or pink, very fine to medium grained, poorly sorted, feldsnathic

DEEP DRILLING DATA RAFT RIVER GEOTHERMAL AREA, IDAHO

STANDARD AMERICAN OIL CO., MALTA, NAF, AND STREVELL PETROLEUM TEST BOREHOLES

by Steven S. Oriel, Paul L. Williams, H. R. Covington, W. Scott Keys, and Kenneth C. Shaver

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DISCUSSION The southern Raft River Valley near Bridge, Idal known as a thermal area (Stearns and others, 1938, p. 1 area southwest of Bridge was designated the Frazier Resource Area (Frazier KGRA) by the U.S. Geological Su	70). In 1971, an Known Geothermal rvey (Godwin and	MALTA BOREHOLE Griffith-Wight No.I T. 14 S, R. 26 E, Sec. Ibd, Elev. 4687	NAF BOREHOLE Griffith—Simplot No.1 T. 16 S, R. 27 E, Sec. 9cd, Elev. 5045	STREVELL BOREHOLE Al Griffith—Isabell Neilson No.1 T.16 S., R. 28 E., Sec. 20ca, Elev. 5282
others, 1971). A geochemical reconnaissance of therma by the U.S. Geological Survey (USGS) in 1972 (Young and indicated a reservoir temperature near 300°F (150°C) for geothermal anomaly. The U.S. Energy Research and Development Administ Department of Energy), as a result of proposals by the Electric Cooperative, became interested in the Raft R potential site for an experimental binary-fluid geothermal buring the summer of 1973 the USGS, in cooperation with integrated geologic, geophysical, geochemical, and hy ation program in southern Idaho. This program was design scientific framework for appraising a potential geothermal research to test the applicability of various geologic, geophysical and hydrologic techniques to the study of geothermal research obtain the physical data necessary to evaluate techniques a drilling program was begun in the spring of 34 auger holes were drilled to depths of about (Crosthwaite, 1974), and in cooperation with the Idal Water Administration, 5 continuously cored wells to depth of the USGS of the continuously cored wells to depth so faction in the program was begun in the spring of 34 auger holes were drilled to depths of about (Crosthwaite, 1974), and in cooperation with the Idal Water Administration, 5 continuously cored wells to depth so factor in the spring of 34 auger holes were drilled to depths of about (Crosthwaite, 1974), and in cooperation with the Idal Water Administration, 5 continuously cored wells to depth so factor geothermal exploratory borehole (RRGE #1), drilled to the continuously cored wells to depth so factor geothermal exploratory borehole (RRGE #1), drilled to the continuously cored wells to depth so factor geothermal exploratory borehole (RRGE #1), drilled to the continuously cored wells to depth so factor geothermal exploratory borehole (RRGE #1), drilled to the continuously cored wells to depth so factor geothermal exploratory borehole (RRGE #1), drilled to the continuously cored wells to depth so factor geothermal exploratory borehole (RRGE #1), drilled	Mitchell, 1973) or the Raft River tration (now the Raft River Rural iver Valley as a smal power plant. h ERDA, began and drologic exploranted to provide a smal resource and sal, geochemical, sources. te these various of 1974. A total to 100 ft (30 m) to Department of this ranging from The first Raft		Composed Composed	Fan gravel: clasts are of light— to dark-gray and pink Octoology
(REECo, 1975; Covington, 1977a), confirmed the present (295°F; 146°C) in quantities (600 gal/min; 38 L/sec) medium temperature experimental binary-fluid geotherm Since then RRGE #2 (REECo, 1976; Covington, 1977 (Covington, 1977c; Covington, 1977d) have been drilled Raft River geothermal anomaly. All three wells can passon gal/min (22 L/sec) sustained flow with temperatu (146°C). During the early stages of the USGS-ERDA integrate ploration program three test boreholes were drilled in Valley for petroleum by Standard American Oil Company completion of this drilling and just before the deep geo by ERDA, Standard American Oil Co. kindly provided the tings and well logs from the three test boreholes. The these boreholes was used for initial interpretations of	ce of hot water suitable for a al power plant. b) and RRGE #3 by ERDA in the coduce more than res above 295°F d geothermal ex- the Raft River . Shortly after thermal drilling USGS with cut- information from geophysical data		MO	Fan gravel: clasts of light- to dark gray and pink, finely crystalline, partly silty limestone; white to pink and buff sandstone; and fragments of tuff clasts or beds Control Contro
and of the subsurface geology of the Raft River basis others, 1976). The only data available to us on the drilling proce drilling logs; no particular problems are noted nor is cation of core having been taken. Geophysical logs we for the Naf (Griffith-Simplot #1) borehole, but acces (Griffith-Wight #1) borehole has been granted. The US physics research project has logged the Malta borehole a of logs are presented in this report. MALTA BOREHOLE DATA SUMMARY Drilling period: Surface elevation: Kelly bushing elevation: 4,687 ft 1,428 m Kelly bushing elevation: 4,697 ft 1,431 m	dure is from the there any indice provided only is to the Malta Solution by the first set Surface Cosing Surfac	SALT LAKE FORMATION Tuffaceous sandstone, siltstone, and shale Shale and siltstone: tan, tuffaceous and calcareous with layers of weakly cemented coarse sandstone that contains clasts of quartz, feldspar, and rhyolite	Light-tan clay, silty clay, and clayey silt with layers of sand and fine gravels: clasts are quartzite and schist	Conglomerate: clasts are white, light— to medium—gray quartzite; white to glassy vein quartz; mica schist; granite(?); amphibolite(?); limestone; and rhyolitic glass. Some interbeds of tuff and light buff to white calcareous fine to very fine grained sandstone Surface Cosing Surface Cosing Rhyolite: medium— to light—gray vitrophyre with feldspar and quartz phenocrysts with light tan pumice at base
Total depth: Artesian flow: Maximum temperature: Surface casing: Core: TOP OF FORMATION 6,787 ft 2,068 m Unknown 198°F 92.4°C 635 ft 193 m None	t 1,673 m t 1,850 m t 1,943 m	Tuffaceous sandstone, and tan siltstone and shale	Surface Casing SALT LAKE FORMATION Tuff: light gray, white, and buff with interbedded tuffaceous siltstone and sandstone. Tuff fragments include glass, feldspar, and quartz; some analcite crystals near middle Surface Casing Surface Casing	Tuff: light-gray to almost white very fine grained to ashy Tuff: light-gray to almost white very fine grained to ashy tuff, with beds of tuffaceous conglomerate, sandstone, and medium gray shale in lower half which is a second of the conglomerate of the conglome
Caliper 625-4,845 190-1, Gamma 625-4,950 190-1, Normal Resistivity-64 inch 4,140-4,900 1,262-1, Normal Resistivity-16 inch 625-4,900 190-1, Spontaneous Potential 625-4,900 190-1, Temperature Surface-4,950 Surface NAF BOREHOLE	509 493 493 e-1,509		Siltstone and sandstone: siltstone is tan, tuffaceous, sandy and calcareous, partly clayey and maltered; sandstone is buff colored, and becomes coarser-grained lownward and includes quartife, sehist, and marble clasts	Limestone and sandstone: limestone at top and base is medium to light gray, pink, or tan, finely to very finely crystalline, calcurenite and calcisilities some is sandy and silty, with veins and veinlets of sparry calcite. Middle 250 feet is calcurous sandstone with interhedded limestone; sandstone is mainly pink to red, silty and very fine to fine grained, but also buff, vellow, and gray
PennsylvanianOquirrh Formation 1,130 ft OrdovicianFish Haven(?) Dolomite 2,250 ft OrdovicianEureka Quartzite 3,010 ft OrdovicianPogonip Group 3,430 ft Cambrian(?)Quartzite of Clarks Basin 3,755 ft Precambrian(?)Schist of Stevens Spring 3,960 ft	158 m 344 m 686 m 917 m 1,128 m 1,144 m 1,207 m 1,365 m	Conglomerate and sandstone: clasts are mainly dark gray to black partly devitrified glass, but also limestone, quartzite, chert, dolomite, and vein quartz in tan calcareous sandstone, siltstone, and mud matrix	Tuff: pale buff to white, medium-grained with abundant glass shards	Sanistone: silty int very calcareous, with minor interbeds of limestone, partly cherty; sandstone is mainly pink, but partly red, buff, or light gray, silty to very silty and very fine to fine grained
Precambrian(?)Unnamed dolomitic marble 4,860 ft Precambrian(?)Schist of the Upper Narrows 5,240 ft EXPLANATION QuaternaryRaft Formation: Massive beds of light-col and thin-bedded calcareous quartzose silt and sabedded locally. Conglomerate or gravel occurs a formation in many places (Trimble and Carr, Formation in the Raft River Basin is primarily clasts of Tertiary volcanic rock, Paleozoic Precambrian quartzite derived from the surro These gravels are interbedded with light-colored and sands. The Raft Formation-Salt Lake Form placed arbitrarily at the base of dominantly grave massive, tuffaceous siltstone and sandstone with conglomerate. In the western part of the Raft Rimansian Lake Formation is divided by a volcanic member at into upper and lower members (Williams and others Upper member (Tsu) is gray to light-green tufface sandstone, and minor buff to gray conglomerate. Volcanic member at Jim Sage Mountain (Tsj) consists separated in many places by a vitrophyre brecci black glassy and red-brown porphyritic-aphar rhyolite containing phenocrysts of oligoclase-and	1,481 m 1,597 m ored clay and silt nd that is cross- t the base of the 1976). The Raft gravel containing limestone, and anding mountains. calcareous silts nation contact is el strata. en thin-bedded to the minor beds of orer Basin the Salt Jim Sage Mountain 1976). ous siltstone and of rhyolite flows a. The flows are itic calc-alkali lesine, pigeonite,		Claystone and siltstone: claystone is gray, tuffaceous, and calcareous; siltstone is tan, clayey, tuffaceous, and calcareous; interbeds of tuffaceous, pink to gray sandstone with clasts of quartzite, biotite schist, mica schist, and dark-gray limestone	Marble, schist, and quartzite: mainly white to medium gray marble and calcitic schist, with layers of very fine grained quartzite and dark-gray siltite, dark-gray argillite and dolomitic argillite 7.7.7 FISH HAVEN(?) DOLOMITE Dolomite: laminated medium-gray recrystallized dolomite with interbedded light- to medium-gray, partly biotitic quartz-muscovite schist
and locally minor quartz. The vitrophyre breccia glass clasts a few cm to 2 m in diameter in a matrix of hydrated glass (Williams and others, 19) Lower member (Ts1) is gray and white thin-bedded to sandstone with light-green interbeds of claystone minor conglomerate. PennsylvanianOquirrh Formation (Compton, 1975): limestone with minor veinlets of sparry calcite a limestone is medium to light gray, pink, or tan, finely crystalline; sandstone is mainly pink to be fine grained, and calcareous. OrdovicianFish Haven(?) Dolomite (Compton, 1975): gray to massive cream colored, fine to very dolomite, with a few thin mica schist units. OrdovicianEureka Quartzite (Compton, 1975): Clea white to clear vitreous, fine to very fine grained few thin layers of sericite and muscovite schist. OrdovicianPogonip Group (Compton 1975): Light- to white finely sucrose marble with units of medi marble at top and base. Layers of muscovite s schist, quartzite, and quartz-mica schist are scat Cambrian(?)Quartzite of Clarks Basin (Compton, 19 medium-gray and white, poorly sorted, fine-t quartzite. Some beds slightly dolomitic. Thin la	consists of black yellow and orange 6). massive tuffaceous and siltstone and Sandstone and and chert nodules; and fine to very unif, fine to very Laminated medium- fine crystalline n, uniform milky quartzite with a medium-gray, some um gray dolomite chist, phlogopite tered throughout. 75): Light- to o medium-grained	Tuffaceous sandstone with tan siltstone and claystone	Sandstone and claystone: sandstone ranges from very fine to coarse grained and is medium gray with clasts of quartzite, mica schist, and carbonates; claystones are light to medium gray, and tan and partly	Dolomite: massive cream to white colored, and light to medium-gray fine to very fine crystalline dolomite, with a few thin mica schist units in the middle and even fewer beds of calcitic marble Dolomite: massive cream to white colored, and light to wern fewer beds of calcitic marble Dolomite: massive cream to white colored, and light to wern fewer beds of calcitic marble Dolomite: massive cream to white colored, and light to wern fewer beds of calcitic marble Dolomite: massive cream to white colored, and light to wern fewer beds of calcitic marble Dolomite: massive cream to white colored, and light to wern fewer beds of calcitic marble Dolomite: laminated silver-gray and light-medium-gray fine to very fine crystalline dolomite, interspersed with a few percent of muscovite and quartz grains
schist throughout. Precambrian(?)Schist of Stevens Spring (Compton 1975 slightly feldspathic, calcitic and dolomitic mark light to dark gray with numerous laminae and quartz-muscovite schist and dolomite quartz-muscovite schist and dolomite quartz-muscovite beds of gray, very fine grained quartzite and silt half. Precambrian(?)Quartzite of Yost (Compton, 1972): Long pink, very fine to medium grained, poorly so): Quartzose and ole, ranging from thick layers of ite schist. Thin tite in the lower ght gray, white,	Claystone and siltstone: tan, tuffaceous, and silty to sandy	silty; some tan clayey siltstone also present	EUREKA QUARTZITE