MEMORANDUM

TO: H. J. Olson

DATE: October 19, 1984

FROM: J. E. Deymonaz

cc: W. M. Dolan
A. P. Wicklund
J. J. King
H. D. Pilkington

SUBJECT: Alum Water Well 67-29
Esmeralda County, Nevada

Attached is the drilling history and well schematic (Fig. 1) for the Alum water well near the proposed TFD site.

As can be seen on the schematic, the static water level is at 610 feet, 30 feet below the casing. While running casing, drag increased with depth and the casing had to be driven below about 550 feet. Due to concerns that thin walled casing might collapse if forced further, no effort was made to drive the casing deeper.

The open hole emits a considerable amount of hot vapors indicating boiling in the well at or above the water level. If the temperature profile is similar to test hole 56-29, located about 50 feet away, temperatures of 100°C exist at the water level. This is about 4°C above boiling at this elevation and would result in minor flashing in the wellbore.

With air lift the well produced a measured flow of 60 gpm. Since most wells will yield more fluids by pumping than with air lift, the well should be capable of pumping 60 - 100 gpm which will be adequate for any drilling operations. Since fluids will need to be extracted from the open hole interval, an air lift method should not be used unless the hole is cased to TD with 4 1/2 inch casing. The lower 175 feet of 4 1/2 inch casing should be slotted if this method is used. To optimize the potential yield of the well, however, either a submersible or jet pump should be used.

After nearly one hour of air lift, the water still had a considerable amount of drilling foam so no water sample was collected. The water is from the same system encountered in nearby 56-29 and the geochemistry from that hole is attached (Table 1) as is the generalized lithology and temperature profile (Fig. 2).

In drilling both 56-29 and 67-29, the pre-Tertiary silicic siltstones below about 350 feet have been very hard and abrasive. Even using downhole hammers, penetration was only 10-20 feet per hour. Bit life was less than 20 hours, in which time they cut less than 200 feet of hole losing inserts and considerable guage in the process. This should be considered in planning the future TFD well. Rather than drilling 1,000 feet of 17 1/2 inch hole as called for in the drilling plan, this should be reduced to approximately 500 feet. If the pre-Tertiary contact is deeper, due to faulting, a general plan to drill about 100 feet into the siltstone unit should be followed.

John E. Deymonaz

JED/jn
attachments

DRILL HISTORY
Alum water well
67-29 (a, b, & c)

9-24 Stevens-Harris crew MOB from Hinkley, Utah to Tonopah, Nevada. Dean Pilkington on site for SRC.

9-25 Rig moved to Alum 67-29a site, set up and drilled a 6 1/4" hole from 0 - 375 feet.

9-26 Lost two cones in hole off rock bit, fished out most of steel with junk basket.

9-27 Abandon 67-29a and moved rig 100' west, set up on 67-29b. Drilled 6" hole with hammer 0 - 235'. Injured helper with pipe wrench, take to Tonopah hospital.

9-28 Drill 6" hole 235' - 375'.

9-29 Drill 6" hole 375' - 550'.

9-30 Stick 6" hammer while reentering hole, twist off, leave two collars, (40') and hammer tool.

10-1 Abandon, 67-29b, move rig 50' east to 67-29c. Set up, drill 12" hole 0 - 19', set and cement 19' of 10" casing.

10-2 No drilling, crew bringing in additional drill pipe and collars.

10-3 Drilling with 8 1/2" hammer 19' - 385'. John Deymonaz relieves Dean Pilkington as SRC representative.

10-4 Drilling with 8 1/2" hammer 385' - 525'.

10-5 Reduce to 8" hammer and drill 525' - 620'.

10-6 Drill with 8" hammer 620' - 705'.

10-7 Reduce to 5 7/8" button rock bit and drill 705' - 775'. Water entries at 712' - 714', 720' - 723', 728' - 733', 734' - 736' and 737' - 739'. Hole making 60 gpm while drillig with air. POH, begin running 6 5/8" OD weld joint casing.

10-8 Complete running casing to 583.5", had to drive last 30" of casing with hammer. RIH to TD, clean hole, air lift water for 30 minutes, POH lay down tools. Cement upper 25" of 6 5/8" casing.

10-9 Weld plate on wellhead, clean up site, release rig at 10:30 a.m.

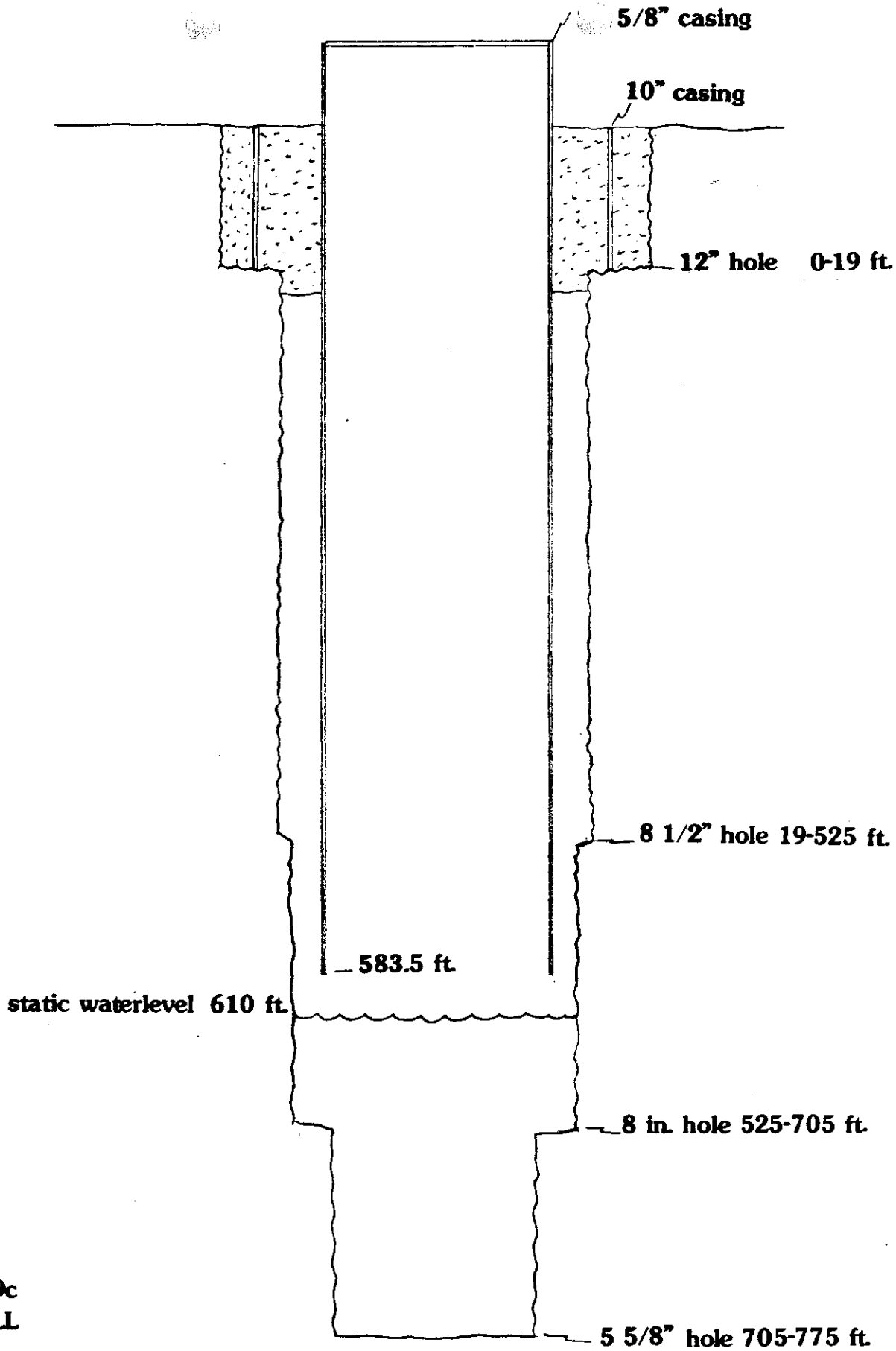


Figure 1

ALUM 67-29c
WATER WELL

Contractor: Stevens-Harris
Rig: Ingersol Rand
Source: J. Deymonaz

TABLE 1

Analysis of water sample collected from Alum hole 56-29. Sample W-14298.

Temperature	80°C
Discharge	60gpm
Depth	665-775 feet
Taste	Strong NaCl
Odor	Moderate H_2S
SiO_2	190ppm
Na	2700
K	320
Ca	87
Mg	20
Li	10.0
Cl	4600
F	5.3
HCO_3	12.3
B	33
Mn	150
Mo	15ppb
pH	8.5
Conductivity	13,000mmho/cm
Tqtz no steam loss	176.5°C
Tqtz max steam loss	165.3°C
T chalcedony	154.8°C
TNa-K-Ca	231.7°C
TNa-K-Ca-Mg	149.9°C

LITHOLOGIC LOG

Project: Alum

Hole: 56-29

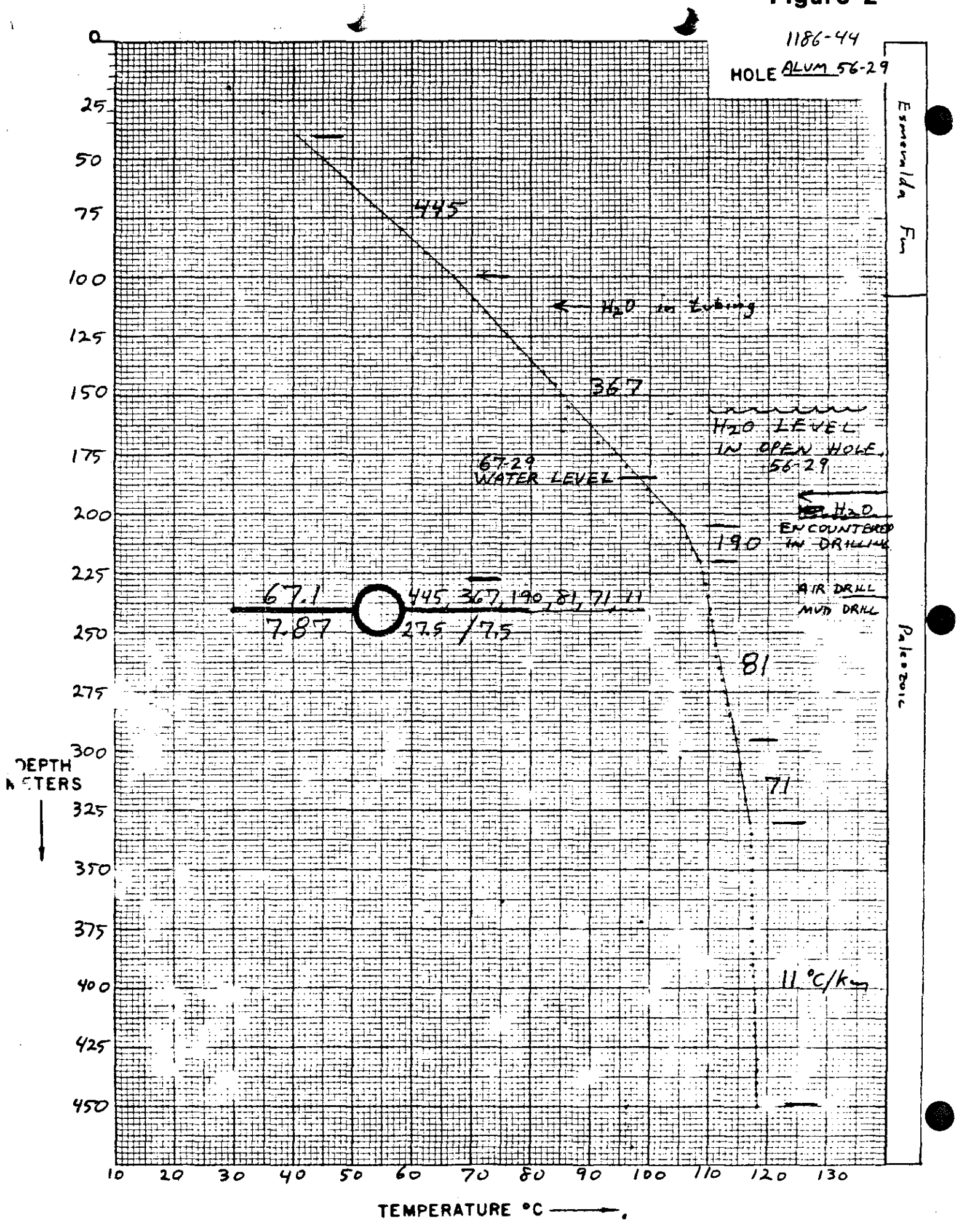
Elevation: 5020' Date Drilled: Completed: 12/21/81

Location: NW 1/4 SE 1/4 Sec 29 T1N R38 1/2E Method: air/foam and mud

Geologist: John Deymonaz Gamma:

Depth (m)	Description
0- 41	Esmeralda Fm - Siltstones and Sandstones - Firm to hard, predominantly light green and gray siltstones with minor fine sandstones. Intermittent zones of silicification. Minor iron staining along fractures and minor pyrite along small tight fractures.
41-111	Esmeralda Fm Siltstone - Med. to dark gray siltstones and soft shales. Some swelling in clays at 41m. Minor calcite along rare fractures. Rare pyrite.
111-454	Siltstone - Paleozoic ? section, hard, abrasive dark gray siltstones and shales. Bedding and laminations visible in larger chips. Intermittent fine grained argillaceous sandstones. Pyrite 5-20%, highest amount in upper portions of section. Large (up to 3 cm) pyrite crystals in white mylonite (?) from fault zone from 200m to unknown depth. Significant amounts of 80°C water encountered at 200-205m. Formation appears pervasively fractured.

Figure 2


1186-44
HOLE ALVM 56-29
Esmeralda Fm
Paleozoic
445
367
H_2O in tubing
H_2O LEVEL IN OPEN HOLE, 56-29
67-29 WATER LEVEL
H_2O ENCOUNTERED IN DRILLING
190
AIR DRILL
MUD DRILL
67.1
7.87
445, 367, 190, 81, 71, 11
27.5 / 7.5
81
71
11 °C/km
DEPTH METERS
TEMPERATURE °C

WHITE—DIVISION OF WATER RESOURCES
CANARY—CLIENT'S COPY
PINK—WELL DRILLER'S COPY

STATE OF NEVADA
DIVISION OF WATER RESOURCES

OFFICE USE ONLY
Log No.
Permit No.
Basin

WELL DRILLERS REPORT

PRINT OR TYPE ONLY — Please complete this form in its entirety

NOTICE OF INTENT NO. 1927

1. OWNER Steam Reserve Corporation (SRC) — ADDRESS AT WELL LOCATION Section 29 Township 1 North
MAILING ADDRESS 1707 Cole Boulevard Golden, Colorado 80401 — Range 38½ East

2. LOCATION ¼ ¼ Sec. 29 T. 1 N/S 38½ E/W Esmeralda County
PERMIT NO. 47029 (Issued by Water Resources) — Parcel No. — Subdivision Name

3. TYPE OF WORK: New Well [X] Recondition [ ] Deepen [ ] Other [ ]

4. PROPOSED USE: Domestic [ ] Irrigation [ ] Test [X] Municipal [ ] Industrial [ ] Stock [ ] Other [ ]

5. TYPE WELL: Cable [ ] Rotary [X] Other [ ]

6. LITHOLOGIC LOG

Material	Water Strata	From	To	Thickness
Valley Wash		0	2'	2'
Brown & White Tuff		2	40'	38'
Black limestone		40	62	22'
Yellow White Tuff		62	95	33'
Blue grew ash		95	195	100'
Blue Tuff		195	305	110'
green & Brown Siltstone		305	345	40'
Blue Tuff Conglomerate	Hard	345	405	60'
Blue Black Quartz	Hard	405	550	145'
grew quartz	Hard	550	570	20'
Blue Back quartz	Hard	570	638	68'
Fractured Slight water		638	641	3'
Water Hot and Very		Small amount		
Blue Black Quartz	Hard	641	712	71'
Fractured Slight Water	Hot	712	714	2'
Black quartz	Hard	714	720	6'
Black quartz Fractured	(yes)	720	739	19'
Water (Very Hot)		Sulfer Smell		
Black quartz	Hard	739	775	36'
Slight amount Steam coming out of hole, Water apperently boiling.				

Date started Sept. 24, 1984
Date completed Oct. 8, 1984

7. WELL TEST DATA

Pump RPM	G.P.M.	Draw Down	After Hours Pump
(Air Lift)	(2 Hrs.) 60	20' (not measured)	from bottem
Water measured from flow ditch			

BAILER TEST

G.P.M. ____ Draw down ____ feet ____ hours
G.P.M. ____ Draw down ____ feet ____ hours
G.P.M. ____ Draw down ____ feet ____ hours

8. WELL CONSTRUCTION

Diameter hole 10 inches Total depth 775 feet
Casing record 777' 6" 775'
Weight per foot ____ Thickness .156

Diameter	From	To
6 inches	0 feet	775' feet
____ inches	____ feet	____ feet
____ inches	____ feet	____ feet
____ inches	____ feet	____ feet
____ inches	____ feet	____ feet
____ inches	____ feet	____ feet

Surface seal: Yes [X] No [ ] Type Cement
Depth of seal 50' feet
Gravel packed: Yes [ ] No [X]
Gravel packed from ____ feet to ____ feet

Perforations:
Type perforation Tourch Cut
Size perforation ⅛" x 4"
From 675 feet to 775 feet
From ____ feet to ____ feet
From ____ feet to ____ feet
From ____ feet to ____ feet
From ____ feet to ____ feet

9. WATER LEVEL

Static water level 610 feet below land surface
Flow ____ G.P.M. ____ P.S.I.
Water temperature Hot °F. Quality ____

10. DRILLERS CERTIFICATION

This well was drilled under my supervision and the report is true to the best of my knowledge.
Name Stevens & Harris Drilling Co. (Contractor)
Address 11650 Iberia Place, San Diego, Ca. (Contractor)
Nevada contractor's license number 1399 021531
Nevada contractor's drillers number ____
Nevada driller's license number 1399
Signed Clyde L. Stevens (Actual Driller)
Date 10-30-84 (Contractor)

USE ADDITIONAL SHEETS IF NECESSARY

(Rev. 6-81) O-627 CR434