

AREA
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Twin Falls
Perrine
Perrine

GL02729

FEASIBILITY OF THERMAL WATER DEVELOPMENT
on the Perrine Ranch
near Twin Falls, Idaho

for
Burton Perrine

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Perrine Ranch
Snake River Canyon
near
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Introduction

The purpose of this investigation is to determine the feasibility of development of thermal water sources in the Snake River Canyon on the property known as the Perrine Ranch. The use of any water developed is to be for supplementing and heating an existing water source to enhance the growth and propagation of catfish. Existing water supplies from Blue Lakes Spring are not of sufficient temperature to allow the growth of the catfish species during winter months.

Geology of the Area

The Perrine Ranch lies on the north side of the Snake River downstream of the Perrine Bridge. The alluvium deposits in the area are generally fine to coarse sands with some gravel and clay beds ranging in total depth from 0 to as much as 100 feet. The Banbury Basalt of late Pliocene age underlines the Ranch and Blue Lakes Cove. Undifferentiated flows of the Snake River Basalt are exposed on the walls of the canyon. This volcanic formation consists of individual lava flows as much as 50 feet or more in thickness with the total depth reaching up to 600 feet in places. The Banbury Basalt is normally gray to black, with very little weathering and generally of low permeability except where fractured. The land surface upon which the Banbury Basalt is laid down is generally uneven and as a result the thickness of these basalts is not uniform being thickest in areas of ancient stream beds. Interbedded deposits of silt are common and may be burned red by subsequent lava flows.

The Banbury Basalt is underlain generally by older silicic volcanic Tertiary rocks generally believed to be of Miocene age. This group consists primarily of flows of rhyolite with andesite, latite and some basalt. Extensive outcroppings of rhyolite occur along the hills south of Twin Falls and are encountered in wells on the Twin Falls South Side Project. Layers of welded tuff, volcanic ash and sands are found in this sequence. These rocks, generally referred to as the Ida-Vada Volcanics dips north and is believed to be much disturbed by faulting with downthrow generally to the north.

A member of this sequence, the Shoshone Falls andesite, is present in the Snake River Canyon from Shoshone Falls to a contact at the north end of the Perrine Ranch. A well drilled for the Twin Falls Cemetery apparently intersected this formation at a depth of about 293 feet. The contact between the Shoshone Falls andesite and the Banbury Basalt at the Perrine Ranch is so abrupt as to suggest the possibility of faulting. In addition, the sequence of the Banbury Basalts and Snake River Basalt in this area are difficult to map.

Hot Springs

Numerous hot springs are found along the Snake River Canyon and tributaries from Bliss to Artesian City. They range in discharge up to $2\frac{1}{2}$ cfs at the White Arrow Hot Springs near Bliss. Water temperatures exceed 130°F in some springs as at Banbury Hot Springs near Hagerman. The supply at Banbury has been increased by drilling of wells into the Hagerman formation which consists of layered basaltic tuff and basalt flows. The hot water is apparently confined below a basalt flow as evidenced by the artesian head in the wells. The temperature of the water at Banbury was also increased about 5°F by drilling. Most of the hot springs along the canyon issue either from the Banbury Basalt or Hagerman formation and are generally associated with fractures or faults.

The small hot spring on the Perrine Ranch is located in the bed of a stream which carries water from Blue Lakes through a series of fish ponds into the Snake River. It is about 100 yds. upstream from the backwaters of a reservoir on the lower end of the ranch. Water at 100°F issues from two small vents which flow only a few miners inches and bring up small quantities of dark and light sand. The bed of the stream contains large exposed boulders which are apparently weathered talus from the canyon wall. The elevation of the springs is about 3100 feet above sea level.

Hot Water Wells

Numerous wells in the Twin Falls area have encountered hot water sources. Wells in the Artesian City area are well known and supply a natatorium and irrigation water. These wells are believed to produce water from the rhyolite flows of the Ida-Vada Volcanics at temperatures of up to 106° and will produce up to 100 inches when pumped.

The City of Twin Falls' Lynwood well apparently penetrated the rhyolite at 1375 feet and was apparently in the Ida-Vada volcanics series down to 1530 feet in depth. At 1530 feet the well was flowing 120 g.p.m. with a water temperature at the bottom of 102°F. The ground surface at the well is about 3700 feet elevation so that the rhyolite was encountered at about 2325 feet.

The Twin Falls Cemetery well apparently penetrated the Shoshone Falls andesite of the Ida-Vada series at 293 feet or elevation 3487 and the rhyolite at elevation 2695 with a water temperature of 84°F. A well at the Buhl reservoir hit reddish rhyolite at elevation 2980 and a well near the railroad depot in Buhl encountered rhyolite at elevation 3020. The Idaho Power Company well in Buhl penetrated rhyolite at a depth of 904 feet or an elevation above sea level of about 2600 feet.

The rhyolite apparently dips or increases in depth below the ground surface in a north westerly direction as evidenced by the well logs. Providing there is no faulting of the Ida-Vada sequence between the City of Twin Falls and the Perrine Ranch, and the general dip or trend of the flows is continuous, one might expect to encounter this formation at a depth of at least 1200 feet at the location of the existing hot water spring.

$$\begin{array}{r} 3487 \\ + 293 \\ \hline 3790 = \text{spad elev.} \end{array}$$

Depth of well
to rhyolite =

$$\begin{array}{r} 3790 \\ - 2695 \\ \hline 1095 \end{array}$$

1575
2325
3100

Water Quality

Chemical analysis of samples taken from the hot springs on the Perrina Ranch on February 17, 1970 have not been completed. Electrical conductivity measurements indicate a conductivity of 450 micromhos per centimeter which corresponds to a total dissolved solids content of 320 ppm (parts per million). This value is low and compares favorably with total dissolved solids of 350 ppm in water from the Blue Lakes Spring. It is not likely that there will be adverse amounts of dissolved cations or anions in this water. The one exception is the possibility of high concentrations of fluoride which may be present in water developed from deeper strata. The Lynwood well of the City of Twin Falls contained 9-10 ppm fluoride at the lower depths which is above Public Health standards for human consumption.

Conclusions

Available geologic information indicates that the rock strata underlying the Perrine Ranch is Banbury Basalt which is characterized by massive flows with generally lower permeability than most other basalts except where fractured. The rhyolite member of the Ida-Vada Volcanics series probably underlies the Banbury Basalt at great depths possibly as much as 1200 feet at the Perrine Ranch. The rhyolite is the probable source of the hot springs on the Perrine Ranch.

Thermal water development on the south side of the Snake River is generally associated with wells in the rhyolite which is encountered at depths of 1100 to 1400 feet in the City of Twin Falls. It is not likely that economic development of thermal water from the rhyolite is feasible on the Perrine Ranch.

Success in increasing hot water yields of Banbury Hot Springs, Tschannen Warm Springs near Bliss, and Artesian City Hot Springs by means of wells in the basalts and related formations of the Snake River Canyon and the evidence of faulting of the basalts in the area of the Perrine Ranch warrants a test or exploratory well in the immediate vicinity of the observed springs.

It is expected that a well in this area will flow under artesian pressure and will have a water temperature of at least 110°F. The expected quality of the developed water will be good with no concentration of dissolved minerals which would be deleterious to fish production.

The quantity of hot water available will depend on the extent of fracturing in the basalt and the proximity of the source. It is expected however that the yield will be less than 1.5 cfs and probably between 0.5 and 1.0 cfs.

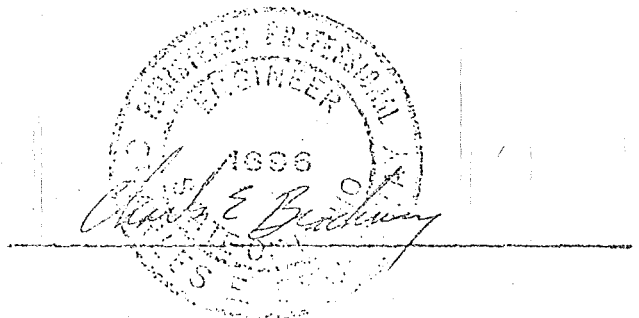
Recommendations

It is recommended that an exploratory well be drilled in the immediate vicinity of the small hot springs at the lower end of the Perrine Ranch. The purpose of the well would be to determine the extent of fracturing, temperature of the water, and the quantity of water obtainable. Based on data obtained from the test well decisions as to additional development can be made.

Drilling should be performed by a licensed water well driller using percussion type equipment. Casing will be required through the alluvium and other caving strata or horizons of undesirable water quality which may be encountered. The well should be started with at least a 16 inch diameter to assure completion with a sufficient diameter to accommodate deep well pump equipment. Water quality should be determined periodically to identify horizons of poor quality if they are encountered.

In order to fully determine the potential for development, the well depth for planning and estimating purposes should be 400 feet. Cost for a well of this depth, including drilling, casing, testing and necessary engineering and overhead would be approximately \$10,000 dollars and would require about two months for completion.

706 Sunrise Blvd. North
Twin Falls, Idaho



February 26, 1970