GL01636

COMPLETION REPORT

GEOTHERMAL EXPLORATORY WELL S-88-3

Sulphurdale, Utah

For

Mother Earth Industries, Inc.
7350 E. Evans, Suite B
Scottsdale, Arizona 85260

GEOTHERMAL MANAGEMENT Co., Inc. P.O. Box 2980 Evergreen, CO. 80439-2980

GL01634

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Prepared By
Geothermal Management Company, Inc.
P.O. Box 2980
Evergreen, Colorado 80439

August, 1989

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PLATE (in pocket)

COMPLETION REPORT FOR S-88-3
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I. ABSTRACT

A geothermal exploratory "slim hole" designated S-88-3 was drilled by Mother Earth Industries, Inc. on land owned in fee by Delano Development Company between the dates of October 10 and October 22, 1988. The well is 2953 ft. south and ÷ 995 ft. east of the northwest corner of Section 7, T26S, R6W, SLB&M.

The well penetrated highly fractured and significantly altered rocks of the upper zone of the Three Creeks Tuff Member of the Bullion Canyon Volcanic series (Moore and Samberg, 1979) and encountered steam with minor H_2S at 823, and 843-846'KB.

The well was drilled to a total depth of 850 feet and has been shut in pending plans to drill an offsetting production well.

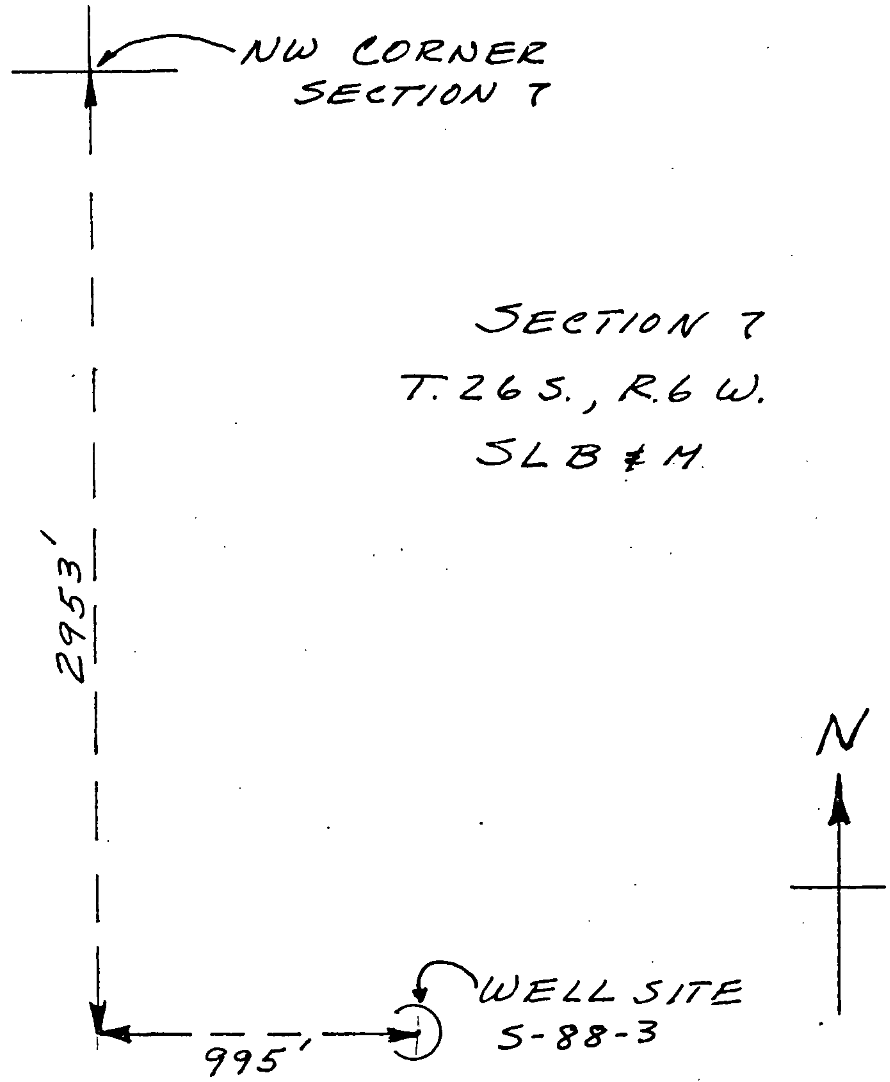
The prime contractor for the well was Sierra Drilling Company, Salina, Utah; the drilling plan was designed by William Jackson of Salt Lake City, Utah and modified by Jay C. Hauth of MEI; surveys were done by Sunrise Engineering, Inc. of Fillmore, Utah; Safety Services were provided by Bell Safety of Evanston, Wyoming; wellsite geological supervision was by Columbia Geoscience of Hillsboro, Oregon; petrographic examination of drill cuttings was done by Joseph Moore of Salt Lake City, Utah. All other activities were conducted by Mother Earth Industries, Inc.

II. LOCATION

This report pertains to MEI exploratory slim hole S-88-3 located near Sulphurdale, in Beaver County, Utah within the Cove Fort-Sulphurdale KGRA.

Specifically, the well is 2953 feet south and 995 feet east of the northwest corner of Section 7, T26S, R6W, SLB&M. It is within a parcel of fee land that comprises the west half of the SW/4 of Section 7, T.26 S.,R.6 W.

Figure 1 depicts the location of the well relative to the section corner; Plate I (in pocket) is a survey plat of the Cove Fort Geothermal Power Plant vicinity showing the relative positions of the several wells drilled in the area, the collection and power generation facilities, and portions of the powerline grid.



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GEOTHERMAL MANAGEMENT Co.
P.O. Box 2980 Evergreen, CO. 80439-2980 (303) 670-3454

SULPHURDALE, UTAH

LOCATION MAP - S-88-3

By: GWH Ckd: GWH
Date: 8-15-89
Scale: 1" = 60'
Dwng. No: ME1883-1
Figure 1

III. WELL DRILLING AND CONSTRUCTION HISTORY

In order to cost-effectively search for extensions of the dry steam geothermal resource discovered in wells 34-7A and 34-7B, S-87-4 and S-88-1, exploratory well S-88-3 was drilled in a "slim hole" configuration as follows:

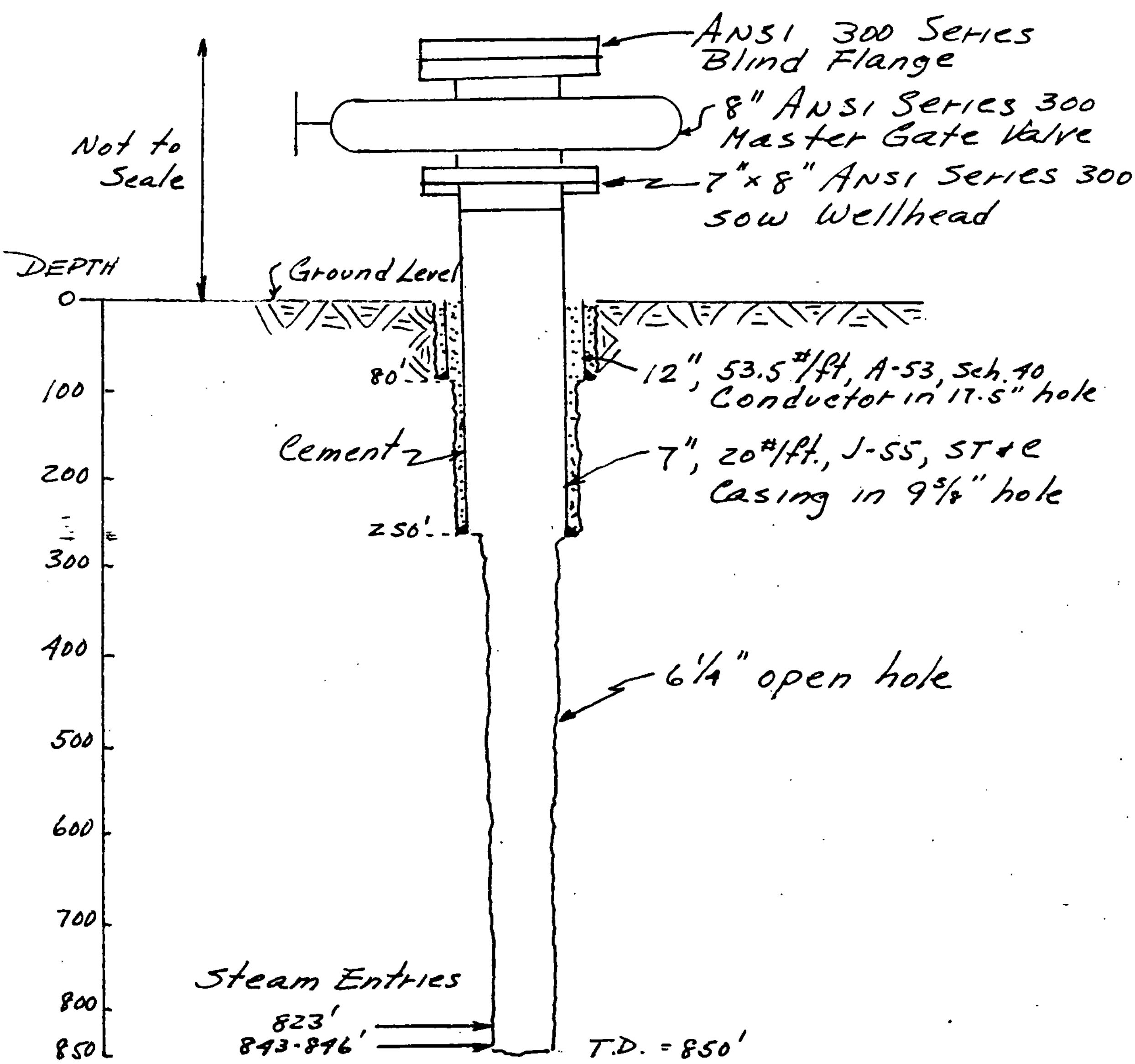
On October 10, 1988 at 1500 hours Sierra Drilling Company spudded using a 12.25" bit and drilled to 80'KB. A reconditioned 17.5" hole-opener was then used to ream the hole to a size suitable for the conductor casing. Eighty (80) feet of 12", 53.5#/Ft., A-53, Schedule 40 casing was then landed and cemented in place through the drill stem.

Using a 9.875" mill tooth bit, the cement was drilled out on October 14 and drilling proceeded to 250 feet by October 18. On October 18, 250 feet of 7", 20#/Ft., J-55, ST&C casing was landed and cemented in place with a type G high temperature mixture. October 19 was spent cutting off casing and nippling up and testing all the blowout prevention equipment on the 7" casing. Approval of the pressure test was obtained from the Utah Division of Water Rights representitive at 1515 hrs on October 19.

After tagging cement, drilling resumed at 0000 hours on October 20 using a 6.25" mill tooth bit and continued at rates ranging between 15 and 40 feet per hour to the final depth of 850 feet.

A small steam entry was recorded at 823'KB on October 21, and a much larger flow was encountered, in a fracture, from 843-846'KB. The flow of steam died temporarily on October 22, but when the hole was reentered and cleaned out on October 23, steam flow at high rates resumed.

A drilling history, describing daily events between October 10 and October 22, 1988 accompanies this report as Appendix A. Figure 2 is a profile of the well as completed; Figure 3 is a drilling curve showing the rate of drilling progress, and Figure 4 shows the Blowout Preventer stack used on the 7" casing. Appendix B, attached, is MEI's basic drilling procedure developed for slim exploratory wells.



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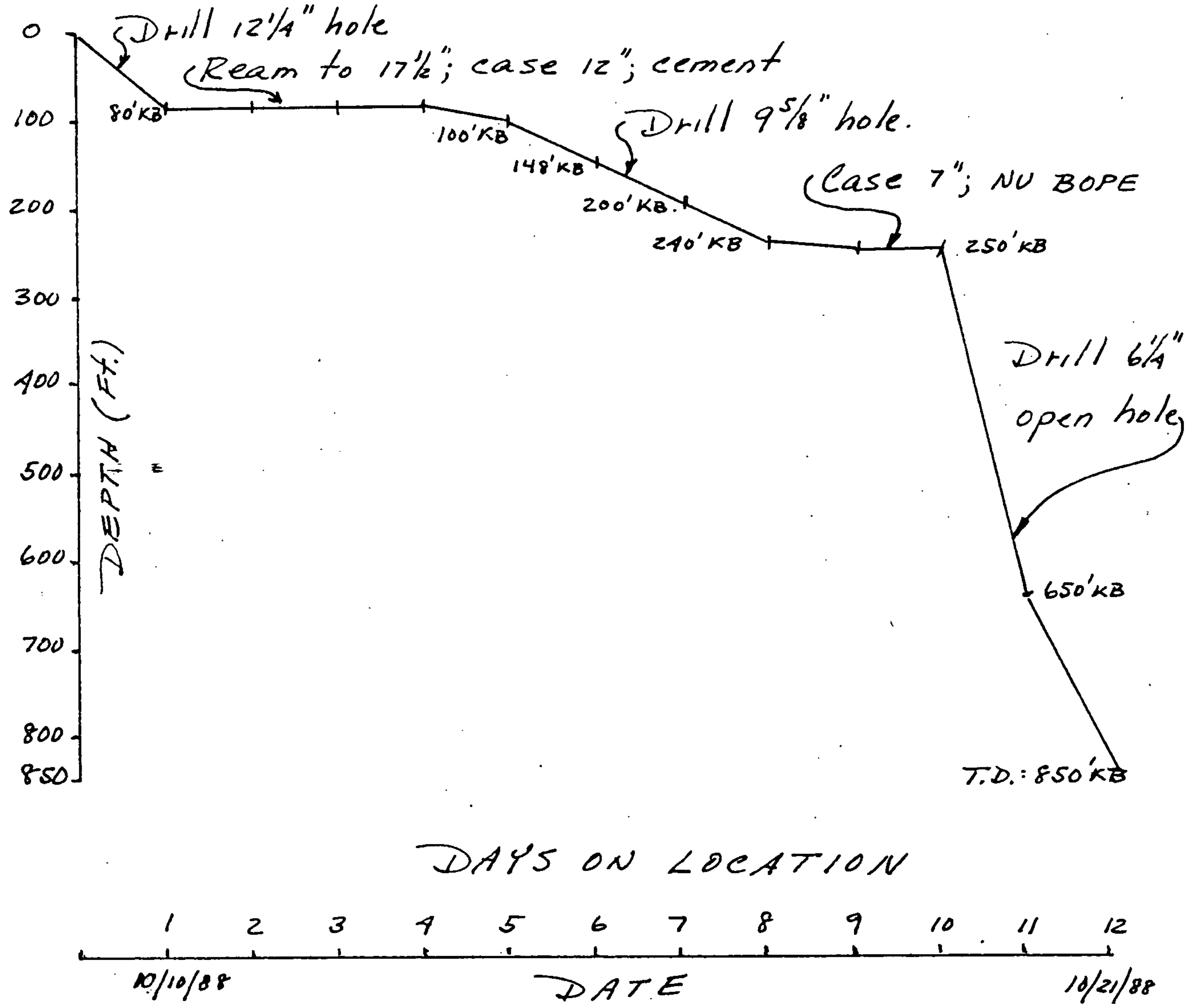
WELL PROFILE S-88-3

SULPHURDALE, UTAH

By: GWH | Ckd: GWH
Date: 8-15-89
Scale: 1"=200' Vert.
Dwng. No: ME1888-2
Figure 2



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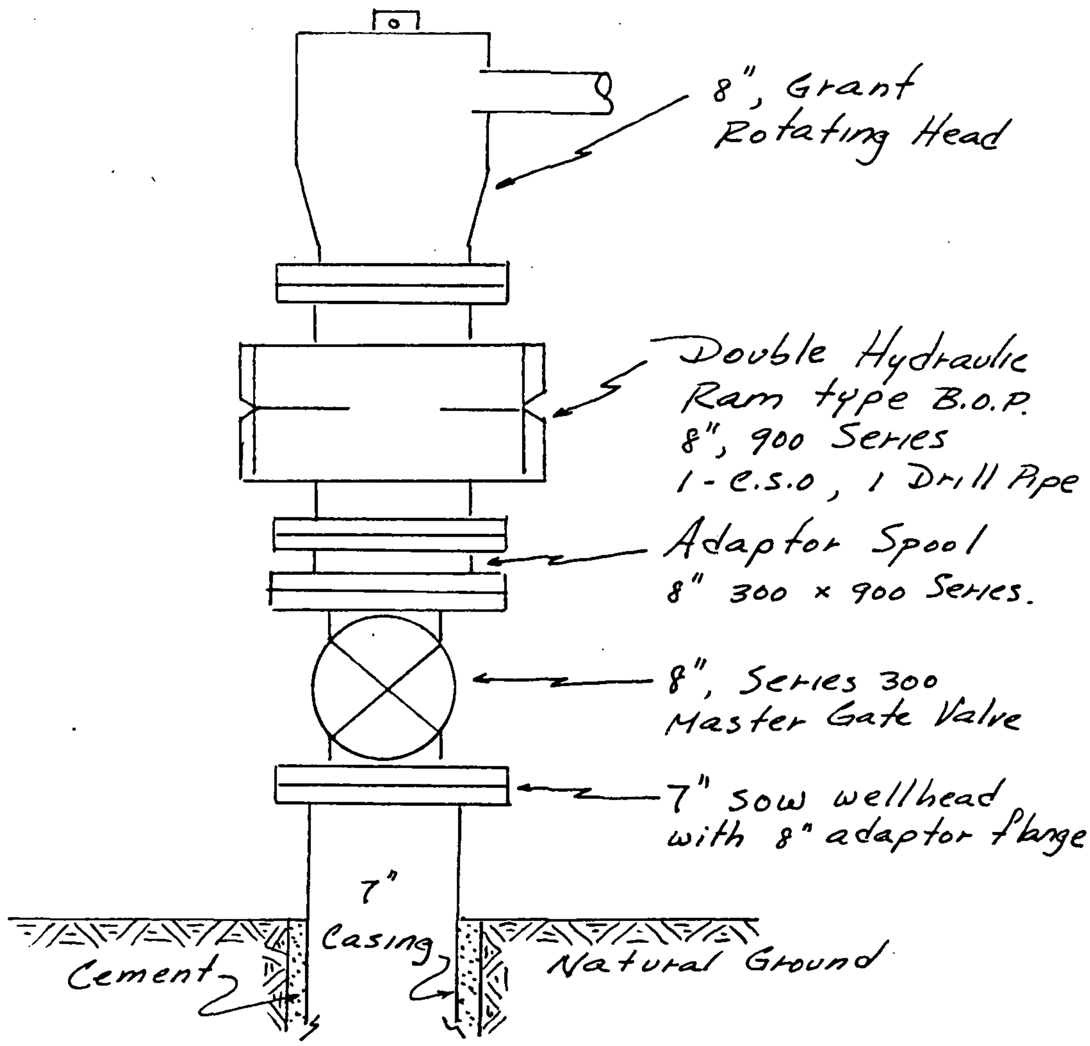
No.	Date	By	P.O. Box 2980 Evergreen, CO. 80439-2980 (303) 670-3454	Date: 8-15-89	
1			DRILLING CURVE S-88-3	Scale: 1"=200' Vert.	
2			SULPHURDALE, UTAH	Dwng. No: ME1883-3	
3				Figure 3	
4					
5					



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7" B.O.P.E. STACK 5-88-3

SULPHURDALE, UTAH

By: GWH	Ckd: GWH
Date: , 1989	
Scale: None	
Dwng. No: ME189 - 4	
Figure 4	

IV. GEOLOGY

The Cove Fort-Sulphurdale region, in southwestern Utah, comprises folded and faulted sedimentary and metasedimentary rocks of Paleozoic to Mesozoic age that are overlain, sequentially, by Oligocene to Miocene age ash-flow tuffs and Quaternary basalts. All of the rocks except the basalts have been intruded locally by Miocene quartz monzonite and/or latite porphyry stocks, sills, and dikes.

The rocks penetrated in S-88-3 consist entirely of ash-flow tuffs designated as the Three Creeks Tuff Member of the Bullion Canyon Volcanics (one of the oldest of the volcanic units). The Three Creeks Tuff has three distinct zones: an upper and a lower zone of red to grey densely welded tuff and a middle zone of poorly welded white tuff. Only the lower zone of the Three Creeks Tuff has been mapped in the area of interest.

This lowermost zone of the Three Creeks Tuff has been further subdivided into two cooling units. The upper unit is characterized by euhedral plates of biotite up to several millimeters wide and euhedral (beta morphology) quartz crystals while the rocks of the lower cooling unit are mineralogically the same but much finer grained. They have been informally named the Wales Canyon formation.

In contrast to nearby well S-87-4, well S-88-3 encountered both of the cooling units.. This suggests that wells S-87-4 and S-88-3 are either separated by a fault which has upthrown well S-88-3 relative to well S-87-4 to the north or, since the Wales Canyon formation was reported both above and below the coarse grained cooling unit of the Three Creeks fm., that the Wales Canyon fm. has slid into its logged position in S-88-3.

S-88-3 encountered highly altered alluvial materials similiar to those found in the Sulphur Pit from the surface to 80'KB. This alluvium caps 45 feet of coarse grained Tbt which in turn overlies 100 feet of Wales Canyon fm.. From 225-820'KB (end of collected samples), the well penetrated variably altered and welded grey to whiteish ash flow tuffs of the upper Tbt cooling unit. Highly silicic rocks were thrown out of the well below 820'KB and it is likely that these rocks are from the Coconino sandstone/quartzite of Paleozoic age.

Alteration of the S-88-3 rocks is of the fumarolic, acidic, solfateric type from 0-80'KB; from 80-750'KB, the rocks are argillically altered with the severity dependant on the degree of welding of the tuffs. Below 750'KB, alteration is silicic, with complete obliteration of texture below 800'KB. Though there was no logged evidence of faulting seen in S-88-3, the intercalation of the fine grained Wales Canyon fm with the coarse Tbt suggests landsliding as a mechanism. The fact that the natural contact between the Tbt and the Wales Canyon was not encountered (as it was in S-88-1), suggests that either S-88-3 is in a fault block that has been downthrown relative to S-88-1 or, more likely, that the contact dips southward beneath S-88-3.

Attached, as Appendices C and D, are lithologic and petrographic descriptions of drill cuttings from this well written, independantly, by J. Moore and by A. Weible, together with some interpretive comments by each logger.

V. PERMITS

As required by law, MEI applied for and received a permit for drilling well S-88-2 from the Utah Division of Water Rights. When S-88-2 was abandoned at a depth of only 80'KB, a decision was made to drill S-88-3 a short distance northwest of the S-88-2 site. Accordingly, MEI requested that the drilling permit for S-88-2 be transferred to S-88-3 and this request was verbally approved by John Solum of the UDWR. MEI also received approval for the drilling of this well from the Delano Development Company, owner of the fee lands.

Attached to this report as Appendix E, are copies of documents related to permit acquisition and compliance.

Appendix 4

S-88-3 DRILLING HISTORY

10-10-88

0800 - 1500	MIRU.
1500 - 1945	DA with 12" bit to 80'KB.
1945 - 2000	POOH.

10-11-88

0730 - 1345	Ream to 17.5" with hole opener to 80'KB.
1345 - 1600	POOH, misc. clean-up of rig and site.

10-12-88

0730 - 1315	Run 80 feet of 12", Schedule 40, A-53, 53.5 lb./ft. casing
1315 - 1400	Cement through drill stem.
1400 - 1600	WOC; prepare wellhead equipment.
1600 - 1900	NU wellhead and flowline.

10-14-88

0800 - 1900	DA with 9.875" bit 80-100'KB.

10-15-88

0800 - 2000	DA to 148'KB.

10-16-88

0800 - 2000	DA to 200'KB.

10-17-88

0800 - 2030	DA to 240'KB; slowed to 4'/hr.

10-18-88

0700 - 1140	DA to 250'KB, TD for 7" casing.
1140 - 1530	Run 250 feet of 7", 20#/ft, J-55, ST&C casing.
1530 - 1600	Cement casing through drill stem; CIP 1600.
1600 - 1900	WOC.

10-19-88

0730 - 1445	Cut off 12" and 7" casings and NU BOPE.
1445 - 1515	BOP test. Held 690-620 psi for 30 minutes. Witnessed and approved by UDWR.
1515 - 1930	RIH; try to drill with air hammer, no luck; POOH; RIH with 6.25" mill tooth bit.
1930 - 2400	Drill out cement and plug to 250'KB.

10-20-88

0000 - 0500	DA to 260'KB with mill tooth bit.
0500 - 1045	Fix clutch.
1045 - 1240	DA to 310'KB; To= 81F.
1240 - 1950	DA to 483'KB; To= 94F.
1950 - 2040	Fix air leak on compressor.
2040 - 2400	DA to 650'KB; To=112F.

10-21-88

0000 - 1430	DA to 810'KB; To= 120F.
1430 - 1455	DA to 830'KB; To= 170F; steam entry 823'KB.
1455 - 1530	DA to 850'KB; Increased steam from fracture between 843 and 846'KB; To=200F.
1530 - 2400	POOH; flow well, clean up rig and site.

10-22-88

0000 - 0300	RIH with 6.25" bit, clean hole, POOH; RD.

MEI DRILLING ACTIVITY LOG WELL#:[S-8?2] DATE:[10-6-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
08:00			getting thing Ready to Run Casing
			put New sparkplug in welder Runs grate
9:20			Ran in 84.5' casing prime mud pump. pump through
			Cementing tube make sure it is Clean Ready to Cement
1:00			cementing hole. pumped in 5yards cement
1:00			cleaning up mud pump and all equment used to cement
1:30			went up and un nippled 10" valve off other well
			Nippled cover Back on it.
3:00			Fix Change over Lever on drawworks
3:30			Shut down

MEI DRILLING ACTIVITY LOG WELL#:[S-88-2] DATE:[10-7-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
8:00		Mike	Start up Rig. get changed back over to Air drilling
8:30		Mike,	put on 9⅞ bit to drill out Cement drilling out Cement
9:30		Mike	well got shut down by Jay Hauth went on Standby
		Mike	
11:00		Mike	start to Rig down moving 10" valve Rotating
			head use cat to build earthen Ramp to get
			Rig off Substructer Move Rig off hole
			# S-88-2. move substructer to hole S-88-3.
			get it Set + Level move mud tank to New
			Location get it set in place. Shut down. 5:00
5:30		Mike	Acme got hear with Cross over spool + Flanges
			got them unloaded

MEI DRILLING ACTIVITY LOG WELL#:[5-88-3] DATE:[10-10-87]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
08:00			Get equipment worming up Build earthen Ramp
			to get Rig on supStructer get every thing
			set up we need to drill with
11:00			drive Rig up on substructer Rig up.
12:00			Start drilling pilot hole with 9 7/8 Bit.
1:15	18	JCS	made Joint Drillin in an Allterd Formation
3:00	34	JCS	Made Joint. still in an Alterd Formatrom Fairley tight
			Wayne wants to go on down to 80 ft trying to get in better Rock
4:45	53		made Joint. Still in a Alterd Formation, 8 min. on Ft. Pent.
6:20	73		made Joint. still in same Gray Alterd Formation
7:45	78		Have gotten into a Lot more solid Formation at 71
			still in it. penatration Rate has slowed down to
8:00			14' min. a Ft. trip out of hole

MEI DRILLING ACTIVITY LOG WELL#:[S 88-3] DATE:[10-11-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
0 8:00			warm up equment trip in hole Finish drilling to
			80' clean hole
9:30			trip out of hole put in hole opener
10:00			start to open up 9⅞ hole to 11 3/4
11:10	29 Ft	JCS	hole opener baund up on Rocks
11:30	35	Mike.	made conection everthing going good
12:00	51	Mike	made Conection Lookin Good
12:30	71.5	Mike	made Conection drilled real Good
1:45	80'	Mike	made Conection got into harder formation drilling has
			slowed Down.
			cleaning hole.
2:00		JCS	cleaned Hole tripped pipe out of Hole
2:30		JCS	cleaned Rig washed, cleaned mud off sub Structer
3:30		JCS	made ditch for Foamer Run OFF
4:00		Mike	Caseng hasn't arived call it won't get hear until Late shut
			down.

MEI DRILLING ACTIVITY LOG WELL#:[S-88-3] DATE:[10-12-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
0:800			Caseing didn't get hear call Natanel steel
			it hasnt left their yard said it would Be down at 1 p.m.
			turned hans Loose until 1 pm.
1.00			Casing hasn't got hear call again it steal
			hasen't Left their yard. they said it would Be
			hear at 6:30 pm. got Rig Running warming up welded
			up 2" + Ran it in hole to cement with. gather up
3:30			equment shut down. Called ~~+~~ Consild on cement
			and welder.
7:30			Casing got hear got him unloded.

MEI DRILLING ACTIVITY LOG WELL#:[S-88-3] DATE:[10-13-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
9:00		Mike	moved casing to Rig Sh[illegible] up Rig
			Get Ready to Run Casing Called Larry to come
10:30		Mike	out to do welding Ran in casing called For
			Cement # will be near at 1:00 got mud pump primed
12:30		Mike	and Ready having Larry get Flange Ready
1:15		Mike	cement is hear. 1:25 Cementing hole going good
1 45		Mike	hole is Cemented got a good Return on cement
			Geting pump and equment washed up. Finish digging [illegible]
			for Larry to get Flange welted on.
3:00		Mike	getting casing cut off Right hight + Flange weled on
4:00		Mike	Flange welded on Ready to put on 10" Gate Valve
4:45		Mike	Valve on putting on cross over spool
5:15		Mike	Ready to Nipple up Rotating head
5:40		Mike	Rotatinghead on Building Flow Line
7:00		Mike	Flow line Bult + Bolted on Shutdown Rig

MEI DRILLING ACTIVITY LOG WELL #:[S-88-3] DATE:[10-14-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
08:00			Finished tighten up Boltes on stack Nipple up
			choke & Kill valves. had a worn out Swab in pump
			had to change it. (mix mud 120 bags)
11:00			go in hole with 9 7/8 drilling out cement.
3:25	80		throug cement drilling Formation drilling has slowed down
4:20	85		Temp In Temp out
6:50			PH 9 Blue mix some polamer in mud system
700	100		Shut down For night.

MEI DRILLING ACTIVITY LOG WELL#:[S-88-3] DATE:[10-15-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
0800	100		Mix mud Trip in hole Start drilling at 100
			Ft.
9:55	105	JCS	made Joint mixed mud 11 bags Bentonite 2 bag soda ash
			PH9 Vc. 32 Wt. 8.1 Mud temp [illegible]
			[illegible] Extremely Slow [illegible]
1:[illegible]	125	JCS	MAde joint mud temp Flowline 27° suction 24° VC 35
			PH 9 mud wt 8.3 Formation Changing From Gray to Red
			It has gotten a lot harder Drilling Rate [illegible]
			way down
7:00	145		Made Joint PH.11 Vis. 37 mudwt. 8.4 Drilling Rate 3.5' pr. hr.
8:00	148		pull 2 stands Shut down Rig

MEI DRILLING ACTIVITY LOG WELL#:[5-88-5] DATE:[10-16-88]

Sunday

TIME	DEPTH	INIT:	COMMENTS, FLOWLINE TEMPS, ETC.
8:00	148		Arrived Started Rig tripped in hole Started
			drilling
840			pump quit pumping had to take it apart Clean it out Replace
10:45			pump packing got pump Going Started drilling
2:15	165	JCS	made Joint Visc. 40 wt. 8.8 ph 9 Drilling Rate 3 Ft. pr. hr.
			Add water to Bring visc. Back down a little Visc. 35 mud wt. 8.9
5:00	180		Made New Joint Drilling Rarte has Increased to 6½ Ft. pr. hr.
			Brought Acumulator over from other hole Got all meterial
			Cleaned up From old Locations + Stacked In one place
8:00	200		Drilling going ok Shutdown 200 Ft.

MEI DRILLING ACTIVITY LOG WELL#:[S-88-3] DATE:[10-17-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
8:00	200	Jcs	Arrived Started rig tripped into Hole started drilling
9:45		Jcs	went and got 6 pc. 9 inch casing
10:10	205	Jcs	made Joint vis 41 mud wt 9.2 ph 9 mud temp Flow 34° Suction 34°
11:30		Jcs	Added water brought tank up 4 inches got Fuel For Rig
3:00	225	Jcs	Made Joint drilling Rate 4 Ft per Hr moved Bop to be
			Fixed digging out cellar For Bop.
5:00			mounted vice Rearainged tools
8:30	240		tripped out off Hole Drilling slowed down

MEI DRILLING ACTIVITY LOG WELL #: [5-88-3] DATE: [10-18-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
07:00			start up Rig trip in hole
07:30	240		Start drilling at 240' drilling slow 49 vis. Mud wt.
			9.4 temp in 73° out 74°
1015	245		made conection - / vic 41.5 / mud wt 9.2 / temp in 74° out 75°
			Slow drilling hard Formation
11:45	250		T. D. For Service Casing. Clean hole
12:00			tripout of hole in stands
12:30			Start to Nipple down Rotating head & 10" valve
1:30			Rotating head & Valve out of way Ready
			to Run casing.
3:30			casing set Ready to Cement. pump in 125 bags Cement
4:00			have good Return on Cement. Cleaning pump & Rest of Equment
			used in Cementing
5:00			through Cleaning Cement off & out of Equment Cleaning
			out Celler getting it Ready for Welder,
			Chang Fan on Rig put on New Shroud add Antifreeze
7:00			to welder

1215 310 ft

MEI DRILLING ACTIVITY LOG WELL#:[5-88-3] DATE:[10-19-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
715	148 ft	JCS	made Joint drilling fast cement /
820	168	JCS	made Joint drilling good c
910	188	JCS	made Joint good drilling
955	208	JCS	made Joint drilling good.
10:30	228	JCS	made Joint drilling fast
1149	248	JCS	made Joint Last 4 feet drilling slow still in casing
12:15	251	JCS	drilling slow mike and chucks shift.

MEI DRILLING ACTIVITY LOG WELL#:[S-88-3] DATE:[10-20-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
12:00	240		drilling out cement with mill tooth Bit
12:40	260		through cement and into formation ten ft.
1:00			triping out mill tooth to put in hammer Bit
3:00	250		10' off Bottom with hammer have to Ream out Last 10'
4:00	255		haveing trouble with aricompresser Cluch sliping stop & adjust Cluch
5:00	260		stop + adjust cluch agin it is getting Real Bad Let it cool off
6:00			try it agin still won't hold under pressure
6:30			tear down cluch to see how bad it is.
7:30			have cluch apart it is clear gone
8:00			Call Jay he has a cluch comming in Air Fraight he will have it down
			this Afternoon.
9:00			take Cluch off mud pump + put in on Air Compresser
10:45			drilling Agin. drilling is going good
11:00	270		Rod up drilling good Air presser 175 psi Drilling Rate 25 Ft. pr. hr.
12:00			FlowLine temp 76° Fix Bad Air Leak on Air Reciever Tank
12:10	290		Rod up drilling good
12:30	300		drilling good 25-30' pr. hr. FlowLine temp. 81°
12:40	310		Made Joint drilling good / temp FlowLine 84°F tank 58°F

MEI DRILLING ACTIVITY LOG WELL#:[S-88-3] DATE:[10-20-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
1:20	330	JCS	made Joint drilling real good. / temp 79°F tank 62°F
1:50	350	JCS	Made Joint drilling good. / temp 83°F /
2:30	370	JCS	Made Joint drilling good / drilling a little Rough /
	375		Temp 84°F / Smoothed out drilling good.
2:55	390		made Joint drilling Fast / temp. 84°F
3:30	410	JCS	Made Joint / drilling good. / temp 88°F / drilled
350	415	JCS	drilled slow for 5 ft Air pressure went from 125 to
355			175 ? / temp. increase 91°F / drilling / slow & Fast different layers
4:40	430	JCS	made Joint / drilling slowed / temp 92°F / drilling rate is
			still slow / different layers.
5:55	450	JCS	Made Joint / drilling slow / temp
6:25	458		Hit some Rough zones torking
6:40	466		Started drilling smooth
7:00	470	JCS	made Joint / drilling faster / temp is 94°F /
7:26	475	JCS	Hitting Hard and soft layers. /
7:50	483	JCS	Still Hitting soft & Hard Layer But Not as Regular /
8:30		JHG	STOPPED TO FIX AIR LEAK ON COMPRESSOR
9:40			DRILLING 8

MEI DRILLING ACTIVITY LOG WELL#:[S-88-3] DATE:[10-20-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
8:30	490	JCS	made Joint / drilled good.
8:55	510	JCS	made Joint. /
9:33	530	JCS	Made Joint / Put oil In Air Compressor / and in Hydrostatic /
10:00	550	JCS	made Joint / temp 102°F /
10:25	570	JCS	made Joint / temp 103°F /
10:40	590	JCS	made Joint / temp
11:05	610	JCS	made Joint / temp 110°F
11:30	630	JCS	made Joint / temp
11:55	650	JCS	made Joint. / temp 112°F

MEI DRILLING ACTIVITY LOG WELL #:[5-88-3] DATE:[10-21-88]

TIME	DEPTH	INIT.	COMMENTS, FLOWLINE TEMPS, ETC.
12:00	680	Mike	drilling good 112°F
12:15	690	Mike	hit Fracture Zone 690-703 hit another Fracture Zone 680-682
12:20		Mike	Temp 114°F
12:40	710	Mike	Temp 118°F drilling good
12:55	730	Mike	drilling very good Flow Line Temp 120°F Void An 744-745.5
1:20	750	Mike	Temp 120°F
1:40	770	Mike	drilling Fast Fracture zone 748-752 Temp 120°F Bad Fractures
1:55	790	Mike	Temp 120°F Hit another Void 783 Temp 132°F Bad Fractures
2:30	810	Mike	Temp 150°F Still in Bad Fractures Temp up to 154°F Still in Bad Fracture Zone
[illegible]		Mike	820 Temp 160°F. 825 ft tep 170°F 828 ft. temp 180°F picked up some Steam
2:55	830	Mike	842 temp 200°F 3 Ft Void 847 Steam has Incresed
3:[illegible]	850	Mike	circulating hole & Spudding it getting it Clean [illegible] to
			trip out of hole
4:[illegible]0		JHG	tripping tools out of hole Pipe Count was 850 Ft
[illegible]	850 Ft	JHG	Sample 810-820 out of hole
[illegible]		Mike	Install pressur Gage on choke side of BOP, put mudpump
[illegible]		Mike	Cloch Back together
8:00		Mike	Getting aria + equment cleand up wating for instruction on hole.

Appendix B

"Slim Hole" Drilling Program

Objective: Drill/Complete exploratory hole to ±1500' TD and evaluate formation. Conductor casing 13 3/8" set at ±40', surface casing set at ±250', 6 1/4" open hole to 1500' or producing formation.

Prepared by: Jay C. Hauth, July 1988

Sequence of Operations

1. Construct location and sump per attached drawing

2. MIRU rotary drilling rig.

3. Mix spud mud per attached drilling fluids program

4. Spud well with 17 1/2" bit and drill to ±40'. Run and cement 13 3/8" conductor with Redi-Mix.

5. Visually inspect and note on Tour Sheet whether all drill pipe is white banded, specifying that it meets AAODC API Class II inspection as to the following:
    1. Electromagnetic inspection of tubes (Sconoscope or Scanalog)
    2. Wall thickness and cross-sectional area (Ultrasonic or gamma ray)
    3. Tool jt inspection (electronic or mag particle)

Also check to see that all drill collar connections have been mag particle inspected and that all bottom hole assemblies have been magnafluxed prior to delivery. Note condition on Tour Sheet. Ensure that 7" casing is on location and in position to run. Ensure all casing accessories, wellhead equipment, and circulating head are on hand.

6. RIH with 9 7/8" bit and drill with mud to ±250', depending on geology. Remove thread protectors, clean threads, drift and measure casing while drilling surface hole. Measure KB height and log on Tour Sheet. After casing point has been selected, drill any additional hole that might be required so that casing can be landed within 1' of bottome, and still space out correctly on surface. Maintain hole as straight as possible while drilling. Take drift shots every 100-200'. Run maximum reading thermometer on each survey. Maximum angle at TD 4 degrees or less. Maximum rate of change 1 degree per 100'. Monitor and record flow line temperatures every hour. Catch 2 sets of formation samples every 10'.

7. Upon reaching desired depth, circulate and condition mud until shaker screen is clean and viscosity is less than 45 sec/qt. Make wiper trip. Check for fill. If hole is in good condition, circulate bottoms up, POOH, and laydown 9 7/8" drilling assembly. If tight hole was encountered on wiper trip, then make another wiper trip. It may also be necessary to further condition mud.

8. Rig up and run 7" casing to TD, per attached casing program. Run in hole

slowly to avoid breaking down formation and losing circulation. Circulate past any bridges encountered. Use proper makeup torque on casing, and geothermal casing dope on threads.

9. Once casing has been run to TD, circulate hole clean, while reciprocating casing, with at least two full circulations. Circulate until hole is clean, mud is in good shape, and viscosity is less than 45 sec/qt. Check bottoms up time to be sure mud is not channeling.

10. When mud is in good shape, cement casing as per attached cement program. Monitor and record cement data per program. Catch cement samples as requested. Continue to reciprocate casing while pumping cement. Land casing within 1' of bottom. Center casing in rotary table.

11. WOC 8 hrs. (check samples to determine if additional time is req'd) Monitor cement in annulus. If it falls back, bring it back to surface with 1" pipe.

12. Land and cut off 7" casing. Weld on 7" x 300 SR Starter flange. Test between welds. Check with level to be sure flange is on correctly. Callout surveyors to survey casing head location.

13. Make sure that BOP equipment has been inspected by the manufacturer or an authorized agent prior to arrival and that all equipment is proper and in good shape on delivery. All BOP rubbers are to be high-temperature/geothermal quality. Nipple up BOP equipment per attachment. Test 7" casing and BOP equipment to 500 psi with BLM representative present to witness. Log test data and request BLM witness to sign name and successful test completion on Tour Sheet.

14. Trip in hole with 6 1/4" mill tooth bit and tag cement. Log top of cement on Tour Sheet. Drill out baffle plate, cement and float shoe from 7" csg with spud mud. Drill 10' of formation and then trip to pick up button bit or hammer/hammer bit. If the decision is made to air drill, run float in bit sub and unload mud out of hole with air on the trip back in. If the decision is made to drill with mud, then displace the spud mud out of the hole with the gel/water/polymer system when you reach bottom with bit. See attached mud system details.

15. Drill 6 1/4" hole with air, foam, or mud to 1500', or until producing formation is encountered. Test formations per engineer's direction, log per permit and engineer/geologist requirements. Operate BOP on each trip out of hole and log on Tour Sheet. Ensure accumulator is holding pressure.

16. Upon reaching TD, circulate hole clean, laydown drill string, ND BOPs, clean location and release rig.

17. Submit all reports as required by regulatory agencies.

Drilling Fluids Program

17 1/2" and 9 7/8" surface hole, 0- ±250'

Mud System: Gel, lime, water, LCM (Spud Mud)
Mix 15-20 Lb/Bbl bentonite in fresh water. Flocculate with lime.

Weight: As low as possible with mechanical solids control equipment

Viscosity: 45-55 sec/qt or as needed to clean hole

Water loss: No control

Total hardness: No control

pH: Mix lime through chemical barrel to maintain 9.5-10.5 pH

Comments: Lost circulation through this interval is possible. No formation pressures are anticipated. Keep plastic viscosity down and yield point up. Run solids control equipment continuously. Break circulation slowly and trip slowly. Use Desco to thin mud if necessary.

6 1/4" Hole, ±250' - TD

Mud system: Polymer, gel, soda ash, Desco, high temp thinner. Drill out cement with Spud Mud and then dump Spud Mud. Build new system. Mud up in clean steel pits by mixing, with fresh water, 1/2 lb/bbl caustic soda and a ratio of 8 bentonite to 1 Drispac regular. Mix bentonite first and then slowly add (30 min/sk) Drispac. (Substitute a high molecular weight anionic liquid polymer such as Magcobar Rapid Mud for Drispac if so desired)

Weight: As low as practical with water and mechanical solids control equipment.

Viscosity: 38-45 sec/qt with bentonite and Drispac (8:1 ratio of bentonite:Drispac) Stay on this ratio to maintain viscosity after Mud-up.

Water Loss: No control

Total Hardness: Below 300 ppm with soda ash.

pH: 9.5-10.5

Rheology: Control flow properties at reasonable levels with Desco thinner. If downhole temperatures increase to where Desco is not effective, then use high temp thinner

Torque, Drag, Hole Stability, and high temp lubricant: Add 2 ppb Soltex additive as necesary.

Lost Circulation (surface to TD): Methods to be used as follows:
1. Lost circulation materials such as nut plug, cotton seed hulls, saw dust, medium Kwik-Seal, etc.
2. Gunk Squeezes
3. Cement
4. Lighter-than-water drilling fluids

Abnormal Presure: Weight material (barite) should be on location at all times.

Corrosion: Add corrosion inhibitors such as oxygen scavengers or scaling amines to control corrosion.

Stable Foam Make-up:
Mix 1/2 - 2 ppb Drispac in water
1-2 ppb soda ash
5-10% foamer just before use (use alpha olefin sulfonate for high temp foamer)
Air-Mud ratio required = 100:1 to 300:1

Special considerations:
1. Drilling recorder to monitor rate of penetration
2. Catch drill cutting samples (2 sets) every 10', cleaned, sacked, and labeled in accordance with geologist direction.
3. All lost circulation zones encountered shall be recorded in Tour book, recording both the depth at which the loss occurred, as well as amount and rate of fluid lost.
4. In and Out temperatures, both mud and air, shall be recorded in Tour book every hour.
5. Temperatures should be taken with every directional survey by running a maximum registering thermometer in the survey instrument.

Casing Program

Conductor casing: ±40' 13 3/8" 61 ppf J-55 BT&C in 17 1/2" hole

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Surface Casing: ±250' x 7" J-55 20 ppf ST&C Range 2 Casing

Torque: 3200 ft-lbs

Drift ID: 6.331"

Strength ratings:
- Yield - 2992 psi
- Collapse - 1816 psi
- Tension - 187,200 lb

Accessories:

Float equipment: flapper type conventional float shoe on bottom of string and baffle plate installed one jt up from bottom

Centralizers: 2 centralizers installed in the middle of the bottom 2 jts (7" x 9 7/8" bow type)

Wellhead equipment: 7" x 300 SR SOW starter flange for wellhead. 300 SR gate valve for master valve.

Notes:

- Tack weld shoe, also top and bottom of couplings on bottom three jts
- Lower casing in hole slowly to avoid formation breakdown and lost circ.
- Use geothermal grade thread dope on casing threads

Cementing program

±250' x 9 7/8" hole x 7" casing surface job

Slurry description: API Class "G" or "H" cement mixed with 5.0 gal/sk water

Requires: .2301 sk/linear ft in 9 7/8" annulus

Slurry wt: 15.8 lbs/gal or 118 lbs/cu. ft.

Yield: 1.15 cu.ft./sk

Water requirement: 5.0 gal/sk or 0.67 cu.ft./sk

Pump time: 1-2 hrs

24 compressive strength: 2915 psi

7" J-55 20 ppf ST&C casing displacement= .0404 bbl/linear ft or .2273 cu.ft./linear ft.

Note: calculate cement job with 100% excess in open hole; 50% in cased hole is OK.

Cementing Procedure:

1. Make prior arrangements with Redi-Mix company to have required amount of class "G" or "H" cement on hand. Inquire as to how much notice they will require to load the cement and drive to location. Advise them that you will need the truck clean and free of rocks or chunks of cement prior to loading. Tell them that you wish the cement loaded and hauled to location dry, and that you will add the water on location just prior to pumping.

2. Make sure you have circulating head on location prior to running casing.

3. Call out Redi-Mix truck, giving required amount of advance notice, so that he will arrive on location before you are ready to cement.

4. While you are circulating, rig up 10 bbl stock tank so that you can reach it with the rig pump suction and so that the Redi-Mix truck can unload into it. Have large mesh grating on hand so that you can screen out any large rocks from cement slurry prior to reaching the pump suction.

5. When you are finished circulating and conditioning mud, rig up to cement, add the mixing water to the cement and mix up the cement slurry.

6. Pump 5 bbl water down the 7" csg ahead of the cement. Start dumping the cement slurry from the truck into the stock tank (screening out large rocks with the grating) and begin pumping the slurry inside the 7" casing with the rig pump.

7. When all the slurry has been pumped, drop the top plug and displace the slurry out of the 7" csg with mud. Bump the plug with 250-300 psi. Do not over-displace more than 1/2 the volume of the shoe jt to bump the plug. Note the following on Tour Sheet:

1. Time begin mixing cmt.
2. Time begin pumping cmt.
3. Time begin displacement
4. Time received cmt returns to surface
5. Time plug bumped, or time finished displacing

Clean all cement out of rig pump, lines, and stock tank.

8. WOC 8 Hrs. (Check samples to see if extra time is required) Monitor cement in annulus. If it should fall back, bring back to surface with 1" pipe.

9. Land 7" csg, cut off, weld on wellhead, and start NU BOP equipment.

H2S Safety

The H2S safety company will be called out to perform certification training, install and maintain properly operating H2S monitors, and provide on-location advice and expertise regarding safety related items. The monitors will be rigged up prior to spudding the hole, and the safety man will be available on location after drilling out the production casing.

In all matters of safety, the H2S safety man has the FINAL WORD on procedures.

H2S monitors will be installed at the following locations:

1. Mud return line
2. Vicinity of floor
3. Vicinity of wellhead/BOP's
4. Additional locations per Safety Man direction, MEI/contractor recommendations.

Windsocks will be installed as to be visible from various areas of location. An H2S warning sign (with green/yellow/red warning flags) is to be installed on the access road, and the appropriate flag will be displayed, depending on current operations. Two different briefing areas will be established, to allow safe briefing in any wind condition. Emergency breathing equipment (5 min. and working-size Scott Air Packs; workline hose; high-pressure air bottles in safety trailer, etc.) will be available.

Prior to spud, all rig personnel shall successfully complete an H2S training/certification course presented by the safety man. This will include Air Pack use, operation and location of H2S monitors around the rig, location and use of briefing areas, and general information regarding safety. Throughout drilling operations, rig personnel will have procedural update briefings, safety meetings, etc., as needed.

H2S ALARM PROCEDURE
POST PROMINENTLY IN DOGHOUSE

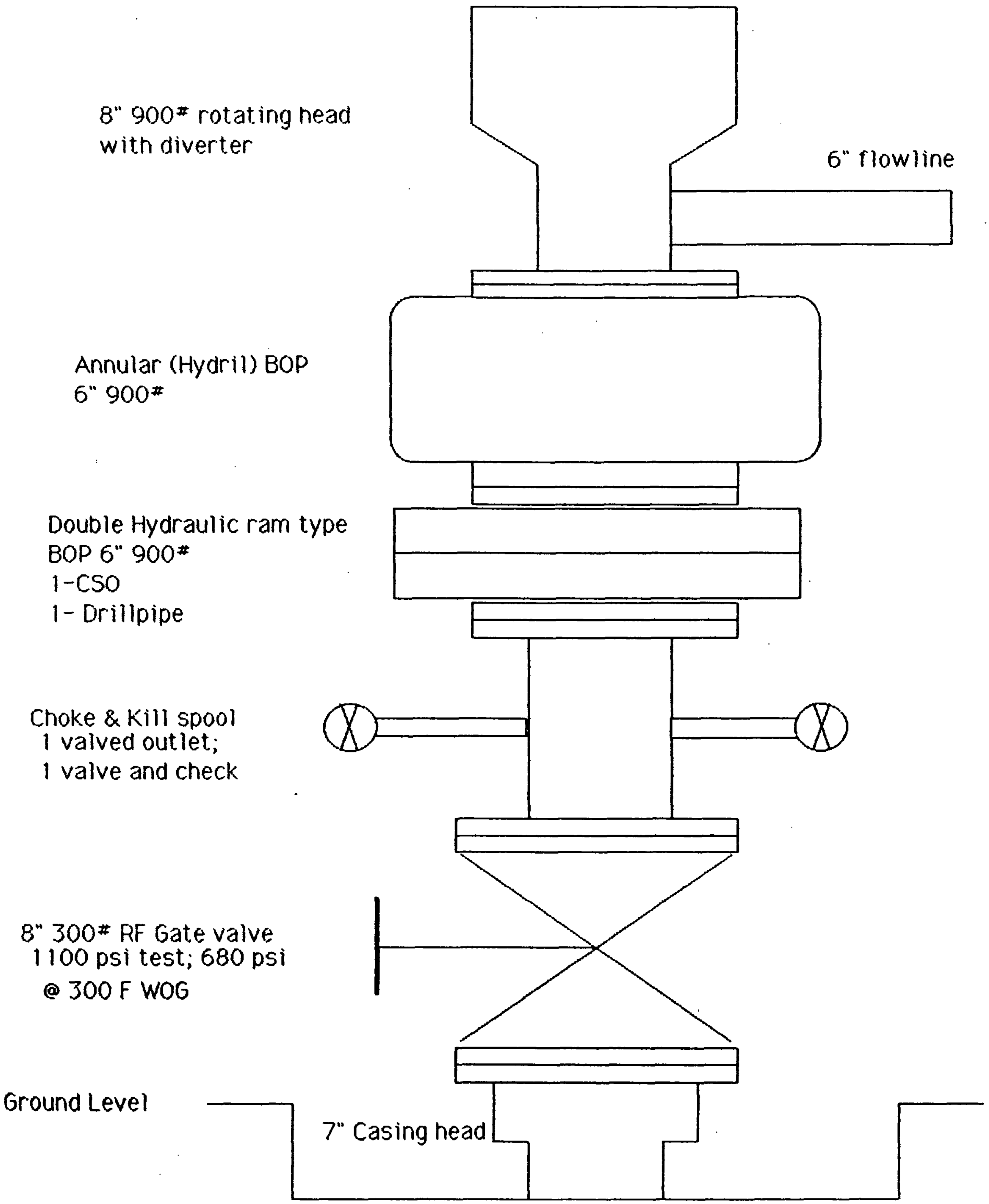
IN CASE OF H2S ALARM:

1. MASK UP WITH ESCAPE UNIT

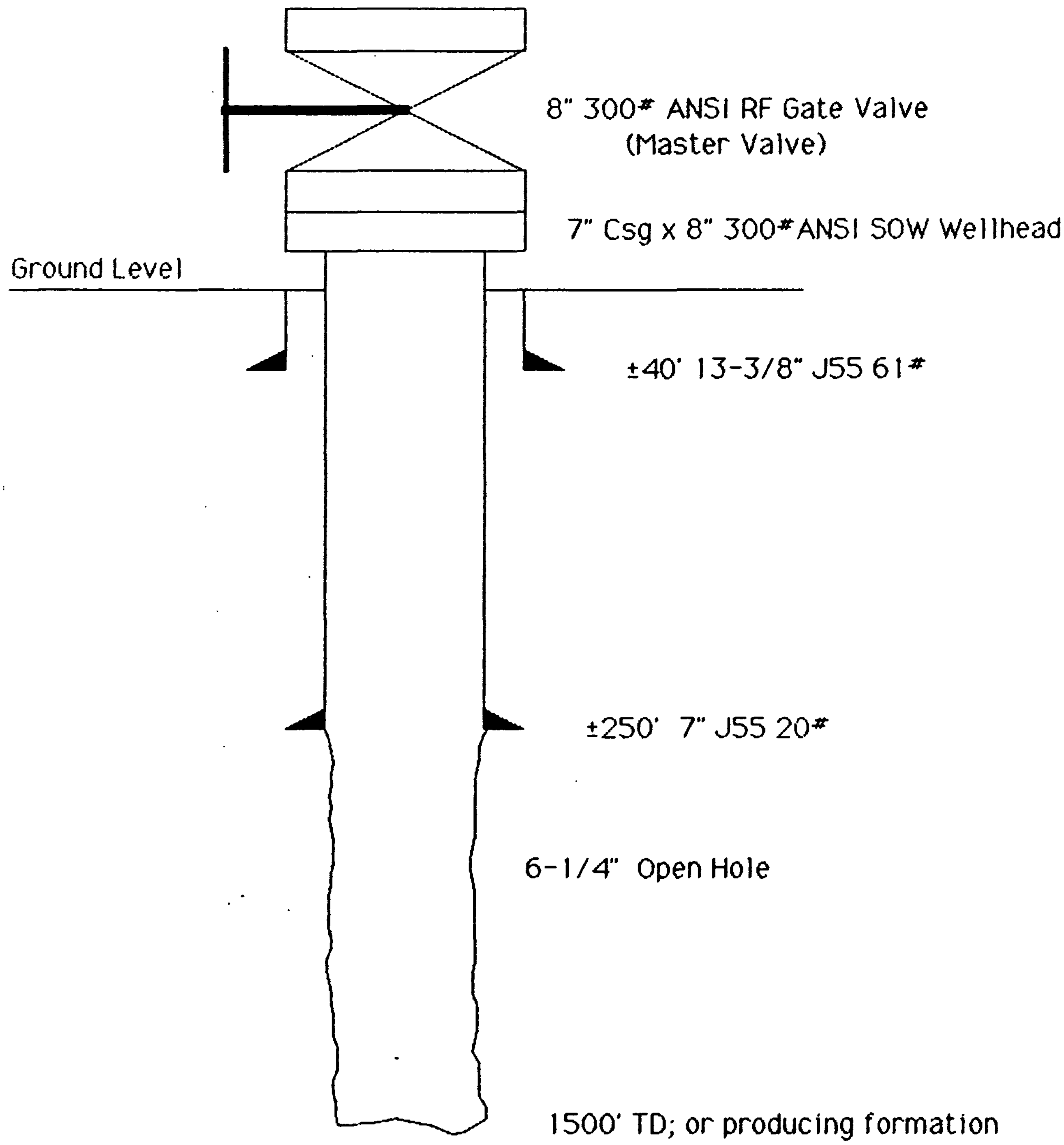
2. GO IMMEDIATELY TO THE UPWIND BRIEFING AREA

NO EXCEPTIONS UNLESS DIRECTED BY H2S SAFETY MAN ON LOCATION

Blowout Preventer Details; 7" casing



Slim Hole Completion Details



Not to Scale

Mother Earth Industries Emergency Notifications

All numbers are 801 area code unless otherwise specified

Name	Comments		Phone
Geothermal Power Plant	Main line		527-4641
	MEI Field Office		527-4734
Mother Earth Industries	Jay Hauth	ofc	263-8300
		res	268-9369
	Wayne Portanova	ofc	(602) 998-3991
		res	(602) 488-9475
	Maureen Haak	ofc	(602) 998-3991
		res	(602) 488-3247
	Darrell Jackson	res	(801) 743-5363
Provo City Power	George Morse	ofc	379-6840
	Steve Christensen	res	438-2672
	Don Fry	res	375-9580
Beaver Valley Hospital		ambulance	438-2416
Fillmore Community Medical Center			743-5591
Delta Community Medical Center			864-5591
Beaver County Sheriff (Beaver)			438-2862
Millard County Sheriff (Fillmore)		ambulance	743-5302
Millard County Sheriff (Delta)		ambulance	864-2755
Utah Highway Patrol (Cedar City)			586-9445
Delano Development Corp	Fee Land : Tom Canada		(812) 334-2618
BLM (Richfield)	Larry Oldroyd	ofc	896-8221
BLM (Fillmore)	Dave Henderson	ofc	743-6811
	Toby Manzanares		
BLM (UT state office)	Howard Lemm	ofc	524-3029
		res	486-5820
	Robert Henricks	ofc	524-3023
		res	484-2294

Mother Earth Industries Emergency Notifications

Forest Service (Beaver Ranger Dist.)	Darwin Jensen Fred Houston George Perkins		438-2436
Bell Safety (Evanston) H2S Safety	John Richter	(307)	789-4013
Penny Construction (Fillmore) Heavy equipment		ofc:	743-6978
Reed Penny		res:	743-5584
Larry Mostrong (Fillmore) Welding			743-5552
RMICO (Milford) Equipment, roustabout, welding			387-2451
		24 hr:	387-2202
Cudd Pressure Control (OK City) Well fighting		(405)	681-2328

JCH 6/27/88

Appendix C

LITHOLOGIC LOG OF MEI WELL S-88-3

Prepared for
Mother Earth Industries, Inc.
7350 E. Evans Road, Suite B
Scottsdale, Arizona 85260

By
Joseph N. Moore
Salt Lake City, Utah

January, 1989

SUMMARY

S-88-3 was drilled to a depth of 850 feet. Steam is reported to have been encountered at depths of 823 feet and from 843 to 846 feet (Columbia Geosciences, 1988). Samples collected from the surface to 820 feet indicate the well was drilled into variably altered ash-flow tuffs of the Three Creeks Tuff. Stratigraphic relationships in the upper three hundred feet of the well suggest that it may have penetrated several landslide blocks bounded by low angle faults. The well was sampled to a depth of 820 feet. Between 750 and 820 feet the ash-flow tuffs are intensely altered and silicified. Mineralogically and texturally similar silicified zones have been identified in each of the productive wells drilled by MEI. The occurrence of silicified rocks at generally similar depths throughout the area, and the presence of fluid inclusions consistent with present conditions in S-88-1, suggests that this alteration may be related to shallow dipping fault zones underlying the Sulphurdale area. Such faults are known to bound the landslide blocks mapped within this area.

STRATIGRAPHY

Well S-88-3 was drilled entirely within variably altered alluvium and ash-flow tuffs. A lithologic log based on an examination of the cuttings with a binocular microscope is attached.

The upper 80 feet of the well consists of unconsolodated alluvium containing fragments of Three Creeks Tuff, silicified breccia, minor scoria, and traces of flow banded rhyolite. The fragments of scoria are relatively small and angular. No cinder or ash deposits have yet been identified within the Bullion Canyon volcanics. Thus, the scoria probably represents fragmental material deposited during recent eruptions of the Cove Fort

Volcanco. These alluvial deposits are underlain by approximately 30 feet of biotite-rich Three Creeks Tuff.

A fine-grained ash-flow tuff(?) that is lithologically similar to the unit we have informally designated the lower portion of the lower cooling unit of the Three Creeks Tuff was encountered between 125 and 225 feet. The cuttings consist of approximately 30% randomly oriented phenocrysts of plagioclase altered to clay, magnetite, and hornblende in a reddish brown matrix. This fine-grained ash-flow(?) is significantly thinner and occurs at a much shallower depth than in other MEI wells suggesting that it is in fault contact with the underlying coarse-grained Three Creeks Tuff. While no definitive evidence of faulting (e.g. brecciation) was observed in the cuttings, minor quartz veining is present near this contact. Thus, a fault contact is possible.

The rocks penetrated by the well between 225 and 800 consist of variably welded and altered Three Creeks Tuff. These ash-flow tuffs are coarse-grained and contain approximately 50% phenocrysts of plagioclase, biotite, and quartz with beta morphology in a matrix of ash and fine-grained shards. The matrix ranges from dark gray in the densely welded zones to white and light gray in the poorly welded zones. The distribution of individual zones is noted in the accompanying log. The rock is identical in mineralogy and texture to the upper portion of the lower cooling unit of the Three Creeks Tuff logged in other wells.

The rocks are strongly altered below 750 feet. Between 750 and 800 feet relict textures preserved in the cutting suggest that these altered rocks are similar to the coarse-grained ash-flows tuffs occurring above 750 feet. Below 800 feet the primary textures of these rocks have been obliterated.

ALTERATION

The alteration present in S-88-3 can be divided into three types. These include:

1. low temperature acid alteration between the surface and 80 feet,
2. argillic alteration between 80 and 750 feet, and
3. silicification between 750 and 820 feet.

Alteration of the alluvium consists mainly of coatings of white, colorless (gypsum?) and orange (jarosite?) precipitates, hematite, opal, and clay on the small rounded fragments within the cuttings and the replacements of feldspar phenocrysts by clay. Pyrite, associated with radiating crystals of marcasite(?) are present in the lower 10 feet (70 to 80) of this interval. The mineral assemblage found in the alluvium is typical of acid altered rocks associated with fumarolic activity, and is similar to the mineral assemblages found within the Sulphurdale pit.

In a few of the cuttings samples, the opal appears to cement fragments contained within the alluvium. However, no layering typical of hot-spring deposits was observed. The presence of sulfates and jarosite(?) associated with the opal suggests that the silica has been remobilized by downward or laterally migrating acid sulfate solutions and not to upwelling hydrothermal fluids. Acid fluids are commonly produced in areas where hydrogen sulfide can condense in surface waters (or condensate) to produce sulfuric acid. This process is actively occurring in the Sulphurdale pit. The formation of marcasite and pyrite is consistant with this interpretation. Both minerals are found in the acid altered rocks of the Sulphurdale pit.

Argillic alteration of the rocks in S-88-3 typically varies from moderate to strong as indicated by the extent of feldspar replacement by clay. Alteration to clay is most intense in the poorly welded rocks. In these zones (for example between 410 and 440 feet), both the feldspar phenocrysts and the matrix of the ash-flow tuffs are highly altered whereas in more densely welded zones (for example between 285 and 410 feet), the feldspars are only partially altered.

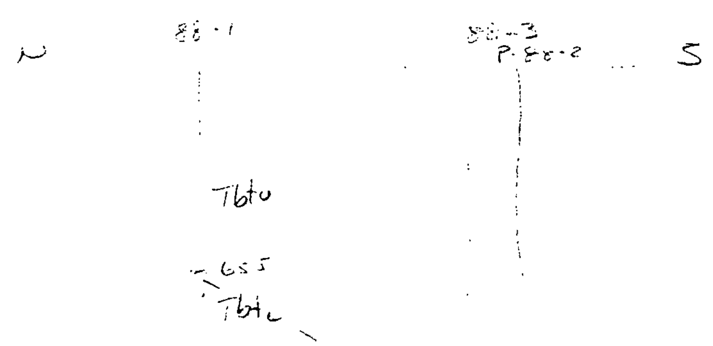
Pyrite is common in the argillically altered rocks. Typically the pyrite forms small mm size aggregates that replace biotite. Less commonly, the biotite is replaced by magnetite (e.g. 670 to 690 feet). Veinlets containing various proportions of quartz, clay, hematite and pyrite are also found throughout the well. Veinlets containing clay are most common in the upper 250 feet of the well.

Strongly silicified rocks that in places contain abundant pyrite are restricted to depths below 750 feet. This alteration has obliterated many of the primary textures of the rocks making identification of the original rock type very difficult, particularly below 800 feet. The presence of angular "fragments" within individual cuttings samples suggests that destruction of the primary textures in these rocks is in part due to brecciation prior to silicification.

STRUCTURAL RELATIONSHIPS

In contrast to many of the other wells studied to date, the rocks in S-88-3 are characterized by widespread veining and alteration, suggesting that they have been extensively fractured. The stratigraphic relationships and alteration observed in this well suggest that a major fault was intersected below 750 feet. Although the orientation of this fault zone cannot be determined from this well, the widespread occurrance of silicified rocks at similar depths in other wells suggests that the silicification may be related to a series of low angle faults. Major low angle faults which bound large scale gravitational glide blocks have been documented at Sulphurdale by Moore and Samberg (1978). Alluvial cover and the lack of stratigraphic marker horizons prohibited detailed mapping of the glide block near Sulphudale at that time. However, they were able to show that to the north, where the glide block is well exposed, it is composed of numerous individual stacked landslides. Thus, many of the fault segments mapped near Sulphurdale may be shallow dipping at depth. A second low angle structure may bound a gravitational glide block that contains the fine-grained ash flow penetrated in the upper portion of the well. Similar structures below 700 to 800 feet may be the primary conduits for the migration of steam within the area drilled by MEI. If this is the case, then a series of vertically stacked steam-bearing fractures may be present.

An important difference in the lithologic columns of S-88-1 and 3 is the depth to the fine-grained ash-flow that forms the lower portion of the lower cooling unit. This unit was encountered at 655 feet in S-88-1 but was not found in the lower portion of S-88-3. This relationship could be caused by a fault between the two wells. Alternatively, the contact between the fine and coarse grained ash-flows may dip to the south toward the fault that bounds the southern margin of the Sulphudale pit. The latter alternative, is consistant with the apparent dip of this unit between S-87-1 and S-87-4.



REFERENCES

Columbia Geoscience, 1988, Well S-88-3: Lithology: unpublished report to Mother Earth Industries, 11 p.

Moore, J. N., and Samberg, S. M., 1978, Geology of the Cove Fort-Sulphurdale KGRA: University of Utah Research Institute Report, 48 p.

DEPTH	GRAPHIC LOGS: ALTERATION (1. WEAK 2. MOD. 3. STRONG): Feld-spar, PY, silic, hem	GRAPHIC GEOLOGY	VEINLETS (Tr. TRACE 1. WEAK 2. MOD. 3. STRONG)	DESCRIPTIONS
0–50				0-80: Alluvium: Acid altered fragments of Three Creeks Tuff, scoria, silicified breccia, flow banded rhyolite. Fragments are locally cemented and coated with opal colorless, white and orange precipitates (sulfates and jarosite?) Feldspars completely altered to clay.
50–150				70-80: radiating crystals of marcasite?
150–200			clay clay	80-125 Gray, coarse grained biotite rich Three Creeks Tuff. Feldspar phenocrysts completely altered to clay; biotite partially altered to pyrite
200–250			Q, clay Q+Hem	85-95: small rounded aggregates of pyrite are common.
250–300			Q	125-225 Brownish-red fine-grained ash-flow tuff containing approximately 30% phenocrysts of feldspar altered to clay hornblende, and magnetite.
300–400			Q Q+Py	Lithologically similiar to the lower part of the lower cooling unit of the Three Creeks Tuff. Fragments of caved alluvium common between 115 and 165 feet.
400–450			Q	165-180: veinlets of orange stained clay?
450–500			Q	

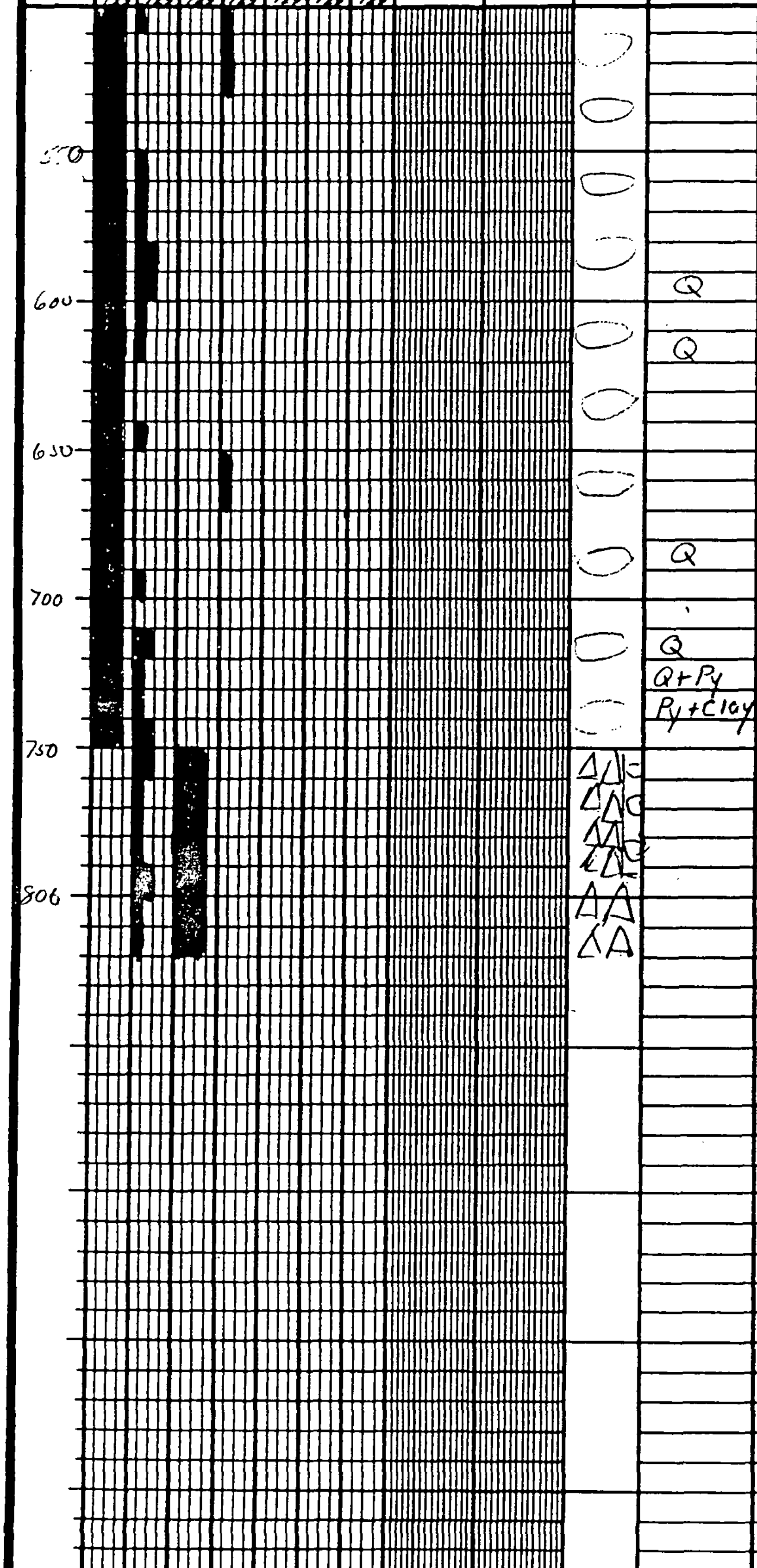
DRILL HOLE S-88-3

LOCATION

LOGGED BY

GRAPHIC LOGS

DEPTH	ALTERATION (1. WEAK 2. MOD. 3. STRONG): Arg alt. · Py · Silic. · hem	GRAPHIC GEOLOGY	VEINLETS (TR TRACE 1. WEAK 2. MOD. 3. STRONG)	DESCRIPTIONS



225-250 Lt to med gray coarse-grained Ttc, abundant biotite, bipyramidal qtz feldspar partially altered to clay; matrix partially altered to clay fragments of fine grained lava common,

250-260 white punky coarse grained Ttc, feldspar and matrix completely altered to clay, lacks fragments of fine grained lava

260-280 cement

285-350 white coarse grained ttc, feldspar partially altered to clay

280 fine grained aggregate of pyrite

350-410 dark gray coarse grained ttc feldspar partially altered to clay

370 - fragment of silicified breccia

410-440 white coarse grained Ttc, abundant pyrite, matrix altered to clay, feldspar strongly altered to clay

410, quartz veins

440-450 cement

450-470 dissaggregated coarse grained Ttc traces of pyrite, bio generally fresh, feldspars altered completely to clay

DRILL HOLE S-82-3

LOCATION

LOGGED BY

DEPTH	GRAPHIC LOGS: ALTERATION (1. WEAK 2. MOD. 3. STRONG)	GRAPHIC GEOLOGY	VEINLETS (Tr. TRACE 1. WEAK 2. MOD. 3. STRONG)	DESCRIPTIONS
				470-490 coarse grained Ttc, abundant yellow stained clay replaces plagioclase;
				490-630 medium gray coarse grained Ttc; feldspar completely altered to clay, minor pyrite
				510-530 traces of hematite after biotite and magnetite
				630-750 light gray coarse grained Ttc; feldspar completely altered to clay
				650-670 magnetite cubes common; in part they appear to replace biotite, some of the magnetite is altered to hematite
				750-800 variably silicified ash-flow tuff. 10-20% of chips display intense argillic alteration of relict textures. Their coarse grain size and presence of quartz phenocrysts suggest rock is coarse grained Ttc as above, pyrite locally abundant
				800-820 intensly silicified rock. All primary textures have been obliterated

DRILL HOLE S-88-3

LOCATION

LOGGED BY

Appendix D

MEI S-88-3

Lithology

A cursory review of the cuttings from hole S-88-3 has been conducted with the aid of a binocular microscope, on location, while drilling was in progres. The results of this preliminary review follow.

0-5 ft.	Angular to rounded pebbles ranging from 0.3 to 2 cm, composed predominantly of metasedimentary rocks with minor volcanic rocks. Angular fragmernts from larger pebbles and cobbles suggest coarse material at least up to 8 cm in the alluvium. Minor reddish scoria fragments are present in the sample, typically as angular fragments less than 0.5 cm. Occasional angular fragments of gray-white precipitated cryptocrystalline silica (sinter ?) are present.
5-10 ft.	a/a with sub-rounded pebbles up to 5 cm present in the sample. Note that the samples have been well washed, removing most silt and clay size fragments that may have been present.
10-15 ft.	55% Brown to gray to near white pebbles and pebble fragments composed of meta-sedimentary rocks. The pebble surfaces have a rounded to subrounded shape. 40% Gray to white angular fragments of precipitated cryptocrystalline silica. Some of the fragments appear to be hot spring or sinter deposits while others show silica cementation of silt and pebbles (sub-hot spring ?). 5% Orange to red angular scoria fragments typically under 0.5 cm.

Gray clay clots are present in the sample, and may in part represent the fine fraction of the sample that was not completely washed away. Note that this portion of the hole was drilled with bentonite mud, appx 9.5 weight and appx. a 40 viscosity.

15-20 ft.	as above, with an increase in the amount of scoria fragments and a decrease in the amount of cryptocrystal- line silica.
20-25 ft.	5% Red to orange scoria fragments. 5% Cryptocrystalline silica, sinter and silica cementation of silt and clay (sub-hot spring deposits). 90% Subrounded to rounded pebbles predominantly of metasedimentary rocks.
25-30 ft.	Generally as above, though now with minor gray welded silicic tuff fragments.
30-35 ft.	Similar to above, with some red-gray to gray angular to subangular welded tuff fragments up to 5 cm long. One large fragment contains fresh biotite phenocrysts.
35-40 ft.	40% Gray subangular gray silicic welded tuff fragments. 35% Subangular to rounded metamorphic pebbles. 20% White to buff-gray angular cryptocrystalline silica (sinter and sub-hot spring deposits) fragments up to 1 cm.
40-45 ft.	Similar to above, with a slight increase in the amount and size of metasedimentary pebbles.
45-50 ft.	50% Variably altered light gray to gray silicic tuff and minor red scoria fragments. 30% Metasedimentary pebbles. 20% Cryptocrystalline hot spring and sub-hot spring silica. Note, clots of soft gray clay in the washed sample suggests that a significant amount of silt and clay size particles may be present as part of the sample prior to washing.
50-55 ft.	As above, with an increase in the amount of metasedimentary pebbles.
55-60 ft.	As above.
60-65 ft.	As above, with occasional fragments of biotite-bearing silicic lava or tuff.

65-70 ft.	As above, with an increase in the amount of soft light brown-gray clay in the sample.
	TOP OF BEDROCK
70-75 ft.	65% Gray pyrite-bearing quartz-biotite-feldspar silicic welded tuff. The quartz crystals show evidence of resorption and embayments. Rarely stubby dipyramidal quartz crystals up to 2 mm long are observed. The biotite books appear to be moderately fresh. Secondary pyrite typically occurs as micro to fine crystalline clusters. 25% Scoria fragments, metasedimentary pebbles, etc. 10% White to gray cryptocrystalline silicic hot spring and sub-hot spring deposits.
75-80 ft.	55% Gray quartz-biotite-feldspar crystal tuff with minor pyrite clusters. 35% Rounded to subrounded pebbles of metasedimentary rock. 10% White to light gray cryptocrystalline silica.
	CASING
80-85 ft.	>95% Gray quartz-biotite-feldspar crystal tuff showing local silicification. Occasional fragments contain secondary pyrite clusters. In part the microcrystalline pyrite has been formed at the expense of biotite phenocrysts. The quartz crystals show minor to well developed resorption texture. Subhedral biotite crystals, up to 0.6 cm, range from moderately fresh to moderately altered. A few of the tuff fragments show purple-gray hematite. The pyrite appears, in part, to be forming at the expense of and subsequent to the hematite. Note, the crystal tuff shows no flow banding, no eutaxitic texture, and no recognizable fresh or devitrified glass shard matrix. The term 'tuff' is used here only tentatively. <5% Fragments of red scoria and strongly silicified tuff.
85-95 ft.	As above, with many fragments appearing to have undergone silica metasomatisation. Secondary sulfides are common. Note, the color of the sulfides range from bright silver- yellow to gray, indicating more than pyrite, and possible surficial oxidation of some pyrite.
95-105 ft.	As above, with an increase in the amount of clay alteration within the tuff.
105-115 ft.	As above, with about 5% brown-gray casing cement.

115-125 ft. 75% Gray quartz-biotite-feldspar crystal tuff with appears to have undergone some silica metasomatisation. Some of the biotite books have been partially replaced by microcrystalline pyrite.
15% Various morphologies of fine to cryptocrystalline silica, ranging from buff to white crystal clusters, showing no clear crystal habits. Some of the silica range to dark gray-brown chalcedony. Minor pyrite clusters, occasionally containing clots of secondary white clay.
Traces of orange-red angular scoria fragments.

125-135 ft. 55% Gray quartz-biotite-feldspar crystal tuff which appears to have undergone some silica metasomatisation. Secondary microcrystalline pyrite is present. A few of the tuff fragments contain light gray clay alteration. The crystal population in this sample is less than that of above samples.
35% Purple-gray, strongly clay-altered, feldspar bearing tuff with trace amounts of relict biotite. No quartz crystals are observed, though a few mm-size silica veinlets are observed. A few of the fragments show a progression of gray, partially silicified, tuff subsequently undergoing clay with rare hematite alteration. Many of the fragments show both feldspar and groundmass altered to clay.
10% Microcrystalline silica fragments, and minor orange- red and orange-yellow scoria and palagonite fragments.

135-145 ft. As above with purple-gray clay and hematite altered tuff making up about 60% of the sample and the gray crystal tuff fragments making up about 30% of the sample. Lithic fragments are identifiable in the purple-gray tuff, suggesting that it originally was a crystal and lithic bearing tuff. Note, traces of secondary pyrite observed.

145-155 ft. As above.

155-165 ft. As above, with continued traces of pyrite clusters.

165-175 ft. 60% Gray to green-gray moderately clay altered tuff with local pyrite and minor sub-mm silica veins.
40% Dark purple-gray welded crystal lithic bearing tuff with minor localized sulfides (predominantly pyrite).

175-185 ft. As above, with about 65% dark purple-gray welded tuff.

185-195 ft. 100% Gray to purple-gray crystal lithic bearing welded tuff with minor quartz vein fragments.

195-205 ft. As above, with welding of the tuff ranging from very light to very strong, to the point that some lithic fragments have lost their definition. Note, about 2% of the fragments are white vein minerals consisting of silica and softer minerals (calcite and/or zeolite?).

205-215 ft. 60% Dark purple-gray highly welded tuff.
40% Gray to green-gray moderately welded tuff with some fragments showing clay alteration, followed by silicification.

215-225 ft. As above, with relict biotite identifiable in the gray to locally green-gray silicified tuff. The sample shows 60% green-gray moderately welded tuff and 40% purple-gray more welded tuff.

225-235 ft. 80% quartz-biotite-feldspar crystal tuff ranging from purple-gray with rather fresh crystals, to green-gray with clay alteration and moderate silicification.
20% Purple-gray strongly welded crystal lithic tuff.

235-245 ft. 100% Quartz-biotite-feldspar tuff with irregularly distributed silicification and minor silica veinlets. Minor secondary pyrite is present. Traces of orange-yellow to brown hydrous Fe oxide alteration is observed on a few fragments.

245-250 ft. As above, with a slight increase in the amount of secondary pyrite, locally forming at the expense of biotite.

CASING

250-260 ft. Gray quartz-biotite-feldspar tuff. Note, the term 'tuff' is used tentatively here as no eutaxitic or flow or glass shard texture is observed. The groundmass and feldspar crystals are altered to a white to gray, locally to green-gray clay. Much of the biotite crystals are altered to a light golden color. Locally hematite bearing zones or seams appear to be associated with silicificaton that preceded clay alteration. No secondary pyrite is observed.

260-270 ft. 55% Gray soft casing cement or ash (no HCl at hand).
35% Light green to light green-gray soft, almost soapy, sheared tuff.
10% Gray to red-gray quartz-biotite-feldspar tuff.

270-280 ft. As above.

280-290 ft. 95% Gray quartz-biotite-feldspar tuff with many fragments containing fine crystalline secondary sulfides (predominantly pyrite). Many fragments show clay alteration, especially of the feldspar crystals.

290-300 ft. 95% Gray crystal tuff as above, with a decrease in secondary pyrite, and a marked increase in the amount of clay alteration.
5% Dark gray, locally red, welded vitric tuff with some feldspar (sanidine ?) appearing to be fresh. This tuff may have undergone some silicification.

300-310 ft. As above with 15% of the rock sample composed of dark gray and red silicified welded tuff.

310-320 ft. 90% Light gray strongly clay altered quartz bearing biotite tuff with only minor biotite. Many of the fragments contain microcrystalline pyrite, which apparently has been unaffected by the clay alteration.
10% Purple-gray slightly silicified quartz-biotite-feldspar tuff with variable, though minor, clay alteration.

320-330 ft. As above, with a marked reduction in the purple-gray biotite tuff fragments. Secondary pyrite is more common than above, and is observed to be locally replacing biotite.

330-340 ft. Gray quartz-biotite-feldspar tuff, as above, with an overall reduction in the amount of clay alteration. Fewer fragments contain secondary pyrite.

340-350 ft. As above, with minor soft light green waxy sheared fragments. Occasional fragments of highly welded vitric tuff are also present.

350-360 ft. 100% Dark gray to gray quartz-biotite-feldspar tuff with very localized fine crystalline pyrite.

360-370 ft. As above, with localized and irregular silicification and minor white silica veinlets. Secondary pyrite is rare.

370-380 ft. As above, with no significant clay alteration.

380-390 ft. As above.

390-400 ft. As above.

400-410 ft. As above, with occasional fragments containing abundant microcrystalline pyrite.

410-420 ft. 70% Light gray moderately to strongly silicified. The rock may have undergone an episode of clay alteration prior to the silica metasomatisation. Most of the

original texture has been lost. Secondary pyrite occurs irregularly, often in isolated clots.
30% Dark gray to purple-gray quartz-biotite-feldspar crystal tuff. The quartz tends to be anhedral and shows the effects of resorption. The biotite is generally euhedral, and variably altered. The feldspar crystals are subhedral to anhedral and show some indication of resorption.

420-430 ft. As above, with 90% of the sample consisting of light gray silicified tuff.

430-440 ft. As above, though the sample contains some slough from up hole.

440-450 ft. Very small sample volume, which appears to be made up predominantly slough. The hole was not being cleaned of cuttings effectively at this time. Fractures may be taking some of the drilling air.

450-460 ft. Predominantly sand-size cuttings, possibly due to reworking of the cuttings due to poor cleaning of the hole. Torqueing and rough drilling indicates fractures in the formation.
The cuttings are a light gray silicified crystal bearing tuff with two distinct feldspar population, a white anhedral feldspar partially altered to clay, and small plagioclase laths now totally altered to clay. Minor secondary pyrite is present.

460-470 ft. Predominantly fine cuttings, as above.
Traces of soft light green sheared rock is present in the sample.
Occasional sand size fragments are stained yellow-brown from recently formed hydrous Fe oxides.
The small amount of cuttings fragments larger than sand size include both quartz-biotite-feldspar tuff and light gray crystal bearing silicified tuff.

470-480 ft. 50% Dark gray to purple-gray quartz-biotite-feldspar crystal tuff.
50% Light gray silicified crystal bearing tuff.
Continued yellow to brown secondary hydrous Fe oxide staining on some of the cuttings.

480-490 ft. 65% Light gray to yellow-gray (hydrous Fe oxides) crystal lithic bearing tuff. The rock appears to have undergone an episode of clay alteration, followed by an episode of silica metasomatisation. Many of the light gray fragments contain sulfides, predominantly pyrite.
35% Dark gray quartz-biotite-feldspar tuff with no observed secondary pyrite.

490-500 ft. 90% Light gray sulfide rich clay altered and subsequently silicified tuff with minor yellow-brown hydrous Fe oxide staining. Minor relict biotite, often showing partial replacement by pyrite, suggests that at least a portion of the rock may have originally been a biotite crystal tuff. Occasional light brown hexagonal clay pseudomorphs after biotite are present.
10% Dark gray quartz-biotite-feldspar crystal tuff. Note, the yellow to orange to brown hydrous Fe oxide staining is present on fragments of both the light gray and the dark gray tuffs.

500-510 ft. 70% Gray sulfide rich silicified altered tuff (originally a biotite crystalline tuff?).
30% Dark gray silicified quartz-biotite-feldspar crystal tuff.

510-520 ft. 100% Dark gray to purple-gray silicified quartz-biotite- feldspar tuff with local minor secondary pyrite. Traces of vein filling quartz up to 3 mm wide are also observed.

520-530 ft. As above, with many cuttings fragments up to 1 cm.

530-540 ft. Very poor sample recovery, hole not cleaning well.

540-550 ft. 100% Dark gray quartz-biotite-feldspar tuff as above, with a few fragments of soft light green sheared rock, and traces of yellow-orange hydrous Fe oxide staining.

550-560 ft. As above, with rare secondary pyrite.

560-570 ft. As above, though some of the fragments show the effects of clay alteration prior to silicification.

570-580 ft. As above.

580-590 ft. As above, with an overall well developed episode of clay alteration within the tuff prior to silicification. Much of the biotite has been altered to clay and minor pyrite.

590-600 ft. As above.

600-610 ft. As above, with a few fragments showing hydrous Fe oxide staining.

610-620 ft. As above, with moderate clay alteration preceding variable silicification. Minor secondary pyrite is observed. No hydrous Fe oxide staining is observed.

620-630 ft. As above.

630-640 ft. As above, with localized minor pyrite.

640-650 ft. As above, with moderate to strong alteration of the quartz-biotite-feldspar tuff prior to silicification.

650-660 ft. Dark gray quartz-biotite-feldspar tuff with moderate clay alteration followed by moderate and variable silicification. Many fragments contain a green clay alteration that appears to have developed subsequent to the silicification. A few tuff fragments show the effects of shearing.

660-670 ft. As above.

670-680 ft. 70% Crystal tuff as above.
30 % Silicified lithic and crystal bearing tuff fragments.

680-690 ft. 50% Gray to purple-gray quartz-biotite-feldspar bearing silicified welded tuff with relict eutaxitic and flow banding texture.
40% Quartz-biotite-feldspar crystal tuff.
10% Green silicified lithic tuff.

690-700 ft. As above.

700-710 ft. 100% Gray to light purple to lignt green silicified crystal bearing (quartz, relict biotite, and possible relict feldspar) lithic tuff. Welded shard, eutaxitic and flow band textures are recognizable. The lithic inclusions are typically strongly altered. The light red-gray to purple-gray color is from secondary hematite which has developed, in part, at the expense of biotite. Gray and green-gray fragments contain microcrystalline pyrite and green clay. Minor white quartz veinlet fragments are present, up to 4 mm wide.

710-720 ft. As above, with pyrite forming along some lithic fragment boundaries, along some fracture surfaces, and at the expense of biotite.

720-730 ft. 65% Silicified welded tuff as above.
25% Gray cement or cemented ash.
10% Light purple-gray quartz-biotite-feldspar tuff.
This sample appears to contain quite a bit of slough from up hole.

730-740 ft. As above, now with 85% of the sample consisting of silicified welded tuff.

740-750 ft. Gray to light purple-gray to green-gray silicified welded tuff as above, with a few fragments containing white to light gray clay alteration.

750-760 ft. 50% Very light gray, strongly silicified, welded tuff with most relict matrix textures obscured. Minor secondary pyrite is observed.
30% White to light gray micro to cryptocrystalline quartz veins and extremely silicified tuff. Secondary pyrite is rare.
20% Gray to light red-gray silicified welded tuff with identifiable eutaxitic and flow band textures. Secondary pyrite is observed.

760-770 ft. 80% Purple-gray to gray silicified crystal lithic tuff with recognizable welded, eutaxitic, and flow band textures. The crystal and lithic components are quite altered. Secondary pyrite is extremely rare.
20% Light gray to white quartz veins and extremely silicified tuff. Secondary pyrite is extremely rare.

770-780 ft. 65% Dark to light gray, rarely green-gray, silicified tuff with microcrystalline pyrite common. Most of the primary tuff textures have been obscured.
35% Light gray to white extremely silicified tuff and microcrystalline quartz. Secondary pyrite is extremely rare.

780-790 ft. As above, with an overall increase in the amount of microcrystalline sulfides.

790-800 ft. Silicified tuff as above, with occasional soft light green sheared or gouge material. Secondary pyrite is present, typically occurring in rounded crystal clusters. Occasional rock fragments > 1 cm are present in the cuttings, suggesting fractured rock with larger chunks being broken off.

800-810 ft. 65% White micro to fine crystalline quartz veins and extremely silicified tuff. Sulfides are very rare.
35% Gray to green-gray sulfide bearing silicified tuff.
Minor light green soft fault gouge is present.

810-820 ft. (TD sample, see note below)
75% White quartz and silica as above.
25% Silicified tuff.

TRUE TOTAL DEPTH, 850 ft.

Note: The final samples were collected at the end of the hole. However, on strapping out, it was found that the noted depths and the actual depth were in disagreement. Errors in sample collecting appear to have been made at tour changes at noon and midnight. One ten foot sample was likely omitted just below 250 ft. when the cement was being drilled out, at midnight. The other two were likely missed around the 700 ft. depth, again near midnight. The sample description depths above are in keeping with the sample labels rather than having been adjusted for omitted samples.

The first production fractures were encountered at 823 ft., showing only a jump in the blooie line temperature. Continued small fractures were encountered, with additional increases in line temperature to a depth of 843 ft. At 843 ft. a 3 ft. open zone of no bit resistance was encountered. The bulk of the steam production comes from this 3 ft. open zone. 4 ft. of rat hole was drilled below this fracture.

Appendix E

MOTHER EARTH INDUSTRIES, INC.

POWER NATURALLY

Corporate Office:
7350 E. Evans Road, Suite B
Scottsdale, Arizona 85260
Tel: (602) 998-3991
Fax: (602) 951-9570

Production Office:
3761 South 700 East, Suite 200
Salt Lake City, Utah 84106
Tel: (801) 263-8300
Fax: (801) 263-1703

August 8, 1988

Mr. John Solum
Utah Division of Water Resources
1636 West North Temple
Salt Lake City, UT 84116

Re: Geothermal Drilling Permit (GDP) applications for slim holes S88-1 and S88-2; Cove Fort-Sulphurdale KGRA, T26S, R6W, Sec 7, SLM, Beaver County, Utah.

Dear John:

Approval is requested to drill two exploratory wells, S88-1 and S88-2. In support of this request, the following are attached:

1. Geothermal Drilling Permit application.

2. Drilling program, including BOP configuration.

3. Area drawing, showing well location relationships to federal/fee boundaries, power lines, etc.

The drilling program is based on Mother Earth Industries' (MEI) experience in 1987 with the two slim-diameter exploratory holes successfully completed. In the case of S87-4, a live steam zone was encountered and evaluated. The BOP's, casing/cement, and wellhead assembly were found to be very effective in handling these steam conditions. As such, the attached program reflects this experience.

Note that these wells are located on fee land in the W1/2SW1/4 Sec 7, T26S, R6W, SLM, Beaver County, Utah. This land is owned by Delano Development Company (DDC). MEI is now finalizing an agreement with DDC to allow this drilling activity. MEI recognizes that any drilling activity taking place on DDC property is subject to DDC authorization in addition to State approval.

These wells are intended as exploratory wells; the relatively small 6 1/4" open hole is too restrictive on steam flow to allow commercial production. Only a short-term (less than 24 hrs) flow test to evaluate steam zones is anticipated. If a commercial-quality producing fracture is found, then a nearby adjacent location would be permitted at a later date as a full-size (12 1/4" open hole) production well. If the exploratory well is dry, then we will have spent only $50,000 instead of $200,000-$250,000 to obtain exploratory data.

Thank you for your handling of these GDP applications. Please call if you would like more information.

Sincerely,

Jay C. Hauth

Jay C. Hauth
Operations Manager

cc: Wayne Portanova

JCH/

Form: USGS 9-1957

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY, CONSERVATION DIVISION

Form Approved
Budget Bureau No. ______

GEOTHERMAL DRILLING PERMIT

The U.S. Geological Survey requires this form or other Supervisor approved form to be prepared and filed in triplicate with requisite attachments with the Supervisor. The Supervisor must approve this permit prior to any lease operation.

1a. TYPE OF WORK: DRILL NEW WELL (✓) REDRILL ( ) DEEPEN ( ) PLUG BACK ( ) DIRECTIONALLY DRILL ( ) OTHER ( )

1b. WELL TYPE: PRODUCTION ( ) INJECTION ( ) HEAT EXCHANGE ( ) OBSERVATION ( ) WATER SUPPLY ( ) OTHER ( ) Exploratory

1c. WELL STATUS: TO-BE-Drilled

2. NAME OF LESSEE/OPERATOR: Mother Earth Industries, Inc.

3. ADDRESS OF LESSEE/OPERATOR: 3761 S. 700E. SLC, UT 84106

4. LEASE SERIAL NO.: NA

5. SURFACE MANAGER: BLM ( ) FS ( ) Other (✓) Fee

6. UNIT AGREEMENT NAME: NA

7. WELL NO.: S88-3

8. PERMIT NO.:

9. FIELD OR AREA: CFS-KGRA

10. SEC., T., R., B.& M.: Sec 7 T26S R6W, SLM

11. COUNTY: Beaver

12. STATE: UT

13. APPROX. STARTING DATE: 10/88

14. ACRES ASSIGNED (WELL SPACING): NA

15. LOCATION OF WELL
At surface: 2951' S. + 990' E. of NW Cor. Sec 7, T26S R6W, SLM
At proposed prod. zone: (Same)

16. DISTANCE FROM PROPOSED LOCATION TO NEAREST PROPERTY OR LEASE LINE: 260' E. to Federal (Fishlake NF) land (well on fee land)

17. DISTANCE FROM PROPOSED LOCATION TO NEAREST WELL, DRILLING, COMPLETED, OR APPLIED FOR ON THIS LEASE: 330' S. to S88-2

18. DRILLING MEDIA AND CHARACTERISTICS: AIR (✓) WATER (✓) MUD (✓) FOAM (✓) Other (✓) Various

19. PROPOSED DEPTH
MEASURED: 1500
TRUE VERTICAL: Same

20. ELEVATIONS: ESTIMATED (✓) FINAL ( ) 6300 ASL
REFERENCE DATUM: GR ( ) MAT ( ) DF ( ) KB ( ) RT ( ) CASINGHEAD FLANGE ( ) OTHER ( )

21. EXISTING AND/OR PROPOSED CASING AND CEMENTING PROGRAM (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH Top	SETTING DEPTH Bottom	QUANTITY OF CEMENT
17½"	13⅜"/12" *	61/53.5	BT+C	J55/A53	0	±40-80	35.4/70 ± Ft³
9⅞"	7"	20	ST+C	J55	0	±250	106.75 ± Ft³
6¼"	(Open Hole)	—	—	—	250	±1500	—

* Note: Program allows opt. use of 12"-sch40 pipe for conductor

22. PROPOSED WORK SUMMARY

Drill well per attached program, incl BOP configuration diagr.

(Use additional space on reverse side of form)

23. SIGNED [signature] TITLE Operations Manager DATE 10/13/88

(This space for Federal use)

APPROVED BY ______ TITLE ______ DATE ______

CONDITIONS OF APPROVAL, IF ANY:

This permit is required by law (30 U.S.C. 1023); regulations: 30 CFR 270.71; Federal Geothermal Lease Terms and Stipulations and other regulatory requirements. The United States Criminal Code (18 U.S.C. 1001) makes it a criminal offense to make a willfully false statement or representation to any Department or Agency of the United States as to any matter within its jurisdiction.

(See instructions on reverse side)

JAY C. HAUTH
(801) 263-8300

John Solum - 10/13/88

588-3 Slim Hole

program, BOP configs., emerg. + safety info.

Thanks,
Jay

Note - We plan on using the (opt.) master valve + rotating head on the conductor, as discussed last week on 588-2.

Note: Verbal approval was received from J. Solum to drill 5-88-3 in the same manner as 5-88-2, abandoned at 80' KB.

LW Huttres 8-15-89
(in accordance with advice via phone from W.A. Portainova)

Authorization to perform geothermal exploration drilling

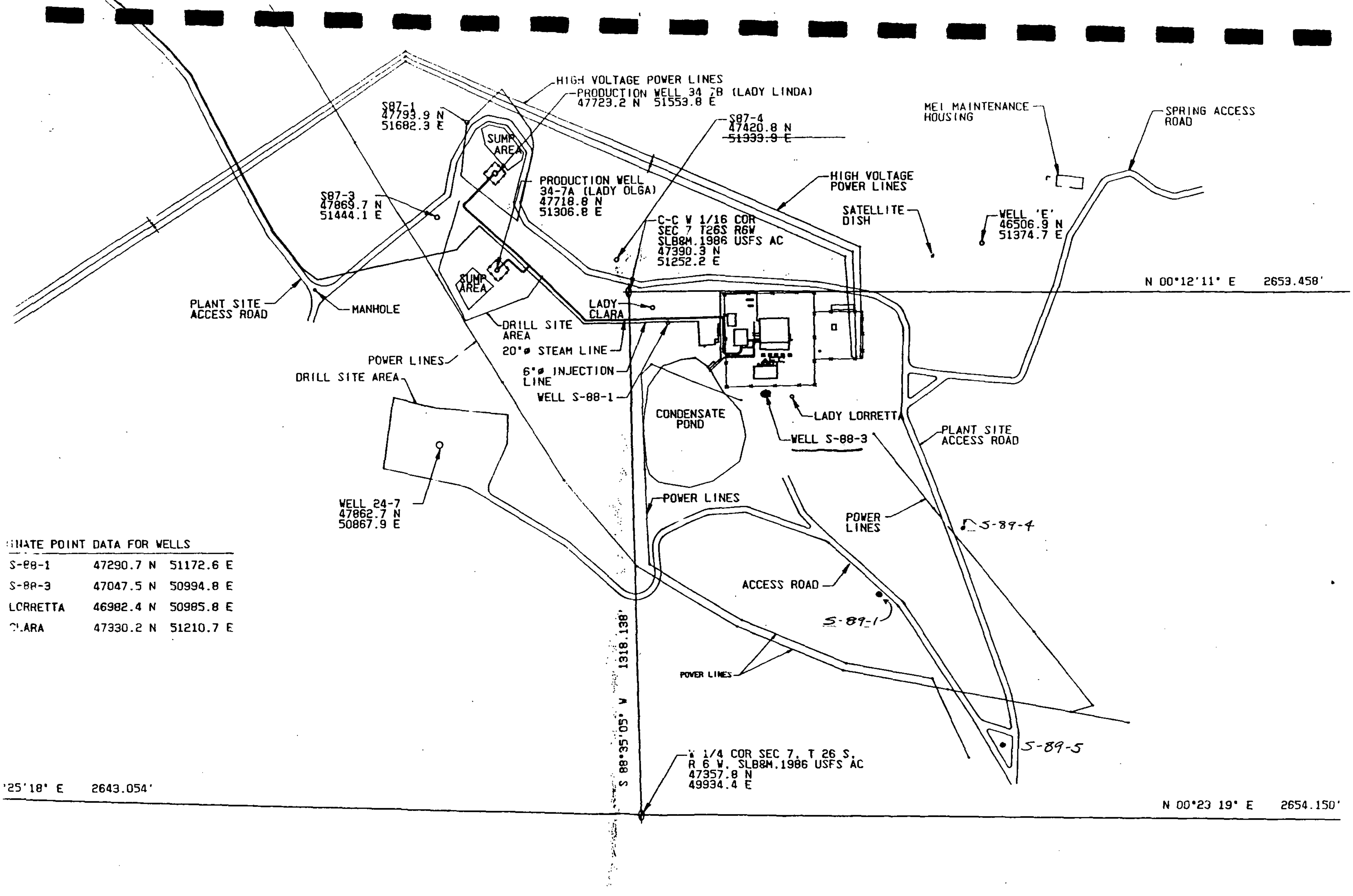
Authorization is granted to Mother Earth Industries, Inc. to perform geothermal exploration drilling activity on Delano Development Corporation property, as follows:

Well Designation: S88-3

Well Location (approximate): South 2951 feet, East 990 feet from the NW cor.
Section 7, T26S, R6W, SLM, Beaver County, Utah.

Signed: Thomas D Canada Date: Oct. 14th 1988

Thomas D. Canada, President,
Delano Development Corporation



...NATE POINT DATA FOR WELLS		
S-88-1	47290.7 N	51172.6 E
S-88-3	47047.5 N	50994.8 E
LORRETTA	46982.4 N	50985.8 E
...LARA	47330.2 N	51210.7 E

Plate I
S-88-3