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Introduction

The area near Blackfoot, Idaho is characterized by two contrasting geologic and physiographic terrains. To the north and west of the city, the broad, gentle topography of the Snake River Plain is dominant while to the south and west are found a series of northwest trending, fault block mountains. In terms of geothermal potential the mountainous areas show some promise while the Snake River Plain remains relatively untested.

Geology and Hydrology

The contrast between the two geologic terrains near Blackfoot has a bearing on the geothermal potential of the area. Rocks which compose the fault-bounded mountains are relatively old, impermeable metamorphic and sedimentary units. These rocks are structurally complex; they have undergone many periods of faulting and folding. Any fluids moving through these mountains are probably fault-controlled rather than aquifer-controlled.

The Snake River Plain is characterized by two rock types which affect its geothermal potential. The underlying basement rocks are composed of dense, non-permeable volcanic rocks known as rhyolites. These are overlain by porous sedimentary rocks and vuggy, vesicular volcanic rocks known as basalts. Thickness of the basalts and sedimentary rocks varies. Near the margin of the Plain they are usually thin, while in the center of the Plain they are extremely thick (up to two miles). The porous nature and numerous depositional unconformities of the basalts and sedimentary rocks make them excellent aquifers. Water from the Island Park area, Big Lost River and other mountain sources percolates into the basalts and sediments and is discharged

near Hagerman in south-central Idaho. This feature is very important because it appears to effectively mask any hot water manifestations in the vicinity of Blackfoot.

Geothermal Potential

In southeastern Idaho most geothermal interest has centered around Blackfoot Reservoir. There has also been activity by two corporations in the Fort Hall Indian Reservation; presumably this has been exploration for high temperature systems capable of generating electricity. All of this activity has been in the fault-bounded mountains outside the Snake River Plain. These geothermal targets are probably fault-controlled, deep circulation systems in areas of high heat flow.

It is entirely possible that some of the hot water that is known to exist near these fault-bounded mountains is transmitted laterally into a favorable aquifer of the Snake River Plain. If it were rising from depth, the water would probably be transmitted along an aquifer below the cold water aquifers mentioned above. The only way to test for this aquifer would be to drill a deep hole which would penetrate impermeable basement rock (i.e. a hole through the deepest cold aquifer). The most favorable location for testing this would be near the margin of the Plain where geophysical work has shown the basalts to be relatively thin. To our knowledge, no one has drilled through the basalts. The deepest hole we know of along the southern margin of the Plain is a 1600' water well for the city of Idaho Falls. The bottom of this well is in basalt and the water it produces is cold. However, a much shallower (860') well drilled at the State Hospital South in Blackfoot, produces moderately

warm water (22°C). This may reflect the fact that the Blackfoot well is closer to the margin of the Plain than the Idaho Falls well.

Known Hot Springs and Wells

Two hot springs and a group of hot wells are known to exist within a 20-mile radius of Blackfoot. Only one is on the Snake River Plain. These springs and wells are listed below with their surface temperatures and subsurface geothermometers (if known). Their locations are shown in Figure 1. Care must be taken in interpreting geothermometry calculations because they represent the maximum temperature that might be found. This maximum may only be achieved at very great depths, for beyond the limits of a producing geothermal well.

NAME	SURFACE TEMPERATURE	GEOTHERMOMETER (chalcedony)
Yandell Hot Springs	22°-32°C	35°C
Alkali Flat Warm Springs	34°C	58°C
Tyhee Warm Wells	20°-41°C	62°C
State Hospital South domestic well (Blackfoot)	22°C	-

Recommendations

If American Potato Company is interested in pursuing a geothermal project in this area of the Snake River Plain, some general recommendations can be made. Under the assumption that you would want a resource on the Plain outside the Fort Hall Reservation, the Tyhee Area would be the most logical sight to conduct an exploration program. Among the steps involved in such a program, the following should be considered:

1) An inventory of all deep water wells and any geothermal, oil or gas tests in the immediate area. From these temperature profiles and stratigraphic correlations could be constructed.

2) Surface mapping of the geology.

3) Procurement of any geophysical work done on the Tyhee Area. ESL is currently trying to determine what might be available.

Since Yandell Hot Springs and Alkali Flat Warm Springs are 6 and 10 miles respectively from the border of the Snake River Plain, it may be impractical to consider these areas. Likewise, the areas which are currently being evaluated as high temperature resources are probably too far from the site of your plants. A distinct advantage of considering one of these locations would be that much of the groundwork has already been accomplished. The geological and geophysical surveys done by oil companies or utilities might be available for purchase. An even more favorable situation would be a geothermal production hole with temperatures too low for electric generation but high enough for direct heat applications.