Site Description

Buffalo Valley Hot Springs (updated 2008)

Buffalo Valley Hot Springs are located in the southeast part of Buffalo Valley (Lander County), in SE¼ Sec. 23, T29N, R41E. They have reported surface temperatures up to 79°C (Olmsted and others, 1975) mainly from 11 springs over an area of 1.2 hectare (Waring, 1919). The estimated thermal reservoir temperature using the silica geothermometer is 125°C (Mariner and others, 1974). In 2002, we measured temperatures in 58 springs, and sampled four of them ranging in temperature from 12 to 77.3°C. The Na-K-Ca temperature from 2002 data is 130°C. Thermal groundwater is present over an area of about 5 km^2 (figure), with temperatures up to 89°C encountered in shallow test holes (Olmsted and others, 1975). Heat-flow studies in Buffalo Valley indicate that the heat flow is near normal for this area of Nevada (2-3 HFU) and rises to greater than 50 HFU near the springs (Sass and others, 1976; Wollenberg and others, 1975; Olmsted and others, 1975). Hot springs are also present in Sec. 6, T29N, R41E (Wollenberg and others, 1977).

The Buffalo Valley Hot Springs are a subcircular group of numerous springs of low flow. They emerge from a mound of marly material which is slightly higher than the surrounding flat (figure). A few of the hottest springs deposit travertine, but many are too cool or have too low a flow to accumulate any deposits (Hose and Taylor, 1974). A modern spring mound of about 16 hectares is located within about 161 of older spring deposits (Olmsted and others, 1975). Wollenberg (1974b) reported anomalous radioactivity (30 to 38 µR/hr) from Buffalo Valley Hot Springs. The main spring area has 80 or more low-flow seeps trampled by cattle (2002 visit), thus, many of the waters were full of organics. Temperatures of the 80+ springs ranged from 14 to 78°C in the 600-m-diameter area. Two major spring areas occur in this 600-m-diameter area, and are noted by springs distributed over each of the two 1- to 2-m-high travertine and mud mounds.

Buffalo Valley is an asymmetrical graben, closed at its southern end. North-trending basin-and-range faults bound the valley on the west at the base of the Tobin Range (Wollenberg and others, 1975). Range-boundary faults are not as conspicuous on the east side of the valley where the hot springs are located. Wollenberg and others (1975) reported that Buffalo Valley Hot Springs are associated with a recognizable fault that extends to the north of the springs along the west edge of the Fish Creek Mountains. In addition, Quaternary basalt cinder cones and flows are aligned along the west edge of the Fish Creek Mountains for about 19 km (Wollenberg and others, 1975, map), suggesting that they were extruded along a basin and-range fault or fault zone. The age of these basalts is in question. Olmsted and others (1975) cited an age of about 3 Ma from oral communication of E. H. McKee (1974). More recent dating by M.L. Silberman (written commun., 1977) indicates that basalt in NW¼ Sec. 3 1, T29N, R42E can be dated by K-Ar methods at about 1.4 Ma (for 3 samples: 1.24±0.21 Ma, 1.29±0.04 Ma, and 1.40±0.14 Ma). The morphology of the cinder cones also suggests that they are quite young. The younger age is further substantiated by the thin alluvial covering which overlies basalt penetrated in two test holes at depths of less than 30 m (Olmsted and others, 1975). They suggest a slow rate of deposition along the east side of Buffalo Valley based on the

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3 Ma date. If the younger date (1.3 Ma) is assumed correct then rates of deposition would probably be normal for this thickness of alluvial material (Trexler, 1977).

Ransome (1909b) described springs on the west side of Buffalo Valley as warm. The exact location of Ransome's springs is uncertain, but Wollenberg and others (1977, Table 7) describe springs in this area (7-10 km northwest of Buffalo Valley Hot Springs) that have temperatures of 14-19°C, which may have seemed warm to Ransome compared to other 10°C springs in the valley. These springs are located in the northwest part of T29N, R41E and the southwest part of T30N, R41E. Some of them have been called Buffalo Springs. Trexler, Koenig, Flynn (1981; Table E2) were unable to locate any springs in this area. In an October 2002 visit, no hot springs could be located on the west side of Buffalo Valley. Local vegetation die-off areas were noted in the Buffalo Springs area that were 10-50 m in diameter. Garside and Schilling (1979, Appendix 1) reported hot springs in this area (Sec. 6, T29N, R41E); however, this was based on an apparently erroneous location for Buffalo Valley Hot Springs by Wollenberg (1977, Table 7). Apparently most springs in the Buffalo Springs area on the west side of Buffalo Valley are dry, and if any were warm in the past, their temperatures were only marginally anomalous.

Ormat Technologies, Inc. announced that they have signed a 20-year power purchase agreement with Nevada Power Company for the sale of energy to be produced from their Buffalo Valley geothermal power plant, projected to be online late 2009 (www.ormat.com/index_1.htm). In 2006, Ormat Nevada, Inc. submitted applications to drill ten temperature gradient wells and four observation wells spread through Secs. 22, 24, 25, 26, 27, 34, and 35 in T29N, R41E (Nevada Geothermal Update, April 2006, Nevada Division of Minerals).