOR CLAYS (PINKISH, ORANGE, WHIT) ↓ COATS VOIDS</p>
500'-517'		<p>BASALT / BASALTIC ANDESITE: AS ABOVE</p> <p>{ 510'-517' - SET INCREASED FeOx</p> <p>ALTERATION: SAME AS ABOVE</p> <p>————— END OF CUTTING DESCRIPTION ————— HOLE CONTINUES W/ ^{PAGE 1} CORE DESCRIPTION (FORM 2) DESCRIPTION</p>

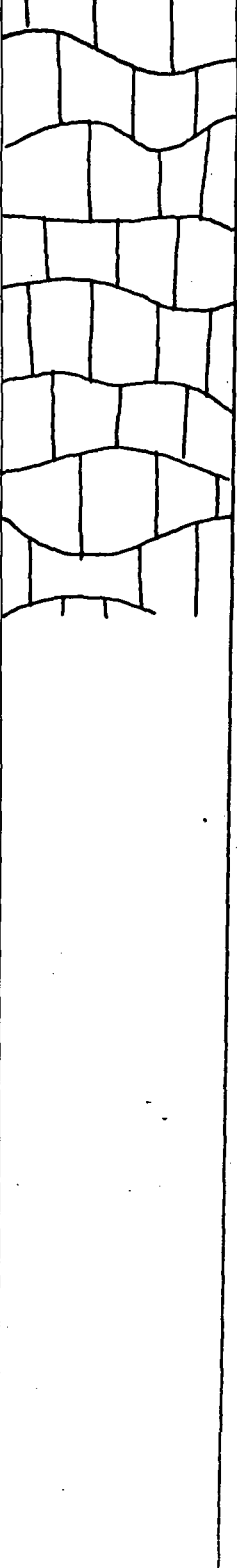


COPY

CUTTING DESCRIPTION

HOLE CTGH-1
FIELD CASCADES / CLACKAMAS

GEOLOGIST (S) McDANNEL / GOODWIN
BASIS _____ DATE 6/22/86

DEPTH INTERVAL	LITHOLOGIC DESCRIPTION	
	LITHOLOGY	
520'-527'		<p>BASALT / BASALTIC ANDESITE : MED. DK GRAY to BRICK RED APHYRIC to SPARSELY PORPHYRITIC PHENOS: PLAG., OL., ± PIX.</p> <p>{ 520'-527' CONTAMINATED SAMPLE (RUBBER, CEMENT, METAL, SLOUGH, & LCMS = 75% of SAMPLE)</p> <p>ALTERATION: FeOx & MINOR CLAYS COAT VOIDS (PINKISH, ORANGE, WHITE)</p> <p>— END OF CUTTING DESCRIPTION — HOLE DESCRIPTION CONTINUES WITH PAGE 1 CORE DESCRIPTION (FORM 2)</p>



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1

GEOLOGIST (S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS

BASIS _____ DATE June 22, 1986

DEPTH INTERVAL	DESCRIPTION	lithology
<u>527'</u>	<p>527' BASALT/BASALTIC ANDESITE Med Lt gry to med gry, finely porphyritic ~15% phenos, all \leq 3mm: plag, ol, cpx glomerocrysts of plag, ol, \pm cpx</p> <p>vertical to 25° fractures common. fracture surfaces have light to moderate coating of white to yellowish and pinkish clays.</p> <p>⊙ 540'-545', 548'-549': fracturing intensifies core pieces 1"-5".</p>	
<u>547'</u>	<p>⊙ 549': oxidized to reddish-gry predominately rubble, w/well consolidated intervals. Becomes vesicular. Voids up to 3 cm</p> <p>⊙ 556': clay increases (lt. yellow + dk red)</p> <p>⊙ 560': ashy intervals</p>	
<u>567'</u>		



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1
FIELD CASCADE/CLACKAMAS

GEOLOGIST(S) McDANNEL/GOODWIN
BASIS _____ DATE 6/23/86

DEPTH INTERVAL	DESCRIPTION	
<u>607</u>	<p>607 BASALT/BASALTIC ANDESITE med dk gray, finely porphyritic ~8% phenocrysts, ≤ 5 mm glomerocrysts of ol., plag., \pm R. pyx? rubbly, w/ minor red scoria & ash until <u>616'</u>. Large <u>616</u> consolidated vesicles <u>612-615</u>. Pinkish clays fill vesicles</p>	
<u>627</u>	<p><u>627-634</u> vesicular interval <u>632-639</u> fractured - predominately small (3") pieces. fractures are vertical to sub-vertical (15°) 2nd set is horizontal to sub-horizontal</p>	
<u>647</u>	<p>646.5: flow boundary? Marked by ash/cinder/scoria zone (until 648)</p>	

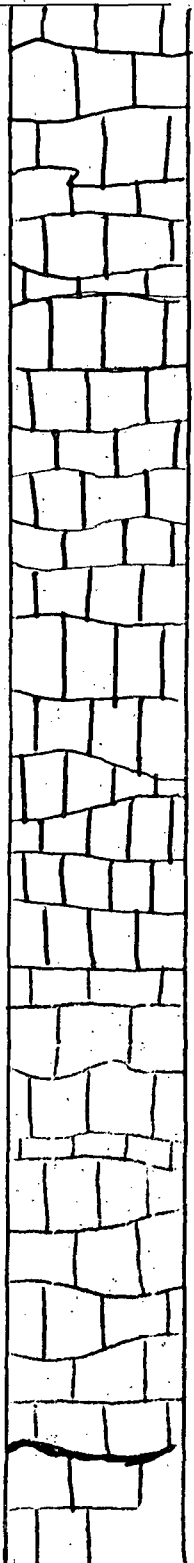
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CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CT6H-1
FIELD CASCADE/CLOCKMAS

GEOLOGIST (S) GODWIN/MCDANIEL
BASIS MICROSCOPE ID DATE 6/23-24

DEPTH INTERVAL	DESCRIPTION	
<u>647</u>	AS ABOVE (Basalt -Basaltic Andesite)	
	<p><u>653'</u>: flow becomes denser, less vesicular fractures common - 0-25° less producing 2"-4" pieces of rock } commonly 60°</p>	
	<p><u>660'</u>: ash & conder zone. Probable flow boundary →</p>	
	<p><u>663'</u>: rock becomes better consolidated, vesicular zones of rubble persist to 684'</p>	
<u>667</u>	<p><u>683-687'</u>: Well consolidated scoriaceous zone - flow breccia. Flow boundary.</p>	
<u>687</u>		

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTG 11-1

GEOLOGIST (S) MC DANIEL / GEE DWIN

FIELD CASCADE / CLACKAMAS

BASIS MICROSCOPE ID DATE 1/24/86

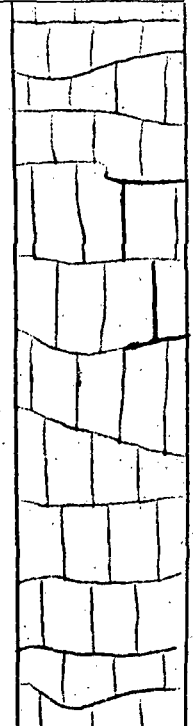
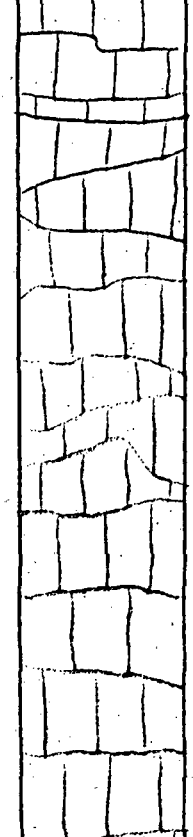
DEPTH INTERVAL	DESCRIPTION	
627	<p>627: BASALT / BASALTIC ANDESITE (A/A) med dk grey, porphyritic (2-5% phenos) phenos \leq 2mm: plag, ol, pyx. cl \rightarrow andesite fractures 0-30°; locally vesicular pink, white, H-brown clays on fracture surface & filling some vesicles 615-620: ^(A/A) very fractured & dense 5-10% vesicles (\leq 1-30um)</p>	
707	<p>710: brick red, micaceous, thin breccia. APPROX. FLOW BOUNDARY: slightly partly consolidated</p>	
727	<p>719: BASALTIC ANDESITE med dk grey, porphyritic (2-3%) phenos \leq 2mm: plag, epx, ol subtle red tint to groundmass light coating of clays on fracture surfaces fractures 0-30° (intense fracturing 720-738) (less common horizontal)</p>	

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTCH 1
FIELD CASCADES/CLACKAMAS

GEOLOGIST(S) GOODWIN/MCDANNEL
BASIS MICROSCOPE 112 DATE 8/24/86

DEPTH INTERVAL	DESCRIPTION	
<u>727</u>	<p>BASALTIC ANDESITE A/A</p> <p><u>733-739</u> SLIGHTLY SCCRACEOUS/ASHY LT. RED</p>	
<u>747</u>	<p>750 BASALTIC ANDESITE</p> <p>lt. med. gray (unusually lt.) to med. dk. gray dense, massive, sparsely porphyritic to aphyric, finely < 1% plag., ol., pyx., rarely fractured (1x/5' O 30' to 4') lt. brn clays coat fractures, < 1% vesicles</p>	
<u>767</u>		

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST(S) McDANNEL/GOODWIN
BASIS BIN. MICROSCOPE DATE 6/25/06

DEPTH INTERVAL	DESCRIPTION	
<u>767'</u>	<p>BASALTIC ANDESITE (A/A)</p>	
	<p><u>770-771'</u> increasing vesicularity</p>	
	<p><u>771'</u> FLOW BOUNDARY</p>	
	<p><u>771-779'</u> rubble, brick red, vesicular, locally scoriaceous, ashy</p>	
	<p>779' BASALTIC ANDESITE</p>	
	<p>med. dk. gray, sparsely porphyritic (2-4%)</p>	
	<p>phenos. < 2mm; plag., ol.</p>	
	<p>vesicles 5-15%, decreasing with depth</p>	
	<p><u>779-781</u> subhorizontal stretching & concentration of vesicles in narrow bands</p>	
	<p>clays: tan, wht, pink in < 20% of vesicles and ptily coating fractures</p>	
	<p><u>788.5-792.5</u> Rubbley</p>	
	<p><u>792.5-795</u> FLOW BOUNDARY: Rubbley med. dk. gray vesicular basaltic andesite and clayey-ashy flow breccia</p>	
	<p>- common med. brn clay filling inter breccia clast voids</p>	
	<p>- tan & lt. brn clays fill fractures and ~10% of vesicles (ie. 90% are void)</p>	
	<p><u>795-800</u> Rubbley, vesicular b.a.</p>	
	<p><u>800</u> Common fractures, often @ 70° to 90°</p>	
	<p>heavier clays, thick coatings on fracture surfaces</p>	
	<p>lt. pink clay is predominate clay.</p>	
<u>807'</u>		



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH 1
FIELD CASCADES/CLACKAMAS

GEOLOGIST(S) ECODWIN / MCDANNEL
BASIS B.N.C. MICROSCOPE DATE 10/25/86

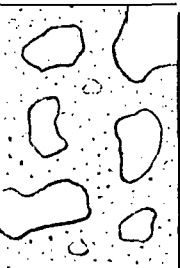
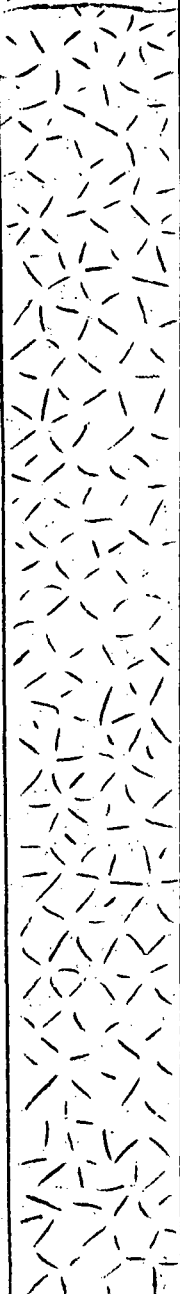
DEPTH INTERVAL	DESCRIPTION	
<u>807'</u>	<u>BASALTIC ANDESITE (A/A)</u>	
	<p><u>E15</u> VOLCANIC DOBRIS FLOW/LINAR sub-angular to sub rounded pebbles (predominantly) & boulders of basalt to dacite (rare) (predom. basaltic andesite) in yellowish brown tuffaceous sand matrix. Matrix includes crystals of biotite, feldspar, opx, opx, qtz(?). Rock is matrix supported and, generally, well-indurated. Concentration of rock fragments varies somewhat but there is no apparent grading or sorting. Tuffaceous matrix is alternating to clay. Light to moderate amounts of clay locally coating surfaces. Fractures show no preferential orientation. Minor limonite stain.</p>	
<u>827'</u>	<p><u>826.5</u> matrix poorly consolidated — ^{mainly mud} rock fragments collected from core barrel.</p>	
<u>847'</u>		

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST(S) GOODWIN/MCDANNEL
BASIS FINCH SCOPE DATE 11/26/80

DEPTH INTERVAL	DESCRIPTION	
<u>847</u>	<p>VOLCANIC DEBRIS FLOW/LAHAR (N/A)</p> <p><u>844' - 854'</u> contact w/ underlying unit marked by zone of boulders of underlying unit & less matrix than above. Transition may represent regolith & soil(?)</p>	
<u>854'</u>	<p>DIORITE?</p> <p>shallow level (i.e. sub-volcanic) intrusive med H. gr, fine grained, porphyritic phenos of plag, ep, opx; groundmass of plag, pyx; black iron bearing mineral. Much of unit is intensely fractured. Most prominent frac. direction ~75°-80°, less commonly vertical. Clay on fracture surfaces - usually light coating of brn or pink clay, locally heavy. Specks of MgO (pyroxene), disseminated FeOx (reddish brn) stain on many surfaces (not assoc. w/ known groundmass mineral sites), plag → clay on/near surfaces (not pervasive), ± tr limonite, localized minor chlorite (see below)</p>	
<u>867</u>		
<u>887</u>		



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTBH 1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) GOODWIN/MCDANIEL
BASIS IND. MICRO DATE 6/26/86

DEPTH INTERVAL	DESCRIPTION	
<u>887</u>	DIORITE? (A/A)	
	<u>894'-899'</u> fractured + sheared. Heavy brn clay	
	<u>905'-906.5'</u> intensely fractured	
<u>907</u>		
	<u>908'-913.5'</u> intensely fractured, light clays	
	<u>917.5'-918.5'</u> rubble, <1" d fragments	
<u>927</u>	<u>922'-923'</u> fractured, w/heavy brn. clay (25%)	



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTEH-1

GEOLOGIST (S) Mc DANIEL / GOODWIN

FIELD CASCADES / CLACKAMAS

BASIS BINOC SCOPE DATE 6/27/86

DEPTH INTERVAL	DESCRIPTION
<u>927</u>	DIORITE (A/A @ 854')
	<u>930-931</u> - intensely fractured
	<u>934-935</u> - " "
	<u>937-948</u> - " "
	<u>939-939</u> - breccia, angular to sub angular rock fragments (1/2"-6") in matrix of lt. tan (consolidated) clay, sand size rock frags, xtls
	<u>944</u> - noticeable ^{but subtle} light & dark ^{grey} bands 1-15 mm thick. Fractures ^{unbroken} (horizontal) marked by pinkish stain (from FeOx) or yellowish (limonite) stain.
<u>947</u>	
	<u>963-965</u> - brecciated zone, increase in clay
	<u>960</u> - slight change in rock texture. Appears less porphyritic, fewer (1 smaller) plag phenos. Strongly resorbed hornblende xtls → feldspar, cpx, opx
<u>967</u>	



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTGH-1

GEOLOGIST(S) GOODWIN/MCDANNEL

FIELD CASCADES/CLACKAMAS

BASIS _____ DATE 10/28/86

DEPTH INTERVAL	DESCRIPTION
<u>967</u>	<p>DIORITE (A/A @ 854')</p> <p><u>967'</u> - minute aggregates of chlorite on frac. surfaces</p> <p><u>972'</u> - chlorite a/a; minor cpx show reddish & g. mass } oxidation</p> <p><u>974'</u> - tr. chlorite, clays have decreased</p>
<u>987</u>	<p><u>988'</u> - tr. chlorite, clays have decreased</p> <p><u>991'</u> - fracturing intensifies, 70°-90°</p>
<u>1007</u>	<p><u>1000'</u> - 6"-8" heavy clay (30%) & breccia</p> <p><u>1001'</u> - 21" " " " "</p> <p>tr. chlorite</p>



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST (S) McDANIEL / GOODWIN
BASIS macro. micro. DATE 6/28/86

DEPTH INTERVAL	DESCRIPTION	
<u>1007</u>	<p>DIORITE (A/A @ 854')</p> <p><u>1010'</u> - 8-10" fractured zone w/ heavy pinkish tan clay. chlorite increases slightly</p>	
	<p><u>1020'-1022'</u> fractured interval (vertical fractures) heavy clay (pinkish)</p>	
<u>1027</u>	<p><u>1023'</u> green clay on surface w/ reniform texture</p> <p>* groundmass darkening, suggesting changing, i.e. more mafic, composition w/ depth, texture is more homogeneous & equigranular</p>	
	<p><u>1028'-1039'</u> fractured interval (vertical to sub-vertical & horizontal to 70° & to 45°) w/ heavy brn clay at base of interval</p>	
	<p><u>1040'-1049'</u> Less fractured, less clay and alteration</p>	
<u>1047</u>	<p><u>1047'</u> lt. coating of grn clay/chlorite on fracture</p>	



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTG H 1
FIELD CASCADES/CLACKAMAS

GEOLOGIST(S) McDANNE/GOODWIN
BASIS binoc. microscope DATE 6/29/86

DEPTH INTERVAL	DESCRIPTION
<u>1047'</u>	<p>DIORITE (A1A @ 854')</p>
	<p><u>1047'</u> R specks black iron mineral (hematite?) v. fine, scattered through groundmass, rare larger hematite blebs</p>
	<p><u>1049.5' - 1050'</u> intensely fractured</p>
	<p><u>1052' - 1053'</u> heavy clay (med. brn color)</p>
<u>1067'</u>	<p><u>1066' - 1081'</u> fracturing - moderate to intense, distinctive conjugate joint set @ 15° to \perp w/ splintery fracture locally lt. limonite to 1109'</p>
	<p><u>below 1075'</u> subtle increase in phenocryst %</p>
	<p><u>6-8% → 8-12% (locally)</u></p>
	<p><u>1076'</u> coexisting hematitic (metallic) and <u>fresh</u> -</p>
	<p>with FeOx (earthy) near fractures</p>
	<p><u>1081' - 1090'</u> fractures @ 45° to \perp ± sinuous</p>
	<p>vertical fracture >> fracture \perp to \perp (90°)</p>
	<p>darker color than upper part of unit</p>
<u>1087'</u>	<p><u>1081' - 1083'</u> heavy clay, med. - lt. brn & grayish</p>
	<p>orange pink w/ tet. calcite associated</p>



CORE DESCRIPTION
40 FOOT INTERVAL

HOLE CTGH-1
FIELD CASCADES/CLACKAMAS

GEOLOGIST(S) McDANNEL/GOODWIN
BASIS bioc. microscope DATE 6/29/86

DEPTH INTERVAL	DESCRIPTION
<u>1087'</u>	<p>DIORITE (A/A @ 254')</p> <p><u>1087' - 1090'</u> Fractures @ 45° to 60° ± Sinuous vertical fracture, fewer ⊥ to 60°</p>
	<p><u>1101' - 1103'</u> Vertical fractures with heavy clay (lt brn)</p> <p><u>1105' - 1109'</u> Small marulitic voids appearing, irregular shapes, small increase in % Pyx.</p>
<u>1107'</u>	<p><u>1109'</u> Intense clay alteration, 6" inclusion (dark gray) reacting w/ diorite (being digested)</p> <p><u>1110'</u> Contact: intense clay alteration but not signs of linking. Lt gray. Appears brecciated & gradational w/ underlying unit, w/ pebbles & boulders of diorite in clay matrix, becoming heterolithic</p>
1112	<p>VOLCANIC DEBRIS FLOW / LAHAR</p> <p>Angular to subangular pebbles^{boulders} of predominantly basalt-basaltic andesite, but includes more silicic lithologies, in a clayey matrix of sand size rock fragments & crystals. Sparse, rounded clay clasts white to tan, contain hornblende & biotite - suggestive of devitrified pumice. (Unit is much like volcanic Debris Flow @ 815' - 831')</p> <p>1123 - unit becomes unconsolidated.</p>
<u>1127'</u>	



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTG11-1
FIELD LABORER / BLACKHILLS

GEOLOGIST (S) GEORGINA / MIK DANIEL
BASIS Handwritten DATE 1/30/86

DEPTH INTERVAL	DESCRIPTION	
<u>1127</u>	VOLCANIC DEBRIS FLOW (VA)	
	<p>1137' unit is consolidated near/at contact w/ underlying unit. Thin (1-2cm), irregular layer of brown clay w/ coarse sand-size rock frags @ contact</p>	
1138'	<p>BASALT med-med dk gray to lt brnch gray, porphyritic (12-18%) w/ plumes of plag; opx, cl, w/ rare sieve textured mineral clots 3-15 mm diameter.</p>	
<u>1147</u>	<p>Ol -> iddingsite; plag -> clay, particularly near fractures. Lt orange & pinkish clay coating on most frac surfaces. rare hornblende, pyroxene, early hematite</p>	
	<p>1139'-1142' horizontal to 40° fracturing</p>	
	<p>1143'-1144' vertical to 15° fracturing - v fractured heavy pinkish brn clay</p>	
	<p>1149'-1152' - frac. predom 15° or less, secondary 40-60° - horizontal</p>	
<u>1167</u>		



CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTCH-1
FIELD LA CADES/CLARKMAS

GEOLOGIST (S) GOODWIN/MCDANIEL
BASIS FINC. MICROLOG DATE 6/30/86

DEPTH INTERVAL	DESCRIPTION	
<u>1167</u>	BASALT (N/A)	
	<u>1181'-1185'</u> - Three 5"-8" zones of heavy clay w/ brecciated rock	
<u>1187</u>	<u>1186'-1227'</u> color med lt ggy - lt. brnch ggy (to 1200)	
	<u>1186'-1215'</u> - common fractures vertical, sinuous, 45°	
	<u>1197'-1200'</u> - hairline incipient fractures, partly dissolved/etched, @ 60°	
<u>1207</u>		

CORE DESCRIPTION

40 FOOT INTERVAL

HOLE CTEH-1
FIELD CASCADIA/CUMKAMAS

GEOLOGIST(S) McDANIEL / COODWIN
BASIS MINOR SCALE DATE 6/30/86

DEPTH INTERVAL	DESCRIPTION	
<u>1207</u>	BASALT (A/A)	
	<u>1215'-1229'</u> - ~80° fracture common; continuous vertical fracture	
	<u>1223'</u> - black, secondary mineral (MnO ₂) staining planes on fracture surfaces	
<u>1227</u>	<u>1229'</u> - flow becomes oxidized (brick red) & brecciated but well consolidated. Cracks into clay matrix w/ clasts of basalt and conder & plag. xtls. Grades into underlying unit.	
<u>1230</u>	VOLCANIC DEBRIS FLOW/LAHAR red-orange-brown (variable color) Sub-angular to subrounded pebble to rubble size clasts in well indurated clay matrix. Poorly sorted. Zone of predom. red clay w/ small rock fragments & crystals grades into brown, clast supported (& 1252') breccia of mafic volcanic, and rarely igneous/silicic, rock fragments. Thinly laminated clay (ripples?) commonly drapes around and between clasts. Sandy clay matrix w/ xtls. of plag. pyx. & amphiboles. Pale orange-pink	
<u>1247</u>		