

DOUGLAS COUNTY (continued)

In 1962 and 1963, Columbia Iron Mining Co., subsidiary of U. S. Steel Corp. explored the hot springs area for geothermal energy. They drilled 26 shallow holes to determine the area of maximum water temperature. These were 100 to 200 feet deep, and encountered temperatures up to 181°F (see fig. 18). Two deeper wells were also drilled in the area (fig. 19). Mariner and others (1974) have estimated the reservoir temperature at 185°F from a Na-Ca-K geothermometer.

Saratoga Hot Spring [44]

A hot spring is present in the SE/4 SE/4 SW/4 S21,T14N, R20E near the west side of Hot Springs Mountain on the eastern margin of Hot Springs Valley (Glancy and Katzer, 1975). The reported temperature is 122°F.

Hobo Hot Springs [42]

Several hot springs in C S/2 S23,T14N,R19E occur over a quarter of a square mile area. These springs are named Hobo Hot Springs on the Genoa 7½-minute quadrangle, but the Reno 1:250,000 topographic map shows Hobo Hot Springs to be 1.5 miles to the northeast of another group of hot springs (see the following description). Glancy and Katzer (1975) report Hobo Hot Springs in SE/4 SE/4 S23,T14N,R19E with a temperature of 114°F.

Unnamed springs, Carson Valley [43]

Water analyses and temperatures have been reported by the Center for Water Resources Research, University of Nevada, Reno on four warm springs in NW/4 NW/4 S19, T14N,R20E. These are 1.5 miles northeast of Hobo Hot Springs. The temperatures range from 76° to 90°F.

ELKO COUNTY

Sulphur Hot Springs [83]

The highest spring temperatures in Elko County (up to 205°F) are reported from Sulphur Hot Springs, in S11, T31N,R59E in Ruby Valley. They are probably named for their odor of hydrogen sulfide. The springs flow from a roughly circular sinter mound about 1,500 feet in diameter on an alluvial apron near the east side of the Ruby Mountains (Olmsted and others, 1975). The water flows into Stonier Lake. A major Basin and Range normal fault forms the contact between consolidated rocks and unconsolidated deposits at the mountain front (fig. 20). Another fault cuts the alluvial units about half the distance between the mountain front and the hot springs. Eakin and others (1951) suggest that the thermal spring waters probably rise along a fault.

The siliceous spring sinter consists of white- to light-gray, earthy, amorphous silica (probably opal) deposited by both present and ancestral hot springs (Olmsted and others, 1975). This extensive area of sinter suggests a high geothermal reservoir temperature. Mariner and others (1974) analyzed water from one of the hottest overflowing pools

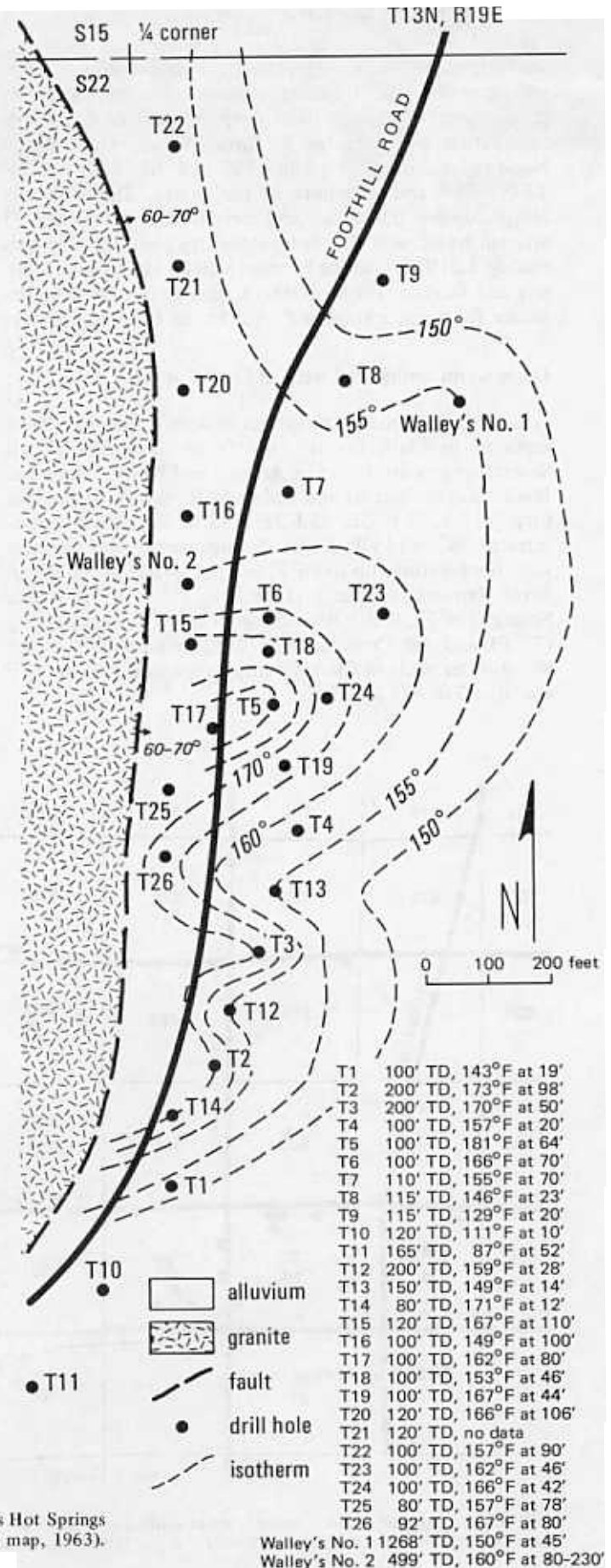


FIGURE 17. Isothermal contour map of the Walley's Hot Springs area, Douglas County (modified from U. S. Steel Co. map, 1963).

ELKO COUNTY (continued)

and estimated the reservoir temperature at 361° to 374° using the silica-quartz geothermometer. The area of sub-surface hot water at Sulphur Hot Springs is roughly circular and covers approximately 2 square miles (fig. 21).

Waring (1965) reports Miller's Hot Springs in T30N, R69E at the northeast end of Franklin Lake. This description probably refers to the Sulphur Hot Springs area. Batzle and others (1976b) report on telluric profiles of the Ruby Valley Known Geothermal Resource Area, which includes Sulphur Hot Springs.

Hot Sulphur Springs [60]

Hot Sulphur Springs at the north end of Independence Valley (S8,T41N,R52E) have reported spring temperatures of 194°F, and an estimated reservoir temperature of 262°F

based on a silica geothermometer (Mariner and others, 1974). Petaini Springs (index no. 63) 7 miles to the southwest in SW/4 S6,T40N,R53E are the only other reported warm springs in Independence Valley.

Elko Hot Springs [78]

The hot springs near the present town of Elko were a landmark along the old emigrant trail. In 1868 Governor Bigler and Col. Thomas Hanley built a two-room steam bathhouse at hot springs southwest of Elko and employed a doctor to supervise treatment of patients. Soon afterward, they constructed a ten-room building (Smith, 1957, p. 16-17). Adjoining springs were developed into Laumeister and Groepper's Humboldt Hot Springs; the hotel and bathhouse went through many ownerships and two disastrous fires before 1900. A brick building, rebuilt after the second fire, and the hot springs are now incorporated in Elko

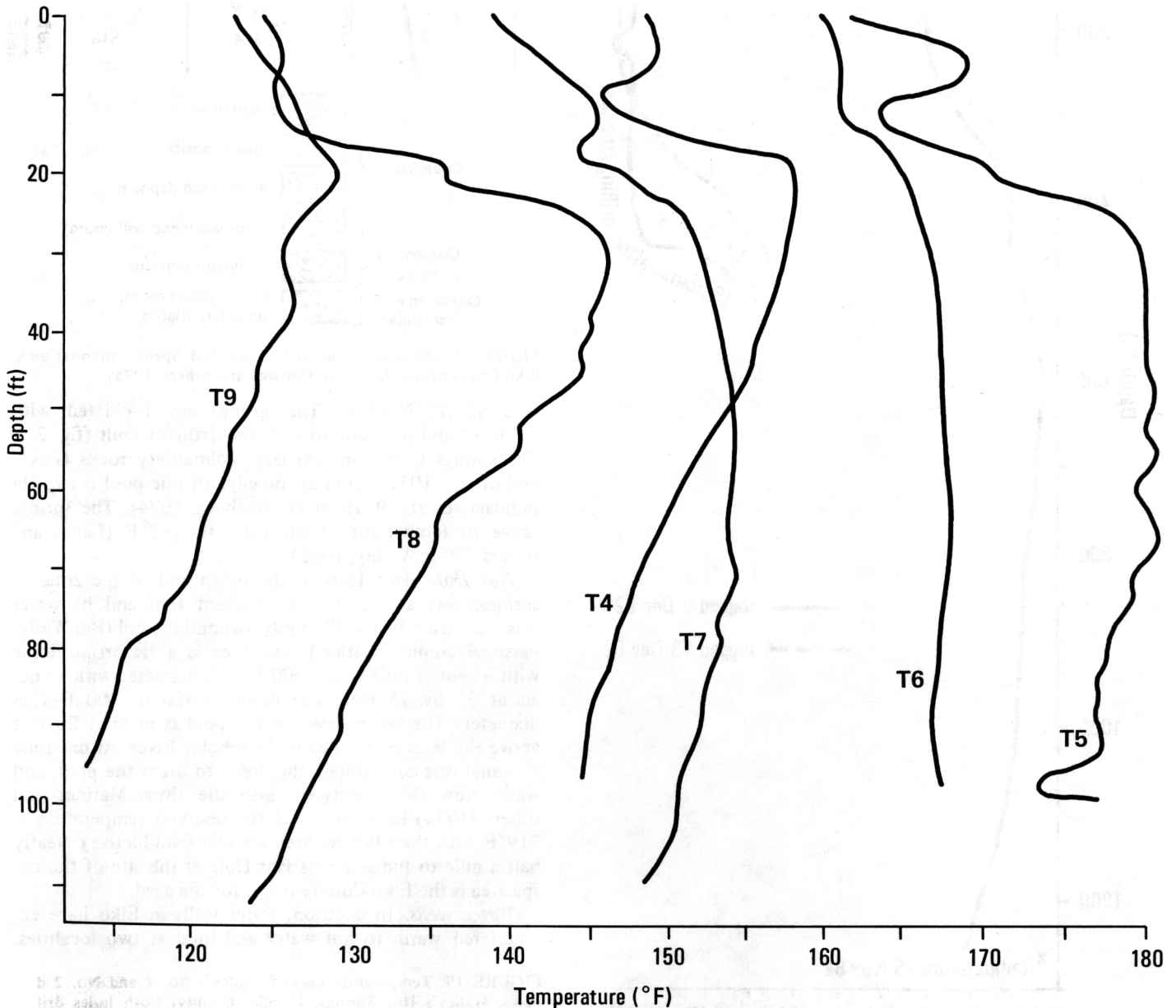


FIGURE 18. Temperature logs of selected shallow test holes at Walley's Hot Springs, Douglas County. Holes 4, 6, 7, 8 and 9 logged December 9, 1962; hole 5 logged December 13, 1962 (from U. S. Steel Co. temperature logs, 1962).

ELKO COUNTY (continued)

County's home for the aged (Patterson and others, 1969, p. 547-548). The hot springs have reportedly been utilized in hatching chickens (Adams and Bishop, 1884, p. 195), and attempts were made in 1921 at the nearby Catlin Oil Shale plant to distill oil from the local oil shales with the aid of hot water from the Hot Hole area (Patterson and others, 1969).

The Elko Hot Springs area is about 1.5 miles southwest of the center of Elko along a half-mile-long zone in the

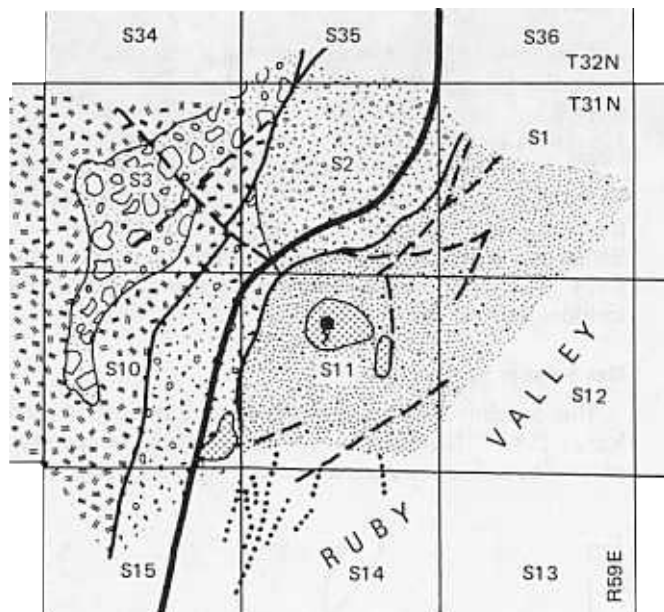


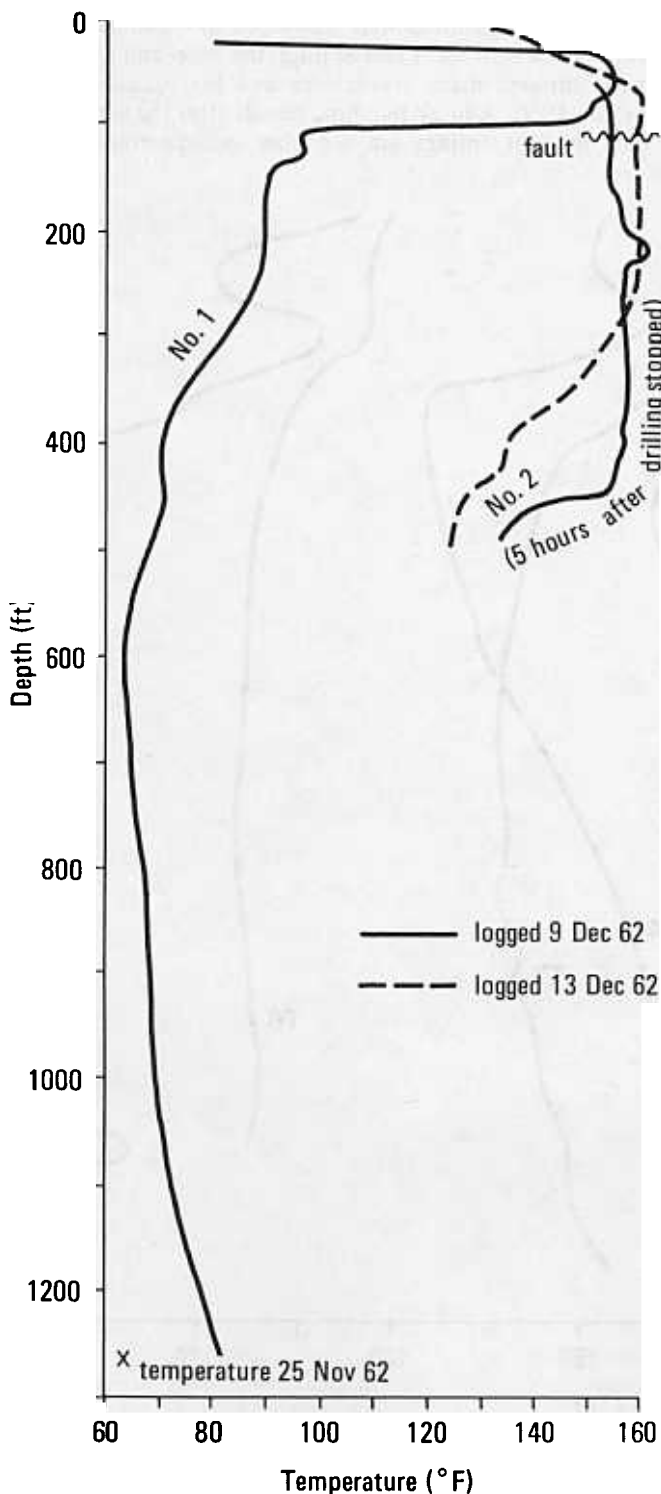
FIGURE 20. Geologic map of Sulphur Hot Springs thermal area, Elko County (modified from Olmsted and others, 1975).

W/2 S21,T34N,R55E. The springs are associated with fractures and adjacent to a north-northeast fault (fig. 22). The springs flow from Tertiary sedimentary rocks (Eakin and others, 1951). Tufa at the edge of one pool is slightly radioactive, at 19 μ R/hr (Wollenberg, 1974). The springs range in temperature from 150° to 192°F (Eakin and others, 1951; Waring, 1965).

Hot Hole. Hot Hole at the north end of the zone of springs, was a stop on the emigrant trail and its water was once used for an Elko city swimming pool (Bill White, personal communication). The area is a travertine dome with a central hole about 200 feet in diameter with a pool about 35 by 75 feet. The dome is 400 to 500 feet in diameter. The water level in the pool is at least 20 feet above the level of the nearby Humboldt River. At one time a tunnel was cut through the dome to drain the pool, and water now flows eastward into the river. Mariner and others (1974) have estimated the reservoir temperature at 219°F with the silica geothermometer (conductive). Nearly half a mile to the south of Hot Hole at the site of the old spa area is the Elko County home for the aged.

Water wells. In addition, water wells in Elko have encountered warm to hot water and mud at two localities.

FIGURE 19. Temperature logs of Walley's No. 1 and No. 2 drill holes, Walley's Hot Springs, Douglas County. Both holes drilled using air, and cased throughout; No. 1 completed November 25, 1962, No. 2 completed December 9, 1962 (from U. S. Steel Co. temperature logs, 1962).



line of equal temperature (°C)
at a depth of 30 meters

hot spring

● 31.9

test hole, number is temperature
(°C) at a depth of 30 meters

fault

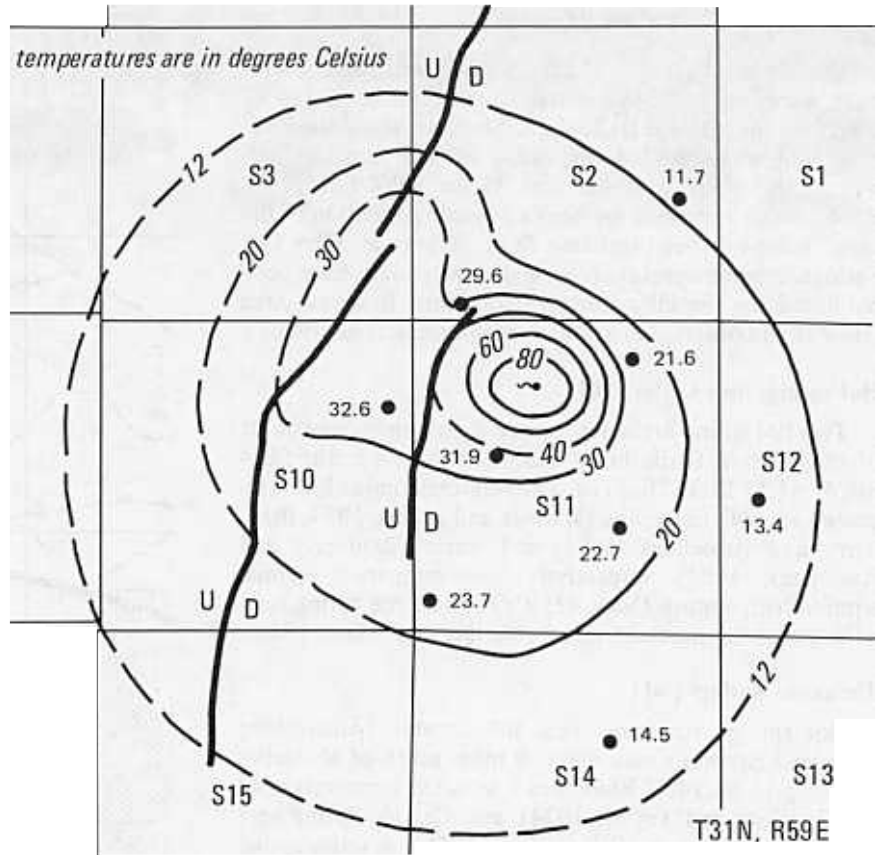


FIGURE 21. Sulphur Hot Springs thermal area, Elko County, showing temperature at a depth of 30 meters, fall 1973 (from Olmsted and others, 1975).

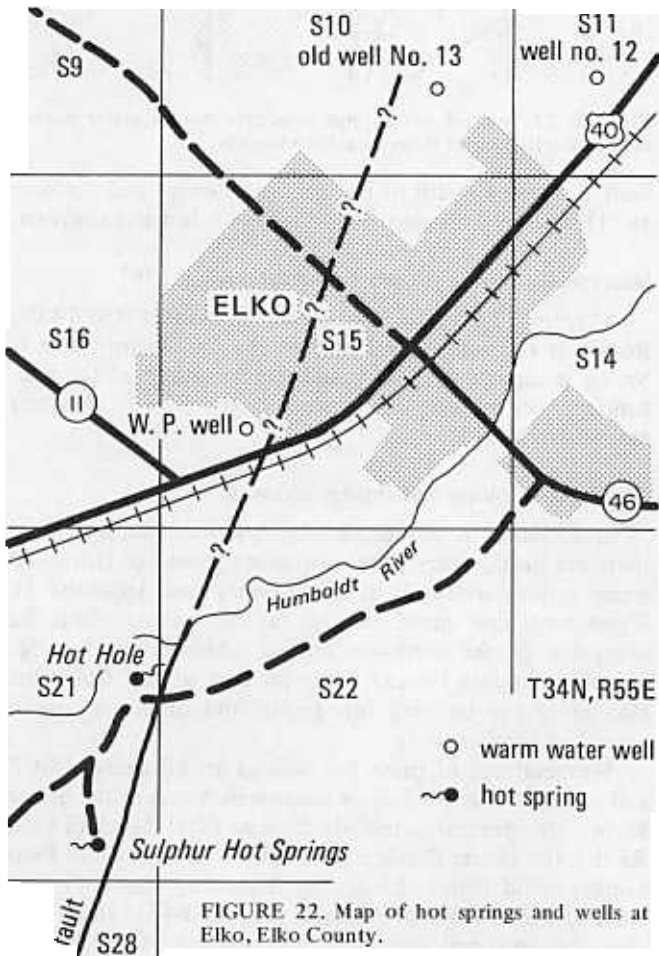
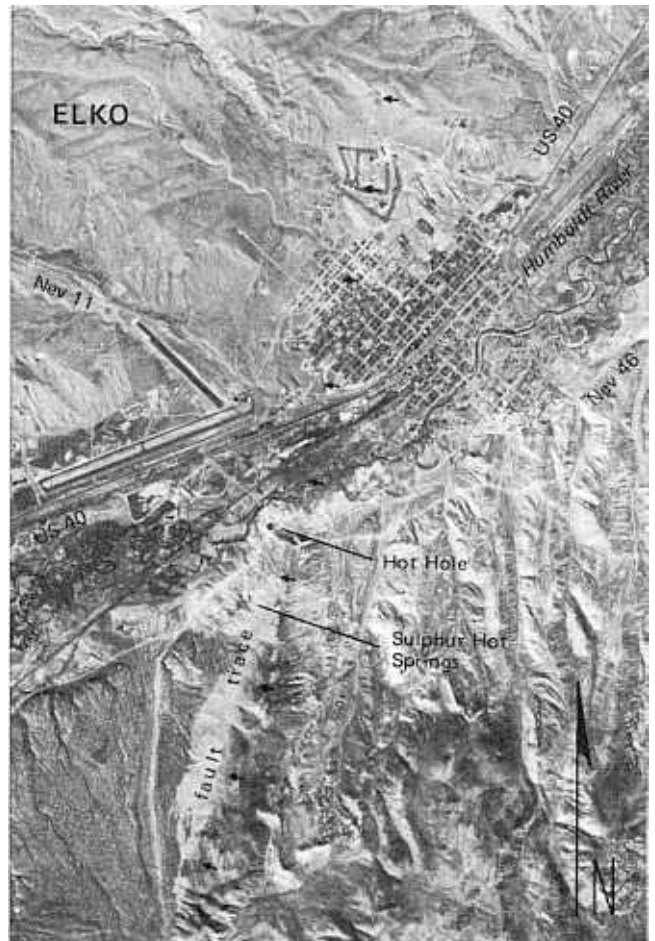


FIGURE 22. Map of hot springs and wells at Elko, Elko County.



ELKO COUNTY (continued)

In the SW/4 S15,T34N,R55E, two Western Pacific wells were warm to hot. And a well in the north section of Elko, in the SE/4 S10,T34N,R55E, was abandoned because hot mud invaded the casing at 425 feet. A 75°F well is also present to the east, in the SW/4 S11,T34N,R55E. These hot wells are near a possible projection of the same north-northeast-trending fault present at Elko Hot Springs. Audiomagnetotelluric and gravity data have been published for the Elko Known Geothermal Resource Area (Hoover and others, 1976; Peterson and Dansereau, 1976b).

Hot springs near Carlin [80]

Two hot-spring areas are located 3 to 4 miles southwest of the town of Carlin in S33,T33N,R52E and in the SE/4 SW/4 S5,T32N,T52E. The temperatures have been reported as 174° or boiling (Mariner and others, 1974; Bradberry and Associates, 1964) and warm (Bradberry and Associates, 1964), respectively. An estimated thermal aquifer temperature (Na-K-4/3 Ca) is near the spring temperature of the northern spring (Mariner and others, 1974).

Thousand Springs [64]

Hot springs are found near the Gamble Ranch along Thousand Springs Creek about 8 miles north of Montello. A spring in S4,T40N,R69E has a reported temperature of 111°F (Hose and Taylor, 1974), and Gamble Spring near the Gamble Ranch is 69°F (Mifflin, 1968). A warm spring is also reported from S14,T40N,R69E, and the Gamble Ranch well no. 4 is reportedly 76°F and 210 feet deep. Stearns and others (1937) report a boiling spring in the area, but it is not known which spring this is.

Humboldt Wells [73]

Numerous springs about one mile north of the present town of Wells were a stopping point on the emigrant trail, and although not particularly warm, they have never been known to freeze over (Adams and Bishop, 1884, p.192). Three areas of hot springs are located adjacent to a Basin and Range fault which runs along the west side of the Snake Mountains north of Wells (fig. 23). These springs are in S29,20, and 17,T38N,R62E. Temperatures are reported as high as 142°F, and estimates of reservoir temperatures are as high as 363°F, based on a Na-K-Ca geothermometer. The thermal waters may have mixed with cool ground water, however (Mariner and others, 1974). Twelvemile Spring (NW/4 NE/4 NE/4 S27,T39N,R62E) is in Bishop Canyon, along Bishop Creek, several miles north of the springs described above. The spring is 102°F (Waring, 1965) and its flow mixes with Bishop Creek, which is used for irrigation. A cement swimming pool is present, and both cold and hot waters flow into it. No major fault is known to be present at the site of this spring. Railroad Spring 4 miles south of Wells (S29,T37N,R62E) is also probably along an extension of the Basin and Range fault described above.

San Jacinto Ranch (Mineral) Spring [54]

Several springs and shallow wells at San Jacinto Ranch 8 miles north of Contact are hot. Spring temperatures are reported as high as 148°F (Miller and others, 1953). A major

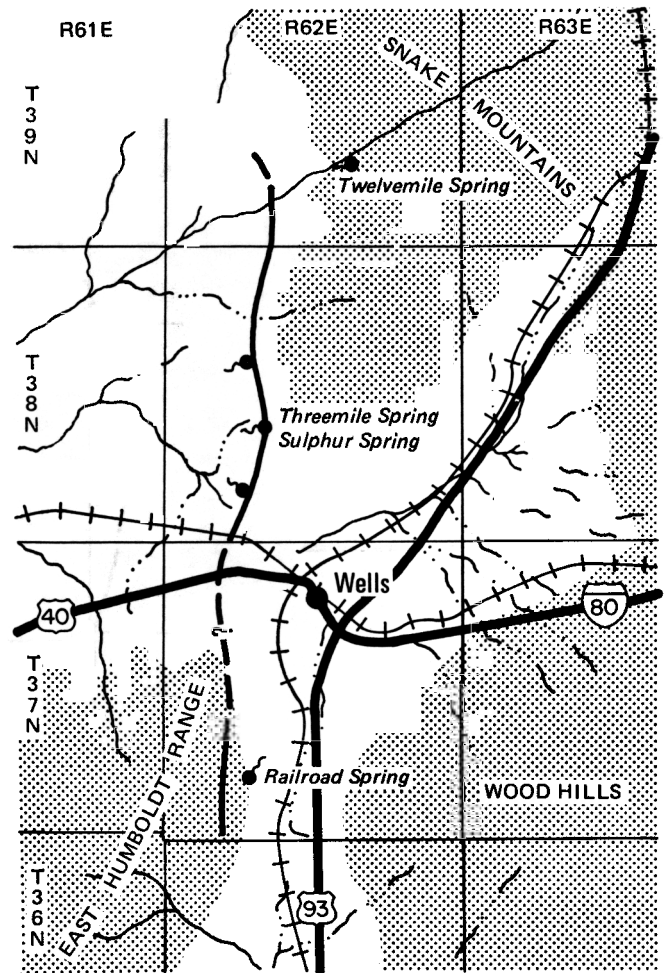


FIGURE 23. Map of hot springs associated with a major normal fault in the Humboldt Wells area, Elko County.

fault is present south of the springs (Stewart and Carlson, 1974) and may be present at the springs below the alluvium.

Mineral Hot Spring (Contact Mineral Spring) [56]

A spring 1.5 miles northeast of Contact (S6,T45N,R64E) and 6 miles southwest of the San Jacinto Ranch Spring is reportedly 140°F and has an estimated thermal-aquifer temperature of approximately 200°F (Mariner and others, 1974).

Other Elko County hot springs and wells

In addition to the previously described thermal areas there are nearly forty other hot-spring groups or individual warm springs and wells in Elko County (see Appendix 1). These areas are spread throughout the county, with the exception of the northwest corner, which is on the edge of the Columbia Plateau. This portion of the Columbia Plateau is cut by very few faults, and outcrops consist mainly of basaltic rocks.

Temperatures of these hot springs are all below 140°F and are as low as 71°F for a water well. Some of the better known hot-spring areas include those at Rizzi Ranch (T45N,R54E), the Goose Creek area in extreme northeastern Elko County, Wild Horse Hot Spring, Wine Cup Ranch (T41N,R64E), Ralph's Warm Springs (T36N,R64E), and those near the northeast margin of Ruby Marsh (T27N,R58E).

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The springs near Ruby Marsh have a long history, and were first described by Bidwell (1842) as being "boiling hot"; Bidwell's party reportedly used them to cook meat. Audio-magnetotelluric data for the Ruby Valley Known Geothermal Resource Area are reported in Long and Batzle (1976b) and Batzle and others (1976b).

Information on some of Elko County's hot springs is extremely limited, and several are known only from their "warm" designation on topographic maps. Some springs are sources for streams or lakes with "hot" or "warm" in their names, but no temperature information is available on them. Recent data are available on a few springs in Mariner and others (1974) and Hose and Taylor (1974).

ESMERALDA COUNTY

Nevada Oil and Minerals V.R.S. No. 1 Well [85]

An oil-exploration well drilled in 1970 in Fish Lake Valley encountered hot water during drilling. A temperature log of the well shows a steady temperature increase from 214° at 1,500' to 253°F at 9,100 feet. However, the bottom hole temperature reported from the electric log was 318°F (Nevada Oil and Gas Conservation Commission, unpublished data). The tops of the major lithologic units are listed below:

surface	valley fill
5,000'	volcanics
6,175'	limestone
6,350'	shale
6,575'	dolomite
6,610'	metasedimentary? rocks
8,120'	limestone
8,300'	metavolcanic? rocks
8,400'	mudstone
8,600'	metavolcanic rocks

Other springs and wells in Fish Lake Valley [85]

In addition to the Nevada Oil and Minerals well, several other springs and water wells in Fish Lake Valley have higher-than-normal temperatures. Gap Spring, an unnamed spring about 1.5 miles northeast of Gap Spring, Fish Spring, and Sand Spring have temperatures ranging from 73° to 81°F and small discharges. At Gap Spring, a small spot of several square feet at the spring outlet is slightly radioactive. The running water has the highest radioactivity, suggesting that the water may contain radon (Garside, 1973). Four water wells in the northern part of Fish Lake Valley have water temperatures of 74° to 77°F.

Alkali Springs [90]

The waters from Alkali Springs (SW/4 SE/4 NE/4 S26, T1S,R41E) originally rose at a number of small seeps, but in the early 1900's, Combination Mines Co. drove a 40-foot adit into the slope to concentrate the flow into a single channel. The water was pumped to the Combination mill at Goldfield (about 10 miles southeast). The temperature at the face in the adit was 140°F (Ball, 1907, p. 19, 20). A



Old bathhouse at Alkali Springs, Esmeralda County.

low dome of gray-brown travertine is present 100 yards north of the adit. The spring is reported to contain lithium although Alkali Flat, unlike Clayton Valley (see Silver Peak Hot Springs), does not (Albers and Stewart, 1972). The springs were operated as a spa by the Joe Guisti family during Goldfield's heyday, and a large building and an indoor wooden swimming pool were on the site (Rosevear, 1976).

Silver Peak (Waterworks) Hot Springs [91]

Near Silver Peak, hot springs are found near the edge of the playa (Silver Peak Hot Springs), and there is another group of hot springs (Pearl Hot Springs) on the east side of Clayton Valley near the edge of Clayton Ridge. The local residents report that hot waters underlie the upper crust of the whole playa or marsh, especially at certain seasons of the year (Spurr, 1906). Silver Peak Hot Springs (C SE/4 S15,T2S,R39E) has a maximum reported temperature of 118°F, while Pearl Hot Springs to the northeast across Clayton Valley are only 89°F.

The Silver Peak Hot Springs are reportedly quite radioactive (Garside, 1973), but contain very small amounts of uranium. Possibly the radioactivity is due to radon gas. Eleven springs are reported, and the water was once used for the town water supply (Waring, 1965). The springs may be on a major north-northeast-trending fault along the west side of Clayton Valley (Albers and Stewart, 1972). Additional information on the hydrology and salines in Clayton