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File 9477

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96 AUG 20 P 3: 15

DIV. OF WATER &
LAND DEVELOPMENT

PUNA
GEOTHERMAL VENTURE



HAWAII

August 16, 1996

Michael D. Wilson
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

DEPT. OF LAND
& NATURAL RESOURCES
STATE OF HAWAII

96 AUG 19 P 4: 27

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SUBJECT: **REPORT ON ANNUAL TEMPERATURE SURVEY IN WELLS KS-4**

Dear Mr. Wilson

Attached is the report regarding the mechanical integrity temperature survey of injection well KS-4 verified by annual tests performed in accordance with the Puna Geothermal Venture well casing monitoring program and Underground Injection Control (UIC) Permit UH-1529. The results show no indication of any casing leak or interzonal communication. Partial fulfillment of the required Mechanical Integrity Test was completed. The annual pressure testing will be performed later in the year, in conformance to the normal schedule.

Please contact me at (808)-965-6233, if you have any questions regarding the subject reports.

Sincerely,

Darren Hunt
Environmental/Safety Coordinator

cc: J. Dean
D. Stovall
D. Hunt
E. Tanaka
File 5.4.3.1,2&3

PUNA GEOTHERMAL VENTURE
REPORT ON ANNUAL TEMPERATURE SURVEYS IN WELL KS-4
June 1996

Summary

Downhole temperature surveys were run in Well KS-4 in June 1996 in partial fulfillment of the requirements for annual mechanical integrity tests under the UIC permit and PGV's Casing Monitoring Program. In accordance with PGV's normal procedure, one survey was run with the well on injection, and two were run after shut-in to measure the transient temperature response. The results exhibit a completely normal temperature recovery, with no indication of any casing leak or any interzonal communication behind casing.

With concurrence from Hawaii Department of Health, Safe Drinking Water Branch, PGV scheduled these temperature surveys in KS-4 to coincide with a planned plant outage. The annual casing pressure test will be performed later in the year, in conformance to the normal schedule.

Well Completion

The mechanical configuration of KS-4 is shown in Figure 1. It has not changed since the well was completed on November 24, 1992.

Shut-in Temperature Surveys

Beginning on June 22, 1996, temperature/pressure surveys were run in KS-4 during injection and twice after the well was shut in to measure downhole pressures and define the thermal recovery profiles. The surveys were run by Pruett Industries using Amerada-type instruments. The injection survey was run beginning at 1100 hrs on June 22, and the well was shut in at 2129 hrs on June 22. At the time of the survey, the well was on injection at 1050 gpm, 230 psig wellhead pressure and 239°F injectate temperature. The first shut-in survey was begun at 0630 hrs on June 23, 9 hrs after shut-in. The second shut-in survey was begun at 1030 hrs on June 24, 39 hours after shut-in. Pruett's data sheets are included in Appendix A.

The June 1996 temperature surveys are plotted in Figure 2, along with a static survey which was run on January 10, 1993. The surveys show normal thermal recovery following injection and give no indication of fluid communication behind

PUNA GEOTHERMAL VENTURE
REPORT ON ANNUAL TEMPERATURE SURVEYS IN WELL KS-4

June 1996

Page 2

casing. The injection interval is clearly indicated by the temperature surveys to be below 6000 ft.

Robert V Verity

Robert V. Verity, P.E.

MESQUITE GROUP, INC.

June 12, 1996

GROUND SURFACE

CELLAR

618' ABOVE MSL

ALL DEPTHS MEASURED FROM KB HEIGHT OF 25' ABOVE TOP OF CELLAR

42" HOLE

26" HOLE

CEMENT

17-1/2" HOLE

12-1/4" HOLE

8-1/2" HOLE

TD 6796' MD

30" CONDUCTOR CEMENTED TO SURFACE

70'

20" 94# K-55 BT&C CEMENTED 0-1054'

20" CASING SHOE 1054'

9-5/8" 47# C-90 NEW VAM CEMENTED TIE BACK 1830'-SURFACE

13-3/8" 61# K-55 NEW VAM CEMENTED 0-2043'

9-5/8" LINER HANGER SET AT 1830'

13-3/8" CASING SHOE 2043'

9-5/8" 47# C-90 NEW VAM CEMENT LINER 1830'-3930'

7" 23# SUMITOMO 22 CHROME VAM ACE HANGDOWN LINER HUNG FROM WELLHEAD TO 3800'

9-5/8" 47# X 7" 29# L-80 LINER HANGER SET AT 3838'

9-5/8" CASING SHOE 3930'

7" 29# L-80 BT&C SLOTTED LINER BLANK TOP JT AND BTM 3 JTS HUNG UNCEMENTED 3838'-6791'

BOTTOM OF SLOTTED LINER 6791' MD

PUNA GEOTHERMAL VENTURE

INJECTION WELL KS-4 AS-BUILT COMPLETION SCHEMATIC

DATE 11/30/92

REV. 2

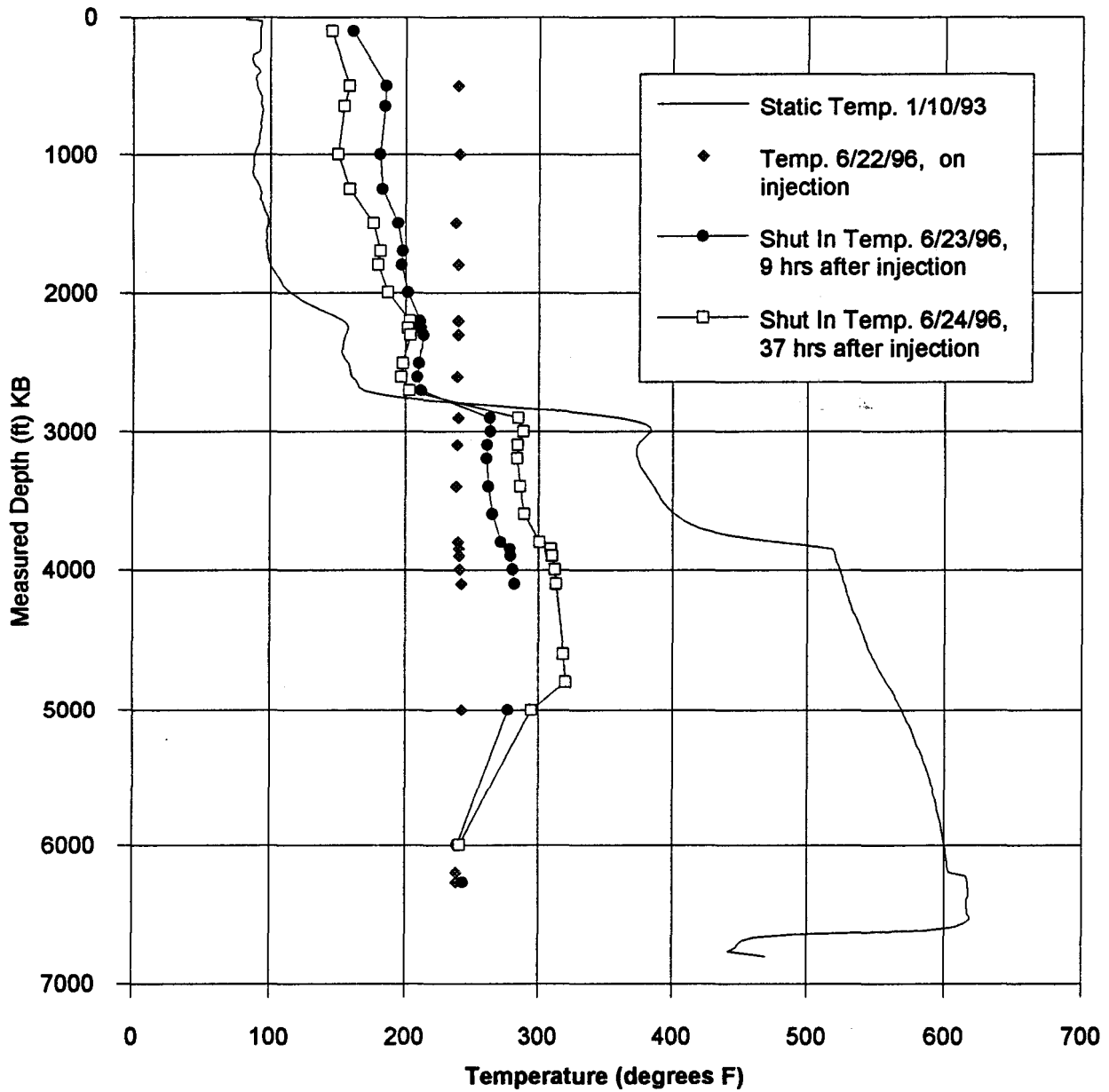
BY TEPLW

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FIGURE NO. 1

FIGURE 2

PUNA GEOTHERMAL VENTURE
KS-4 TEMPERATURE SURVEYS FOR
1996 MECHANICAL INTEGRITY TEST



Appendix A

TEMPERATURE/PRESSURE SURVEY DATA

PRUETT INDUSTRIES, INC.
 8915 ROSEDALE HWY BAKERSFIELD, CA 93312
 (805) 589-2768 FAX (805) 589-3268

SUB-SURFACE TEMPERATURE SURVEY

CO. PUNA GEOTHERMAL VENT	RUN 1A FIELD KAPOHO	WELL KS-4
EFF DEPTH 6796'	WELL STAT INJECTION	TOOL HUNG
CASING 9.625"Ø' -3930'	CASING PRESS	ON BOTTOM 13:40
LINER 7" 3838'-6791'	TUBING PRESS	OFF BOTTOM 14:00
DATE 062296	ELEMENT RANGE 89 - 724	ZERO POINT 25'
ELEVATION	ZONE	SHUT-IN
MAX TEMP	PICK-UP 6270'	ON-PROD
PERF 3888' -	CAL SER NO. K5830	MPP
TUBING -		
UNITS ENGLISH	PURPOSE INJECTION	TEMPERATURE GRADIENT

SURVEY DATA

CO. PUNA GEOTHERMAL VENT				RUN 1A FIELD KAPOHO				WELL KS-4			
TIME	DEPTH	P-T	GRAD	TIME	DEPTH	P-T	GRAD	TIME	DEPTH	P-T	GRAD
11:00	0	179.1	.000	1:00	3400	238.0	-.002				
1:00	500	239.0	.120	1:00	3800	239.6	.004				
1:00	1000	239.9	.002	1:00	3850	240.2	.012				
1:00	1500	237.4	-.005	1:00	3900	240.5	.006				
1:00	1800	239.0	.005	1:00	4000	240.8	.003				
1:00	2200	239.3	.001	1:00	4100	242.1	.012				
1:00	2300	239.0	-.003	1:00	5000	242.4	.000				
1:00	2600	238.7	-.001	1:00	6000	240.8	-.002				
1:00	2900	239.6	.003	1:00	6200	238.4	-.012				
1:00	3100	238.7	-.005	1:00	6270	238.4	.000				

BY STEVE WILSON

PRUETT INDUSTRIES, INC.
 8915 ROSEDALE HWY BAKERSFIELD, CA 93312
 (805) 589-2768 FAX (805) 589-3268

SUB-SURFACE PRESSURE SURVEY

CO. PUNA GEOTHERMAL VENT	RUN 03 FIELD KAPOHO	WELL KS-4
EFF DEPTH	WELL STAT STATIC	TOOL HUNG
CASING 9.625"Ø' -3930'	CASING PRESS	ON BOTTOM 9:29
LINER 7" 3838'-6791'	TUBING PRESS	OFF BOTTOM 9:36
DATE 062396	ELEMENT RANGE 0 - 4130	ZERO POINT 25'
ELEVATION	ZONE	SHUT-IN
MAX TEMP	PICK-UP 6270'	ON-PROD
PERF 3888' -	CAL SER NO. K9006	MPP
TUBING -		
UNITS ENGLISH	PURPOSE	STATIC PRESSURE GRADIENT 9 hrs

SURVEY DATA

CO. PUNA GEOTHERMAL VENT			RUN 03 FIELD KAPOHO			WELL KS-4		
TIME	DEPTH	P-T	GRAD	TIME	DEPTH	P-T	GRAD	
6:20	0	.0	.000	1:00	2700	838.0	.416	
1:00	100	.0	.000	1:00	2900	917.0	.395	
1:00	500	.0	.000	1:00	3000	956.5	.395	
1:00	650	.0	.000	1:00	3100	995.9	.395	
1:00	1000	137.5	.393	1:00	3200	1035.4	.394	
1:00	1250	237.6	.400	1:00	3400	1114.2	.394	
1:00	1500	340.4	.411	1:00	3600	1190.8	.383	
1:00	1700	422.9	.413	1:00	3800	1267.3	.382	
1:00	1800	464.2	.414	1:00	3850	1285.9	.372	
1:00	2000	547.1	.414	1:00	3900	1304.4	.372	
1:00	2200	630.1	.415	1:00	4000	1343.6	.392	
1:00	2250	650.9	.415	1:00	4100	1382.8	.391	
1:00	2300	671.7	.416	1:00	5000	1733.1	.389	
1:00	2500	754.8	.416	1:00	6000	2141.4	.408	
1:00	2600	796.4	.416	1:00	6270	2250.9	.405	

BY STEVE WILSON

PRUETT INDUSTRIES, INC.
 8915 ROSEDALE HWY BAKERSFIELD, CA 93312
 (805) 589-2768 FAX (805) 589-3268

SUB-SURFACE TEMPERATURE SURVEY

CO. PUNA GEOTHERMAL VENT	RUN 3A FIELD KAPOHO	WELL KS-4
EFF DEPTH	WELL STAT STATIC	TOOL HUNG
CASING 9.625"Ø' -3930'	CASING PRESS	ON BOTTOM 9:29
LINER 7" 3838' -6791'	TUBING PRESS	OFF BOTTOM 9:36
DATE 062396	ELEMENT RANGE 89 - 724	ZERO POINT 25'
ELEVATION	ZONE	SHUT-IN
MAX TEMP	PICK-UP 6270'	ON-PROD
PERF 3888' -	CAL SER NO. K5830	MPP
TUBING -		
UNITS ENGLISH	PURPOSE	STATIC TEMPERATURE GRADIENT 9 hrs

SURVEY DATA

CO. PUNA GEOTHERMAL VENT				RUN 3A FIELD KAPOHO			WELL KS-4		
TIME	DEPTH	P-T	GRAD	TIME	DEPTH	P-T	GRAD		
6:20	0	89.3	.000	1:00	2700	211.9	.028		
1:00	100	160.8	.715	1:00	2900	263.3	.257		
1:00	500	185.4	.062	1:00	3000	263.9	.006		
1:00	650	184.8	-.004	1:00	3100	261.7	-.022		
1:00	1000	180.6	-.012	1:00	3200	261.4	-.003		
1:00	1250	182.6	.008	1:00	3400	262.4	.005		
1:00	1500	194.3	.047	1:00	3600	265.4	.015		
1:00	1700	197.8	.017	1:00	3800	271.8	.032		
1:00	1800	196.8	-.009	1:00	3850	278.6	.134		
1:00	2000	201.9	.025	1:00	3900	279.2	.012		
1:00	2200	210.6	.044	1:00	4000	281.0	.018		
1:00	2250	211.3	.013	1:00	4100	282.2	.012		
1:00	2300	213.2	.038	1:00	5000	277.6	-.005		
1:00	2500	210.0	-.016	1:00	6000	239.3	-.038		
1:00	2600	209.1	-.009	1:00	6270	243.6	.016		

BY STEVE WILSON

NOTE : PEAK @ 289.5 DEG F BETWEEN 4100' & 5000' STOPS

PRUETT INDUSTRIES, INC.
 8915 ROSEDALE HWY BAKERSFIELD, CA 93312
 (805) 589-2768 FAX (805) 589-3268

SUB-SURFACE PRESSURE SURVEY

CO. PUNA GEOTHERMAL VENT	RUN 04 FIELD KAPOHO	WELL KS-4
EFF DEPTH 6796'	WELL STAT STATIC	TOOL HUNG
CASING 9.625"Ø' -3930'	CASING PRESS	ON BOTTOM 13:28
LINER 7" 3838'-6791'	TUBING PRESS	OFF BOTTOM 13:33
DATE 062496	ELEMENT RANGE 0 - 2628	ZERO POINT 25'
ELEVATION	ZONE	SHUT-IN 21:50 6/22
MAX TEMP	PICK-UP 6270'	ON-PROD
PERF 3888' -	CAL SER NO. K7688	MPP
TUBING -		
UNITS ENGLISH	PURPOSE	STATIC PRESSURE GRADIENT 39 hrs

SURVEY DATA

CO. PUNA GEOTHERMAL VENT	RUN 04 FIELD KAPOHO	WELL KS-4					
TIME	DEPTH	P-T	GRAD	TIME	DEPTH	P-T	GRAD
10:10	0	.0	.000	1:00	2900	905.3	.415
1:00	100	.0	.000	1:00	3000	946.1	.408
1:00	500	.0	.000	1:00	3100	985.6	.395
1:00	650	.0	.000	1:00	3200	1025.2	.395
1:00	1000	112.8	.322	1:00	3400	1104.3	.395
1:00	1250	214.1	.405	1:00	3600	1184.7	.402
1:00	1500	316.8	.411	1:00	3800	1265.1	.402
1:00	1700	399.8	.415	1:00	3850	1284.9	.396
1:00	1800	441.4	.417	1:00	3900	1304.7	.396
1:00	2000	526.4	.425	1:00	4000	1344.2	.396
1:00	2200	611.7	.426	1:00	4100	1383.8	.396
1:00	2250	632.7	.421	1:00	4600	1583.3	.399
1:00	2300	653.7	.421	1:00	4800	1662.7	.397
1:00	2500	737.9	.421	1:00	5000	1742.2	.398
1:00	2600	780.1	.421	1:00	6000	2142.3	.400
1:00	2700	822.2	.422	1:00	6270	2252.8	.409

BY STEVE WILSON

PRUETT INDUSTRIES, INC.
 8915 ROSEDALE HWY BAKERSFIELD, CA 93312
 (805) 589-2768 FAX (805) 589-3268

SUB-SURFACE TEMPERATURE SURVEY

CO. PUNA GEOTHERMAL VENT	RUN 4A FIELD KAPOHO	WELL KS-4
EFF DEPTH 6796'	WELL STAT STATIC	TOOL HUNG
CASING 9.625"Ø' -3930'	CASING PRESS	ON BOTTOM 13:28
LINER 7" 3838'-6791'	TUBING PRESS	OFF BOTTOM 13:33
DATE 062496	ELEMENT RANGE 89 - 724	ZERO POINT 25'
ELEVATION	ZONE	SHUT-IN 21:50 6/22
MAX TEMP	PICK-UP 6270'	ON-PROD
PERF 3888'-	CAL SER NO. K5830	MPP
TUBING -		
UNITS ENGLISH	PURPOSE	STATIC TEMPERATURE GRADIENT 39 hrs

SURVEY DATA

CO. PUNA GEOTHERMAL VENT				RUN 4A FIELD KAPOHO				WELL KS-4			
TIME	DEPTH	P-T	GRAD	TIME	DEPTH	P-T	GRAD	TIME	DEPTH	P-T	GRAD
10:10	0	89.3	.000	1:00	2900	284.6	.409				
1:00	100	144.9	.556	1:00	3000	288.3	.036				
1:00	500	158.5	.034	1:00	3100	284.4	-.039				
1:00	650	154.3	-.028	1:00	3200	283.7	-.006				
1:00	1000	149.8	-.013	1:00	3400	285.9	.011				
1:00	1250	158.5	.035	1:00	3600	289.5	.018				
1:00	1500	176.2	.071	1:00	3800	301.1	.058				
1:00	1700	181.3	.026	1:00	3850	309.6	.170				
1:00	1800	179.4	-.019	1:00	3900	310.2	.012				
1:00	2000	186.7	.037	1:00	4000	312.3	.021				
1:00	2200	202.8	.081	1:00	4100	313.2	.009				
1:00	2250	201.9	-.019	1:00	4600	318.6	.011				
1:00	2300	203.4	.031	1:00	4800	320.5	.009				
1:00	2500	198.1	-.027	1:00	5000	294.7	-.129				
1:00	2600	197.1	-.009	1:00	6000	240.8	-.054				
1:00	2700	202.8	.057	1:00	6270	246.4	.021				

BY STEVE WILSON

Land Division
Engineering Branch

August 26, 1996

TO: Dean Uchida, Administrator
THROUGH: Andrew Monden, Branch Chief *AM*
FROM: Hiram Young, Design Section *Hy*
SUBJECT: Minerals Resources - Geothermal

Per Administrative Rules Chapter 13-183-79, all geothermal injection wells must be surveyed at least every two years, or as often as the Chairperson may order. For PGV, the UIC permit issued by Department of Health requires an annual survey. The attached temperature survey submitted by PGV fulfills both DLNR and DOH requirements. However, with the elimination of the Mineral Resources Section, there is no one to monitor, review and approval the survey.

Per Dean (8/28/96) - we still have the regulatory function for geothermal.

Hiram, pls instruct Elaine on "where" and "how" is the geothermal files so she can file future correspondances. Eric Tanaka should also have a copy for his files. Pls note Eric was "cc" a copy.