DEEP DRILLING DATA, RAFT RIVER GEOTHERMAL AREA, IDAHO

RAFT RIVER GEOTHERMAL EXPLORATION WELL #3 SIDETRACK-C

T. 15 S., R. 26 E., sec. 25bd Elev. 4850'

Compiled by H.R. Covington

INTRODUCTION

The third Raft River Geothermal Exploratory borehole (RRGE #3) site was chosen in order to determine the extent and capacity of the geothermal reservoir. Drilling of RRGE #3 by Reynolds Electrical and Engineering Company, Inc., began on March 28, 1976, using drilling mud to 1,385 ft where 13 3/8-inch surface casing was installed. Drilling then continued, using water as drilling fluid, to 4,240 ft, taking cores at 2,786 ft, 3,147 ft, and 1,947 ft. The decision to install production casing at 4,240 ft was brought about by an increase in alteration of the cuttings and a bottom hole temperature of 219°F. After the 9 5/8-inch production casing was installed, drilling continued to 4,418 ft, where the first sidetrack began.

Sidetrack-A was drilled in a westerly direction, with an average deviation angle of 8°, through the remaining Tertiary basin fill and into the Precambrian basement to a depth of 5,853 ft. Geophysical logs were run in sidetrack-A and a flow test conducted. The sidetrack produced approximately 40 gal./min. artesian flow with a 285°F bottom hole temperature.

Sidetrack-B, beginning at 4,590 ft, was drilled in a northeasterly direction, with an average drift angle of 3°45°, to a depth of 5,532 ft. Total production from the well then increased to approximately 100 gal./min., with a bottom hole temperature of 295°F.

Sidetrack-C was then drilled from 4,384 ft, in a northerly direction, to a total depth of 5,917 ft. The drift angle in this sidetrack was continuously increased from 1°45° at the kickoff point to 22°45° at total depth. Cores were taken in the Tertiary basin fill at 4,958 ft, and 5,249 ft, and in the Elba Quartzite at 5,532 ft. Just below the kickoff point, very clean cuttings of schist and quartzite were recovered, with a good break above, below, and between the two "units." Geophysical logs indicate this is contamination by cuttings from sidetracks A and B. After flow testing with airlift stimulation, this sidetrack brought total production of the well to approximately 350 gal./min. artesian flow with a bottom hole temperature of 295°F. The lithologic descriptions for RRGE #3; sidetracks A, B, and C plus the geophysical logs for RRGE #3 sidetrack -A are now available as USGS Open-File Report 77-616.

SIDETRACK-C DATA SUMMARY

Drilling period:	May 16-May 24, 1976			
Average drift angle:	11°			
General drift direction:	Northwest			
Artesian flow:	250 gal./min.			
Maximun Temperature:	295°F			
	meas. depth	vert. depth	angle	direct.
Kickoff point:	4,384 ft.	4,378 ft.	1°45'	N 85° W
Total depth:	5,917 ft.	5,844 ft.	22°45'	N 60° W

Formation	meas. depth	vert. depth
Precambrian quartzite of Yoest	5,342 ft.	5,304 ft.
Precambrian schist of the Upper Narrows	5,400 ft.	5,359 ft.
Precambrian(?) Elba Quartzite	5,502 ft	5.456 ft.
Precambrian older schist	5,715 ft.	5,656 ft.
Precambrian quartz monzonite	5,795 ft.	5,731 ft.

CORE

Core #4 4,958-4,978 ft. Tertiary Salt Lake Formation
Siltstone and sandstone: Alternating laminae of greenish-gray siltstone, and green sandstone; calcareous, tuffaceous; soft-sediment deformation throughout, bedding dips 30°-40°; many fractures dipping 60° to vertical; brecciated zone 4,978-4,981 ft.

Core #5 5,249-5,258 ft. Tertiary Salt Lake Formation
Siltstone and sandstone: Alternating thin laminae of brown siltstone, and light-green sandstone; calcareous, tuffaceous; bedding dip 25°; fractures vertical to 70° throughout, open or filled with calcite.

Core #6 5,532-5,533 ft. Precambrian(?) Elba Quartzite
Quartzite: White to milky, clean, dense, micas on bedding surfaces, and rare magnetite grains.

Sidetrack-C Geophysical Logs

Log	Date	Run	Logged Interval
Caliper	4-18-77	one	4,245-5,931 ft.
Compensated Densilog	4-18-77	one	4,245-5,931 ft.
Gamma	4-18-77	one	4,245-5,931 ft.
Compensated Neutron	4-18-77	one	4,244-5,932 ft.
BHC Acoustilog	4-17-77	one	4,244-5,924 ft.
Dual Induction Focused Log	4-17-77	one	4,245-5,935 ft.
Temperature	4-15-77	four	4,100-5,935 ft.
Spectralog K-U-Th-To	4-17-77	one	4,200-5,928 ft.

EXPLANATION

Tertiary--Salt Lake Formation: Gray to light-green thin-bedded to massive, tuffaceous siltstone and sandstone with minor beds of conglomerate. In the western part of the Raft River Basin at Jim Sage Mountain, the Salt Lake Formation is divided by a volcanic member into upper and lower members (Williams and others, 1976).

Upper member (Tsu) is gray to light-green tuffaceous siltstone and sandstone, and minor buff to gray conglomerate containing subrounded to well-rounded clasts of quartzite, dolomite, limestone, schist, and rhyolite.

Volcanic member at Jim Sage Mountain (Tsv) consists of rhyolite flows separated by light-gray and white tuffaceous siltstones and sandstone, and in many places by a vitrophyre breccia. The flows are black glassy and red-brown porphyritic-aphanitic calc-alkali rhyolite containing phenocrysts of oligoclase-andesine and pigeonite. The vitrophyre breccia consists of black glass clasts a few cm to 2 m in diameter in a yellow and orange matrix of hydrated glass (Williams and others, 1976).

Lower member (Tsl) is gray and white thin-bedded to massive tuffaceous sandstone with light-green interbeds of claystone and siltstone, and minor conglomerate containing clasts of quartzite, dolomite, limestone, and schist.

Precambrian--quartzite of Yoest: White, sparsely to moderately muscovitic, in beds a foot or less thick; green and greenish-gray coloration due to chrome-bearing mica can be found throughout. May contain as much as 10 percent K-feldspar (Compton, 1972).

Precambrian--schist of the Upper Narrows: Dark-brown to gray, fine- to medium-grained biotite schist and fine-grained gneiss that contains quartz or quartz-feldspar lenses (Compton, 1972).

Precambrian(?)--Elba Quartzite: White, tan or locally pale green quartzite with muscovite-quartz schist between some beds (Compton, 1972).

Precambrian--older schist: Brown and silvery mica-rich schists consisting of muscovite-biotite-quartz schist, mica-plagioclase-microcline-quartz schist, and muscovite-quartz schist (Compton, 1972).

Precambrian--quartz monzonite: Gneissic, light to dark greenish-gray with a trace of pyrite and magnetite.

Formational contacts and lithologic changes within the Salt Lake Formation are based solely on the well cuttings, and may not correspond exactly to changes in the geophysical logs. Cuttings and core were examined and described at the well site by H. R. Covington during drilling, and lithologic breaks assigned without the benefit of geophysical logs. Sample depth control was maintained, through the use of a carbide lag, by Rocky Mountain Geo-Engineering Company; this unit was released at 5,600 ft. in sidetrack-C. Directional drilling surveys were carried out by Eastman Whipstock, Inc. Geophysical logging was carried out by Dresser Atlas Wireline Services.

All depths, if not otherwise indicated, are measured from ground level.

REFERENCES

Compton, R. R., 1972, Geologic map of the Yost quadrangle, Box Elder County, Utah, and Cassia County, Idaho, U.S. Geol. Survey Misc. Geol. Inv. Map I-672.

Covington, H. R., 1977a, Deep Drilling Data, Raft River geothermal area, Idaho, Raft River Geothermal Exploration well #3: U.S. Geol. Survey Open-file report 77-616.

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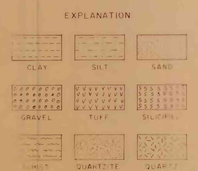
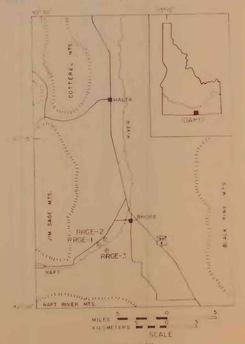
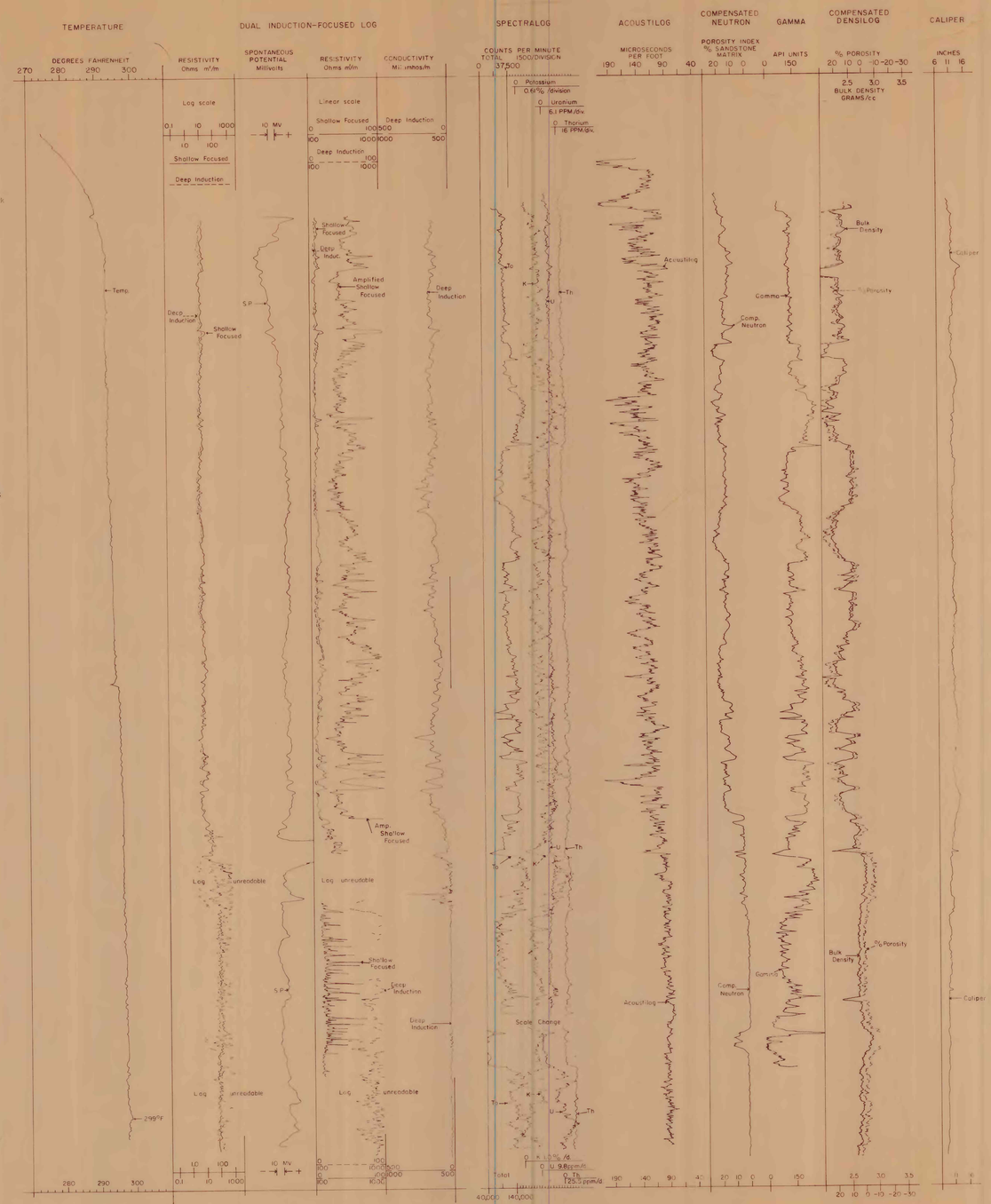
Williams, P. L., Mabey, D. R., Zonky, A. A. R., Ackermann, H., Hoover, D. B., Pierce, K. L., and Oriel, S. S., 1976, Geology and geophysics of the southern Raft River Valley geothermal area, Idaho, U.S.A. [1976]: Second United Nations Symposium on the Development and Use of Geothermal Resources, San Francisco, Calif., May 20-29, 1975, v. 1, p. 1273-1282.





INDEX MAP



C°=5/9(F°-32) microsecond/m=microsecond/ft(0.3048) cm=in(2.54)

LITHOLOGY

Sidetrack-C lithology

Production casing

Sidetrack-C 4384'

samples contaminated

no sample

no sample

5917'

Tertiary Salt Lake Formation

Sandstone--Quartz, brown to gray, calcareous, with a trace of pyrite and gypsum. Thin interbeds of light-green, calcareous tuff; and tan, calcareous siltstone with scattered quartzite pebbles.

Tuff--Light green to greenish gray, sandy, calcareous, few silicified zones and few thin interbeds of tan, calcareous siltstone.

Siltstone--Tan to brown, calcareous, and micaceous, with minor sandy interbeds.

Tuff--Light-green, silicified, abundant quartz and feldspar grains, and rare pyrite.

Siltstone--Tan to gray, calcareous, micaceous, minor pyrite, and few thin interbeds of light-green tuff.

Sandstone--Quartz, light gray, calcareous, pyrite and calcite flakes, minor tuff.

Tuff--Light green to white, silicified, abundant pyrite and calcite flakes.

Siltstone--Brown, calcareous, micaceous, thin interbeds of light-green, silicified tuff. Pyrite, magnetite, and calcite flakes.

Tuff--Light green to white, silicified, abundant pyrite.

Precambrian quartzite of Yoest

Quartzite--White, minor chlorite and disseminated pyrite. Some schistose lenses of silvery to green micas.

Precambrian Schist of the Upper Narrows

Schist--Quartz-biotite-muscovite, abundant pyrite and magnetite.

Precambrian(?) Elba Quartzite

Quartzite--White to green with muscovite on bedding surfaces. Trace of pyrite and magnetite.

Precambrian older schist

Schist--Biotite-chlorite-muscovite-quartz, brown color, abundant magnetite.

Precambrian quartz monzonite

Quartz monzonite--40 percent quartz, 45 percent feldspars, 20 percent biotite and chlorite, greenish-gray color, minor pyrite and magnetite.

Scale feet meters