NEVADA BUREAU OF MINES AND GEOLOGY

BULLETIN 91

THERMAL WATERS OF NEVADA

LARRY J. GARSIDE
JOHN H. SCHILLING

Descriptions of Nevada's thermal waters in springs, wells, and mine workings: locations, geology, temperatures, flow rates, water chemistry, well depths, drilling and other exploration activities, and past and present uses.

MACKAY SCHOOL OF MINES
UNIVERSITY OF NEVADA • RENO
1979

First edition, second printing, 1989: 1000 copies
Composed in IBM Press Roman type at the Nevada Bureau of Mines and Geology
Printed by A. Carlisle, 1080 Bible Way, Reno, NV

Note:
Minor corrections to the first printing were made in text, appendixes, and plate.

For sale by the Nevada Bureau of Mines and Geology, University of Nevada-Reno, Reno, NV 89557-0088. Price $14.00

NEVADA BUREAU OF MINES AND GEOLOGY

BULLETIN

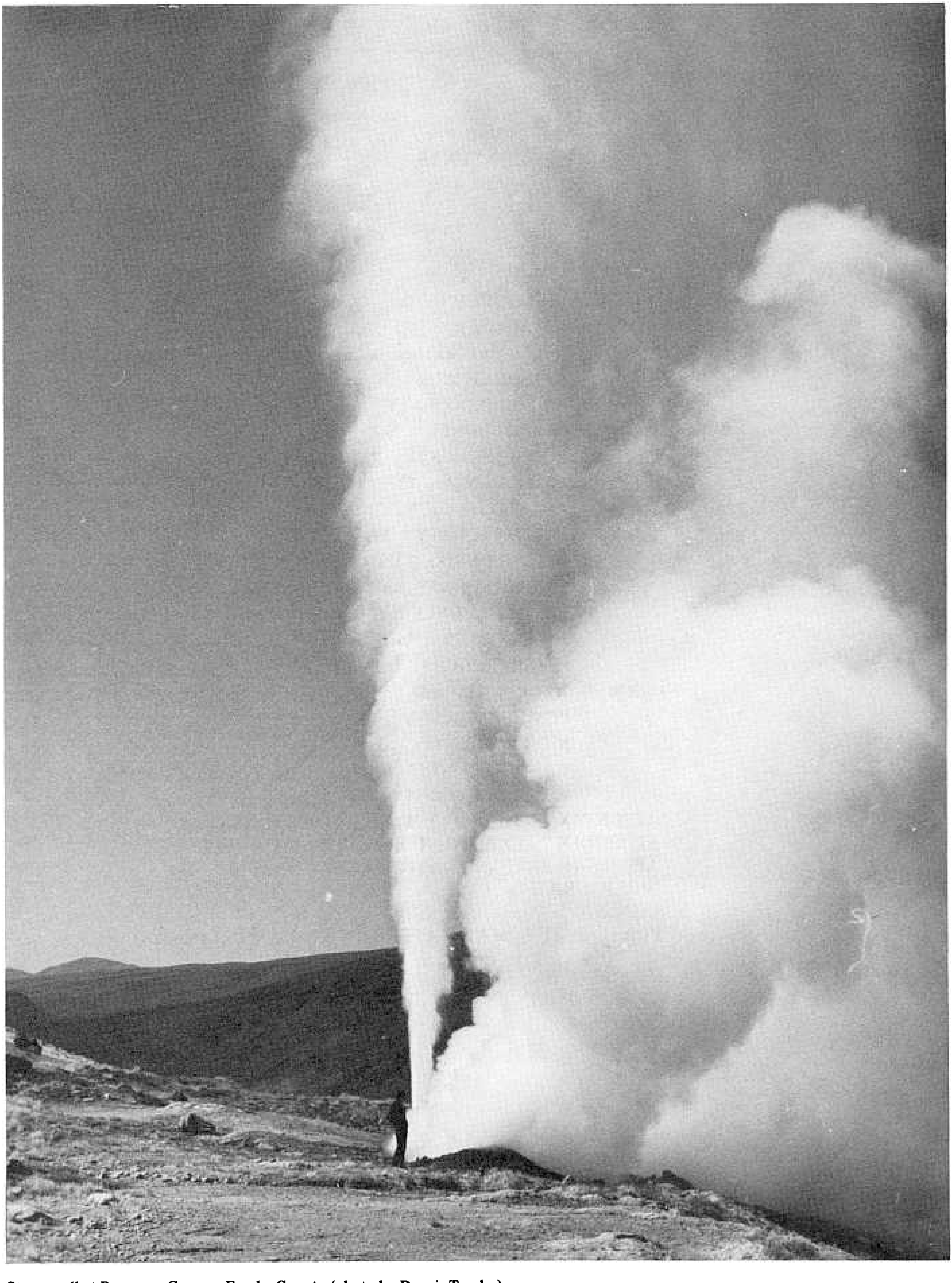
THERMAL WATERS OF NEVADA

LARRY J. GARSIDE
JOHN H. SCHILLING

Descriptions of Nevada's thermal waters in springs, wells, and mine workings: locations, geology, temperatures, flow rates, water chemistry, well depths, drilling and other exploration activities, and past and present uses.

MACKAY SCHOOL OF MINES
UNIVERSITY OF NEVADA • RENO
1979

CONTENTS



Steam well at Beowawe Geysers, Eureka County (photo by Dennis Trexler).

INTRODUCTION

Purpose and scope

The goal of this report is to provide basic information that can be used to determine the potential of Nevada's geothermal resources and aid in their exploration, development, and utilization—to bring together under one cover all the scattered data, published and unpublished, on Nevada's thermal waters, both hot water and steam. Information about springs, wells, mine workings, and other occurrences is included. Nevada does have huge geothermal-energy resources, as this report indicates, however, no attempt was made to evaluate the potential of any given area in the State.

Although we have tried to be as complete as practicable without making an exhaustive search, this report should be considered as preliminary and incomplete—a first pass at collecting existing data. The bibliography lists most of the references containing information on Nevada thermal waters. Many errors probably have been perpetuated because temperatures, flow rates, and chemical analyses were not field-checked.

The Nevada Bureau of Mines and Geology will continue to collect data on geothermal resources; this information will be available for inspection (by appointment), and staff members will continue to be available to answer questions.

Corrections, as well as additional information, are welcome (please send to Larry Garside, the senior author).

Organization of report

Much of the data collected is given in tabular form in *Appendix 1* (Nevada Thermal Water Data) and *Appendix 2* (Exploratory Geothermal Drilling in Nevada). It also is summarized in narrative form, alphabetically by county and by geothermal area, in the section preceding the two Appendices. In a general way the descriptions of geothermal areas within individual counties are arranged according to maximum reported temperature.

Definition of thermal water

This report lists all warm or hot (anomalously thermal) water—water that has a higher temperature than it would if affected only by "normal" wall-rock and/or surface temperatures. Unfortunately, it is difficult at best to determine an accurate cutoff for individual springs or wells.

Subsurface temperatures are affected by climatic conditions to depths of about 100 feet; below 100 feet temperatures in most of Nevada "normally" increase about 1°F every 55 feet, but increase more rapidly in areas of anomalously high heat flow. The water temperature in a spring or well depends on: (1) the surface-water temperature at the ground-water recharge point; (2) heating or cooling during near-surface movement; (3) heating during movement to greater depths; (4) cooling in returning to the surface or shallower depths; and (5) cooling or heating by mixing with other ground water.

Unfortunately all the information needed to determine accurately the absolute minimum temperature necessary for a well or spring to be thermal, is never available. *In this report we have used 70°F as an arbitrary cutoff for springs and water wells; in a few cases springs with temperatures above 70°F have been omitted for various specific reasons, and in Pahrump Valley and the Las Vegas basin water wells were omitted when they fell below the temperature expected from a normal geothermal gradient.*

Because an arbitrary cutoff had to be used, some truly thermal wells and springs undoubtedly have been left out of this report, and some nonthermal occurrences have undoubtedly been included. Users should also keep in mind that "cold" (nonthermal) and warm water can chemically indicate the presence of anomalously hot temperatures at depth; cold springs and wells should not be ignored when exploring for geothermal resources.

Definition of geothermal area

In this report a geothermal area must: (1) have at least one known occurrence of thermal water; and (2) form a geographic cluster and/or appear to have a common source and form a continuous anomaly at depth. Information is usually lacking to prove a connection between two or more occurrences, and in many cases springs and wells have been grouped together only to simplify their presentation. Thus the limits of each geothermal area have had to be defined in a rather arbitrary manner.

System of naming and numbering

Geothermal areas have been assigned geographical names—usually that of the largest, best known hot spring, or less commonly of a well-known feature in the area. Hot-spring names used in this report are those considered to be the most widely used; where needed, other alternate names are listed in parentheses after the primary name. It is hoped that the primary names will be used whenever possible.

Each hot-spring group, geothermal area, and isolated hot spring has been given a unique identification number which is used in the text and tables, as well as on plate 1.

Location

Section-township-range locations are given for each spring and well. Where more detailed locations are known the quarter-quarter-quarter system is used (for example: NE/4 SE/4 NW/4 S5,T20,R30E indicates that the occurrence is located within approximately a 10 acre parcel which is the northeast quarter of the southeast quarter of the northwest quarter of Section 5, Township 20 North, Range 30 East). In some cases, these described locations were estimated by projecting the land grid into unsurveyed areas.

Usually the location of springs and wells is from (or was cross-checked with) U. S. Geological Survey 7½′, 15′, and 1x2° topographic quadrangle maps, using the most detailed map available for a given area. Unless the well or spring is actually shown and named on the map, or the location was field-checked, the location information was taken from the reference listed and may be wrong. Incorrect locations were found in many published reports, and some undoubtedly are carried over to this report.

Acknowledgements

So many individuals and organizations have contributed to this report that we have not listed them individually in this section. Their help is gratefully acknowledged. We have tried to show their support by citing sources of information throughout the report, and by listing published sources in the Bibliography.

The Nevada Oil and Gas Conservation Commission contributed $1,500 toward the funding of this project. We greatly appreciate this support.

We also wish to thank other members of the Nevada Bureau of Mines and Geology staff who helped make this report possible: Janet Amesbury, Bill Daniels, Robert Kirkham, Helen Mossman, Susan Nichols, LaVerne Rollin, Georgianna Trexler, and Becky Weimer.

NEVADA RESOURCES

General Information

Geothermal energy is simply the natural heat of the earth. The earth can be thought of as a great furnace with the amount of contained heat so vast that it is impossible to comprehend. It has been estimated, for example, that heat equivalent to the combustion of 300 million barrels of oil is released if 1 cubic mile of hot, near-surface rock is cooled from 625°F to 350°F. The problem is in extracting and utilizing this energy.

The source of the earth's heat, which increases with increasing depth beneath the surface, is believed to be due to the decay of radioactive elements as well as to frictional (tidal) forces. Because heat continues to be produced, one should think of the earth as a heat generator, not simply as a reservoir.

At present it is probably not economically feasible to drill a deep well in any arbitrary area and obtain useful quantities of heat. Therefore, for the near term, geothermal energy utilization will be concentrated in those areas of the world where "hot spots" are known to occur, for example, the "Ring of Fire"—the belt of volcanoes and earthquake activity many thousands of miles in length that circles the Pacific Ocean. Nevada is located within this tectonically active belt. Hot springs or other areas where temperatures increase more rapidly than normal with depth may indicate near-surface sources of heat, such as magma chambers, or hot recently solidified rock. If water flows through such heated zones, it will, in turn, become heated. Therefore it is in these areas, where water can act as a transfer agent for the heat, that exploration for geothermal energy will be concentrated.

Although geothermal energy can be used directly for space heating, much of the exploration in Nevada will concentrate on finding naturally heated reservoirs that can produce steam or hot water for use in electric-power generation. The so-called dry-steam fields, like The Geysers in northern California, are probably rare in nature. When wells are drilled to tap a geothermal reservoir, the product may be dry steam unaccompanied by water, or it may be extremely hot water at elevated pressure. Hot-water fields are much more common, but more complicated equipment will be required to best utilize their energy. Minerals are much more soluble in hot water than in cold, therefore these fields often yield water with considerable amounts of dissolved minerals. Also, the amount of dissolved mineral matter varies from one geothermal area to another. Dissolved minerals can clog and corrode pipe and generating facilities, and equipment to handle these problems is still mainly in the experimental stages. (For example, down-hole heat exchange systems could prevent the mineral-laden water from coming in contact with generating equipment.)

Hydroelectric power is the only power source that has been found to be cheaper than geothermal power, and then only in certain cases. At The Geysers, California, the only commercial U. S. geothermal installation, geothermal electric power has proven to be cheaper than power from other fuel sources, regardless of plant size (Koenig, 1973). The cost of generation at The Geysers is in fact, about two-thirds of that which could be obtained from a coal-fired plant. The Geysers presently produce 500 megawatts of electricity, enough to supply all of San Francisco's needs.

Use

Hot springs and wells are scattered over the entire State (plate 1), and there are at least 300 thermal wells, springs, and spring clusters. The use of hot springs in Nevada dates back to prehistoric time, when Indians used them for bathing, scalding ducks and geese, and as an aid in removing the pitch from pinyon-pine cones and seeds. Early explorers and the wagon trains of the 49'ers used the hot springs for drinking, bathing, and watering stock. Because of the State's arid climate, water, even if mineralized and hot, has always been an important resource. The waters of almost all the springs in the State, whether hot or not, have been appropriated for some beneficial use. The mines of the Comstock Lode at Virginia City were famous for the great quantities of hot water encountered. At Tonopah, 3 million gallons of hot water were pumped every day from the workings; the flow from the Tonopah mines was used to operate greenhouses. In the 1800's and early 1900's resorts grew up around many of the hot springs. Many of these spas are now gone, but some, such as those at Steamboat and Lawton Hot Springs near Reno, are still popular. Today many hot-spring areas are used for swimming and other recreational activities. Swimming pools using the naturally heated water from hot springs are common in the less populated areas of the State. The hot water, either from springs or shallow wells, is often suitable for use in pools with no treatment, although mixing of water of various temperatures may be necessary. Natural pools and ponds at hot springs can be near boiling and are extremely dangerous. When investigating hot-spring areas, persons should exercise considerable caution. (Hot mud often occurs under a seemingly solid surface. This surface may break under a person's weight.)

Steamboat Hot Springs, 8 miles south of Reno, have been used for several commercial purposes, including bath resorts, processing asphalt emulsions, and in the melting and casting of plastic explosives. The hot water from Moana Hot Springs in Reno has been used in the past for a swimming pool and to melt winter ice and snow from streets. In the Stillwater area near Fallon in west-central Nevada, steam and hot water were encountered while drilling water wells in an area where there were no hot spings, and have been used to heat dwellings in this farming area. A number of homes in the southwestern part of Reno (along the Steamboat–Moana–Lawton's thermal anomaly) are heated by simple heat-exchange systems that utilize the heat from hot water encountered in wells. This source of home heating has considerable potential (Bateman and Scheibach, 1975).

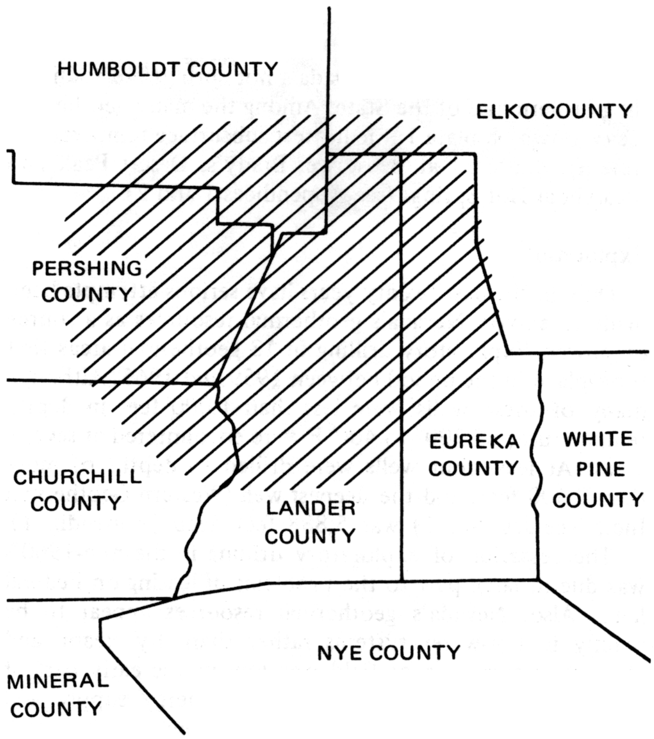


FIGURE 1. Location of Battle Mountain heat-flow high in north-central Nevada.

The heating of greenhouses with naturally heated water also has great potential. At Wabuska, near Yerington, water at temperatures of over 200°F has been used to heat greenhouses for growing vegetables, especially tomatoes. Geothermally heated greenhouses are also in use at Wendel Hot Springs near Honey Lake, Calif. (near the California–Nevada boundary) and, a food dehydration plant is being built at Brady's Hot Springs.

Although no electricity is generated in Nevada from geothermal steam, the utilization of geothermal energy for electric power is probably its highest potential dollar-value use. Although technological problems remain, the State is blessed with several areas that may soon be the sites of geothermal generating facilities, possibly utilizing heat-exchange systems.

Geothermal energy is of special importance to Nevada. Electric power needs in the State are expanding at a rapid rate because of the growing population and increased per capita consumption, as well as the extension of transmission lines to many remote areas. Power consumption in Nevada will probably be about 11 million megawatt-hours in 1978 and is expected to rise to approximately 18 million megawatt-hours per year by 1990. Generating capacity in Nevada will rise to an even higher level, as generating facilities are constructed in Nevada to supply the needs of population centers in California. Nevada's entire population of over half a million persons could be supplied by a single 1200-megawatt nuclear plant, or by a geothermal field the size of The Geysers in northern California (when this field is fully developed). Obviously the demand for electrical energy from outside the State will greatly influence both the development of electric generation facilities and the exploration for new energy sources, including geothermal power.

Geology

The Basin and Range physiographic province, in which Nevada is located, is an area of high heat flow, believed to result from near-melting conditions in the lower crust and upper mantle. The west-central and north-central areas of Nevada have higher hot-spring temperatures and are regions of greater than normal heat flow. An area of conspicuously higher heat flow, called the "Battle Mountain high," is located in north-central Nevada (fig. 1). The boundaries of this region, and possibly others as yet undetected, need to be delineated by more systematic heat-flow surveys. This would provide useful guidance in the search for economically exploitable geothermal fields (Sass and others, 1971). The Battle Mountain high has an indicated average flow of about three heat flow units (two heat flow units is an average value for Nevada), but the thermal gradients, which range from 30° to 60°C/km (about 2.6–4.3°F/100 ft), are not as high as might be expected because of relatively high thermal conductivities of the rocks in this area (White, 1973). The Battle Mountain high may be the result of fairly recent intrusion of magma into the earth's crust. The Quaternary volcanism within the region suggests that this view is reasonable (Sass and others, 1971).

Nevada has a considerable range in mean annual temperature due to both its variations in elevation and its extent over approximately 7 degrees of latitude. The mean monthly temperature usually varies 15° to 20°F from northern to southern Nevada. For this reason, comparisons of hot-spring temperatures with statewide mean annual air temperatures are usually not worthwhile.

In many areas of the world, hot springs and other high-temperature phenomena such as fumeroles are associated with geologically young igneous rocks, commonly less than 5 million years old. Young volcanic rocks or active volcanoes at the earth's surface often indicate that hotter bodies of rock, or fluid magma, are present below, in the upper part of the earth's crust.

Nevada lies in the center of a large province of Cenozoic volcanic rocks. Although many of these rocks are 10 to 30 million years old, younger volcanic rocks are found in many areas. In Nevada, young volcanic rocks are found in the Mono Lake–Aurora area of southwestern Mineral County and adjacent California, in southwestern Eureka County, north of Silver Peak (Esmeralda County), in the Carson and Virginia Ranges near Reno, at Lunar Crater in northeastern Nye County, at the north end of the Fish Creek Mountains in northern Lander County, in Reveille Valley and the Amargosa Desert in Nye County, on Railroad Point in northwestern Humboldt County, and in the Winnemucca–Battle Mountain area of north-central Nevada, as well as in a number of other areas (Stewart and Carlson, 1976a). K-Ar (potassium-argon) dating has defined the age relations of many volcanic centers in Nevada, and will continue to be useful in the future. Isotopic ages of Nevada rocks are listed in Schilling (1965b), and additional data have been and will continue to be reported in various articles of the journal Isochron/West.

Many of Nevada's numerous hot springs occur along major faults which bound the State's mountain ranges. The basin-and-range pattern of linear, north-south-trending mountain and valley blocks is a result of these faults. The ground water in the valleys often circulates to considerable depths along some of these fractures, and is heated by the

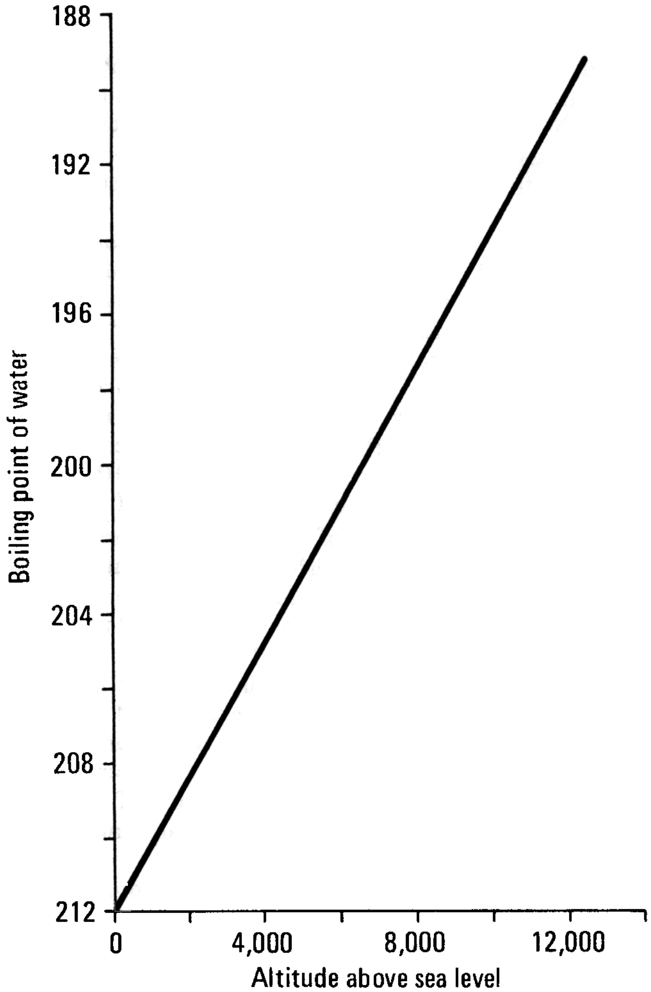


FIGURE 2. Variation of the boiling point of water with altitude above sea level (data from Waring, 1965).

hotter rocks found at these depths. If one knows the approximate geothermal gradient, the depth of circulation of ground water can often be estimated from water temperatures of springs (assuming little cooling has taken place as the water ascends to the surface). The ground water under many of Nevada's valleys is measured in the millions of acre feet per basin.

Hot-spring temperatures in the State range up to boiling, although surface-water measurements on boiling springs will commonly be somewhat below the boiling point for any given elevation because surface evaporation and other cooling phenomena may substantially reduce water temperatures. The best measurements are usually made directly in the orifice of the spring, below the water surface where the flow is greatest. Below altitudes of 5,000 meters (about 16,000 feet), the boiling point of water decreases 1°F for each 550-foot (1°C for each 303 meters) increase in elevation above sea level. Figure 2 is a graph showing altitude plotted against the boiling point; from this graph it can be seen that a spring at an elevation of 6,500 feet will be boiling at water temperatures nearly 12°F below the sea-level boiling point. Conversely, the boiling point rapidly increases with depth below the earth's surface (see fig. 3). Gases in solution lower the boiling point while mineral substances in solution raise the boiling point (however, the effect of elevation or depth is much greater than any change due to dissolved materials).

The major portion of Nevada's hot springs are found in the northern half of the State. Among the many geothermal areas shown on plate 1, the hottest subsurface temperatures were encountered at Beowawe, Brady's, Desert Peak and Steamboat Hot Springs (see Appendices 1 and 2).

Exploration

Only in the past twenty years have serious attempts been made to exploit Nevada's geothermal resources as a source of power. Exploratory drilling in 13 geothermal areas first took place in the period between 1959 and 1965. Although many of these wells were less than 1,000 feet in depth, temperatures of 300° to 400°F were encountered at several areas. At least four wells were drilled to depths of more than 3,500 feet, and the deepest well (Western Geothermal Inc., Needles No. 1) was 5,888 feet deep (Appendix 1).

The cessation of exploratory drilling in the mid-1960's was due in large part to the problems of leasing on Federal land. Also, Nevada's geothermal resources appear to be mainly in hot-water systems rather than dry steam, and interest in this type of field was low in the early part of the 1960's. Today, with changes in energy supply and investment attitudes, exploration is once again being carried on in Nevada for geothermal power. The geothermal wells in the 1970's are being drilled to greater depths and at locations outside of known hot-spring areas. In general, these major exploratory wells are considerably more expen-

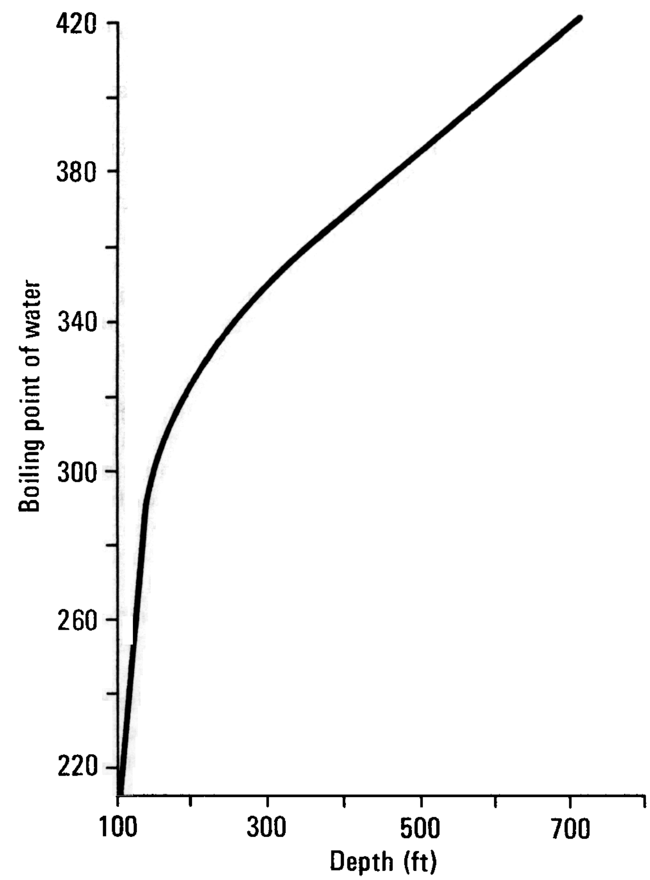


FIGURE 3. Variation of the boiling point of water with depth below a water surface at sea level (data from Waring, 1965).

sive than were those drilled in the 1960's and they are being located on the basis of sophisticated geological, geochemical, and geophysical exploration techniques. A large number of temperature-gradient drill holes were drilled in Nevada in the mid 1970's by private geothermal exploration companies and government agencies. In addition geophysical exploration (gravity, magnetics, seismic, electrical resistivity, etc.) has been used to site major exploration wells in a number of areas. Grose (1971) presents a review of the various exploration methods used in the search for geothermal energy.

A great deal of geothermal-related geologic research has been done in the State over the past several years. Much of this research has been directed toward the collection of basic geologic data on Nevada's known geothermal systems. This data has been released by a number of research groups as published and open-file reports, and these reports are cited where appropriate in the following sections of this report and are listed in the bibliography. The private sector has also collected a large amount of geothermal information; much of it has not been released to the public, although exchanges of this information between companies for their mutual benefit is quite common.

There are numerous sources of general background information on the geology of Nevada. Most of the geologic and geophysical reports and maps have been published by either the Nevada Bureau of Mines and Geology or the U. S. Geological Survey. Also, many of the open-file and limited-distribution reports on Nevada's geothermal resources are available at the Bureau's offices. For help in determining what is available, (including unpublished information) contact the Nevada Bureau of Mines and Geology (on the University of Nevada, Reno, campus: 702-784-6691).

Regulations

An August 1965 opinion by the Deputy Attorney General of Nevada considers geothermal resources as water resources, and has placed the regulatory jurisdiction with the Division of Water Resources, Department of Conservation and Natural Resources. Anyone planning to drill a geothermal well should therefore contact:

Roland G. Westergard, State Engineer
Division of Water Resources
201 South Fall Street
Carson City, NV 89701
(702) 885–4380

The State regulations for the drilling and plugging of temperature-gradient drill holes and geothermal wells are similar to those for drilling water wells. Although exploration and subsurface information obtained as a result of a geothermal project must be filed with the State engineer, this information is confidential for a 5-year period, unless written consent to disclose it is given by the operator (Nevada Revised Statutes, chapter 534A).

The Nevada Division of Environmental Protection establishes regulations for all forms of pollution. Although there are no laws specifically dealing with pollution caused by geothermal exploration and development, the general State laws and regulations definitely apply. For more information, contact:

Division of Environmental Protection
Department of Conservation and Natural Resources
201 South Fall Street
Carson City, NV 89701
(702) 885–4670

Nevada State land consists of less than 1 percent of the 110,540 square miles (70,745,600 acres) of total land area. Nearly half of all State-owned land consists of State parks. Because there is essentially no State land with geothermal potential on which leasing would be allowed, no State geothermal-leasing regulations have been issued.

Approximately 86 percent of Nevada's land area is under the jurisdiction of the Federal Government. Much of this land is public domain—public lands under Federal management which have not been reserved for special uses such as parks, National Forests, recreation areas, and military installations (Lutsey and Nichols, 1972). Public domain lands in Nevada total approximately 47 million acres (about 66 percent), and are administered by the Bureau of Land Management of the U. S. Department of the Interior. The Secretary of the Interior is authorized by Public Law 91–581 (The Geothermal Steam Act of 1970) to issue leases for the development and utilization of geothermal steam and associated geothermal resources. Lands administered by the Forest Service, U. S. Department of Agriculture, are included in those lands available for geothermal leases. Further information can be obtained from:

U.S. Bureau of Land Management
Nevada State Office
850 Harvard Way
Reno, NV 89502

The BLM office also has available for public inspection land plats and other maps which show land use, ownership, survey markers, and other data.

Only about 12 percent of the land area in Nevada, amounting to some 8 million acres, is held in private ownership. The Southern Pacific Co. is the single largest owner of private land, and holds about 1.5 million acres. Over 80 percent of Nevada's private land lies along the route of the Southern Pacific Railroad (and the Humboldt River), forming a 40-mile wide band across the northern third of the State. Much of the private land in Nevada is available for geothermal exploration and development through lease arrangements with private owners.

A recent ruling by the Ninth U. S. Circuit Court of Appeals has indicated that the geothermal rights were reserved to the Federal Government when it reserved the rights to "coal and other minerals" on grazing land conveyed to homesteaders through the Stock-Raising Homestead Act of 1916. The Supreme Court has upheld this ruling. The Ninth Court also ruled that all elements in geothermal systems—porous rock, magma, and steam—are minerals for the purpose of deciding ownership. Thus, the owner of the land surface and water rights may not necessarily hold title to the geothermal rights.

Indian lands, comprising 1.6 percent of the State, may also be available for geothermal exploration and exploitation through the U. S. Bureau of Indian Affairs or individual tribal councils.

Hot Springs and Geothermal Areas

This section of the report describes the State's major hot springs and geothermal areas. It consists of summaries of the geology and history of the better known geothermal localities, and is not intended to be a complete listing of data on all thermal springs and wells—Appendix 1 contains the detailed information on water quality, location, spring and well names, etc. The springs, spring clusters, and geothermal areas are organized by county, and in a general way, by the maximum reported temperature within an individual county.

CARSON CITY

Carson (Swift's, Shaw's) Hot Springs [1]

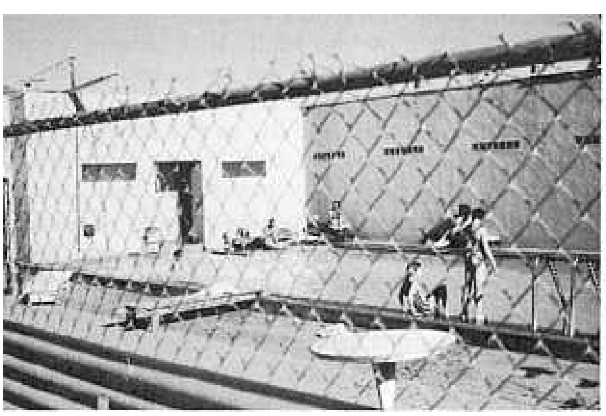
Hot springs on the north edge of the town of Carson City, have temperatures as high as 120°F. These springs, now referred to as Carson Hot Springs, were formerly called Swift's or Shaw's Hot Springs. The water is used in a swimming pool that is open to the public. Water supplied to the pool is pumped, probably from a shallow well near the pumphouse to the north of the pool area.

Nevada State Prison spring [2]

A hot spring is reported from the area of the Nevada State Prison (Waring, 1965). The old State Prison building was used for some of the early meetings of the Nevada Legislature in the early 1860's, and the legislators often used a large bathhouse there, probably Curry's Warm Springs Hotel (letter of Andrew Marsh to the *Sacramento Union*, Sept. 30, 1861, published in Nevada Highways and Parks, Spring, 1974). The Warm Springs Hotel was in operation adjacent to the prison in 1867 (Gillis, 1868).

Pinyon Hills [3]

There are a number of warm water wells in the Pinyon Hills subdivision about 2 miles southeast of the Nevada State Prison. The temperatures are generally 90° to 114°F, and the water is generally of poor quality (Glancy and Katzer, 1975; Center for Water Resources Research, University of Nevada, Reno, unpublished data).



Geothermal swimming pool at Carson Hot Springs, Carson City.

CHURCHILL COUNTY

Brady's (Springer's, Fernley) Hot Springs [10]

The hot springs along U. S. Highway I–80 about 20 miles northeast of Fernley have been referred to as Hot Springs, or Brady's, Springer's or Fernley Hot Springs, and are the Emigrant Springs of the Forty-Mile Desert. Some early travelers called it the Spring of False Hope. Coming across the desert, the oxen of the wagon trains could smell the moisture before reaching the springs. However, when they rushed forward to drink, they found the water scalding. The emigrants collected water in casks to cool, but pushed on to the Truckee River, as there was no forage at the springs (Work Projects Administration, 1940).

In the 1880's Russell (1885) reported that hot boiling water issued from a number of orifices, and when these became obstructed, the steam escaped with a hissing and roaring sound. During this same period there was an unsuccessful attempt to separate boric acid from the waters. In later years the hot water was used in a bathhouse and swimming pool which were located at a service station along U. S. Highway 40. The concrete pool, built in 1929, is all that remains today. The pool was apparently supplied by hot water directly from the springs. The hot springs do not flow at the surface today.

Brady's Hot Springs are located in NE/4 NE/4 SW/4 S12,T22N,R26E. Thermal ground water is found within an area of 6 to 8 square miles centered on this location (fig. 4). The elongate thermal area is parallel to the "Thermal Fault" mapped by Anctil and others (1960). Areas of hydrothermal alteration are aligned along this fault, and its trace has also been outlined by areas of observed snowmelt, indicating warm ground (Olmsted and others, 1975, fig. 37). This fault has had recent movement, as it cuts spring sinter and the alluvial fan deposits in the spring area and to the north. The fault is normal and dips steeply to the west, with the downthrown side to the west; the amount of displacement is unknown (Olmsted and others, 1975). All successful steam wells were collared in the hanging wall of the Brady Thermal Fault (Anctil and others, 1960).

The rocks exposed in the vicinity of Brady's consist of Tertiary basalt and andesite, Tertiary sedimentary rocks, Pleistocene lake sediments, and Quaternary alluvial deposits and siliceous sinter (figs. 5, 6). None of the wells drilled at Brady's (up to 7,275 ft. deep) penetrated the pre-Tertiary rocks, although they are exposed in the northern Hot Springs Mountains and were found in steam wells near Desert Peak (see the following section).

Bailey and Phoenix (1944, p. 51) report the presence of cinnabar and sulfur in S6(?),T22N,R27E about one-quarter mile southeast of U. S. Highway 40 and one-half mile east of the hot springs. The best showings of cinnabar are reported from around an active hot-spring vent. The occurrence is in hydrothermally altered tuff. Soil gas in the vicinity of the main Thermal Fault and around active steam vents at Brady's is anomalous in mercury (John Robbins, Scintrex Limited, written communication, 1973).

The spring sinter at Brady's is predominantly opal, and is quite extensive. It is concentrated along the main Thermal Fault and a small subsidiary fault to the east (Oesterling and Anctil, 1962).

The ground water in Fireball Valley (Hot Springs Flat) to the north probably moves as underflow to Brady's Hot

CHURCHILL COUNTY (continued)

Springs, and other ground water may move as underflow from the Fernley area (Harrill, 1970). Olmsted and others (1975) suggest that the recharge of the thermal area could be outside the local drainage area.

Ground-water discharge from the thermal area is in part by evapotranspiration and in part by lateral subsurface outflow toward the south. Prior to the drilling of geothermal wells in the late 1950's and early 1960's (but after diversion of the flow to a swimming pool) White (written communication, 1974 *in* Olmsted and others, 1975) estimated a spring flow of about 20.6 gpm. Waring (1965) reported a larger flow (50 gpm), but White believes that this may be too large. The withdrawal of water during drilling may have caused the springs to cease flowing (Harrill, 1970) and at present all discharge is in the subsurface. The original spring was 180°F (Oesterling, 1962). Boiling water reportedly stands at 20 feet below the surface in one well (Willden and Speed, 1974, p. 55).

Twelve major geothermal wells have been drilled at Brady's Hot Springs over the past 20 years, ranging in depth from 341 to 7,275 feet (see Appendix 2 for details). The temperatures encountered during drilling were up to 418°F, (Koenig, 1971). Following the drilling of Magma Power Co. Brady No. 2 well in 1959 thermal activity spread along the 3-mile portion of the main fault. This activity was probably due to steam escaping through the encased portions of the wells and into the fault zone. Olmsted and others (1975) describe this activity in more detail from data in a 1960 unpublished report by Allen. Tests on several wells shortly after drilling indicated 170,000 to 700,000 lbs/hr of fluid. The well head pressure was 9.5 to 18.0 lbs/in^2 gage (psig) (Middleton, undated report). The steam flashover is reported to be 5% (Koenig, 1971). Calcite is reported to form rapidly in the well bores during flow, requiring reaming of the wells after a short period of time. However, the amount of scaling is reported to decrease after the wells have been produced for some time (Oesterling, 1962). The thermal water at Brady's is of the sodium chloride type, with total dissolved solids from some steam wells reported to be over 2,400 ppm. The silica concentration from a steam well near C S12,T22N,R26E (Harrill, 1970) indicates a reservoir temperature of about 360°F (Olmsted and others, 1975). This seems somewhat low in view of the 400°F + temperatures reported during drilling. Geothermal Food Processors, Inc. of Reno, Nevada have received a $2,836,800 Federally guaranteed loan to construct a geothermal food dehydration plant at Brady's. The Federal guarantee will cover 74 percent of the $3.8 million total cost of the project (Nevada State Journal, October 29, 1977).

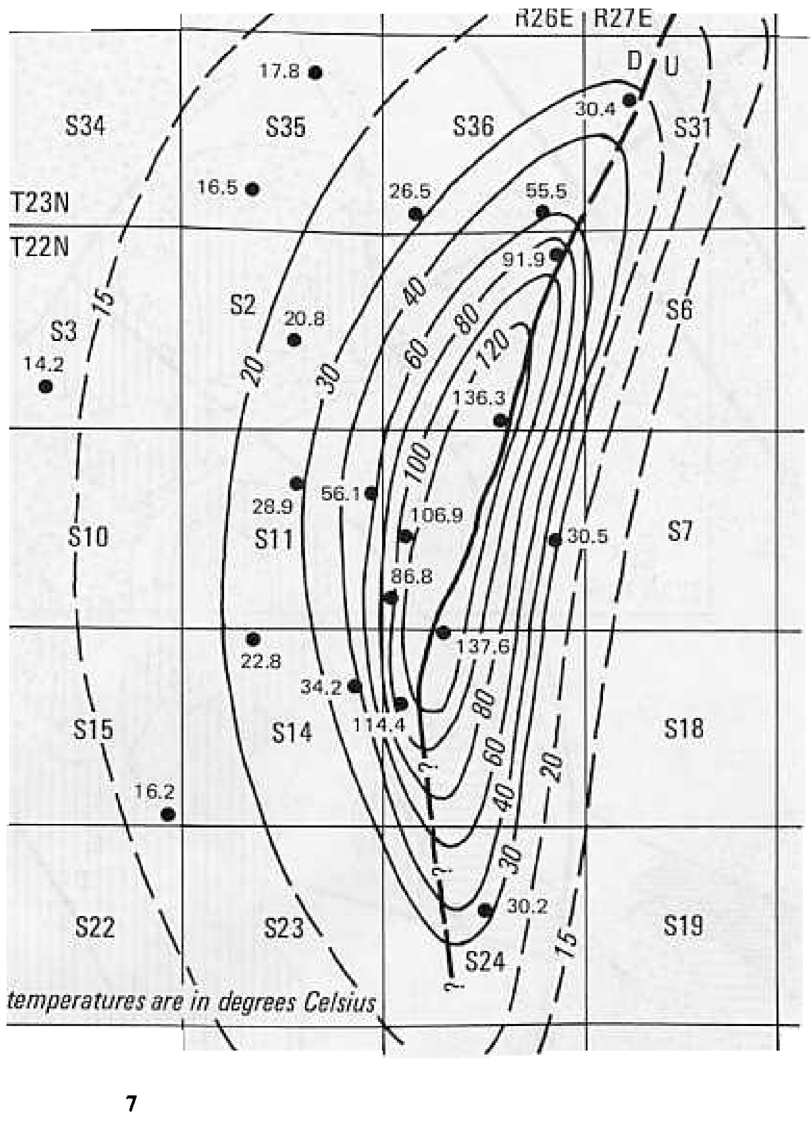
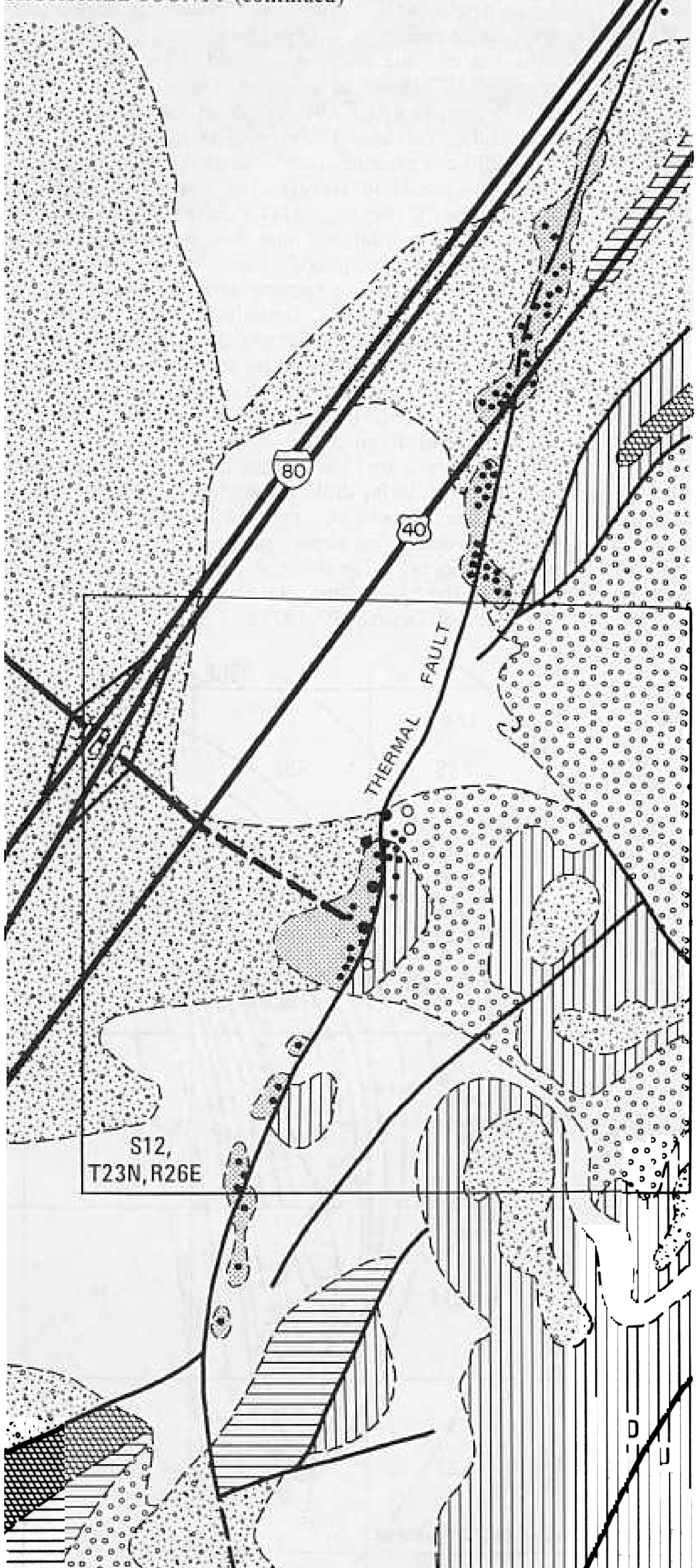


FIGURE 4. Map of Brady's Hot Springs thermal area, Churchill County, showing temperature at depth of 30 meters, 1973 (modified from Olmsted and others, 1975).



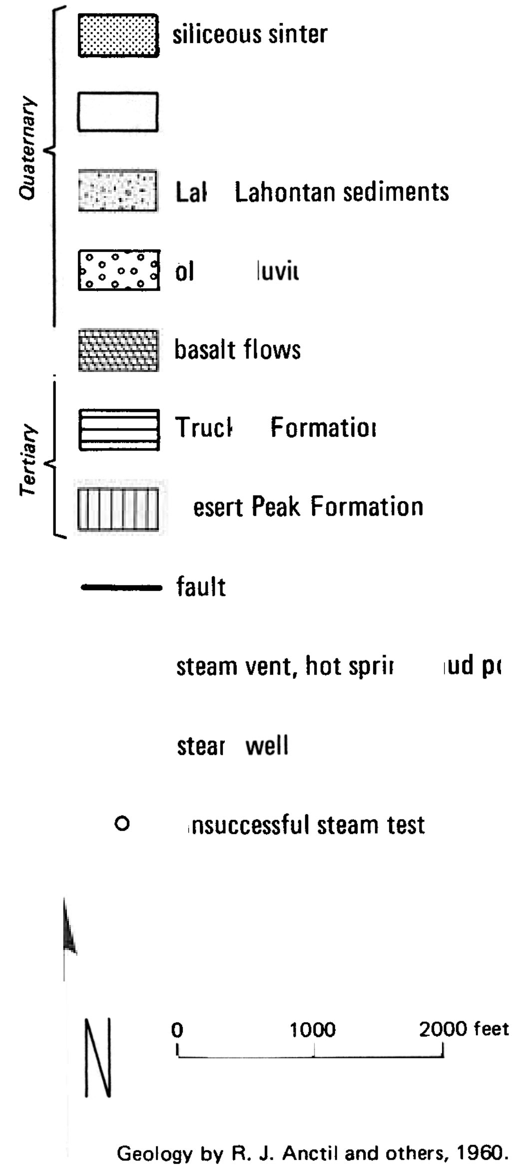


FIGURE 5. Geologic map of Brady's Hot Springs area, Churchill County (thermal activity as of May, 1960).

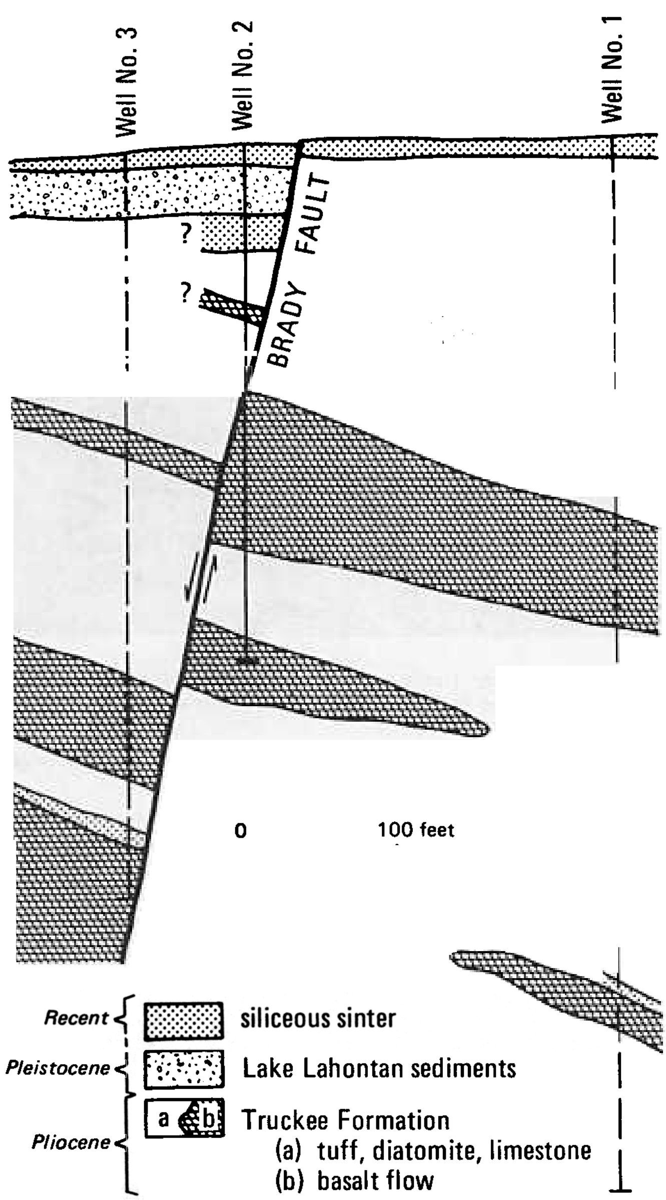


FIGURE 6. Cross section (based on driller's logs), looking north-northeast, at Brady's Hot Springs, Churchill County (after Oesterling and Anctil, 1962).

Desert Peak area [12]

The Desert Peak geothermal prospect is located in the northern part of the Hot Springs Mountains about 4 miles southeast of Brady's Hot Springs, and is named for a prominent peak 2 to 3 miles northwest of the area of the steam wells. The thermal area is apparently centered on S21,29,T22N,R27E (fig. 7). It was discovered by Phillips Petroleum Co. after drilling approximately 50 temperature-gradient holes up to 500 feet in depth. Much of the following information is summarized from data released by Phillips.

There are no surface thermal indications at the area, other than a few small occurrences of siliceous sinter and travertine, probably from springs which are now inactive. The geology of the rocks exposed at the surface has not been helpful in predicting the subsurface geology. The three geothermal wells drilled in the 1974–1976 period encountered Mesozoic metavolcanic and metasedimentary rocks at depths of 3,000 to 4,500 feet, below a sequence of Miocene volcanic rocks (fig. 8). Wells 21–1 and 21–2 produce a mixture of steam and water from fractured meta-andesite. It has been suggested that the Tertiary volcanic rocks may act as a seal for the reservoir.

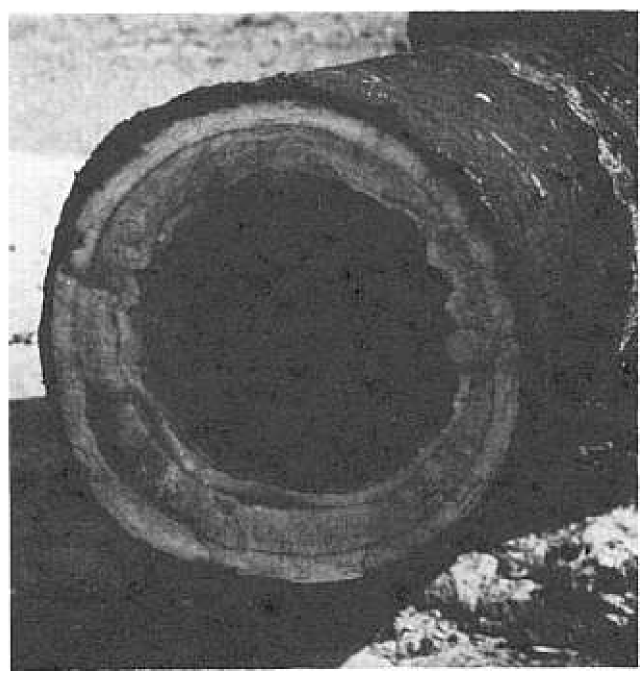
The reservoir is believed to have a temperature of 406°F, and the fluid produced is a sodium chloride type containing about 7,500 ppm total dissolved solids.

Soda Lakes–Upsal Hogback thermal area [13]

The Soda Lakes–Upsal Hogback thermal area is in the west-central part of the Carson Desert, 7 to 8 miles northwest of Fallon (fig. 9). The thermal ground water is mostly present in the central part of T20N,R28E over an area of 7 to 8 mi^2. The area is along the Carson River Route of the Old California Trail; soda was mined from Soda Lakes in the middle to late 1800's.

The presence of hot water in the area was not known until a well drilled in 1903 to supply water for a topographic survey camp for the Truckee–Carson Irrigation Project hit boiling water at about 60 feet. A cinder-block bathhouse was built later to utilize the steam and hot water (Peggy Wheat, oral communication, 1975). The well was still emitting hot steam in 1974, although the bathhouse had been torn down.

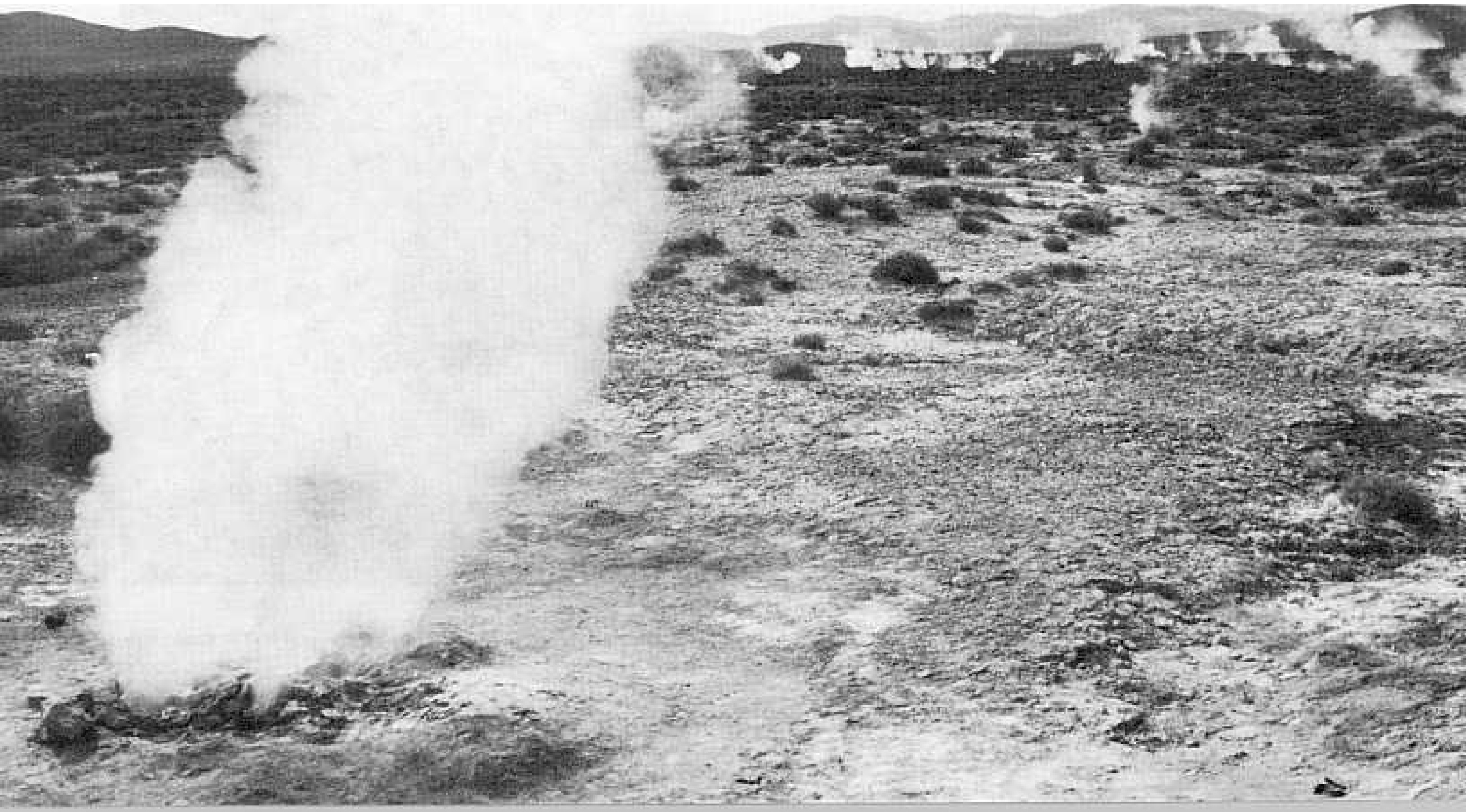
The extent of the thermal anomaly in the shallow subsurface has been outlined by the drilling of temperature-gradient holes (fig. 10) by the U. S. Geological Survey and the U. S. Bureau of Reclamation (Olmsted and others, 1975). Also, warm springs apparently enter the bottom of Big Soda Lake near its center, which is approximately 200 feet deep. Breese (1968), conducted a temperature survey of the lake bottom and reported temperatures up to 86°F. Nearby temperature-gradient drill holes of the U. S. Geological Survey indicate that cool ground water is present

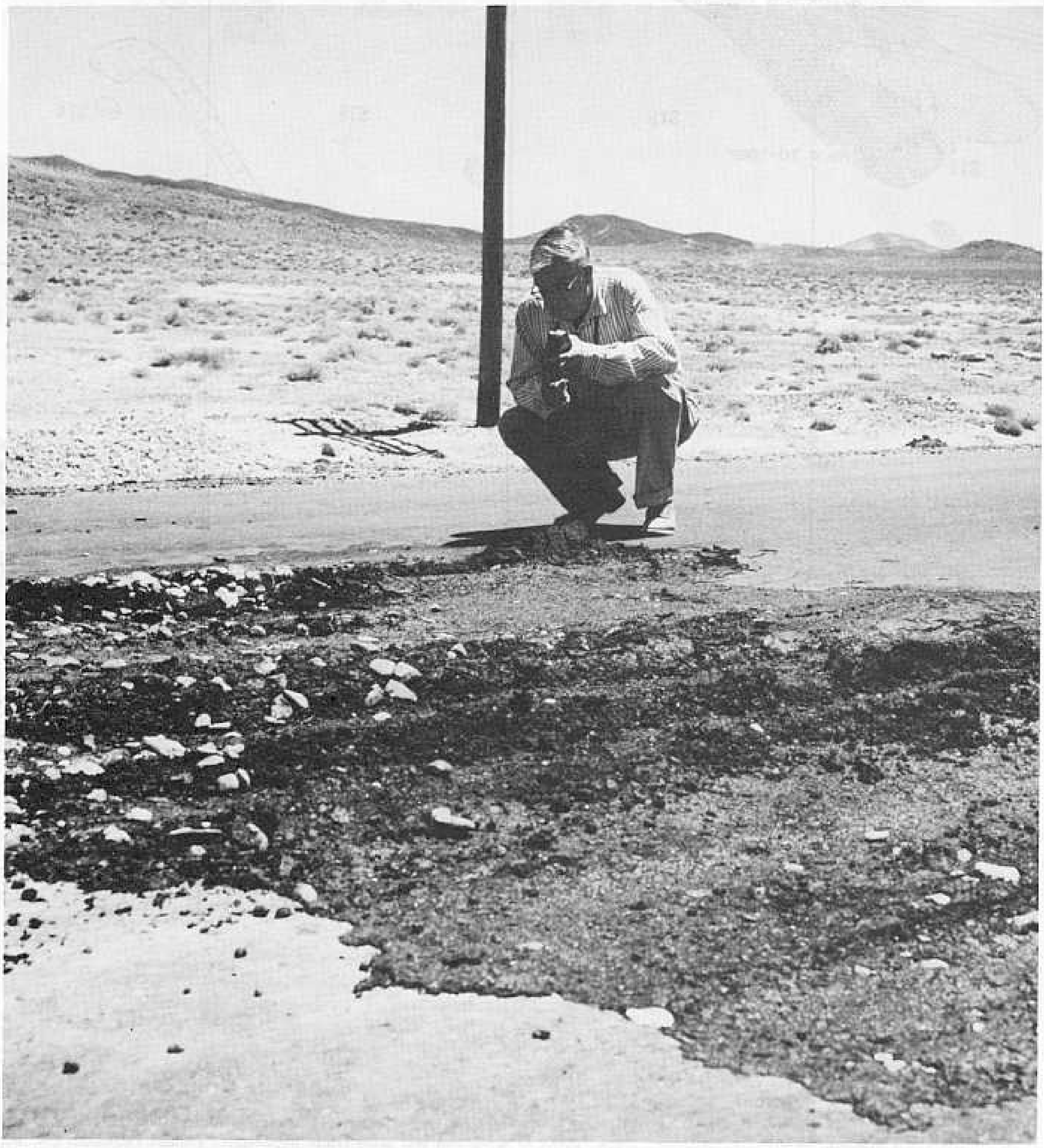


Travertine deposited in the pipe of a geothermal well at Brady's Hot Springs, Churchill County.

Above: Steam escaping from a fault zone which crossed U. S. Highway 40 approximately 1 mile north of Brady's Hot Springs, Churchill County. This unusual geothermal activity resulted from a well blow-out following drilling in 1959 (photo courtesy Nevada State Highway Department).

Below: Close-up of a steam vent which formed after the well blow-out at Brady's Hot Springs. Other new vents can be seen in the background (photo courtesy Nevada State Highway Department).





Resurfaced area of U. S. Highway 40 which was disrupted by geothermal activity following blow-out of a well at Brady's Hot Springs in 1959 (photo courtesy Nevada State Highway Department).

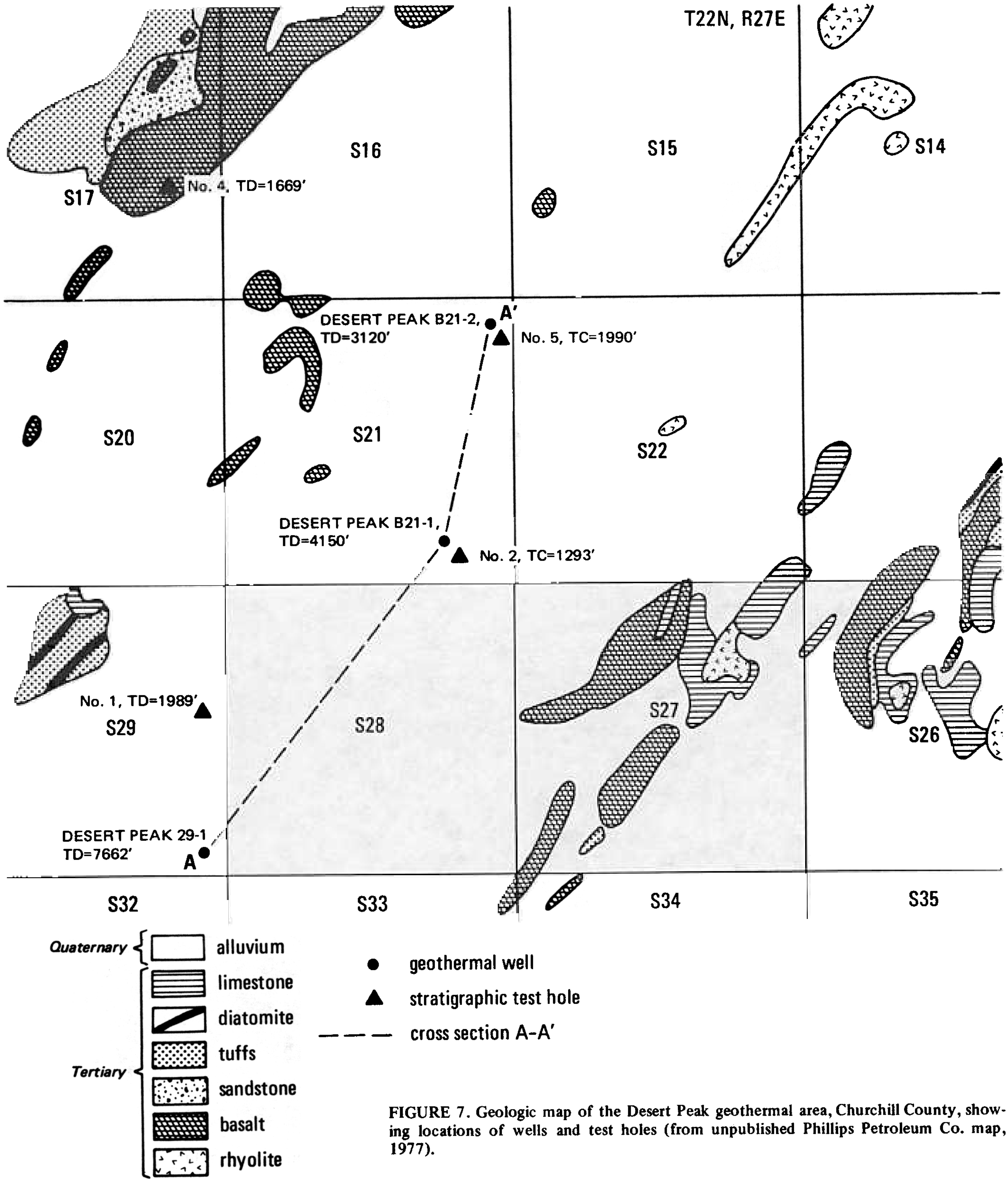


FIGURE 7. Geologic map of the Desert Peak geothermal area, Churchill County, showing locations of wells and test holes (from unpublished Phillips Petroleum Co. map, 1977).

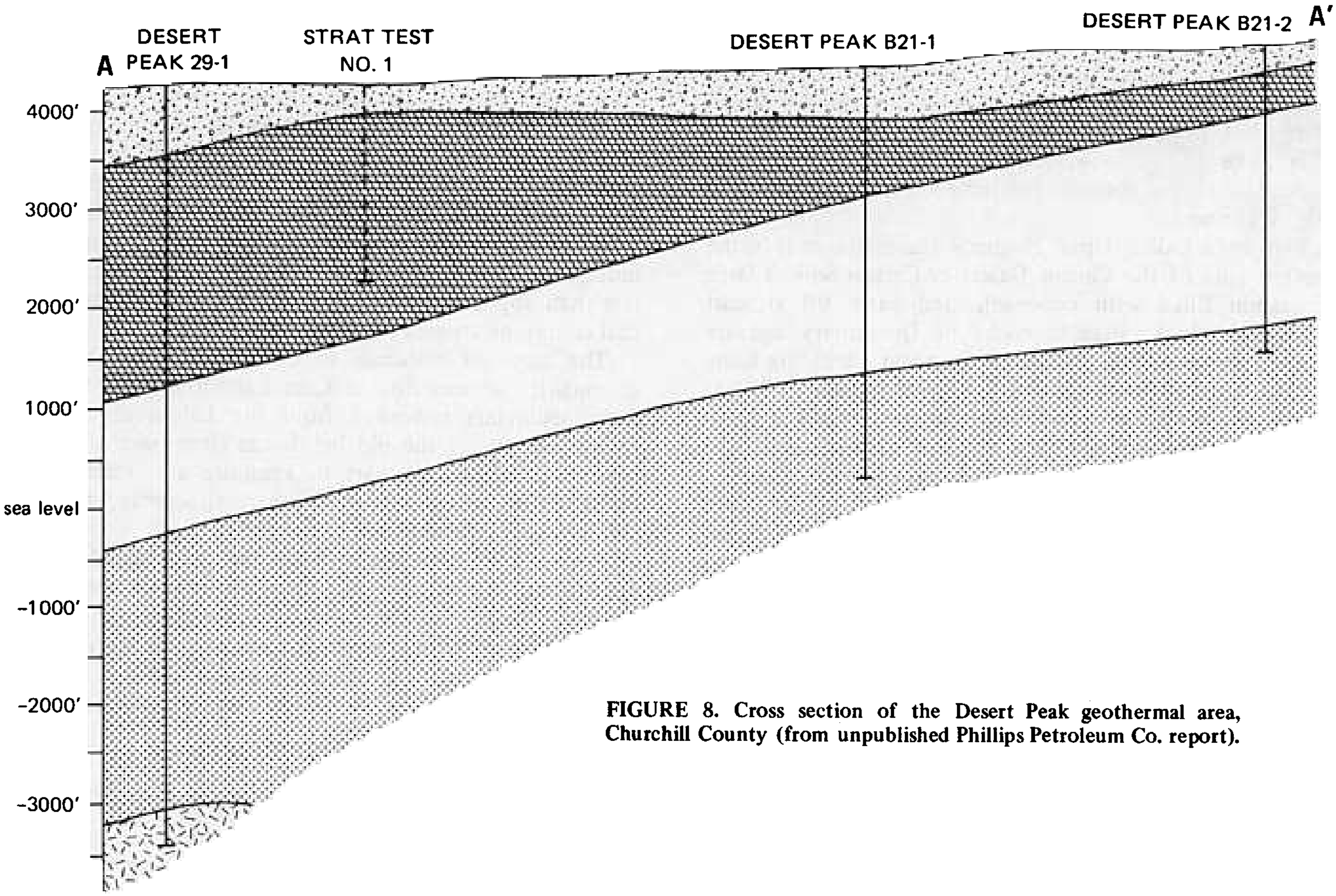
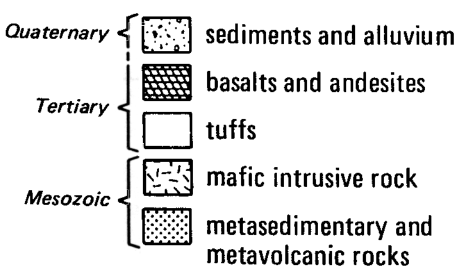
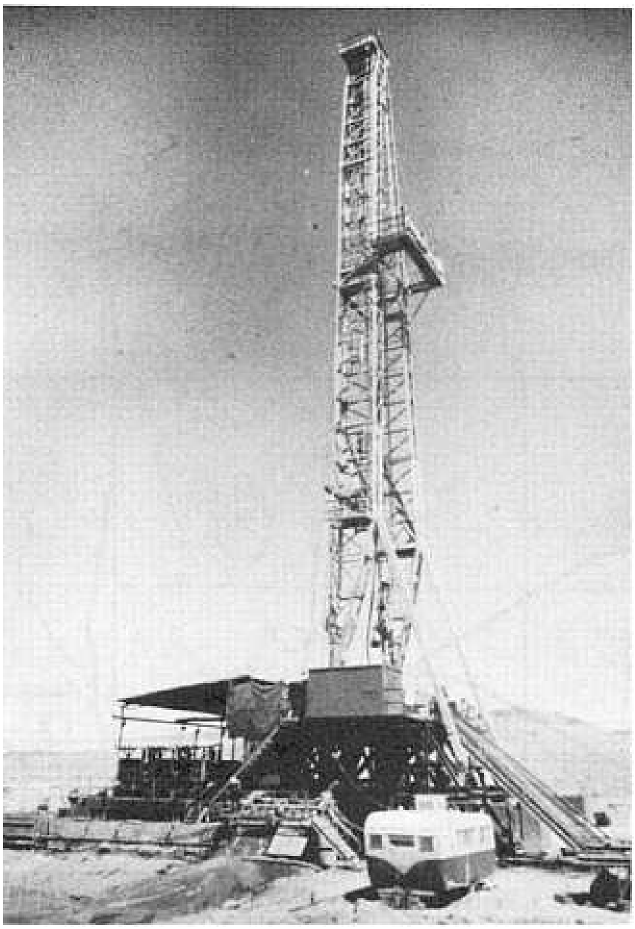


FIGURE 8. Cross section of the Desert Peak geothermal area, Churchill County (from unpublished Phillips Petroleum Co. report).





Drilling rig at the Phillips Petroleum Co. Desert Peak No. 29–1 well in 1974 (photo by Patricia Garside).

between Big Soda Lake and the thermal anomaly approximately 3 miles to the northeast. A geothermal well drilled in C SE/4 SE/4 S29,T20N,R28E (The Chevron–Phillips Soda Lake 1–29) to 4,306 feet reportedly encountered gabbro? near the bottom. No temperature data are available on the well.

The Soda Lakes–Upsal Hogback thermal area is in the western part of the Carson Desert or Carson Sink, a large depression filled with unconsolidated basin fill at least 6,000 feet thick. Basalitc rocks of Quaternary age are exposed at several places within the basin, including Lone Rock in the northeast Carson Sink, Rattlesnake Hill near Fallon, and Soda Lakes and Upsal Hogback (fig. 11). Lone Rock may be a remnant of a volcanic plug or neck, and Rattlesnake Mountain consists of basalt flows and the eruptive vent, which is now filled with agglomerate (Morrison, 1964). Upsal Hogback is a cluster of several basaltic cones, and Soda and Little Soda Lakes are craters or maars which are rimmed by a mixture of basaltic and nonvolcanic debris blown out by repeated gaseous eruptions (Olmsted and others, 1975). The eruptions that formed the craters may be phreatic in part.

The eruptions that formed the cones at Upsal Hogback occurred chiefly during an interpluvial time in the late Pleistocene when Lake Lahontan was dry (Morrison, 1964). Upsal basaltic tephra is found in the lower Sehoo Formation, which is probably about 25,000 to 30,000 years old (Jonathan Davis, oral communication, 1977). The earliest eruptions at Soda Lakes may have been as early as or earlier than those at Upsal Hogback (Morrison, 1964), but the rim of Soda Lake (elevation 4,000 ft.) has not been cut by any Pleistocene lakes. Since the last lake above 4,000 feet elevation was in the lowermost upper Sehoo, this would indicate that the present maar at Soda Lake was formed less than approximately 6,900 years ago (Jonathan Davis, oral communication, 1977).

The exposed materials in the thermal area are predominantly unconsolidated Lake Lahontan sediments and some sediments reworked from the Lahontan deposits. In the vicinity of the old bathhouse steam well the sands have been altered in part to kaolinite and various iron oxides or hydroxides by hydrothermal activity, probably chiefly vapor (Olmsted and others, 1975).

Exposed faults in the area are rare, although Morrison (1964) has mapped several northeast-trending faults (see fig. 11). The general alignment of Soda Lakes, the thermal anomaly, and Upsal Hogback along a north-northeast trend suggests faults at depth, possibly along a zone of rupture in the Tertiary or pre-Tertiary consolidated rocks (Olmsted and others, 1975).

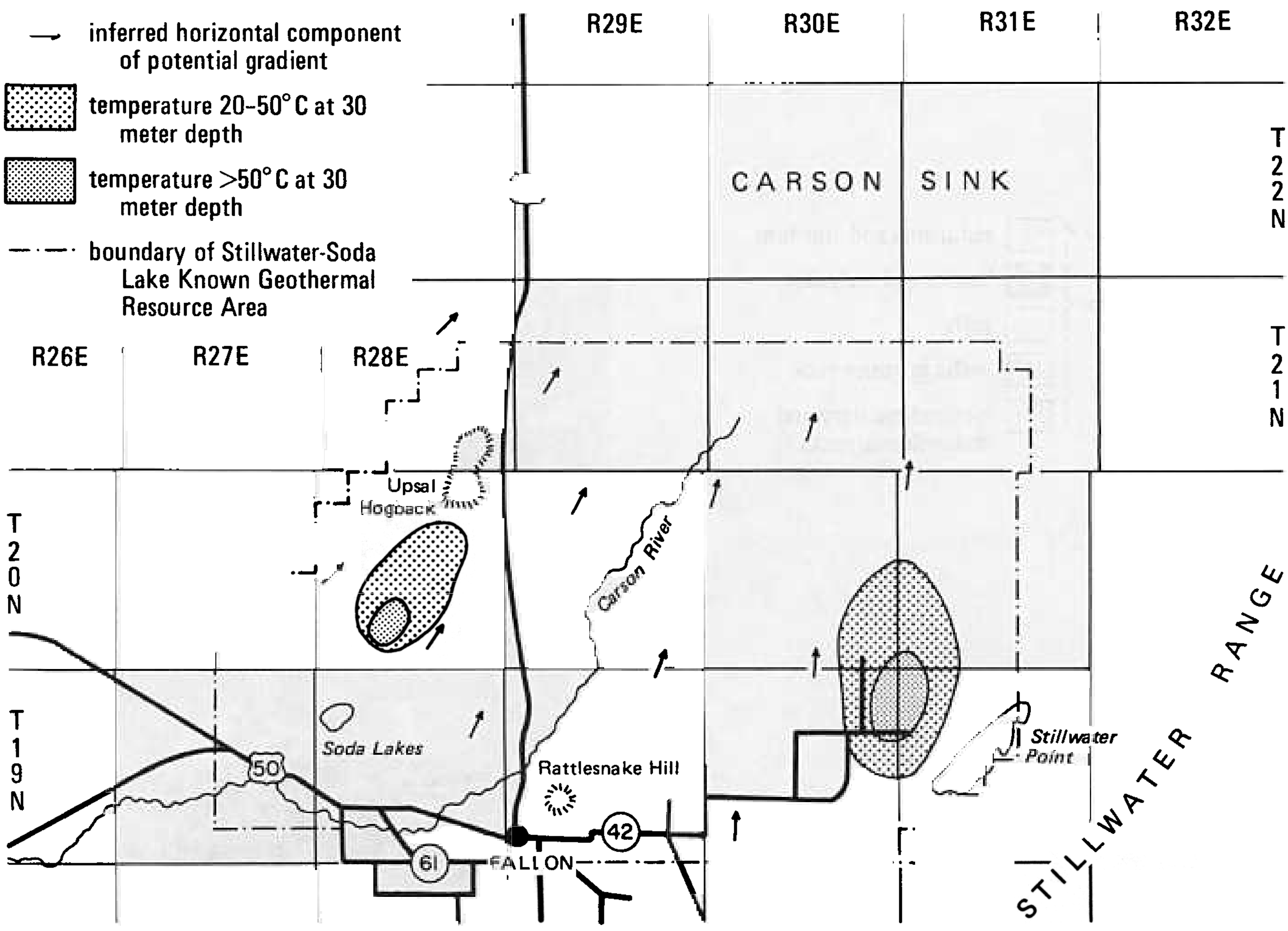
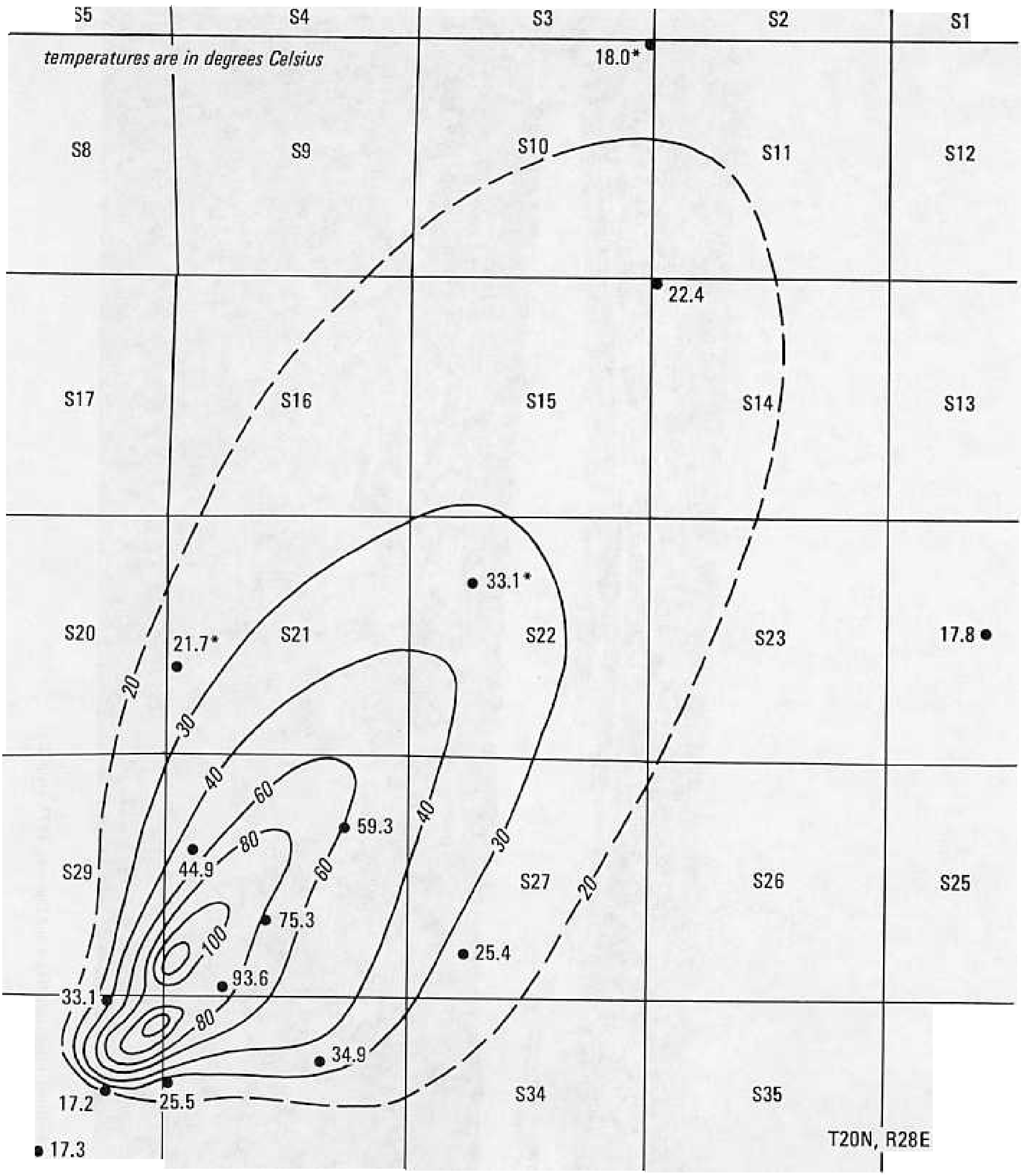


FIGURE 9. Portion of the Carson Sink showing locations of Stillwater and Soda Lakes–Upsal Hogback thermal areas (from Olmsted and others, 1975).

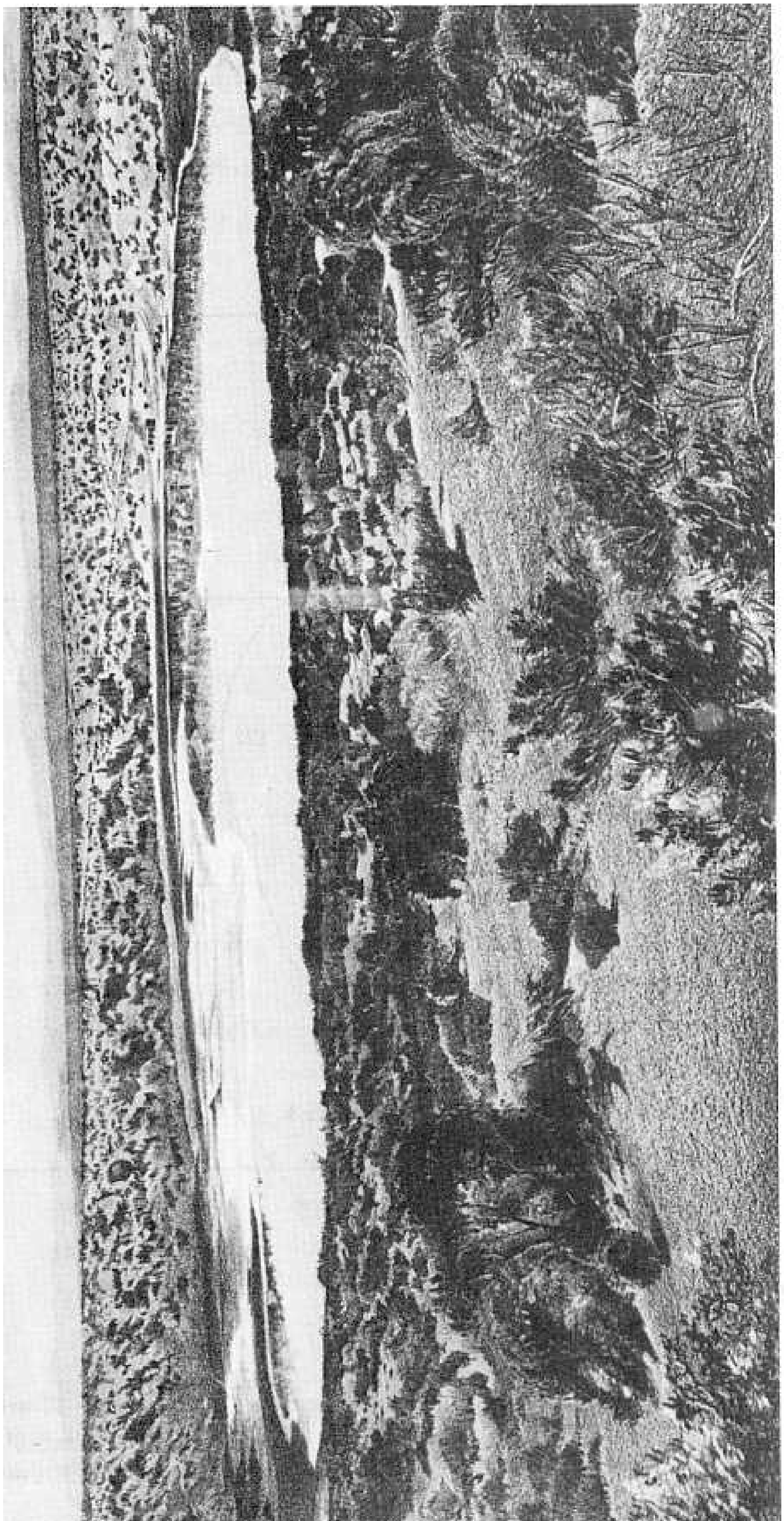


20 line of equal temperature (°C) at a depth of 30 meters

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

*temperature extrapolated from thermal gradient above 30 meters

FIGURE 10. Soda Lakes–Upsal Hogback thermal area, Churchill County, showing temperature at a depth of 30 meters, December, 1973 (after Olmsted and others, 1975).



Soda Lake, Churchill County (from lithograph, Hague and Emmons, 1877, plate 22).

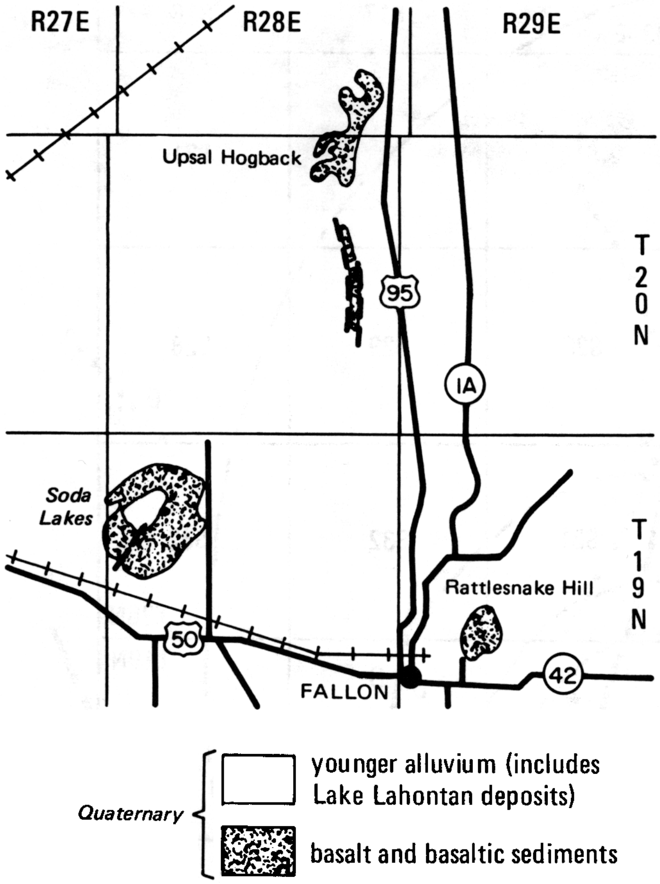


FIGURE 11. Geologic map of the Soda Lakes–Upsal Hogback area, Churchill County (after Willden and Speed, 1974, plate 1).

Since the early 1900's irrigation has raised the water table throughout the area. The thermal water rises from depth, mixes with the shallow nonthermal water, and moves laterally to the north-northeast (fig. 9). The extent of the zone of mixing is not known (Olmsted and others, 1975).

Stillwater thermal area [14]

The Stillwater area, like Desert Peak and Soda Lakes–Upsal Hogback, is a "hidden" geothermal area, its presence being discovered in 1919 when Charles Kent hit hot water in a shallow well. Shortly thereafter, W. W. Wheeler and a man named Freeman struck hot water in a well drilled for oil near the picnic grove. The well reportedly geysered about once a minute, shooting water into the air to a height of over 30 feet. This phenomenon continued until some very brave souls capped off the well (de Braga, 1964, p. 30–31). This well was the first of many hot artesian wells in the area. The well at Greenwood's store in the small community of Stillwater was used to heat the store in 1947. The well is 230 feet deep and has a temperature of 190°F (Morrison, 1964, p. 117). The community of Stillwater in S7,T19N,R31E is near the center of a thermal ground-water anomaly covering 20–25 mi^2 (fig. 12). The high water temperatures are believed to be due to flow from much greater depth along faults (figs. 12 and 13) and into shallower aquifers (Morrison, 1964). The Stillwater thermal area appears to be in a portion of the Carson Sink that has had recurrent Quaternary faulting (Morrison, 1964) and to lie along the extension of a fault bordering the west side of Rainbow Mountain a few miles to the south. Olmsted and others (1975) suggest that the velocity of upflow of the thermal water rising along the fault near Stillwater is sufficient to maintain the water temperature near that of the deep source, which is inferred to be close to 320°F on the basis of geochemical data (Mariner and others, 1974). The source of thermal water probably lies at a depth of several kilometers, well within the pre-Tertiary basement (Olmsted and others, 1975).

Several geothermal wells have been drilled in the Stillwater area (see Appendix 1), but data are available only for the O'Neill Geothermal Inc. (Oliphant) Reynolds No. 1 well which was drilled to a depth of 4,237 feet in 1964. The maximum temperature recorded was 277°F. Three other wells were drilled to approximately 4,000 feet in 1976 and 1977 by Union Oil Co. in several sections about 1 mile north of Stillwater.

Other wells in the Carson Desert [15–19]

Several wells in various parts of the Carson Desert (Carson Sink) have temperatures over 70°F. Some of these are heat-flow drill holes, and probably indicate the regional heat flow. A 3,758-foot-deep oil well (S15,T22N,R30E) is reported to flow hot water (R. Forest, oral communication, 1974), and a water well in S7,T17N,R30E has a reported temperature of 158°C (C. W. Klein, oral communication, 1977).

Lee Hot Springs [21]

Lee Hot Springs are in the NW/4 S34,T16N,R29E. In the past these springs may have been called Allen's Hot Springs (Miller and others, 1953), although Allen's Springs are located about one-quarter of a mile northwest of Lee Hot Springs and are not reported to be warm. However, spring deposits are found at Allen's Springs.

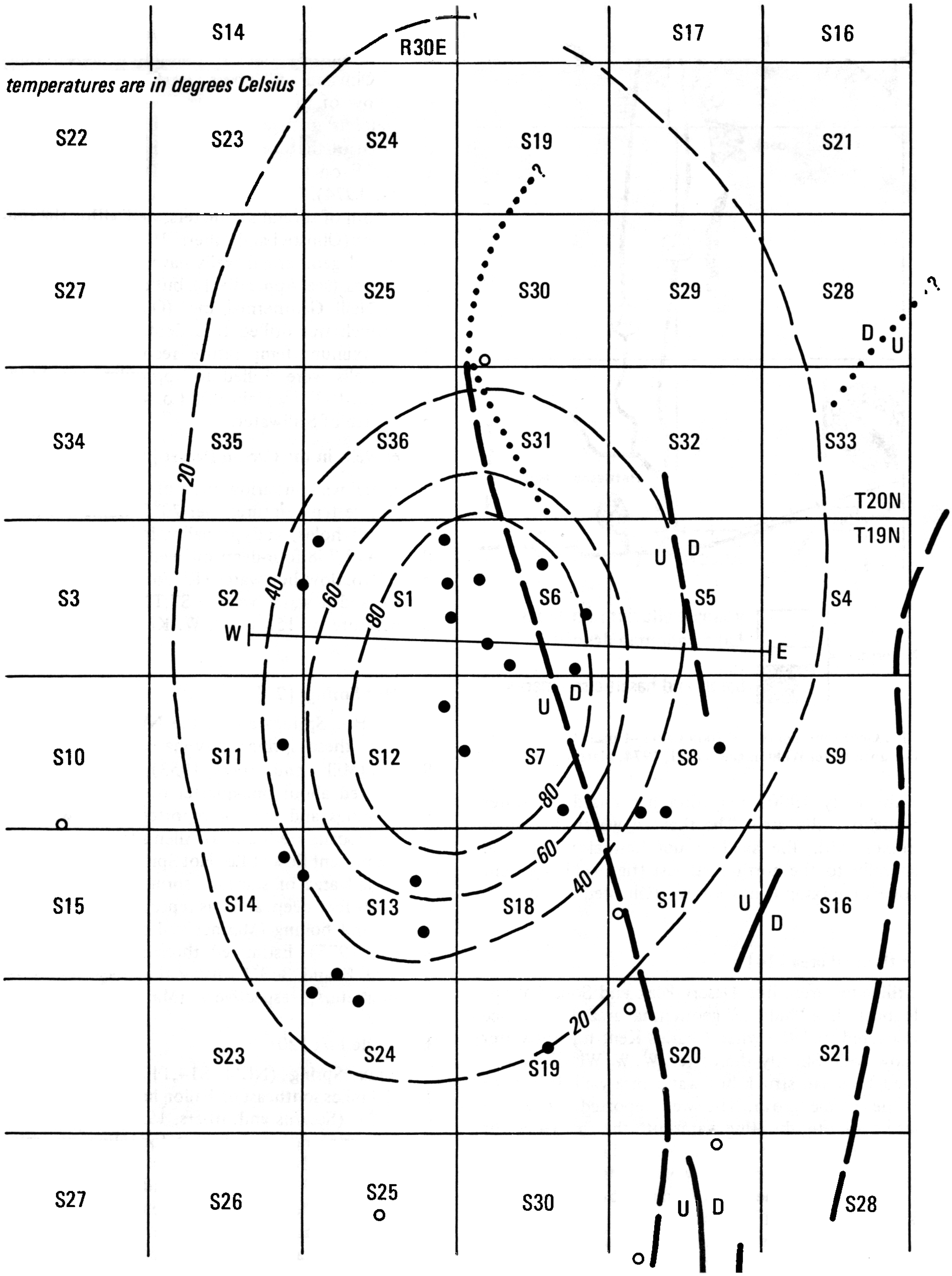
The present flow at Lee Hot Springs is from a well located in a small area of siliceous spring sinter: this well is probably 56 feet deep, and has reported temperatures between 190°F and boiling (Mariner and others, 1974; Glancy and Katzer, 1975). Estimated thermal reservoir temperatures are 323°F and 343°F, using the silica and Na-K-Ca geothermometers, respectively (Mariner and others, 1974).

Eightmile Flat [20]

Borax Spring (NE/4 S14,T17N,R30E) on Eightmile Flat 18 miles southeast of Fallon has a reported temperature of 178°F (Stearns and others, 1937; Russell, 1885, pl. 8). Also an exploration drill hole for saline minerals in NW/4 NW/4 S12,T17N,R30E reportedly hit very hot water at 400 feet. The drill hole is in playa and lake sediments to a total depth of 500 feet (Nevada Bureau of Mines and Geology unpublished data). The Fourmile Flat section of Salt Wells Basin, a playa area to the southeast of Eightmile Flat also has a reported hot spring in S6,T16N,R32E (Waring, 1965, no. 75).

Dixie Hot Springs [6]

Numerous hot springs are located in SE/4 S5 and NE/4 S8,T22N,R35E along the west side of Dixie Valley. Cold springs are present about 1 mile to the south in S17,T22N, R35E (Dixie Valley 15-minute topographic quadrangle).



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

○ ● test hole (open circle) or well (solid circle) for which temperature data are available

fault, dashed where concealed, dotted where inferred

FIGURE 12. Stillwater thermal area, Churchill County, showing temperature at a depth of 30 meters and location of fig. 13 (after Olmsted and others, 1959).

The springs seem to be along a northeast-trending line which may be the continuation of a range-front fault present to the north at the Dixie Comstock Mine (see the following description). Movement was reported along this fault in the 1954 Dixie Valley earthquake (Willden and Speed, 1974). The estimated thermal reservoir temperature is 291–293°F, using the silica and Na-K-Ca geothermometers (Mariner and others, 1974).

Eight to ten miles south of Dixie Hot Springs (T21N, R34E and 35E) a number of flowing wells are found in the central part of southern Dixie Valley. These wells, with slightly anomalous temperatures of 70° to 76°F, may be related to the same thermal system active elsewhere along the west side of Dixie Valley.

Senator Fumaroles [4]

Cinnabar, metacinnabar, sulfur, and minor pyrite are present in siliceous sinter at the Senator Mine (Senator Fumaroles) in the northern end of Dixie Valley. The mine is located along the N30°E fault which bounds the eastern edge of the Stillwater Range (Lawrence, 1971). The location of the mine is reported to be 1 mile north of the Boyer Ranch at the mouth of Cottonwood Canyon, probably in the vicinity of SW/4 S31,T25N,R37E. The deposit was discovered in 1968.

No hot springs are present at the site, as it is approximately 60 feet to the water table. Cinnabar appears to be depositing at the present time around two main fumaroles which are 300 feet east of the main deposit. Small amounts of sulfur and pyrite have also been deposited, and considerable solfataric alteration has taken place. Small volumes of steam with some hydrogen sulfide are being emitted at the vents, and preliminary work indicates that the cinnabar was being deposited from a vapor phase at the surface (Lawrence, 1971).

Dixie Comstock Mine [5]

Vanderburg (1940, p. 48) reports that mining in the Dixie Comstock Mine was hindered by the intense heat and a large volume of hot water in the mine workings less than 75 feet from the surface. These workings referred to by Vanderburg are probably in S14,T23N,R35E near the major range-front fault which had movement in the 1954 Dixie Valley earthquake (Willden and Speed, 1974). This fault and related parallel faults continue south 5.5 miles to the Dixie Hot Springs area, and north to Senator Fumaroles. Waring (1965) reports a small spring in T23N,R35E, which may possibly be near the Dixie Comstock Mine.

Cottonwood Canyon sinter deposit [4]

Ransome (1909b, p. 57) described an extinct hot spring located 2 or 3 miles above Boyer's Ranch and about half a mile below the Nickel Mine in Cottonwood Canyon (approximately SE/4 S35,T25N,R36E). A large mound of siliceous sinter is surmounted by a craterlike orifice, about 200 feet above the present stream, which has cut deeply into the mound. The deposit rests on diorite. The relationship of the sinter deposit to the nearby Senator Fumaroles (about 2 miles to the southeast) is not known.

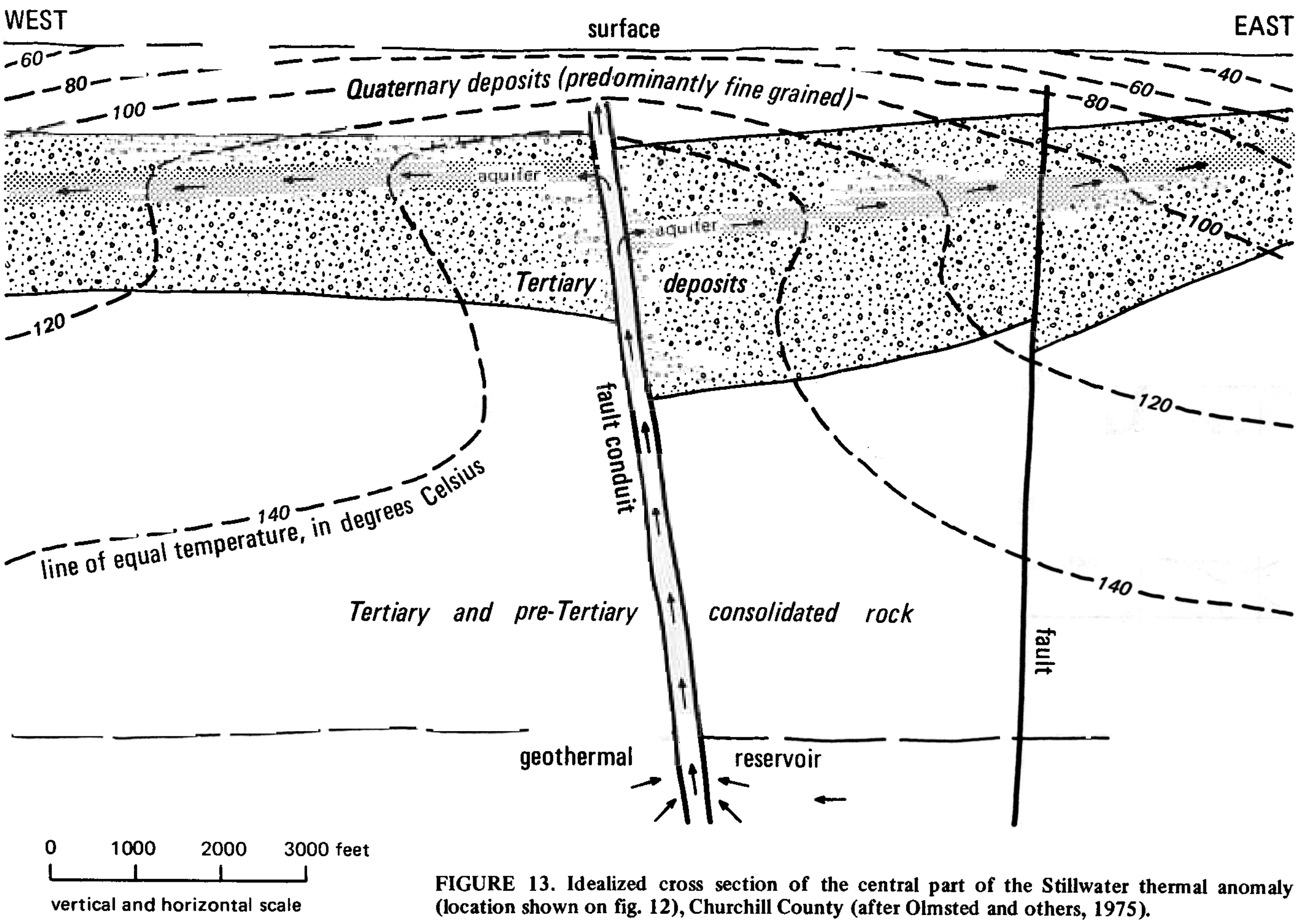


FIGURE 13. Idealized cross section of the central part of the Stillwater thermal anomaly (location shown on fig. 12), Churchill County (after Olmsted and others, 1975).

Moapa area [24]

Warm springs and wells 6 miles northwest of Moapa are at the head of the Muddy River (fig. 14) and have reported temperatures that average 90°F. The springs issue from alluvium but probably are supplied by water which is transmitted through Paleozoic carbonate rocks which crop out nearby. Preliminary analysis of minor long-term spring discharge variations suggest a 15-to 20-year lag in response to recharge from precipitation (Eakin and Moore, 1964). The water at Iverson's Warm Springs has been used for irrigation and bathing (Eakin, 1964).

Las Vegas Valley [33]

Many water wells and several springs in Las Vegas Valley have water temperatures between 70° and 106°F. The area has a high mean annual temperature (probably over 60°F) and this is a factor in the reported water temperatures. However, when water temperatures from wells are adjusted for the increase of temperature with depth (the geothermal gradient), a number of wells still seem to be anomalous. A geothermal gradient of 1°F per 75 feet was selected as the lower limit, and only those wells with a gradient above that were included in this report. Any surface temperature over 70°F was considered anomalous, as has been the practice elsewhere in this report. Therefore, the 1°F/75′ line on figure 15 was begun at 70°F, and only wells which fell to the right of that line were considered. Much of the water data for Las Vegas Valley was obtained from Maxey and Jameson (1946, 1948).

In Las Vegas Valley the warm-water springs and wells seem to be concentrated in three areas. The most northerly of these, Kyle Spring in S15,T20S,R61E, has a reported temperature of 75°F. Several warm-water wells in the surrounding sections seem to indicate that their source is also related to this spring. These anomalous spring and well temperatures probably indicate that the water at this area has circulated to depths greater than much of the rest of the water in Las Vegas Valley.

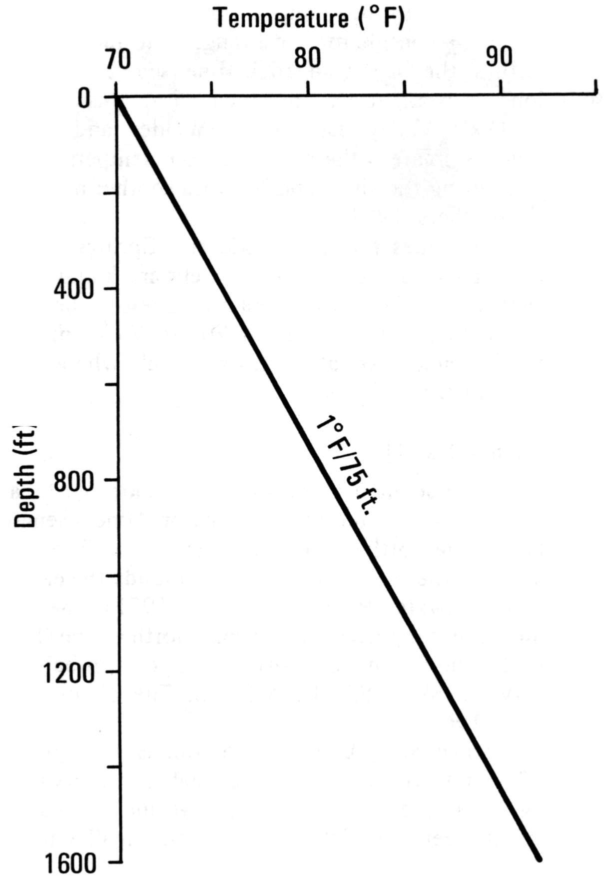


FIGURE 15. Graph of temperature vs depth; only Las Vegas Valley wells which fall to the right of the 1°F/75 ft-line were included in this report.

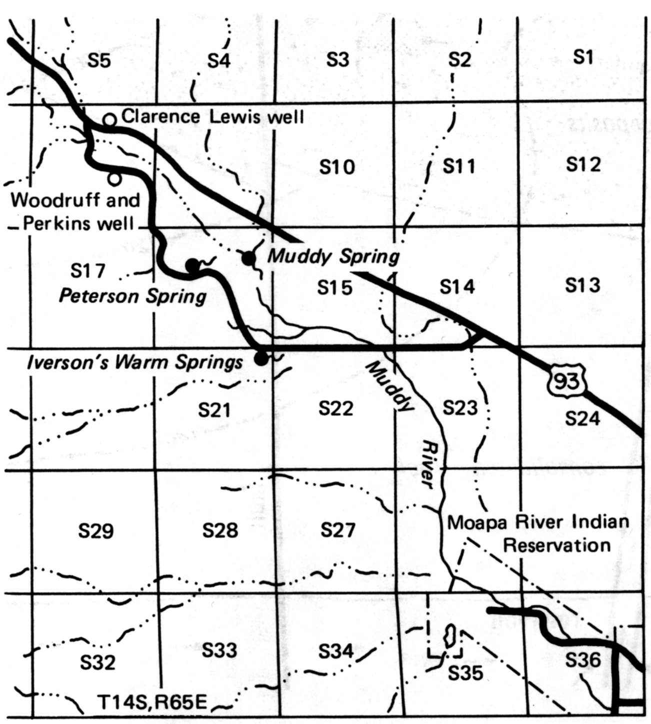


FIGURE 14. Locations of warm springs and wells 6 miles northwest of Moapa, Clark County.

Las Vegas (or Vegas) Springs are located in S30 and 31, T20S,R61E east of downtown Las Vegas and have temperatures up to 79°F. Frémont stopped here on May 3, 1844 and reported that the waters were "two narrow streams of clear water, 4 or 5 feet deep, with a quick current, from two singularly large springs." The water had a pleasant taste but was too warm to be agreeable (Carpenter, 1915). The springs were used locally for irrigation, but have gone dry due to intense ground-water development. They originally flowed 2,567 gallons per minute, and are reportedly along a fault which displaces the basin alluvium (Mifflin, 1968).

More than 20 wells with anomalous temperatures are clustered around Warm Springs Ranch in S10,T22S,R61E (fig. 16). No temperature data are available for springs which may have been present at Warm Springs Ranch, but nearby well waters are 90°F, and temperatures of 79° to 84°F are encountered in an area up to 1 to 1.5 miles north and west of the ranch. A 106°F water well is present in NW/4 S16,T22S,R61E about 1 mile southwest of Warm Springs Ranch (Malmberg, 1965). Several other warm-water wells are found in the southern part of Las Vegas Valley, but do not seem to be concentrated in any one area. The

CLARK COUNTY (continued)

warmer water probably represents a deeper source area, and may be useful in determining areas of maximum ground-water discharge from deep aquifers or faults. An exploration well (the Joe W. Brown Wilson–Government No. 1) was drilled for oil in 1957 in C NW/4 NW/4 S24, T21S,R61E and encountered hot water. The well was plugged below 6,050 feet and converted to a hot (137°F) artesian water well. The hot water entry point was approximately 5,210 feet, in the Permian Kaibab Limestone (Schilling and Garside, 1968). Waters similar to this could be the source for warm springs and wells in the Las Vegas Valley.

Other warm springs and wells in Clark County

Seven additional warm springs or spring areas have been reported in Clark County, mainly in its northern half. Several springs are found in Arizona and Nevada along the Black Canyon part of the Colorado River east of Boulder City (S32,T22S,R65E; S5,8,21,T23S,R65E) with temperatures of 78° to 145°F. Rogers Springs are the next warmest with temperatures up to 86°F, and the springs at the Virgin River Narrows reportedly range from 75° to 80°F. Indian Springs (79°F), White Rock Spring (78°F), Brown's Spring (75°F), and Ash Creek Spring (72°F) are somewhat cooler. Warm-water wells in Clark County range from 70° to 88°F and are 60 to 825 feet deep.

DOUGLAS COUNTY

Walley's (Genoa) Hot Springs [45]

Walley's Hot Springs are about 2.5 miles south of Genoa on the west edge of Carson Valley (S21 and 22, T13N, R19E). The springs are named for David Walley, who built a large hotel and spa on the site in 1862. The resort had 40 bedrooms and, for a time, a physician in attendance. Later, the hotel was partly destroyed by fire, and completely demolished in 1929–1930 (Dangberg, 1972). At present, Ed and Helen Johnson have a bar and dining room in their home on the site of the old hotel. The Johnsons provided the authors with copies of the U. S. Steel Corp. maps and well logs from geothermal investigations done there in 1962 and 1963.

The hot springs themselves occur over an area of several acres, and range in temperature from 136° to 160°F (Waring, 1965). The flow of the springs has been estimated at 600 gpm (Lamke and Moore, 1965). The springs are along the trace of a major fault (fig. 17), which forms the edge of the Carson Range in this area for at least 12 miles (Moore, 1969). This fault has had recent movement, although the plainly visible scarp has been in existence since before 1854. Lawson (1912) has measured the recent displacement on this fault at 44 feet at Walley's Hot Springs, and believed it to represent movement from a single earthquake. The springs flow from a salient on a topographic low which occurs here along the trace of the fault.

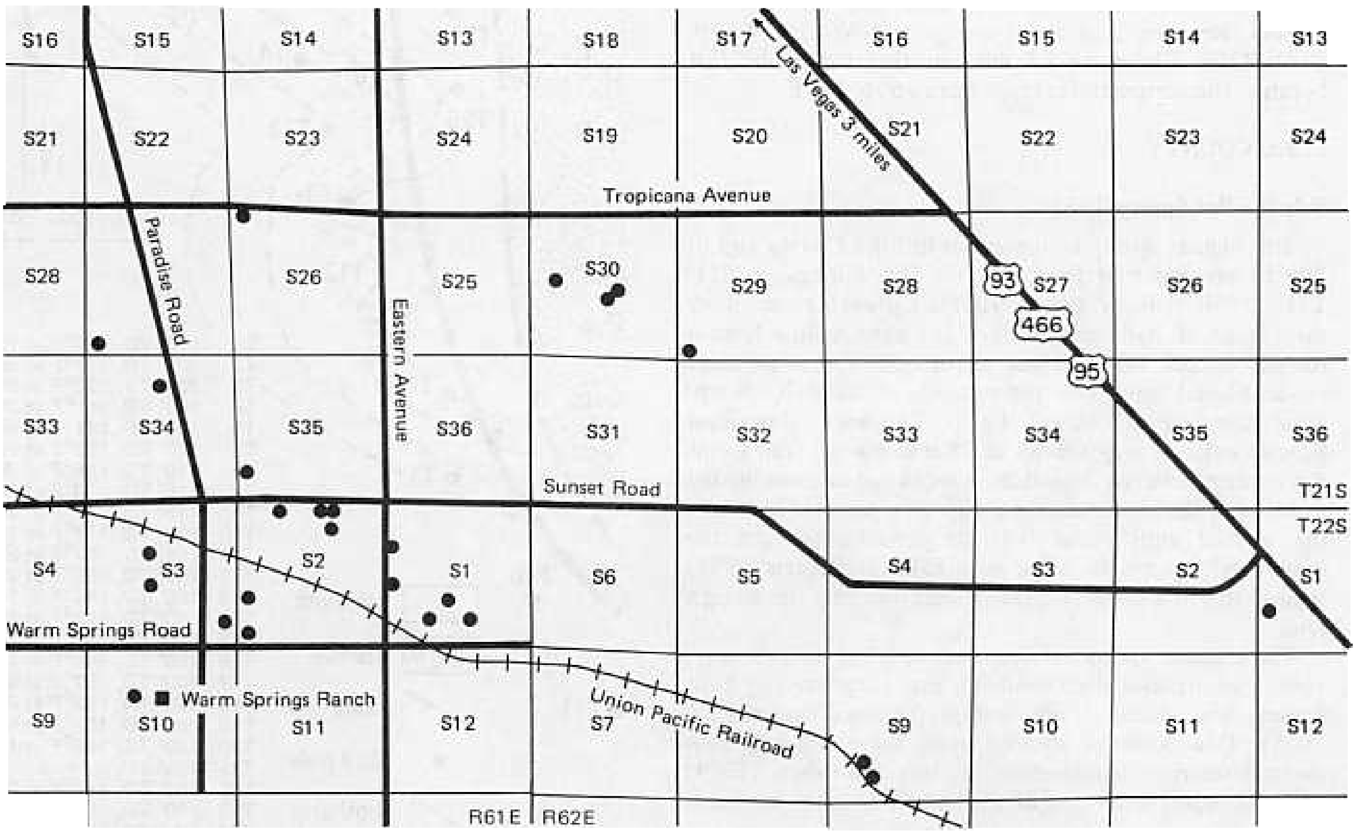


FIGURE 16. Selected thermal water wells in south Las Vegas Valley (wells shown have temperatures greater than or equal to 70°F after adjustment for a geothermal gradient effect of 1°F per 75 feet of well depth).

In 1962 and 1963, Columbia Iron Mining Co., subsidary 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

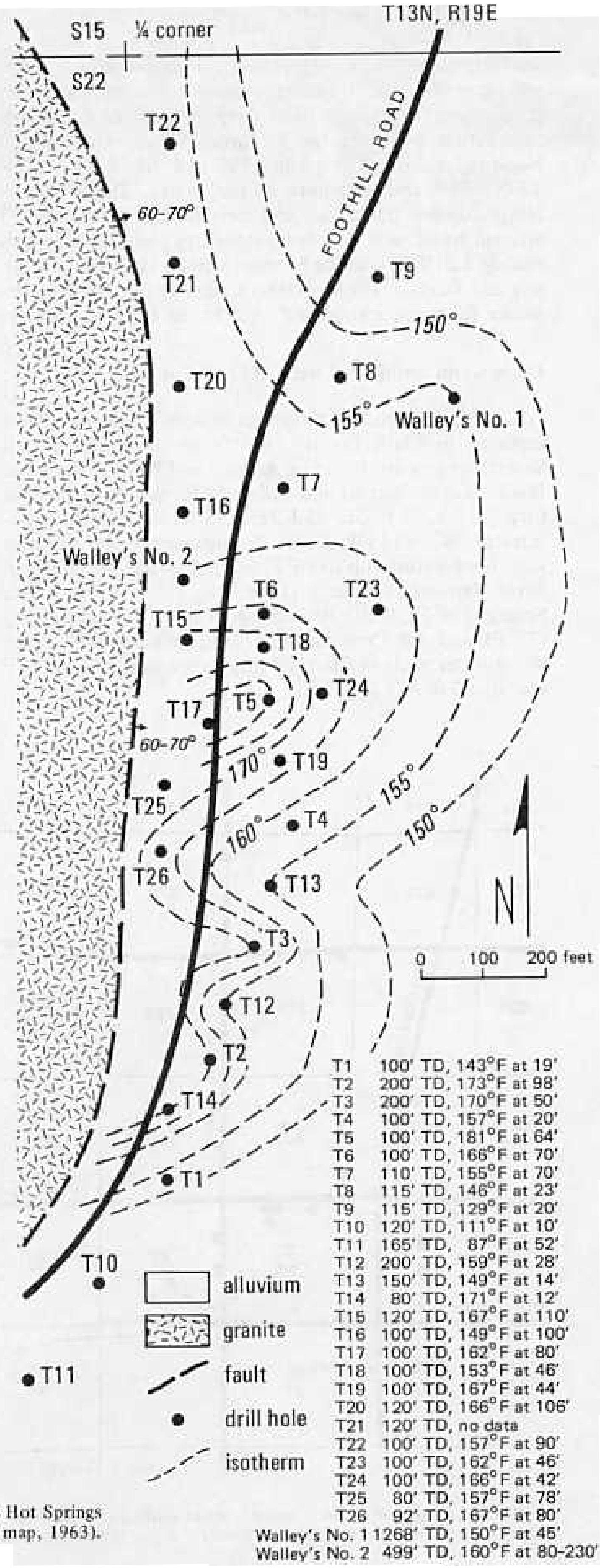


FIGURE 17. Isothermal contour map of the Walley's Hot Springs area, Douglas County (modified from U. S. Steel Co. map, 1963).

and estimated the reservoir temperature at 361° to 374° using the silica-quartz geothermometer. The area of subsurface 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 slicia 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 are now incorporated in Elko

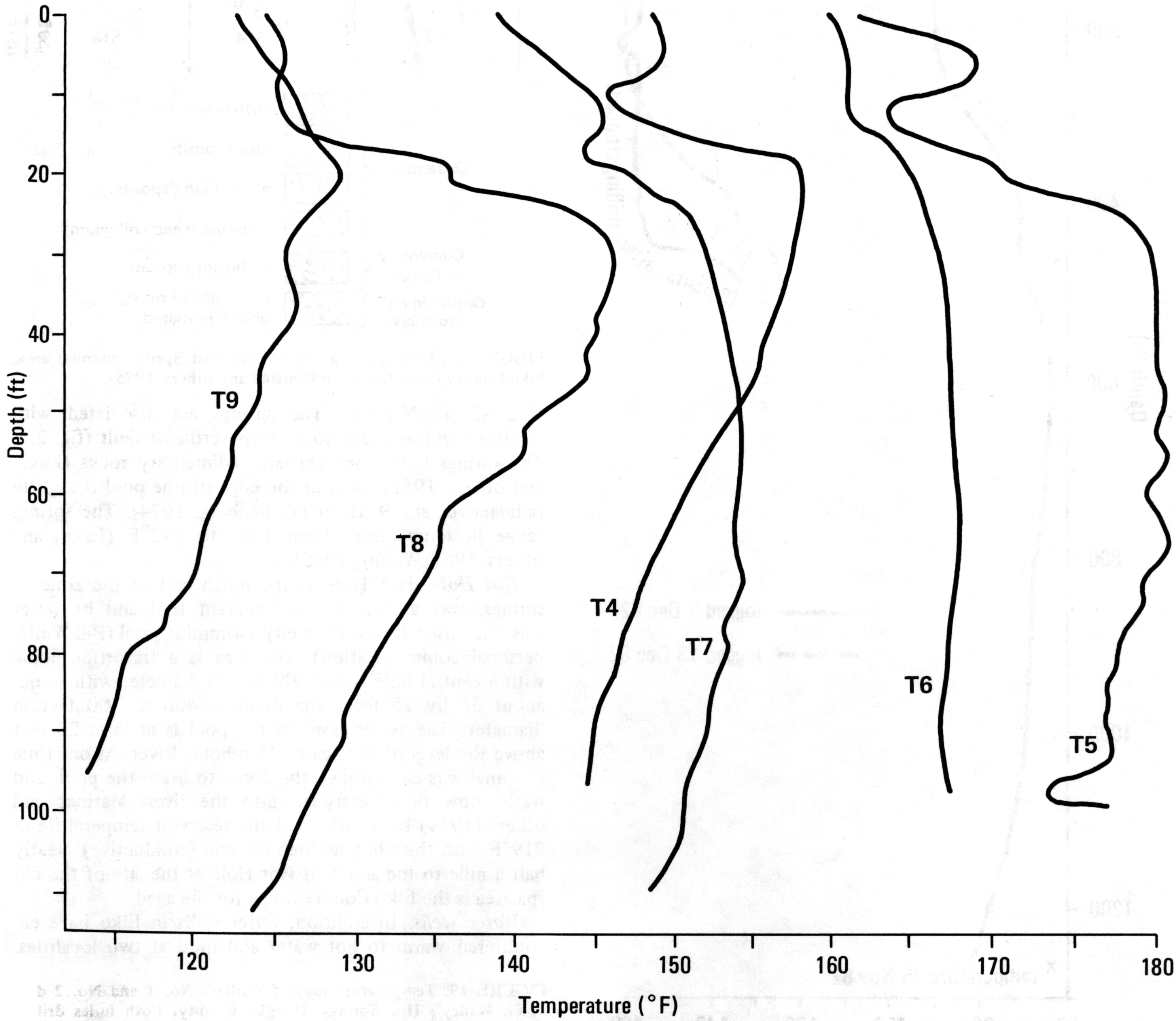


FIGURE 18. Temperature logs of selected shallow test holes at Walley's Hot Springs, Douglas County. Holes 4, 6, 7, 8 and 9 logged December 9, 1962; hole 5 logged December 13, 1962 (from U. S. Steel Co. temperature logs, 1962).

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 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 μR/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.

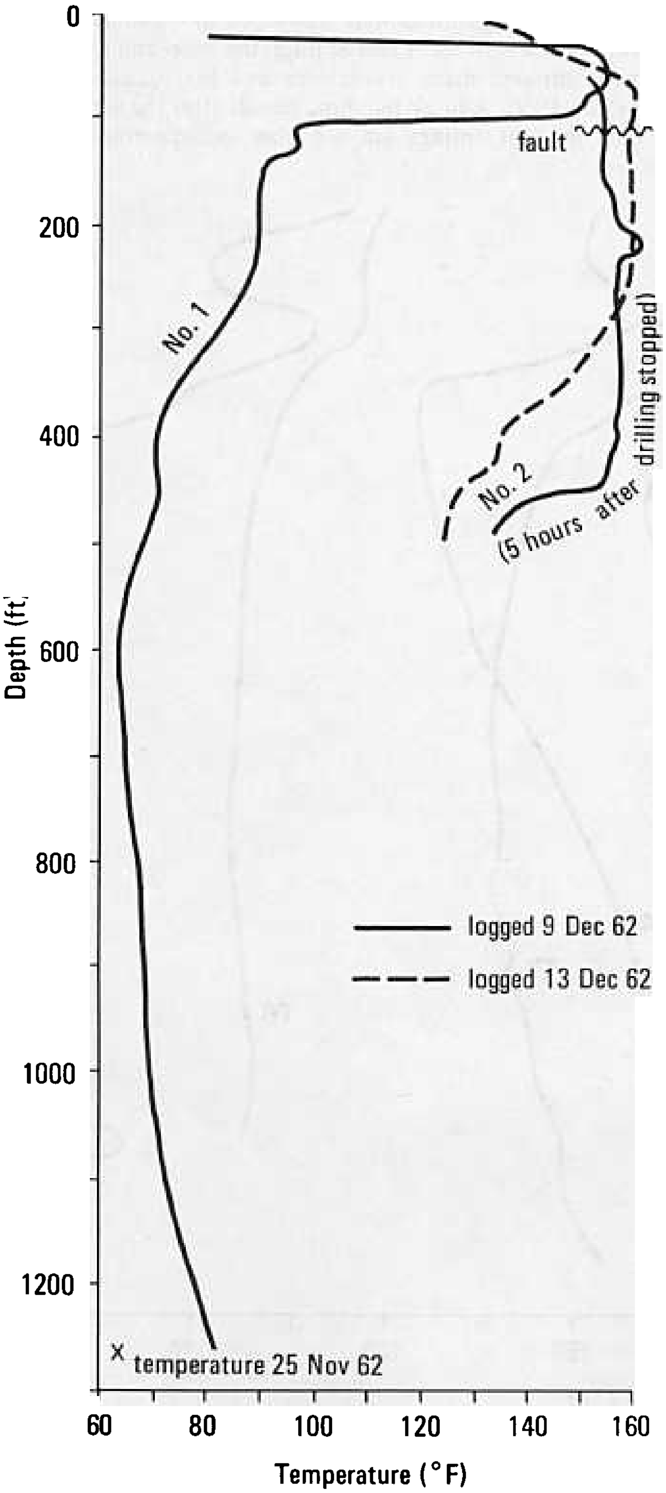


FIGURE 19. Temperature logs of Walley's No. 1 and No. 2 drill holes, Walley's Hot Springs, Douglas County. Both holes drilled using air, and cased throughout; No. 1 completed November 25, 1962, No. 2 completed December 9, 1962 (from U. S. Steel Co. temperature logs, 1962).

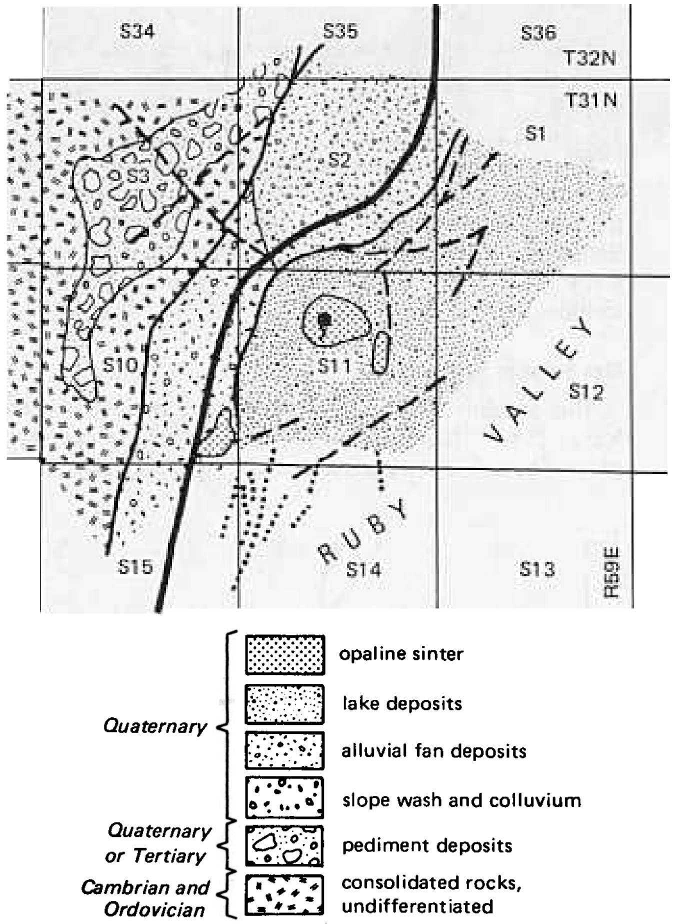


FIGURE 20. Geologic map of Sulphur Hot Springs thermal area, Elko County (modified from Olmsted and others, 1975).

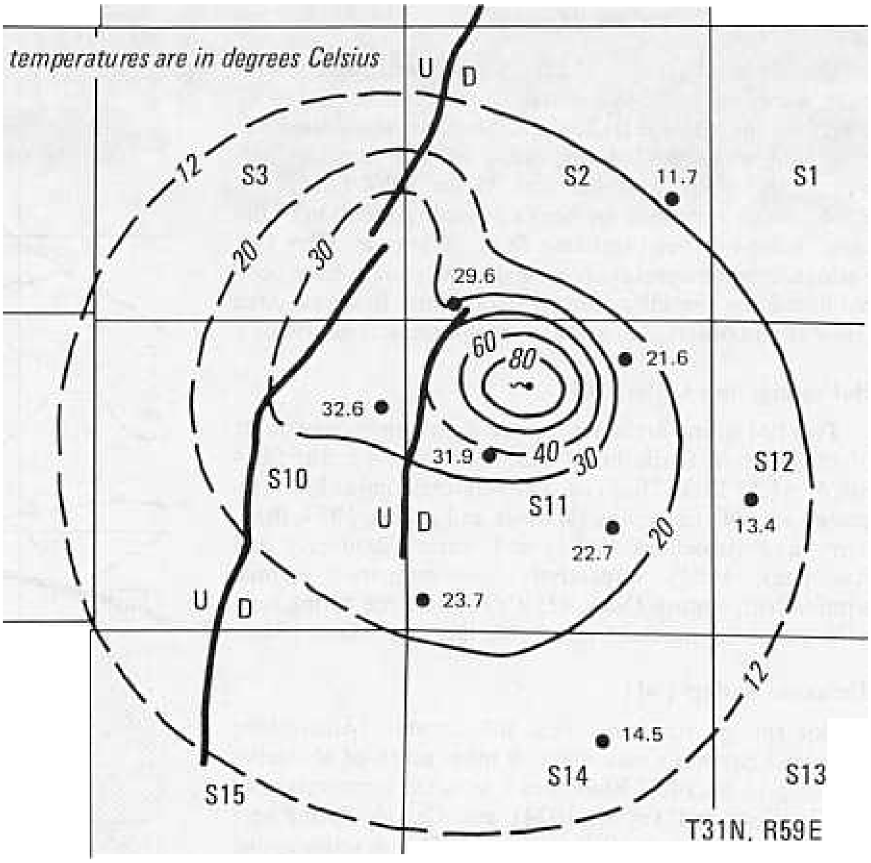


FIGURE 21. Sulphur Hot Springs thermal area, Elko County, showing temperature at a depth of 30 meters, fall 1973 (from Olmsted and others, 1975).

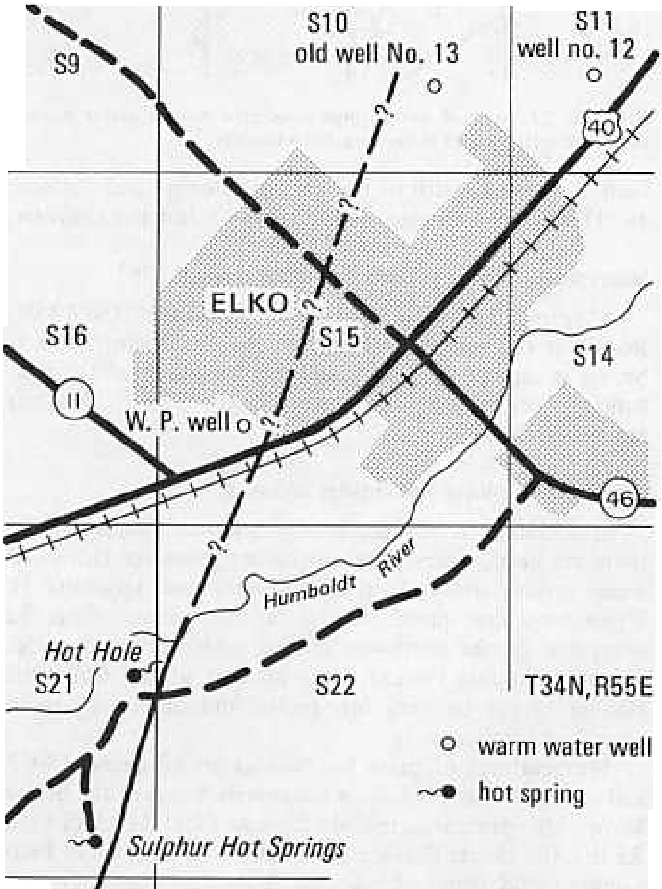
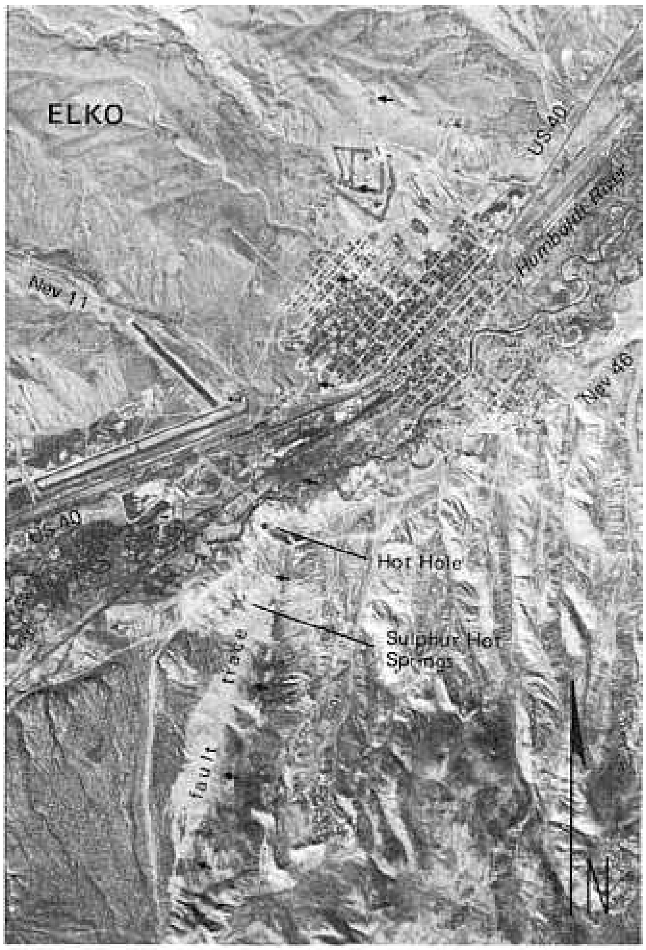


FIGURE 22. Map of hot springs and wells at Elko, Elko County.



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

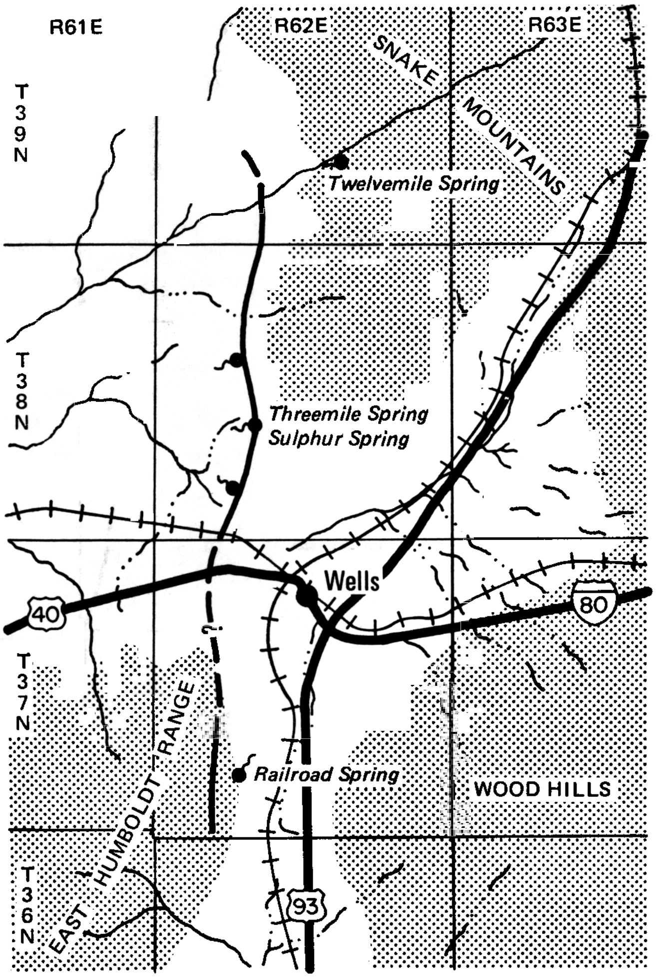


FIGURE 23. Map of hot springs associated with a major normal fault in the Humboldt Wells area, Elko County.

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).

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 temperautre 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:

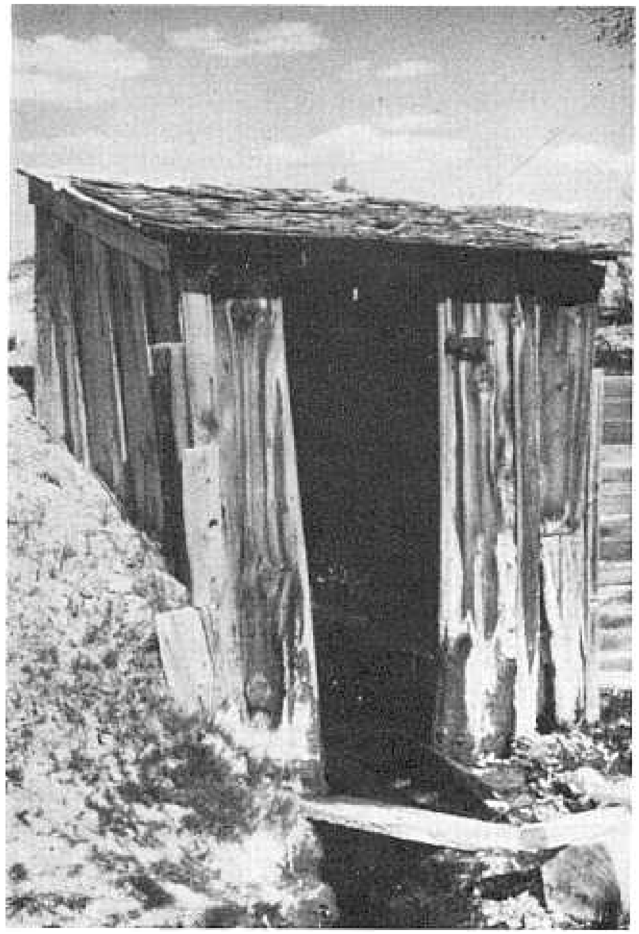
surface	valley fill
5,000′	volcanics
6,175′	limestone
6,350′	shale
6,575′	dolomite
6,610′	metasedimentary? rocks
8,120′	limestone
8,300′	metavolcanic? rocks
8,400′	mudstone
8,600′	metavolcanic rocks

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 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).



Old bathhouse at Alkali Springs, Esmeralda County.

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

ESMERALDA COUNTY (continued)

Valley can be found in Dole (1913) and Meinzer (1917).

One of the world's principal sources of lithium is Clayton Valley. The Foote Mineral Co. has been producing the lithium from brines pumped through about 15 wells from depths of 300 to 700 feet. Lithium values occur at different depths in different wells although the depth to water level remains constant at 30 feet in all wells. Temperatures are constant at 70°F (Albers and Stewart, 1972).

The brines contain about 400 ppm lithium and also contain sodium, potassium, and magnesium, and a little calcium and minor sulfates. The ratio of lithium to potassium is 1:25 and of lithium to magnesium 1:1.5 (Albers and Stewart, 1972). The lithium is concentrated by evaporation.

Geologists employed by Foote Mineral Co. believe that the most likely source of the lithium is hot springs under the valley (Albers and Stewart, 1972).

Pearl Hot Springs [89]

Pearl Hot Springs are located in S25,T1S,R40E and had a reported temperature of 98°F on January 19, 1967 (University of Nevada, DRI, Center for Water Resources Research data). These are probably the springs referred to by Spurr (1906) as issuing from the east side of the playa across Clayton Valley from the Silver Peak Hot Springs. A major north-northeast-trending fault may run through the site of the springs (see Albers and Stewart, 1972, plate 1).

Big Divide Mine [87]

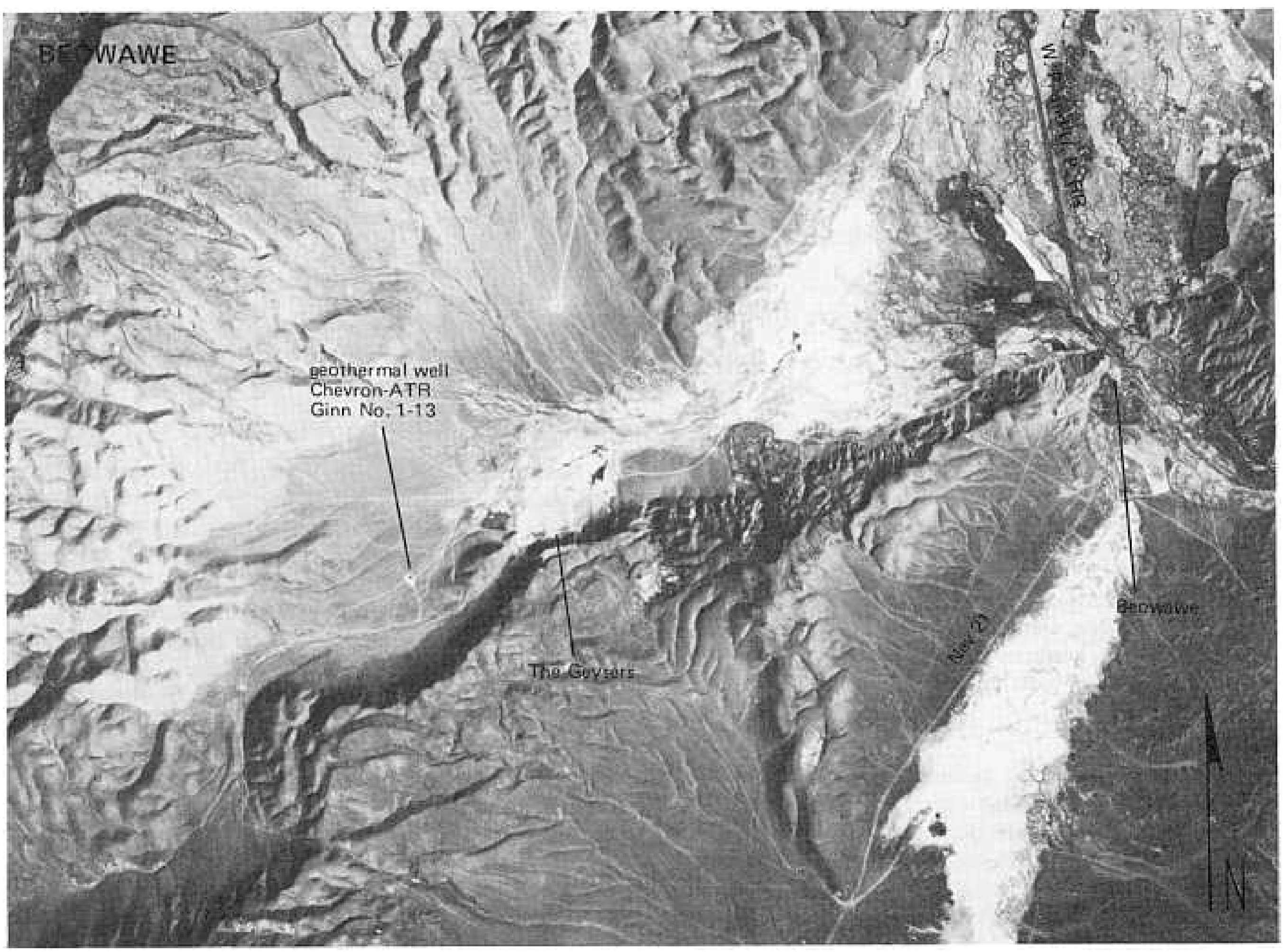
Hot water was reportedly hit below the 1,000 foot-level in the Big Divide Mine (NW/4 SW/4 S26,T2N,R42E) during the 1920's. Approximately 42,000 gallons per day were pumped during this time (Engineering and Mining Journal Press, 1923). Two miners were reportedly scalded in the shaft sump, and the shaft steamed at the surface in cold weather until the ventilation system was changed (Norman Coombs, personal communication, 1972).

Water wells in southern Big Smoky Valley [86]

Three wells in the southern part of Big Smoky Valley have anomalous water temperatures. These wells (Emigrant well, Fishlake Livestock Co. well, and an unnamed well) are 300 to 500 feet deep, and one, the Fishlake Livestock Co. well, hit hot water at 165 feet.

Unnamed spring, southern Esmeralda County [92]

A spring is reported from S6,T11S,R43E, just inside Death Valley National Monument. The temperature is 77°F (University of Nevada, DRI, Center for Water Resources Research).



ESMERALDA COUNTY (continued)

Travertine deposit [88]

A mound of calcareous spring travertine occurs in C NW/4 S5,T1N,R43E, near the south end of the Klondyke Hills. There are no known hot springs in the vicinity. The mound is about 600 feet in diameter, and occurs in an area of Tertiary welded tuffs and Paleozoic limestones.

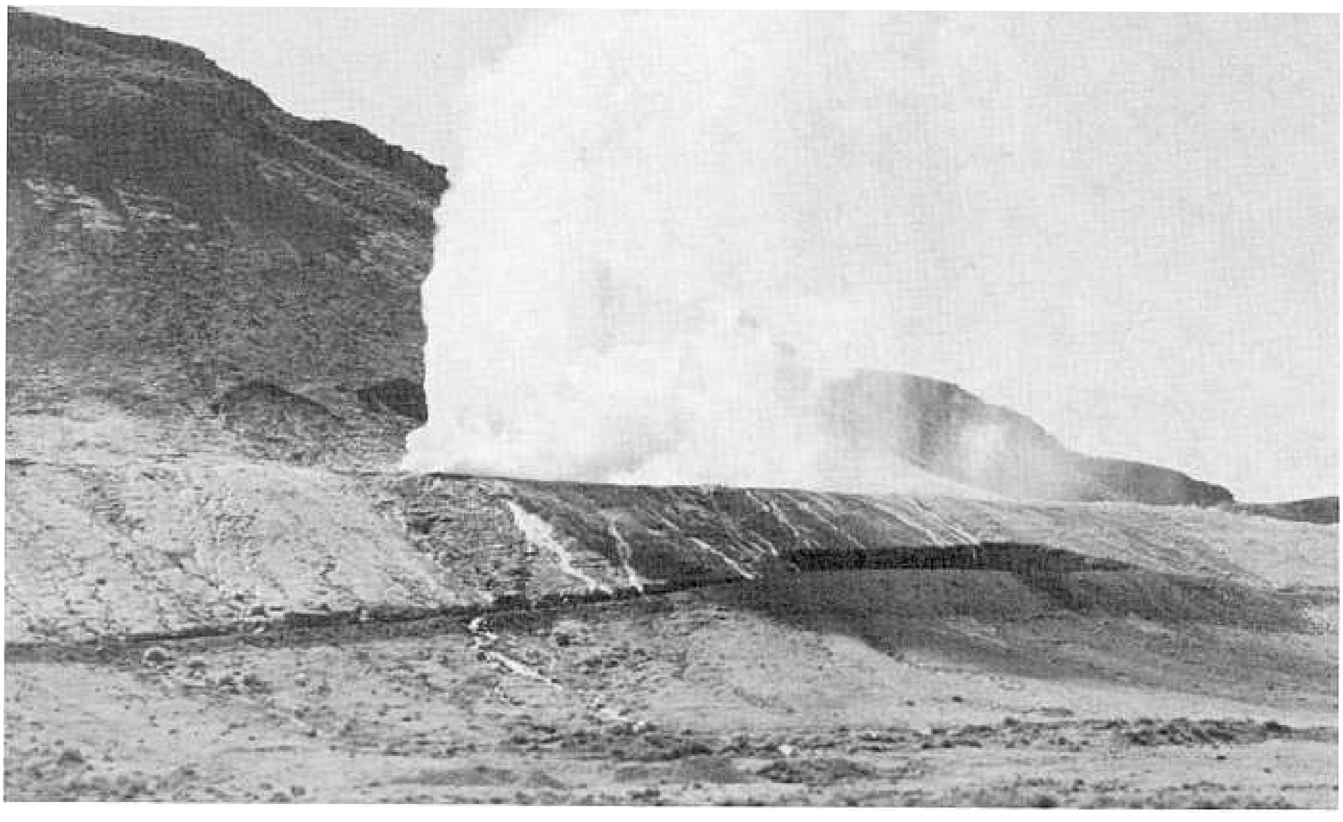
EUREKA COUNTY

Beowawe Geysers [94]

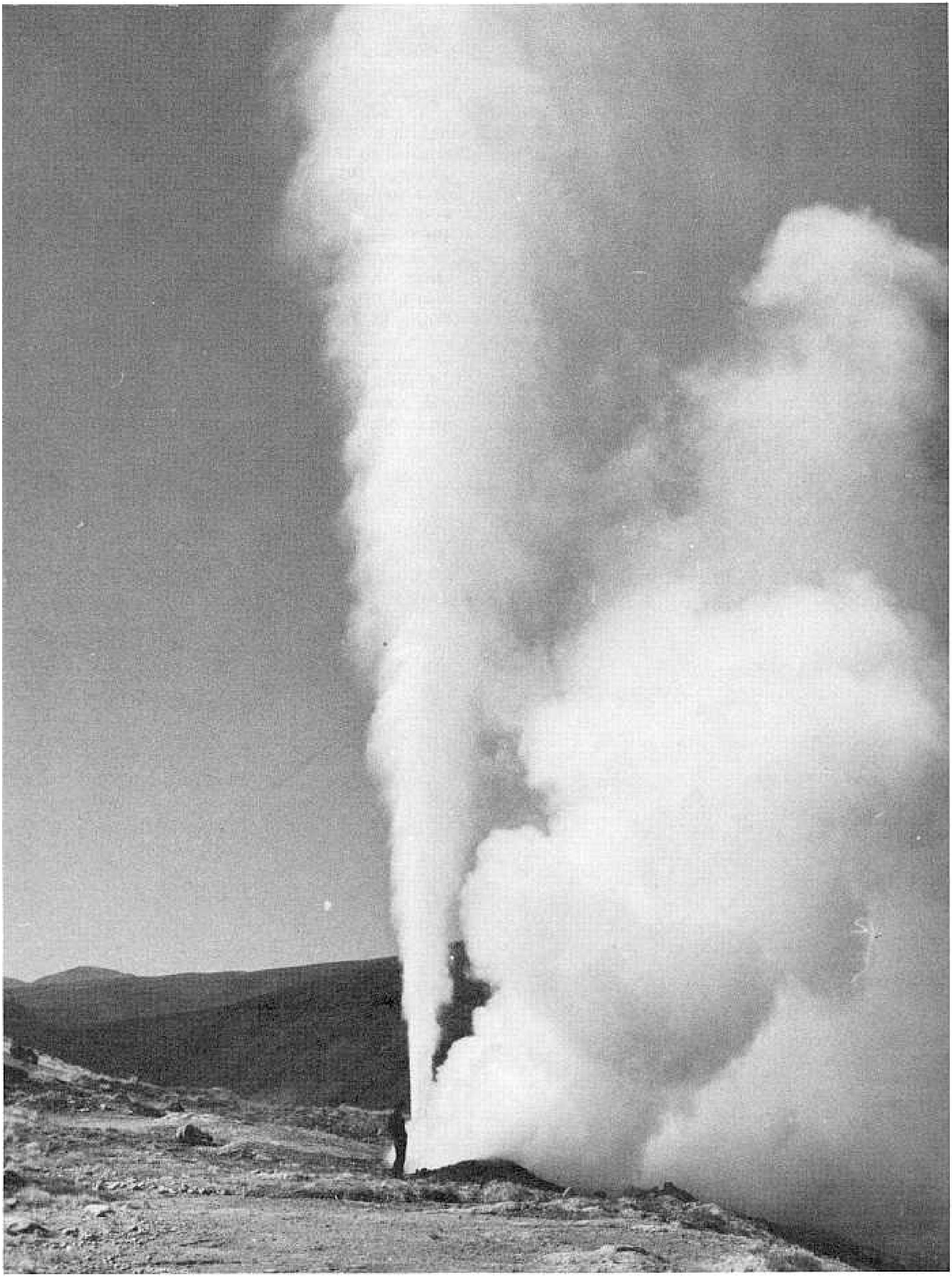
The geothermal area at Beowawe Geysers has the highest reported subsurface temperatures in Eureka County, and, with the Brady's Hot Spring area in Churchill County, has the highest steam-well temperatures in Nevada. It is one of the most drilled geothermal areas in the State, and has been actively investigated by several energy companies over the past 15 years.

The surface geothermal activity at the Beowawe Geysers area is mainly confined to S8,17,18,T31N,R48E. This area is mainly in Eureka County, although S18 is in Lander County. For simplicity, this description is included in Eureka County. The Geysers is in southwestern Whirlwind Valley, about 6 miles west of the small community of Beowawe.

The hot springs, geysers, and fumaroles have temperatures up to 202° to 204°F, and in 1932 several geysers were reported to erupt to heights of several feet (Nolan and Anderson, 1934). One geyser reportedly played to a height of 3 feet and another to 12 feet. Drilling of geothermal exploration wells on the main sinter terrace in the early 1960's resulted in the disruption of natural geyser activity there, but geysers on the valley floor to the west of the terrace were considerably more thermally active in 1968 than in 1932 (Rinehart, 1968). These geysers erupted to heights of 3 to 6 feet. Vandals blew the caps from four steam wells on the main terrace sometime prior to 1972, and one of these released steam and water in rather large volumes. One of the notable effects of this release of fluid and possibly the original drilling was the cessation of geyser activity (Hose and Taylor, 1974). The "best guess"



Steam wells on the sinter terrace at Beowawe Geysers in 1977 (photo by Dennis Trexler).



Steam well at Beowawe Geysers, Eureka County (photo by Dennis Trexler).

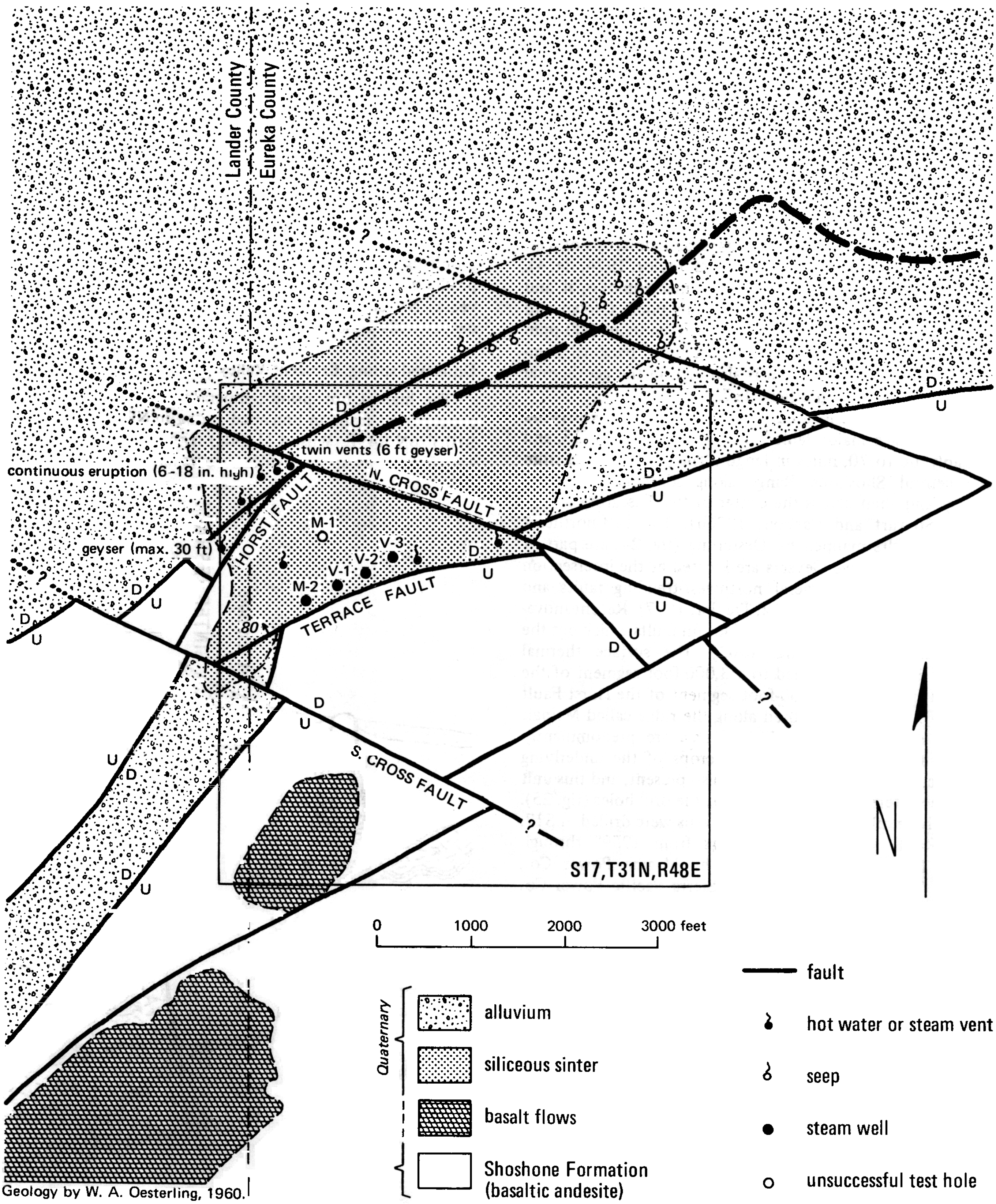


FIGURE 24. Geologic map of Beowawe Geysers, Eureka and Lander Counties (from Oesterling, 1962).

estimates of thermal reservoir temperatures are approximately 385°F for a sample from a spring, and 440° to 460°F for a sample from a steam well (Mariner and others, 1974). Since temperatures of over 400°F are reported from shallow depths, the higher estimates seem likely to be realized.

The most conspicuous feature of the Beowawe Geysers is an enormous, symmetrical spring-sinter terrace which stands some 250 feet high. The top of the terrace, which measures 100 feet wide and 2,800 feet long, is remarkably level (Oesterling, 1962). The flowing springs and geothermal wells are located along a narrow band of older sinter which is present between the main terrace and outcrops of Tertiary andesite to the south (Hose and Taylor, 1974, fig. 4). The siliceous sinter is almost entirely made up of opal, and it is presently forming around certain pools (Nolan and Anderson, 1934). The sinter reportedly contains 300 ppm tungsten and high beryllium (R. Erickson, personal communication, 1970); tungsten is also high in the geothermal fluids (Wollenberg and others, 1975).

The Geysers are located at the south edge of Whirlwind Valley along a major fault zone which is at least 35, and possibly up to 70, miles in length. The zone extends from the central Shoshone Range along southern Whirlwind Valley and then across the center of the Tuscarora Mountains (Stewart and Carlson, 1976b). The east-northeast trending faults mapped by Oesterling (fig. 24) are part of this zone. Beowawe Geysers are located at the intersection of this zone with several northwest-trending faults and lineaments (Oesterling, 1962; Trexler, 1977). Recent movement is believed to have taken place on faults which cut the sinter terrace (Oesterling, 1962). The surface thermal activity is mainly confined to a 3,000-foot segment of the Terrace Fault and a 1,300-foot segment of the Horst Fault (fig. 24). The rocks exposed along the ridge called Malpais to the south of the geothermal area are predominantly basalts and andesites. A few outcrops of the underlying Ordovician Vinini Formation are also present, and this unit was encountered at depth in some of the drill holes (fig. 25).

Twelve exploratory geothermal wells were drilled in S17, T31N,R48E at Beowawe Geysers from 1959? through 1965. These wells were drilled by Magma Power Co., Vulcan Thermal Power Co., and Sierra Pacific Power Co. The deepest well drilled during this period was 2,052 feet; several of the wells had temperatures of 407° to 414°F at depths of 700 to 800 feet. Since 1974, three more wells have been drilled, two of them to approximately 5,500 feet, and a third to 9,563 feet. The Magma Energy, Inc. Batz No. 1 was drilled to 5,447 feet in S17,T31N,R48E, near the previous wells. Two wells, the Chevron-American Thermal Resources Ginn No. 1–13 and the Chevron U.S.A., Inc. Rossi No. 21–19, were drilled in an area approximately 1.5 miles to the southwest of the Geysers. These wells reportedly encountered high-temperature fluids in faulted zones near the bottom of both wells. Little data are available for any wells drilled in the 1970's. Names and detailed location data for geothermal wells are given in Appendix II.

The earlier wells at Beowawe Geysers underwent considerable testing shortly after drilling and for several years thereafter (Middleton, 1961; Oesterling, 1962; Allen, 1962). Although some of the data are confusing or conflicting, it seems clear that several of the steam wells did produce large flows of steam and hot water from shallow depths. Temperature-depth curves for some of the wells are reproduced in Figure 26. Some of the wells apparently produced at least 400,000 to 500,000 lbs/hr of fluid, with 10 to 15 percent steam flashover. Middleton (1961) reports approximately 1.5 million lbs/hr of fluid at 342°F from the Vulcan No. 4 well, with 41,500 lbs/hr of that being steam. The wellhead pressure was reported to be 116 lbs/in^2 absolute (psia). Static pressure in several of the wells is apparently in the 40 to 100 psia range, and flow pressure is reportedly 20 to 30 psia. Problems of cold water inflow have been reported because the holes were not cased deeply enough. Scaling in the wells can also be a problem (Koenig, 1970). These problems may have contributed to the general lowering of productivity indicated in test results over a period of several years. No data are available on the productivity of the deeper wells drilled in the mid-1970's.

Unnamed spring, Crescent Valley [97]

The highest hot-spring temperatures in Eureka County are reported from an unnamed spring in NW/4 NW/4 NE/4 S10,T28N,R49E. Wilson (1960a) reports a temperature of 186°F for this spring, which occurs along a major basin–

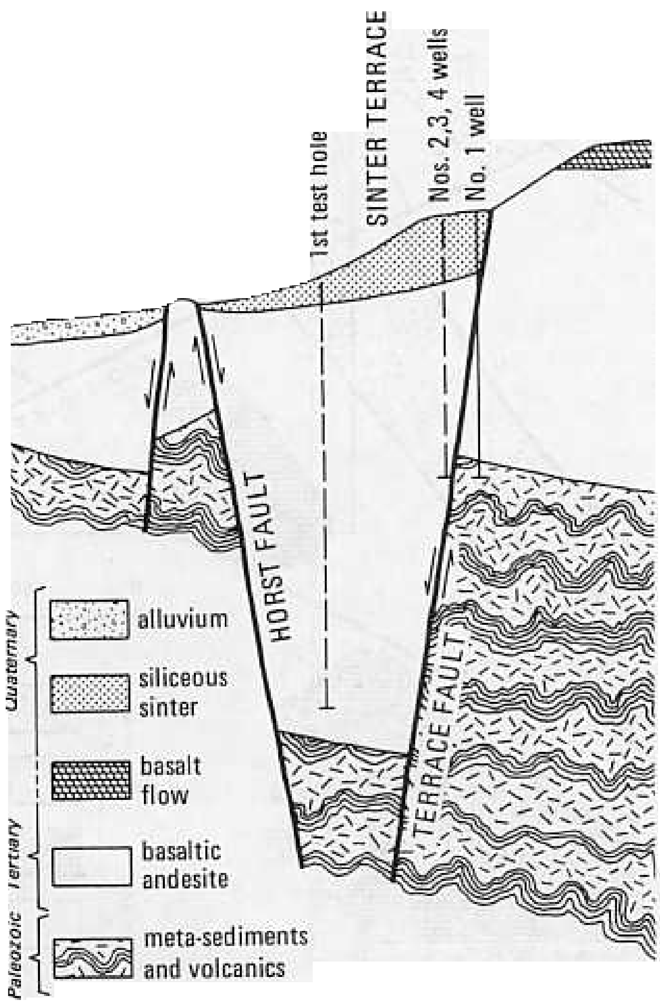


FIGURE 25. Diagrammatic cross section, looking east-northeast, at Beowawe Geysers, Eureka County (after Oesterling, 1962).

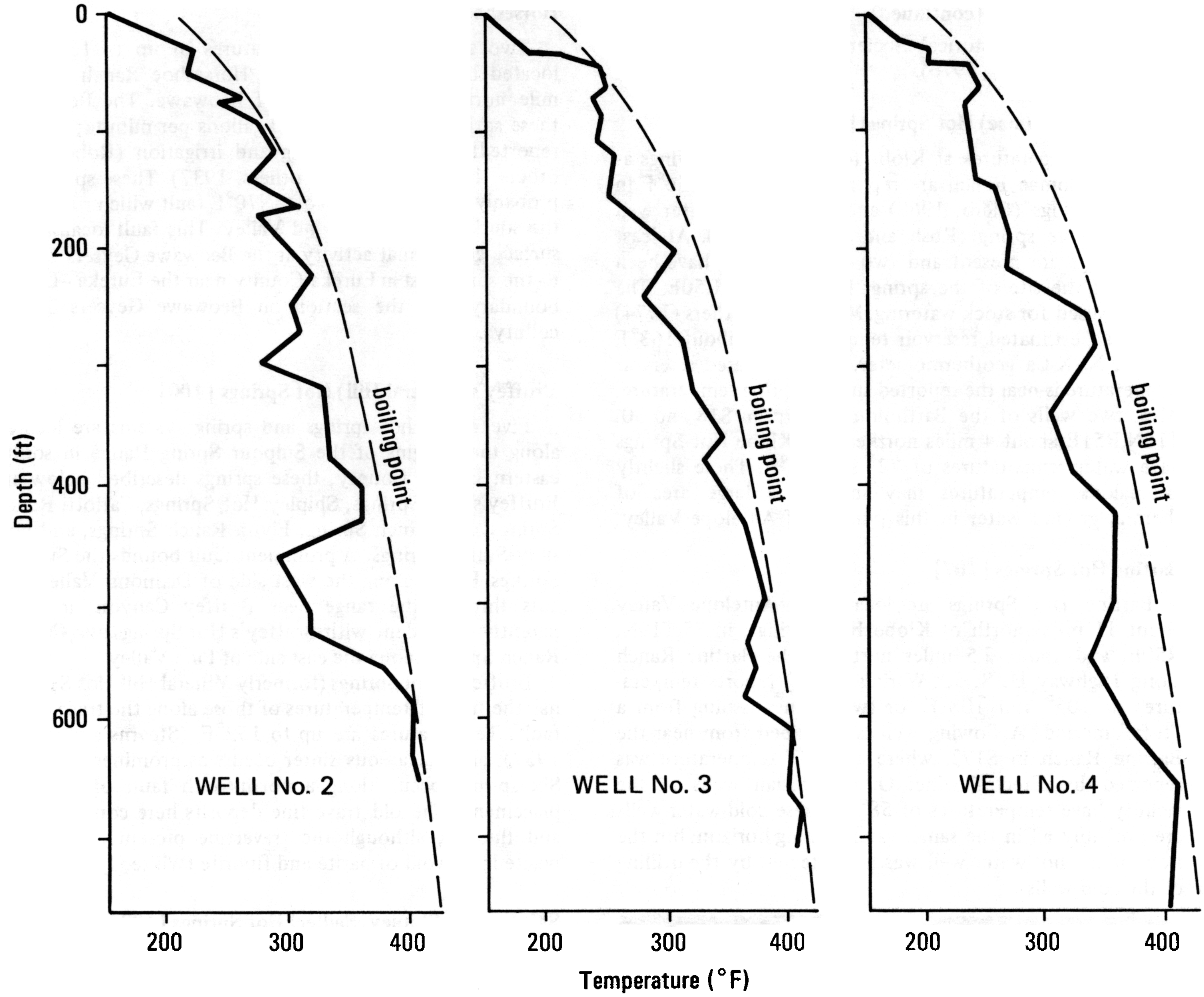


FIGURE 26. Temperatures recorded during drilling of Vulcan Thermal Power Co. wells by cable tool rig at Beowawe Geysers, Eureka County (from Middleton, 1961).

range fault (the Crescent Fault) which has significant displacement.

Hot Springs Point (Crescent Valley) [96]

At least five hot springs are found at Hot Springs Point in Crescent Valley. These are located near the corner of S1, 2, and 11,T29N,R48E and arise from alluvium and bedrock in a line 1.5 miles long. Native sulfur occurs in the Ordovician Valmy Formation along a northwest-trending, nearly vertical fault zone (Keith Papke, personal communication, 1975) just southeast of the hot springs. Hot Springs Point itself is bounded on its northwest and southeast sides by faults. The hot springs fall along the trace of the Dry Hills fault, which extends northeast along the northwest side of Hot Springs Point for about 8 miles. The deposit of native sulfur appears to be associated with the hot-springs activity, and small amounts of cinnabar and antimony occur sporadically throughout the sulfur (Olson, 1964). Spring temperatures fall between 122° and 138°F, except for one spring on the valley floor which is 79°F. A 410-foot-deep geothermal well drilled by Magma Power Co. encountered subsurface temperatures up to 166°F. The estimated thermal-aquifer temperature for this spring system is 239°F (Mariner and others, 1974). Spring sinter and caliche are reported from along nearby northeast-trending faults which cut Tertiary andesites (Wilson, 1960b). These deposits are in the north half of S6,T29N,R49E. Also, calcareous sinter is reportedly being deposited at the hot springs. Young north- and northeast-trending faults are also common in the alluvial deposits of Crescent Valley in this area.

Walti Hot Springs [102]

Walti Hot Springs in Grass Valley have the third highest reported water temperatures in Eureka County. Several springs are presently depositing siliceous spring sinter (Roberts and others, 1967). Mariner and others (1974) estimate that the reservoir temperature of Walti Hot Springs is probably about 179°F according to a Na-K-Ca geothermometer. The springs lie near a major fault along the west margin of the Simpson Park Mountains (Roberts and others, 1967, plate 3). An alligator is reported to have survived in the hot-spring waters for 16 years in the early

EUREKA COUNTY (continued)

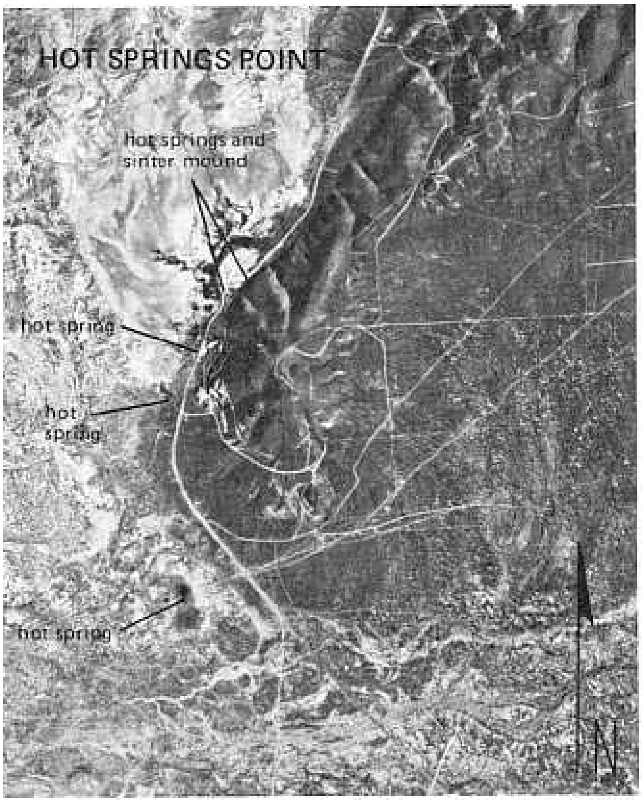
1900's (Nevada Historical Society *in* the Nevada State Journal, October 17, 1976).

Klobe (Bartholomae) Hot Springs [108]

Water temperatures at Klobe (or Clobe) Hot Springs at the Bartholomae Ranch are reported as high as 156°F in flowing springs (Fiero, 1968) and 158°F in a water well drilled in the spring (Rush and Everett, 1964). At least two springs are present and two or more wells have been drilled at the site of the springs in S28,T18N,R50E. The water is used for stock watering. Mariner and others (1974) report an estimated reservoir temperature of about 163°F from a Na-K-Ca geothermometer. This estimated reservoir temperature is near the reported surface spring temperature. Also, two wells of the Bartholomae Corp. in S18 and 30, T18N,R51E about 4 miles northeast of Klobe Hot Springs have water temperatures of 72° and 74°F. These slightly anomalous temperatures may indicate a large area of thermal ground water in this portion of Antelope Valley.

Bartine Hot Springs [107]

Bartine Hot Springs are located in Antelope Valley about 11 miles north of Klobe Hot Springs, in S5,T19N, R50E, and about 2.5 miles north of the Bartine Ranch along Highway U. S. 50. Waring (1965) reports temperatures of 105° and 108°F for two springs issuing from a "tufa" mound. A flowing well is described from near the Bartine Ranch in S17?, where a 116°F temperature was reported by Fred Bartine. Other artesian wells in the vicinity have temperatures of 58°F. These cold-water wells are probably all in the same water-bearing horizon, but the flow of the hot-water well was not affected by the drilling of the cold wells.



Horseshoe Ranch Springs [93]

Two springs having temperatures of up to 136°F are located in S32,T32N,R49E at Horseshoe Ranch about 1 mile northeast of the town of Beowawe. The flow from these springs is only about 30 gallons per minute; they are reportedly used for bathing and irrigation (Roberts and others, 1967; Stearns and others, 1937). These springs are probably on an extension of a N70°E fault which runs along the south side of Whirlwind Valley. This fault localizes the surface geothermal activity at the Beowawe Geysers 7 miles to the southwest in Eureka County near the Eureka–Lander boundary (see the section on Beowawe Geysers in this county).

Bruffey's (Mineral Hill) Hot Springs [100]

Five or six hot springs and spring systems are located along the margins of the Sulphur Spring Range in southeastern Eureka County, these springs described below are Bruffey's Hot Springs, Shipley Hot Springs, Carlotti Ranch Springs, Siri Ranch Spring, Flynn Ranch Springs, and possibly Sulfur Springs. A prominent fault bounds the Sulphur Springs Range along the west side of Diamond Valley and cuts through the range near Bruffey Canyon; it is apparently coincident with Bruffey's Hot Springs and Carlotti Ranch Springs along the east side of Pine Valley.

Bruffey's Hot Springs (formerly Mineral Hill Hot Springs) has the highest temperatures of those along the trace of the fault. Temperatures are up to 152°F, (Stearns and others, 1937), and calcareous sinter occurs as prominent terraces. Six springs occur along a north-south fault of large displacement. The old travertine deposits here contain barite and fluorite, although the travertine presently being deposited is devoid of barite and fluorite (White, 1955a).

Shipley (Big Shipley, Sadler) Hot Springs [103]

Springs in S23,T24N,R42E known as Shipley, Big Shipley, or Sadler Hot Springs have temperatures up to 106°F and issue from alluvium near the bedrock outcrops. The springs are probably supplied by water moving through secondary openings in Paleozoic rocks (Eakin, 1962a). Reported discharges range from 3,000 to 6,750 gallons per minute.

Carlotti Ranch (Sulfur) Springs [99]

Two springs a quarter of a mile apart have temperatures of 95° and 102°F (Stearns and others, 1937). The springs are used for irrigation. They are along the east side of Pine Valley 5 miles north of Bruffey's Hot Springs and are probably along the same fault reported there.

Siri Ranch Spring [104]

A warm spring and water well are found in S6,T24N, R53E at Siri Ranch along the west side of Diamond Valley north of Shipley's Hot Springs. A small pool in the alluvium is reported (Mifflin, 1968). The reported temperatures vary from 81° to 87°F for the spring, while the well is 95°F. Discharges reported are 5,800 and 300 gallons per minute (Mifflin, 1968; Stearns and others, 1937). These springs are probably associated with the range-front fault along the Sulphur Spring Range here.

Flynn Ranch Springs [101]

The Flynn Ranch Springs consist of several slightly warm springs of low discharge and a deep pool. The temperatures range from 69° to 70°F, and the discharge is reported to be 10 gallons per minute. The springs are located in S5,T25N,R53E, about one-half the distance between Shipley's and Bruffey's Hot Springs, along the west edge of the Sulphur Spring Range.

Sulfur Springs [105]

Two slightly warm springs are located in S36,T23N, R52E along the east side of the Sulphur Spring Range about 8 miles south of Shipley's Hot Springs. The temperature of the springs is 74°F and they discharge about 20 gallons per minute. These springs are near the mountain front, and may be related to a possible extension of the frontal fault near Siri Ranch and just north of Shipley's Hot Springs.

Thompson Ranch Spring [106]

A warm (69° to 75°F) spring issues from alluvium adjacent to limestone at Thompson Ranch on the east side of Diamond Valley in S3,T23N,R54E (Mifflin, 1968). This spring may be the same as the Jacobson Ranch Springs reported by Waring (1965). Harrill (1968) suggests that the spring is probably fault-controlled, as is, according to Roberts and others (1967), a part of the range front along the edge of the Diamond Range.

Hot Creek springs [98]

Six springs flow from alluvium just adjacent to limestone bedrock. The main spring orifice is reportedly in bedrock. The springs are in S12,T28N,R52E (Mifflin, 1968). The reported temperature is 84°F. These springs have reported discharges of 1,800–2,250 (Eakin, 1961) and 5,900 (Mifflin, 1968) gallons per minute. This flow often largely maintains Pine Creek which flows north down the center of Pine Valley. The Na-K-Ca thermal reservoir estimate is near the spring temperature (Mariner and others, 1974).

Raine Ranch? Springs [95]

Springs in S6,T31N,R52E are reportedly warm and flow 100 gallons per minute (Bradberry and Associates, 1964).

HUMBOLDT COUNTY

Double Hot Springs–Black Rock Hot Springs [131]

A number of hot springs are located in alluvium along the west side of the Black Rock Range (fig. 27). These springs are normally 1 mile or less from the bedrock outcrops, and are aligned along a 7 mile long zone from south of Black Rock Point to Double Hot Springs (Hose and Taylor, 1974). The springs are along a major range-boundary fault with slight Holocene displacement which extends north from Black Rock Point to Soldier Meadows, a distance of approximately 35 miles. A hot spring is also present in S10,T37N,R26E about 5 miles north of Double Hot Springs (Waring, 1965), and warm ground was encountered about half a mile north of that spring in a U. S. Geological

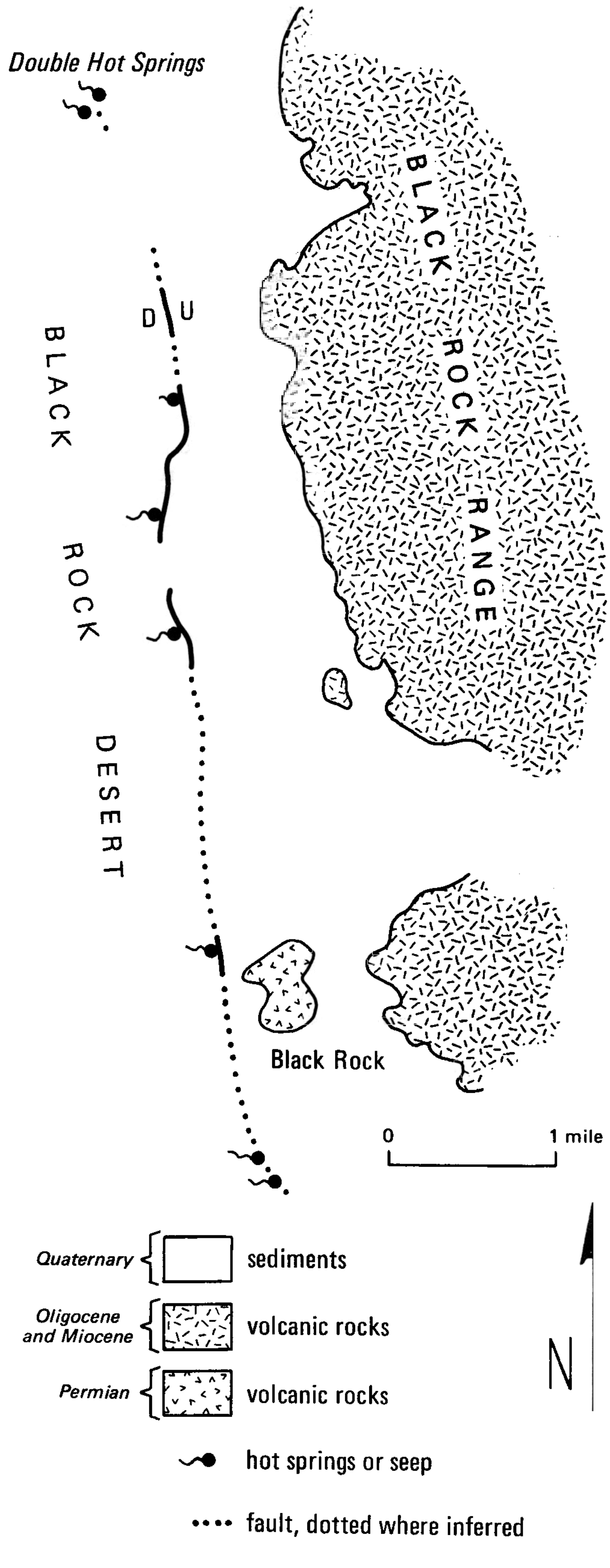


FIGURE 27. Geologic map of the Double Hot Springs–Black Rock area (after Hose and Taylor, 1974).

Survey test hole (Olmsted and others, 1975). Thus, the known extent of the thermal anomaly is about 12 miles. No data are available for the northern portion of the boundary fault. To the south of Black Rock Point the fault crosses the Black Rock Desert (fig. 27) and joins with a fault associated with the hot springs at the Trego area in Pershing County (L. T. Grose, written communication, 1977). Hose and Taylor (1974) suggest that the Holocene displacement on this fault may be related to an earthquake of magnitude 4.1 at latitude 41°N, longitude 119°W in 1936.

The hot springs along this zone were used for drinking, bathing, and stock watering by wagon-train emigrants (Paden, 1949) on the Applegate–Lassen Trail. Today they are used for stock watering and irrigation.

The nearest young volcanic rocks are the less than 6-million-year-old basalts 40 to 50 miles to the north along a north-northeast trending lineament which runs from Soldier Meadows to Railroad Point (fig. 28). The Double Hot Springs–Black Rock Hot Springs fault appears to turn to the northeast and join this lineament just west of Soldier Meadows Hot Springs.

Higher concentrations of dissolved solids are reported from springs near the south end of the fault. This is believed to be due to contamination of the waters by more saline brines which probably collect in low areas of the Black Rock Desert (Hose and Taylor, 1974).

Estimates of the subsurface aquifer temperature based on SiO_2 content show reasonably consistent temperatures for springs at either end of the fault. These estimated aquifer temperatures are 275° to 298°F. Trace amounts of both travertine and siliceous sinter are reported (Hose and Taylor, 1974).

Water temperatures at springs along the fault are usually 130° to 170°F, with temperatures up to 202°F, which is near boiling for this elevation (4,000 feet), reported from the spring furthest south along the fault.

Two heat-flow drill holes in the central part of the Black Rock Desert (within 3 miles of Black Rock), which are not affected by the local movement of thermal ground water, indicate that the heat flow in the Black Rock Desert area is probably not more than two heat flow units (HFU), which is not unusually high for the northern Basin and Range province (Olmsted and others, 1975).

Pinto Hot Springs [129]

The second highest spring temperatures in Humboldt County are reported from about 1 mile north of Pinto Mountain. These springs shown in S17,19,T40N,R28E on the Pinto Mountain 7½-minute quadrangle, are East and West Pinto Hot Springs, respectively. Location data given in older references are somewhat confused, owing to the irregular nature of the land grid in this area. Reported temperatures for the springs, which are about 1 mile apart, are 199° to 201°F. The water analyses are also quite similar, indicating a close hydrologic connection. The springs are in a small outcrop area of quartz monzonite (Willden, 1964, plate 1) in some low hills of mafic Tertiary volcanic rocks along the west margin of the Black Rock Desert. The estimated thermal reservoir temperatures using the conductive silica geothermometer are 324° to 329°F (Mariner and others, 1974). Travertine and siliceous sinter are interlayered in the spring deposits at the springs (Hose and Taylor, 1974). Batzle and others (1976a) report on telluric profiles at Pinto Hot Springs.

Baltazor (Continental) Hot Springs [111]

Baltazor Hot Springs are located in S13,T46N,R28E at the north end of Continental Lake. They are along a fault which bounds the east side of the Pueblo Mountains, and which is a small part of a lineament which extends from Soldier Meadow Hot Springs through Baltazor Hot Springs and into Oregon (Hose and Taylor, 1974). This lineament is at least 65 miles long and can be seen in the fault pattern shown on the preliminary geologic map of Nevada at 1:500,000 (Stewart and Carlson, 1974). A warm spring in S12,T44N,R27E also lies along this lineament, and a subparallel zone extends from Summit Lake along the east side of McGee Mountain to Bog Hot Springs, where it reportedly terminates. In the vicinity of McGee Mountain, steam and warm water are reported from along this fault, and a core hole, reported 131°F at 200 feet (Wendell, 1970, p. 95, 98, 109), possibly in the vicinity of the Painted Hills mercury mine in S23?,T45N,R27E. The only young (less than 6 m.y.) volcanic rocks in this area are basalts which are exposed just to the northwest of this fault in the extreme northwest corner of Humboldt County (Stewart and Carlson, 1976a).

Hose and Taylor (1974) have suggested that this N30°–35°E lineament existed as a large fault in the early Tertiary terrain and that tectonism that occurred after the Oligocene and Miocene volcanic rocks were deposited resulted in modest renewed displacement that manifested itself in the volcanic cover.

Water temperatures at Baltazor Hot Springs are at or near 200°F, and small amounts of both travertine and siliceous sinter are present. The best estimates of the reservoir temperature are 306°F and 329°F for the Na-K-Ca and silica geothermometers, respectively and traces of travertine and siliceous sinter are reported (Mariner and others, 1974).

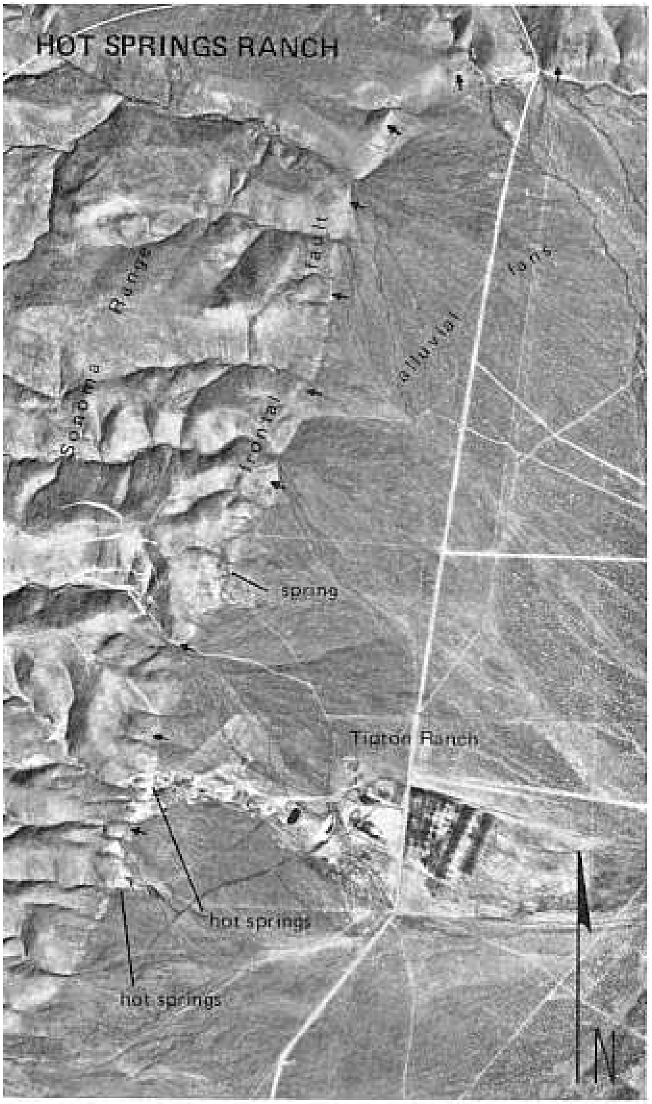
Hot Springs (Tipton) Ranch [146]

Hot springs at Tipton Ranch in S4,5,T33N,R40E have temperatures as high as 185°F (Mariner and others, 1974). These springs are along a N20°E fault which forms the boundary of the Sonoma Range in that area. The spring deposits are predominantly travertine with a trace of siliceous sinter. The "best" estimates of the thermal-aquifer temperature are 381° to 385°F (Mariner and others, 1974). Wollenberg (1974b) reports that slightly anomalous radioactivity (up to 22.5 μR/hr) is present at the springs. In 1974 Magma Power Co. drilled a geothermal well at Tipton Ranch to a total depth of 3,071 feet. The well has also been called the "Pumpernickel Valley well."

Golconda area [139]

Hot springs are found in S29,32,T36N,R40E near the town of Golconda, and hot water is present in a drill hole at the Golconda tungsten mine in S36,T36N,R40E.

Approximately 12 springs are reported at Golconda Hot Springs, with temperatures ranging from 109° to 165°F (see Appendix 1). The area was famous as a resort and health center where early settlers often spent several weeks



at its large hotel drinking and bathing in the mineral waters (Miller and others, 1953).

In the early 1880's, Adams and Bishop (1884) reported that farmers in the vicinity used the springs for scalding swine. The swimming area at that time was a hole excavated in the ground. Also, the water was used for irrigation, and radishes, lettuce, onions, etc. were raised early in the growing season due to the warmth produced by the hot-spring water. A 175-foot-deep well drilled in 1940 was used from 1940 to 1945 for water in the chemical plant treating the tungsten-iron-manganese ores from the Golconda Mine, 4 miles to the east (D. I. Segerstrom, written communication, 1972). For many years the water from this well was used for health baths at the Golconda Hot Springs Hotel.

Penrose (1893) reported that the deposits of Golconda Hot Springs were highly charged with manganese oxides. Some of the areas around the hot spring vents are anomalously radioactive, up to 175 μR/hr (Wollenberg, 1974b), and thorium may be present in the water (D. I. Segerstrom, written communication, 1972). Also, a few parts per million tungsten are reported.

The spring deposits at the Golconda Hot Springs are reported to consist of travertine, and an estimate of the thermal reservoir temperature using the silica geothermometer is 239°F (Mariner and others, 1974). Basalt flows younger than 6 m.y. are present about 2.5 mi south of the Hot Springs area (Stewart and Carlson, 1976b).

At the tungsten-manganese deposits of the Golconda Mine in S36,T36N,R40E, as much as 6 feet of tungsten-bearing ferruginous and locally manganiferous clayey gravel rests on steeply dipping Cambrian rocks. Much of the ore is overlain by up to 20 feet of travertine. The tungsten is believed to have been deposited from water emerging from a fissure in phyllite beneath the deposit, and the travertine was deposited from spring waters issuing from a parallel fissure in limestone upslope from the tungsten deposit (White, 1955, p. 136). In a few places,

Hot-water pool at Golconda Hot Springs, Humboldt County.

travertine underlies the ore, and although the relative age of the travertine and tungsten deposits is not completely clear, White (1955a) believes that they were deposited contemporaneously. Barium occurs within the manganiferous tungsten deposits, and barite nodules have been found locally in the travertine. Analyses of the ore indicate that it is anomalous in Co, Nb, Ni, As, Be, Ge, and Th (Ralph Erickson, personal communication, 1971).

The most likely explanation for this deposit seems to be that it is of hot-springs origin, deposited at or very near the present land surface. A 258-foot-deep drill hole at the mine contained marcasite throughout its entire depth (D. I. Segerstrom, written communication, 1972), another indication of deposition at shallow depth and low temperature. The bedded deposit is underlain by scheelite-bearing skarn rocks, and remobilization of tungsten and arsenic could account for all of the metallization associated with the hot-spring water (Berger and others, 1974).

The Golconda tungsten-manganese deposit has been interpreted as being related to the high-water stage of Lake Lahontan (see Willden, 1964, p. 111). Although the deposits are about 100 feet above the highest late Pleistocene shoreline (Kerr, 1940), the springs that formed these deposits probably had their greatest discharge when the lake level and surrounding ground-water levels were high (Willden, 1964). This relationship with Pleistocene Lake Lahontan would make the deposit very young, probably less than 50,000 years old. Erickson and Marsh (written communication in Berger and others, 1975) suggest that the deposit is the result of spring activity less than 5 m.y. old.

A drill hole in the C SW/4 S36,T36N,R40E at the site of the Golconda Mine has a temperature of 143°F at 220 feet. As there was considerable marcasite encountered in this hole, the temperature could be due to oxidation of sulfide minerals (D. I. Segerstrom, written communication, 1972). A spring about 600 feet to the northeast of this well is reported to flow 1.5 gallons per minute of 69°F water.

Howard Hot Spring [117]

Water temperatures at Howard Hot Spring (S4,5,T44N, R31E) are usually reported to be 118° to 136°F, although Sinclair (1962a) does list one spring with a temperature of 163°F. There are several described hot springs in Waring (1965) and Stearns and others (1937) for which detailed location data are lacking, but which may refer to Howard Hot Springs. Hose and Taylor (1974) report that siliceous sinter is present, and they prefer a 262°F estimated reservoir temperature using the silica (conductive) geothermometer.

Dyke Hot Spring [119]

Dyke Hot Spring is approximately 11 miles south of Howard Hot Spring in S25,T43N,R30E. It lies at the southern end of a fault which forms the east boundary of the Pine Forest Range. The temperature is reported to be as high as 158°F (Sinclair, 1962a). The estimated thermal-aquifer temperatures are 262°F and 279°F, although these are from mixed waters, and may be significantly below the true thermal-aquifer temperature. A trace of travertine is reported (Mariner and others, 1974).

Cordero Mercury Mine [109]

White (1955a) reported that the lower workings of the Cordero Mercury Mine (S33,T47N,R37E) were noticably hot, in the order of 86° to 95°F, but no precise temperature measurements were taken. He also mentioned that the level of oxidation in the mine was between the 500- and 600-foot level. Water wells downslope from the mine have temperatures of up to 140°F (Visher, 1957) at depths of 400 to 600 feet. Isotopic analysis of the well waters indicates a strong dominance by water of meteoric origin (White, 1974). A well in S17,T47N,R38E, 5.5 miles northeast of the Cordero Mine, has a reported temperature of 90°F.

Bog Hot Springs [110]

Bog Hot Springs in S7,18,T46N,R28E have been used since the turn of the century for stock watering and irrigation of over 400 acres of wild hay. Also, they are presently used for domestic water and hot mineral water baths on the Bog Hot Springs Ranch (Peterson, 1976). The springs are reported to discharge as much as 1,000 gallons per minute, and are probably associated with an active fault zone (Sinclair, 1963c). The highest surface temperature reported is 131°F (Sanders and Miles, 1974), and estimates of the reservoir temperature from chemical geothermometers are approximately 227°F, although the springs may be a mixed-water system.

Bog Hot Springs are located at the north end of the western branch of a major lineament which extends from Soldier Meadows Hot Springs into Oregon (fig. 28), a distance of over 65 miles (Hose and Taylor, 1974). Geothermal anomalies are reported along the western branch of this lineament to the south in the vicinity of McGee Mountain (see preceding description of Baltazor Hot Springs).

Soldier Meadows Hot Springs [128]

The hot springs in Soldier Meadows are generally in and around S23,T40N,R24E. The area is named for the soldiers which were stationed at a U. S. Army field camp, Camp McGarry, located in the northern part of the meadows in the 1860's. Hose and Taylor (1974) have described a N30°–35°E lineament which is believed to extend from Soldier Meadows 65 miles to the northeast into Oregon (see the preceding sections on Baltazor and Bog Hot Springs). There are a large number of thermal springs in the Soldier Meadows area, with temperatures reported as high as 129°F. Grose and Keller (1975b) mention 49 distinct features noted on airborne thermal infrared scanner imagery, which are believed to be distinct thermal springs. Some warm springs were noted in areas where no thermal springs have been reported in the literature.

The discharge of some springs is estimated to be up to 500 gallons per minute, and the spring temperatures often fall into a bimodal distribution at approximately 70° and 126°F (Grose and Keller, 1975b). A considerable number of springs with temperatures of 110° to 120°F are located along a flowing creek, which had an average temperature of 100°F in the spring of 1973. The Na-K-Ca estimated reservoir temperature (149°F) is near the spring temperatures (Mariner and others, 1974).

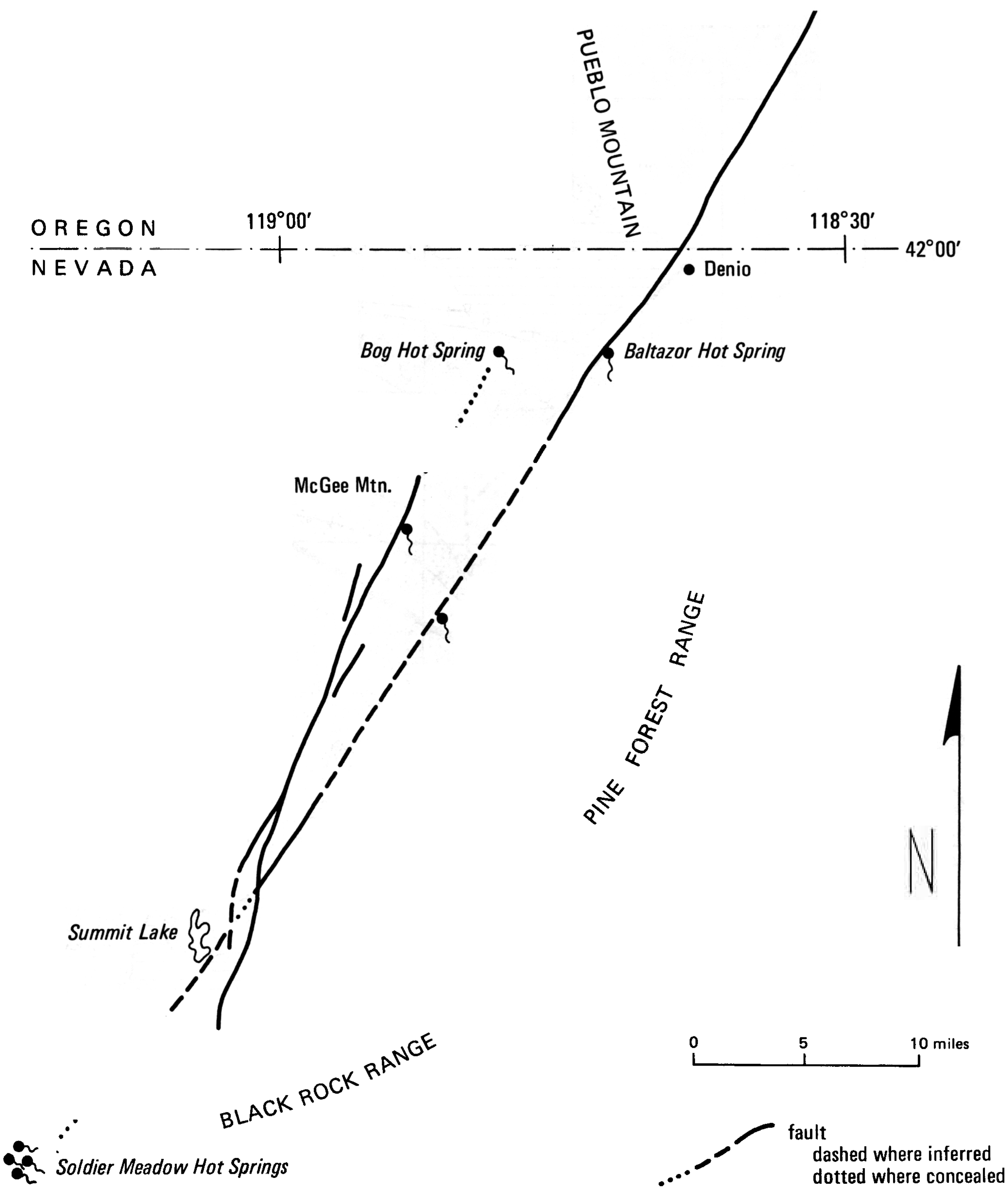


FIGURE 28. Relation of a lineament in northwestern Humboldt County to hot springs (modified from Hose and Taylor, 1974).

Northern East Range area [142]

Warm springs and wells are located at the northwestern corner of the East Range in S28,T35N,R36E (Cohen, 1962c, 1964). These springs are along the extension of a range-boundary fault which is believed to cross U. S. Highway I–80 near the center of S28, according to geophysical evidence (Cartwright and others, 1964). The springs are approximately 82° to 84°F and high in boron. Water wells down-gradient from the springs also contain 2 to 15 ppm boron (Cohen, 1964).

The East Range fault described above is believed to intersect a buried northwest-trending fault which has been extended southward from the Krum Hills (fig. 29). These

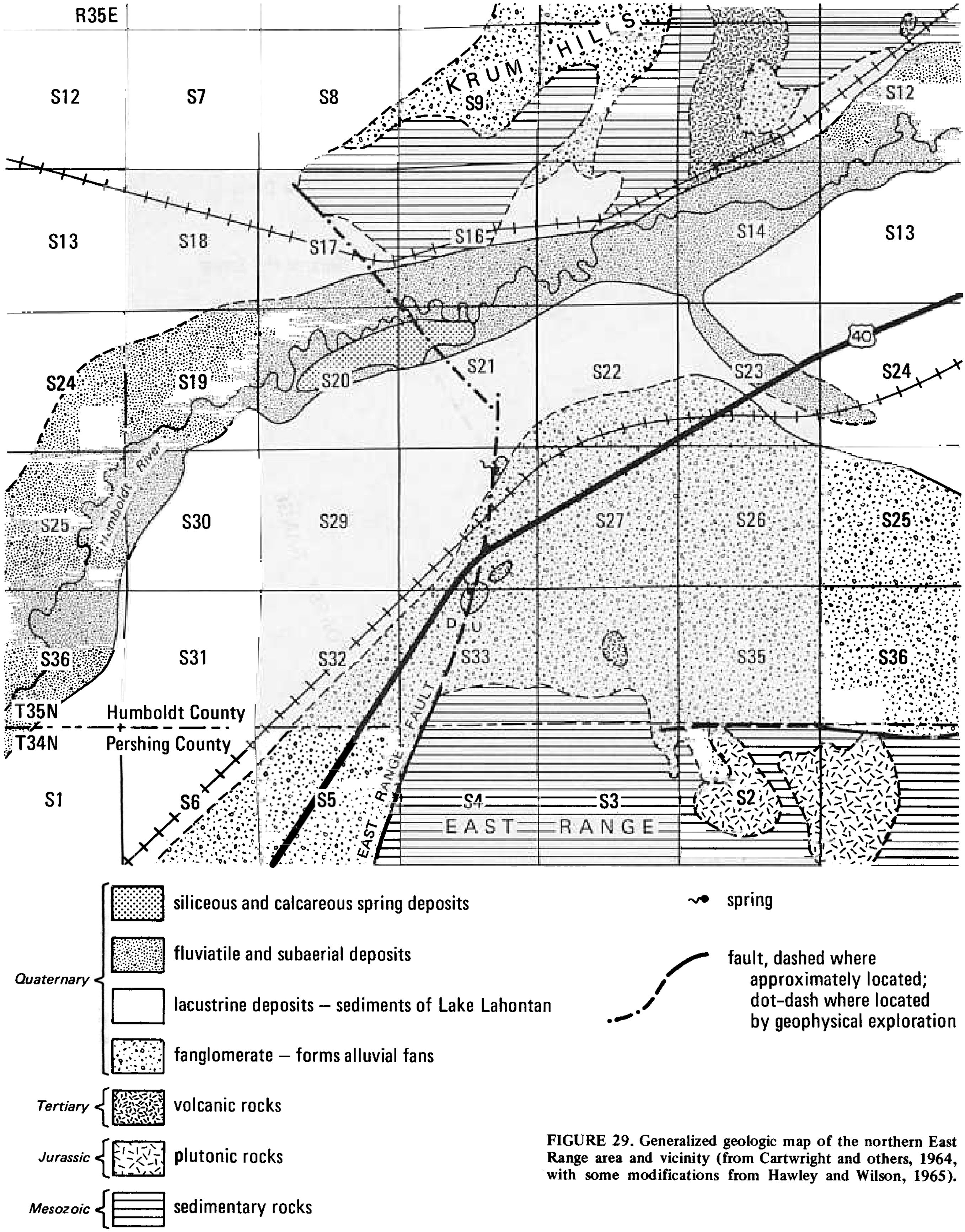


FIGURE 29. Generalized geologic map of the northern East Range area and vicinity (from Cartwright and others, 1964, with some modifications from Hawley and Wilson, 1965).

faults are projected on the basis of geophysical evidence plus the presence of thermal water in springs and wells along the fault. Also, the alluvial units are altered in the vicinity of the faults, and spring deposits are present at several areas. These spring deposits consist of both siliceous sinter and travertine (Cohen, 1962b). The deposit in S33 is at the approximate maximum level of Pleistocene Lake Lahontan, and is possibly related. In that case, the deposit would be younger than approximately 50,000 years. White (1955a) describes the travertine at one spring terrace (probably in NE/4 NW/4 S33,T35N,R36E) as being light brown in color and very porous. One sample contained 9 percent Mn and 0.3 percent WO_3. The present spring is not depositing travertine.

Tungsten-bearing manganese veins in E/2 SE/4 S5,T34N, R36E are along the west border of the East Range, and near the East Range fault. This property has been called the Victory Lode, and is located just inside Pershing County, but is included with this Humboldt County description because of its possible relation to the fault. The veins consist largely of calcite with films of manganese and iron oxides. Other gangue minerals are quartz, chalcedony, and gypsum. R. J. Roberts (quoted in White, 1955a), believes that these veins are the "roots" of spring deposits now removed by erosion. They are no doubt older than the travertine deposits to the north, but are probably genetically related (White, 1955a).

Sulphur area [141]

The Sulphur Mining District is an old sulfur-mining area, with minor associated mercury. No thermal activity is now evident, but White (1955a) reported that a strong odor of H_2S can be noticed in some of the short adits of the Devil's Corral workings (S30,T35N,R30E).

The sulfur was deposited by hot springs, and these probably had their greatest discharge when the level of Pleistocene Lake Lahontan and the surrounding ground-water level was high. All of the deposits are at or near the upper level of the lake, except for the Peterson deposit, which is in a fault zone considerably above the upper level of Lake Lahontan (Willden, 1964, p. 111).

LANDER COUNTY

Beowawe Geysers [94]

The geothermal activity at Beowawe Geysers is found in both Eureka and Lander Counties but most of the spring area is in Eureka County, and for simplicity the descriptions and water quality data are included in that county.

Spencer Hot Springs [162]

The hot springs and wells at Spencer Hot Springs are mainly located in the SE/4 S13,T17N,R45E (projected). There are also springs to the east of the main spring area (fig. 30), in S14,T17N,R45½E (Fiero, 1968). Meinzer (1917, p. 50, 91) reports the presence of a travertine terrace nearly 1 mile long and half a mile wide with spring deposits not more than 50 feet thick. According to Meinzer (1917), the main spring is 144°F, the north spring 117°F, and the east spring "normal." Hot water from the main spring is conducted by steel pipe to a concrete-lined pool

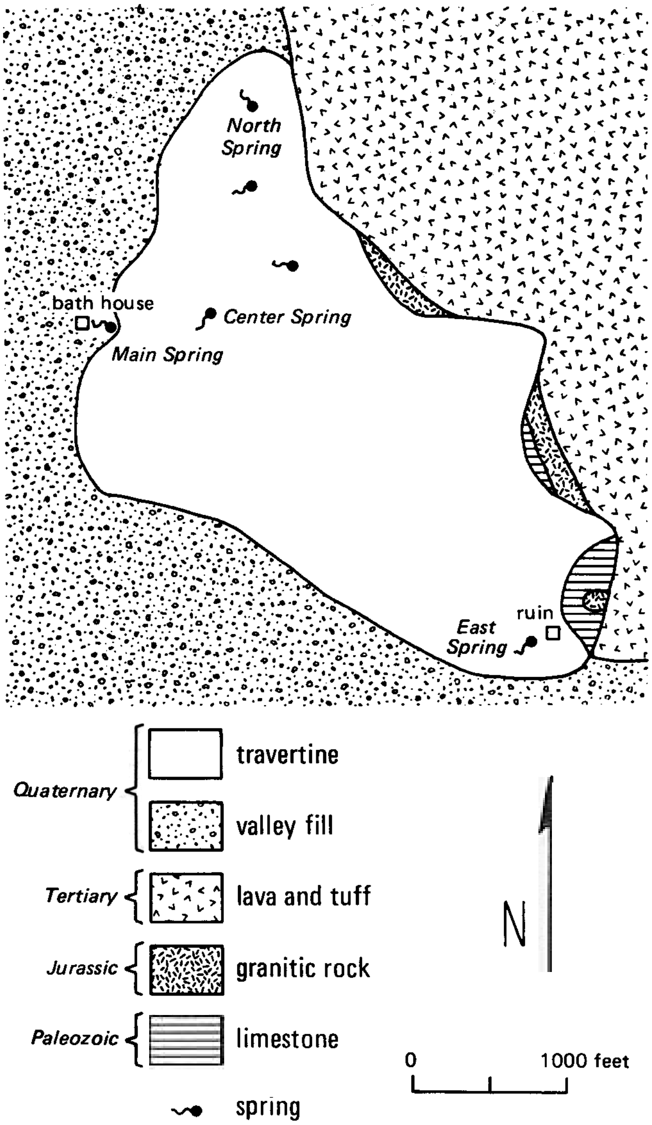


FIGURE 30. Geologic map of Spencer Hot Springs area, Lander County (modified from Meinzer, 1917).

(Sanders and Miles, 1974). Wollenberg (1974b) reports that the spring has slightly anomalous radioactivity (19 μR/hr).

Except for Sanders and Miles (1974), who report that the springs are at the boiling point, the highest temperature, 162°F, was recorded by Mariner and others (1974), who suggest that the best estimate of the reservoir temperature is 253°F, using the silica geothermometer. Fiero (1968) believes that the water discharging at Spencer Hot Springs may originate in Monitor Valley to the east after flowing through the intervening Paleozoic carbonate and clastic rocks. The geology of the hot springs and surrounding area is also shown on the 1:62,000 geologic map by McKee (1968).

Smith Creek Valley [159, 160]

At least four hot springs are reported from widely separated areas in Smith Creek Valley. The northernmost of these (no. 102, pl. 1) is in NW/4 NW/4 S36,T20N,R40E at Peterson's Mill (Mount Airy 7½-minute sheet). Everett and Rush (1964) report an 85°F well at this location. The hot

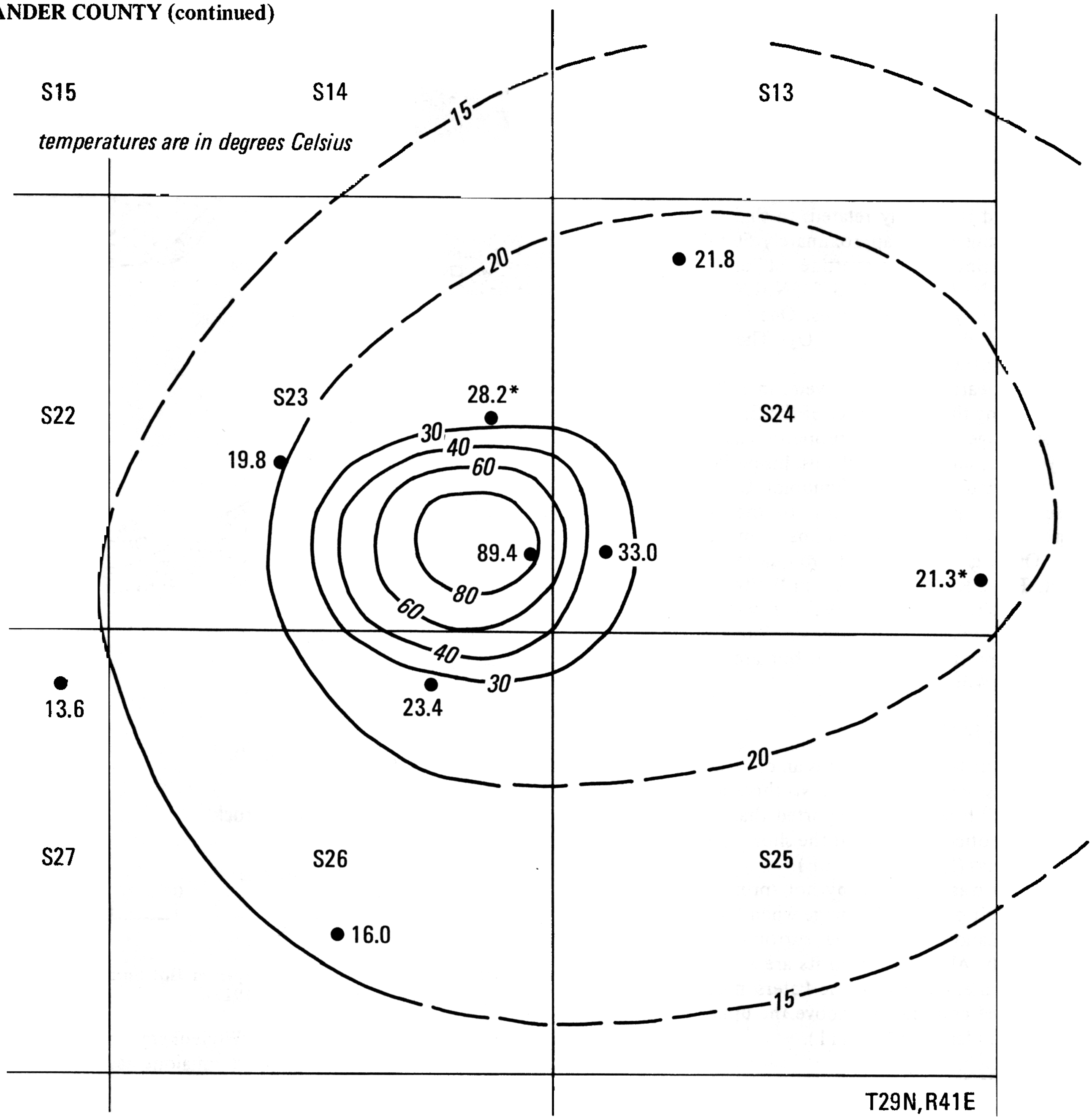


FIGURE 31. Map of Buffalo Valley Hot Springs thermal area, Lander County, showing temperature at a depth of 30 meters, fall 1973 (from Olmsted and others, 1975).

spring at Peterson's Mill is just down-gradient from a northeast-trending concealed fault in the alluvium (Stewart and Carlson, 1976b). Warm springs are also reported 6 miles north of Smith Creek Valley Hot Springs in S27(?),T18N, R39E by Waring (1965). No temperature information is available for these springs.

Mariner and others (1974) measured a temperature of 187°F at a spring in S11,T17N,R39E. A trace of travertine is reported, and the estimated thermal reservoir temperature is between 289° and 315°F for various chemical geothermometers. Smith Creek Valley Springs, in S25,26, T17N,R39E, consist of about 20 hot springs which are near boiling. The springs appear to be associated with recent faults which cut the younger alluvium (Everett and Rush, 1964). A hot spring is also reported in S25,T17N,R40E by Waring (1965). No spring is shown on the Iron Point 7½-minute sheet, and the location may refer to Smith Creek Valley Springs.

Buffalo Valley Hot Springs [151]

Buffalo Valley Hot Springs are located in SE/4 S23, T29N,R41E and have reported surface temperatures up

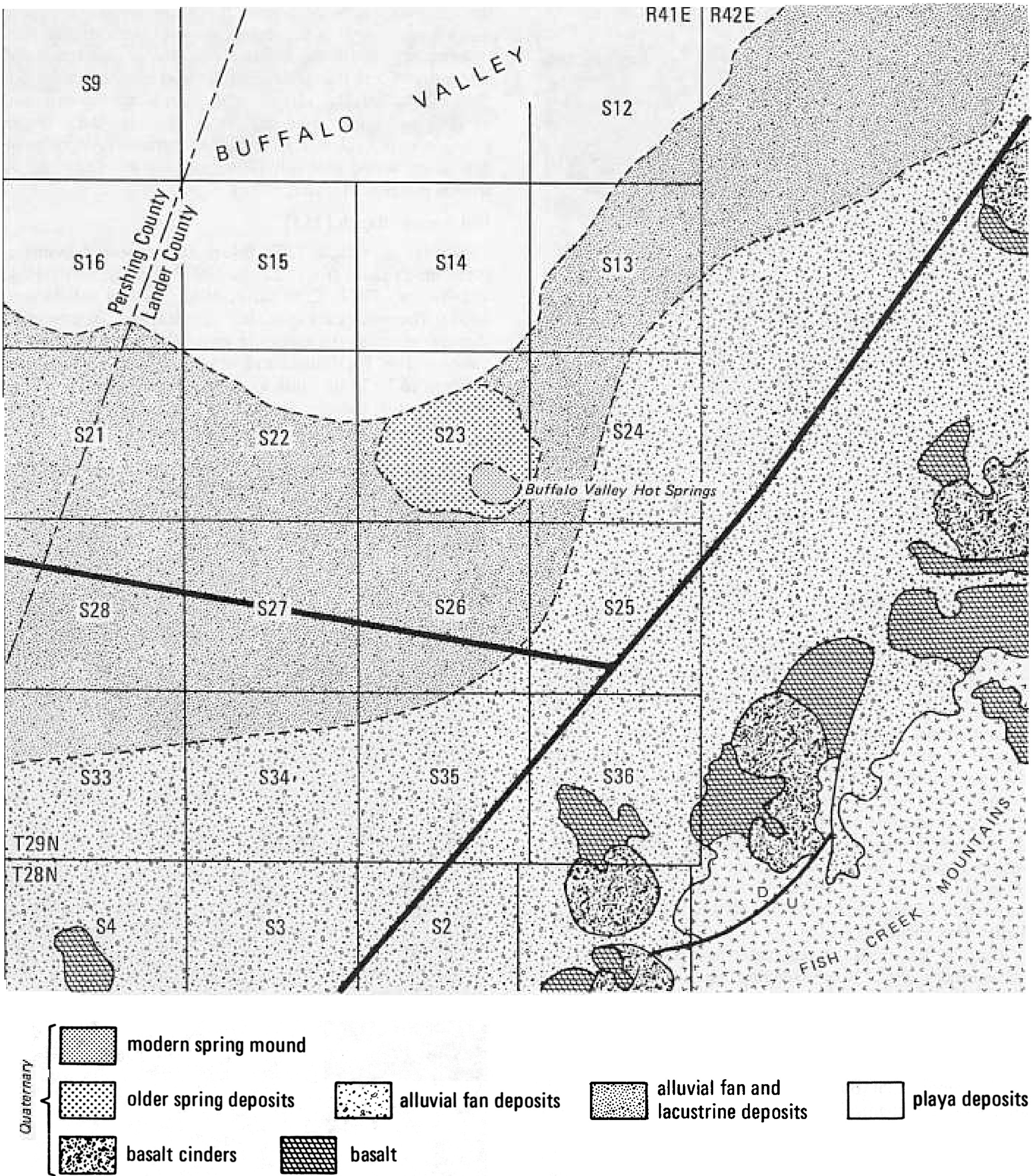


FIGURE 32. Geologic map of Buffalo Valley Hot Springs area, Lander County (modified from Olmsted and others, 1975).

to 174°F (Olmsted and others, 1975) mainly from 11 springs over an area of 3 acres (Waring, 1919). The estimated thermal reservoir temperature using the silica geothermometer is 257°F (Mariner and others, 1974). Thermal ground water is present over an area of approximately 2 square miles (fig. 31), with temperatures up to 193°F 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 S6,T29N,R41E (Wollenberg and others, 1977).

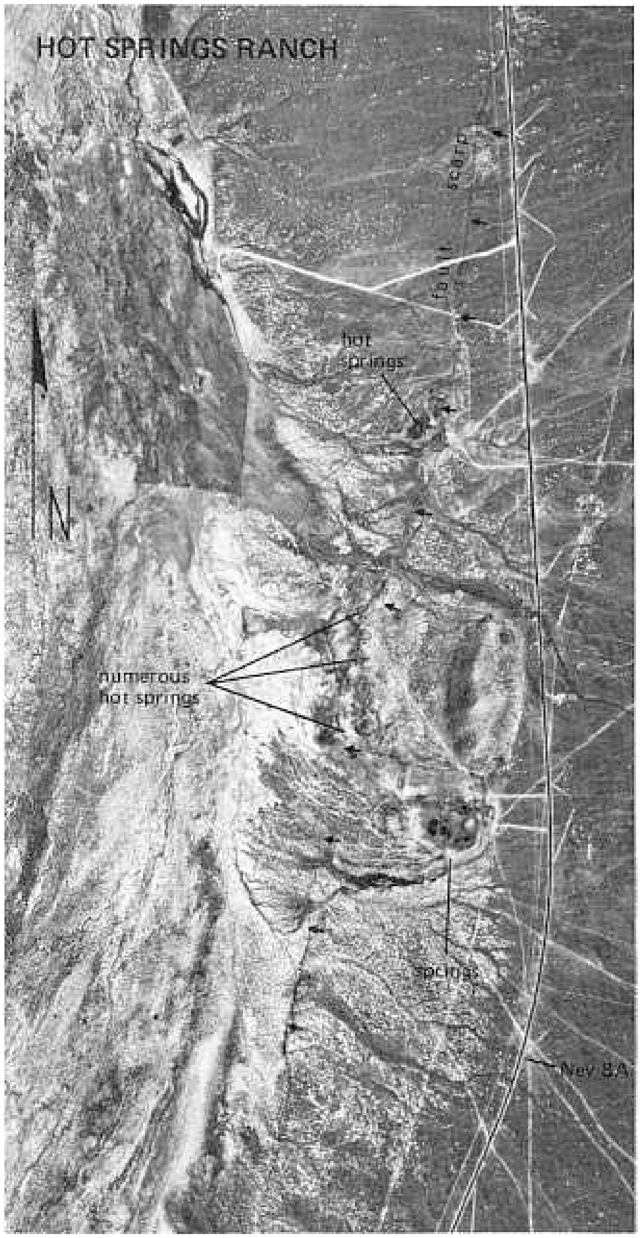
The Buffalo Valley Hot Springs are a subcircular group

of numerous springs of low flow. They emerge from a mound of marly material which is a few feet higher than the surrounding flat (fig. 32). 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 40 acres is located within approximately 400 acres of older spring deposits (Olmsted and others, 1975). Wollenberg (1974b) reports anomalous radioactivity (30 to 38 μR/hr) from Buffalo Valley Hot Springs.

Buffalo Valley is an assymmetrical 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) report that Buffalo Valley Hot Springs are associated with a recognizable fault which 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 approximately 12 miles (Wollenberg and others, 1975, fig. 7), 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) cite an age of approximately 3 m.y., from oral communication of E. H. McKee (1974). More recent dating by M. L. Silberman (written communication, 1977) indicates that basalt in NW/4 S31,T29N,R42E can be dated by K-Ar methods at approximately 1.4 m.y. (for 3 samples: 1.24 ± 0.21 m.y., 1.29 ± 0.04 m.y., 1.40 ± 0.14 m.y.). 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 100 feet (Olmsted and others, 1975). They suggest a slow rate of deposition along the east side of Buffalo Valley based on the 3 m.y. age date. If the younger date (1.3 m.y.) is assumed correct then rates of deposition would probably be normal for this thickness of alluvial material (Trexler, 1977).

Hot Springs Ranch [153]

Springs in S23,26,T27N,R43E have reported temperatures which range from 122° to 129°F (Waring, 1919; Hose and Taylor, 1974; Crostwaite, 1963; Lamke and Moore, 1965). The waters are quite low in silica, and the estimated thermal reservoir temperature using the silica geothermometer is 198°F (Mariner and others, 1974). The water is believed to be heated due to deep circulation along a fault which passes through the area (Waring, 1919). At least 11 springs are present, and the spring deposits are travertine.



LINCOLN COUNTY

Caliente Hot Springs [173]

The Caliente Hot Springs in S8 & SW/4 S5,T4S,R67E in Lincoln County have temperatures over 100°F—temperatures up to 118°F have been reported (Sanders and Miles, 1974). The town of Caliente derives its name from the springs. The springs no longer flow; much of the water apparently flowing underground into Caliente Creek. However, a 66,000-gallon swimming pool can be filled in 4 hours with a small pump lifting water only 7 feet (Smith, 1958). The springs are along a fault in Tertiary volcanic rocks (Adams, 1944; Hardman and Miller, 1948; Phoenix, 1948a).

Several water wells in the area have high temperatures. The highest is 145°F in the Wallis Health well near the Caliente Hospital (Sanders and Miles, 1974). The city of Caliente's North Well in the NE/4 S7,T4S,R67E is 130 feet deep, and has water temperatures of 78°F at 25 feet, 90°F at 100 feet, and 128°F at the bottom (Phoenix, 1948a). The Caliente Public Utility No. 4 well in the SW/4 S5,T4S,R67E also is 130 feet deep and has a temperature of 104°F (Rush, 1964). Another(?) well "near Caliente Hot Springs" has a temperature of 135°F (Smith, 1958).

Other springs northeast of Caliente

Several other hot springs extend in a line northeast from Caliente along Meadow Valley Wash. The location of these springs is obviously fault-controlled. This reach of Meadow Valley Wash follows the northeast extension of the Menard Lake Fault (Tschanz and Pampeyan, 1970, plate 3), a major transverse fault in this region.

Panaca (Owl) Warm Spring [170]. The Panaca Warm Spring is in the CN/2 S4,T2S,R68E just north of the town of Panaca. It has reported temperatures ranging from 85° to 88°F, and flow rates ranging from 1,800 to 6,277 gpm. The water issues from a fault contact between alluvium and Paleozoic limestone. The town of Panaca uses the spring as its water supply (Carpenter, 1915; Phoenix, 1948a; Rush, 1964).

Hot water occurs in a least six wells north and south of the spring, in S32,33,T1S,R68E, and S5,7,8,T2S,R68E. Temperatures ranged from 74° to 70°F (see Table 1 for analyses, etc.).

Delmue's Springs [168]. The two Delmue's springs are about 6 miles northeast of the Panaca Warm Spring in the NE/4 NW/4 SE/4 S13,T1S,R68E. The reported temperature is 70°F with a flow rate of some 200 gmp. The water is used for irrigation (Hardman and Miller, 1934; Rush, 1964).

Flatnose Ranch Spring [167]. The Flatnose Spring is about 6 miles northeast of the Delmue's Springs in the SE/4 S34,T1N,R69E. Temperatures up to 77°F and flow rates up to 400 gpm are reported. The spring is along a buried fault under Tertiary lava. The water is used for irrigation (Phoenix, 1948).

Springs in Pahranagat Valley

Several hot springs occur for a distance of about 12 miles along the east edge of Pahranagat Valley, along the west edge of the Hiko Range.

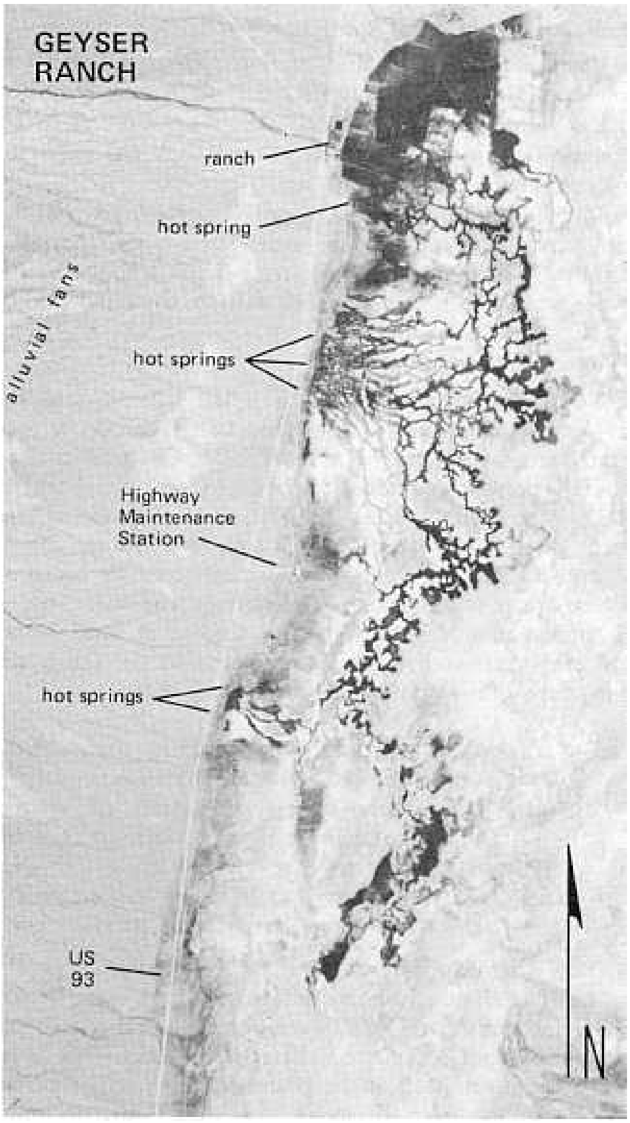
Hiko Spring [172]. Hiko Spring, in S14,T4S,R60E, is the northernmost of this group. Temperatures range from 90° to 80°F and flow rates from 538 to 2,400 gpm (Carpenter, 1915; Mifflin, 1968). The water issues from a contact between alluvium and dolomite. The water is used for irrigation and domestic purposes.

Crystal Springs [174]. Crystal Springs are south of Hiko Spring, in S10,T5S,R60E. Temperatures range from 90° to 81°F and flow rates from 9,000 to 2,680 gpm (Hardman and Miller, 1934; Eakin, 1963b). There are at least two springs; one flows from an orifice in limestone bedrock. The water has been used for irrigation and domestic purposes.

Ash (Alamo) Springs [175]. Ash (Alamo) Springs are south of Crystal at the corner of T5,6S and R60,61E. There are six main springs. Reported temperatures range from 97° to 88°F and flow rates from 10,300 to 7,630 gpm (Eakin, 1963b; Mifflin, 1968). The springs issue from a contact between alluvium and dolomite bedrock. The water is used for irrigation and domestic purposes. Carpenter (1915) mentions a "warm" spring in section 18, three miles to the south.

Other areas

Geyser Ranch Springs [165]. A series of warm springs occur at the Geyser Ranch in S1,12,13,23,T9N,R65E, at



the north end of Lake Valley, along the toe of the alluvial fan from the Schell Creek Range. Reported temperatures range from 65° to 70°F, with flow rates (one spring ?) of 50 to 1,400 gpm. The water is used for irrigation (Rush and Eakin, 1963; and Lamke and Moore, 1965).

Hammond Ranch [166]. A large hot spring issues from limestone at the head of Camp Valley (probably S17,T5N, R69E) on the Hammond Ranch. The water has a temperature of 84°F and is used for irrigation (Carpenter, 1915).

Sand Springs Valley [171]. Sand Springs in S26,T2S, R55E is the only reported hot spring in northwestern Lincoln County. It has a temperature of 86°F but a flow rate of only 0.2 gpm. The N. J. Gunderson well to the southwest in S19,T3S,R55E has a water temperature of 83°F, and two other wells in S5,8,T4S,R55E are reported to contain "warm" water (Van Denburgh and Rush, 1974).

Bennetts Springs [169]. Bennetts (Bennett) Springs in S7,T5S,R66E, have a temperature of 70°F and a flow rate of 10 gpm. There are two springs along a buried fault. The water is used to water cattle (Hardman and Miller, 1934).

LYON COUNTY

Hazen area (Patua) Hot Springs [177]

Patua Hot Springs consist of four springs and two mud domes, located in S8,13,T20N,R26E about 4 miles northwest of Hazen (Miller and others, 1953; Tischler and others, 1960). The springs are reported to be boiling. Only one published analysis is known from the springs.

In 1961 Magma Power Co. drilled three shallow cable-tool exploratory wells in the area. These were reportedly 300 to 750? feet deep, with temperatures above 275°F (Koenig, 1971; B. C. McCabe, written communication).

Wabuska Hot Springs [181]

Hot springs, approximately 1 mile north of Wabuska, range in temperature from 138° to 162°F and occur over a large area in S14,15,16,23,T15N,R25E. Gas bubbles issue from the pools with a faint odor of H_2S (Stearns and others, 1937). According to Russell (1885, p. 48, 49), the springs occur along an east-west line that coincides with the course of a post-Lahontan fault which is plainly shown by an irregular scarp, in some places 20 feet high. The springs occur in circular mounds; the water is collected in small basins and evaporated, reportedly forming a saline deposit, a section of which is described below (Russell, 1885):

1 to 2 in.	white, hard crust of sodium sulfate with sodium chloride, some calcium carbonate.
2 to 7 in.	soft, mealy or clayey deposit of sodium sulfate, calcium carbonate, calcium sulfate, etc.
6 to 8 ft.	clear, transparent crystals of sodium sulfate with some impurities; resting on saline clay.

The American Sodium Co., using evaporating ponds, refined and shipped sodium sulfate from here in the 1930's. Davis and Ashizawa (1960) have suggested that a chemical company might be able to use hot water from wells to refine sodium sulfate. Samples of mixed sodium chloride and sodium sulfate from surface incrustations reportedly show minor amounts of potash but no lithium, rubidium, cesium, nitrate, phosphate, or borate salts (Moore, 1969, p. 40).

Steam well at Wabuska Hot Springs, Lyon County.

In 1959 Magma Power Co. drilled three steam wells at the Wabuska area. Two of the wells were shallow (less than 600 ft) and the third was drilled to 2,223 ft, with a maximum reported temperature of 227°F. Several water wells in this area have temperatures above 80°F. Also, a well about 4 miles to the southeast reportedly has 70°F water. Samples of water from the Magma Power Co. wells yield estimated reservoir temperatures of 293° and 306°F based on silica and Na-K-Ca geothermometers (Mariner and others, 1974).

In 1972 Agri-Technology Corp. began building greenhouses near the site of the steam wells. The company plans to grow vegetables hydroponically, especially tomatoes, using the steam and hot water from the wells to heat the greenhouses.

Long and Brigham (1975a) and Peterson (1975) have reported on audiomagnetotelluric and gravity data in the Wabuska area.

Hinds' (Nevada) Hot Springs [184]

The third hottest springs in Lyon County, after Hazen and Wabuska, are those found near the edge of the Pine Nut Mountains along the western margin of Smith Valley. These springs are named for J. C. Hinds, the first settler in the north end of Smith Valley. Hinds utilized the springs as early as 1860 for agriculture and in a spa built on the site (Loeltz and Eakin, 1953; Thompson and West, 1881). The flow of the springs was also used to turn a water wheel, which powered a rock arrastre employed to mill various ores from mines in the vicinity (Pioneer Nevada, 1951, p. 96).

The temperatures reported at Hinds' are as high as 149°F (L. J. Garside, unpublished data), although cool sulfur water reportedly issues from a spring only a few hundred feet away. Thermal springs are also found along the edge of the valley from half a mile south of the main springs at Hinds' to a point due south of the alkali flat. Generally the flow of each spring is less than 5 gpm and the temperature is a little less than 70°F (Loeltz and Eakin, 1953). The water from these springs is probably rising from depth along a system of faults. The fluoride content of Hinds' Hot Springs has been reported as 2.7 and 3.1 ppm. Most water in Smith Valley whose temperature indicates little if any mixing with thermal water contained only 0.2 to 0.4 ppm fluoride. It appears that high contents of fluo-

LYON COUNTY (continued)

ride in this area are associated with the thermal water found along the south and west sides of Smith Valley, presumably along fault planes (Loeltz and Eakin, 1953). An estimate of the reservoir temperature of Hinds' Hot Springs, using the Na-K-Ca geothermometer, is 187°F, and deposits of travertine are reported (Mariner and others, 1974).

In the early 1960's, U. S. Steel Corp. drilled three geothermal exploration wells at Hinds' Hot Springs (Appendix 1). The temperatures encountered in these wells were reportedly lower than the maximum temperatures from nearby springs. Today the water from Hinds' Hot Springs is used to irrigate pasture and other salt-tolerant grasses, and in a swimming pool near the site of two of the geothermal wells. The third geothermal well is a short distance to the south of the pool.

Hinds' Hot Springs are only one of several thermal water areas along the eastern edge of the Pine Nut Mountains. The contact between alluvium and bedrock along the mountain front is a series of faults (Moore, 1969). Recent faulting is indicated in this area by discordant breaks in slope on some alluvial fans, such as on the small fan just south of Hinds' Hot Springs (Loeltz and Eakin, 1953). The other thermal areas are the Wellington area, 10 miles to the south, and the Artesia Lake area, 2 to 4 miles north of Hinds' Hot Springs.

Wellington area [187]

At least seven water wells near the town of Wellington have encountered warm to hot water at depths of 65 to 200 feet. The wells are located in S2,11,12,T10N,R23E. The deepest well (200 feet) has a reported temperature of 117°F, and there are indications that it may become hotter with increased pumping (Loeltz and Eakin, 1953). The water chemistry of this well is very similar to Hinds' Hot Springs 10 miles to the north, suggesting a common source for the thermal water. Water from the 117°F well is used for a public swimming pool.

Artesia Lake area [183]

The Artesia Lake area is 2 to 4 miles north and northeast of Hinds' Hot Springs and is a continuation of the thermal anomalies along the Pine Nut Mountains from Wellington to Artesia Lake. Warm-water wells and springs are reported from S25,27,34,T13N,R23E and S10,T12N,R23E. Well temperatures are up to 82°F for the Ambassador well; no temperature data are available for the springs, except that they are warm (Moore, 1969, pl. 1). The Ambassador well is 540 feet deep and artesian. Measurements of uranium and radium in water from this well indicate that it may penetrate volcanic rocks at depth (Scott and Barker, 1962).

Other springs and wells

Four other hot springs are reported in Lyon County. Two of these are in southern Mason Valley along the east edge of the Singatse Range. Wilson Hot Spring (S34,T11N, R25E) was reportedly dry in 1969 (Alvin McLane, personal communication, 1973), and no information is available on the other Mason Valley hot spring in S34,T12N,R25E. Unnamed springs in the SW/4 SE/4 S4,T7N,R27E along the East Walker River in southern Lyon County are approximately 110°F and are reportedly slightly radioactive (possibly due to radon in the water). The spring is in the vicinity of several uranium occurrences (Davis, 1954). Stearns and others (1937) reported two springs and a public bathing area.

Two water wells in Dayton Valley have temperatures of 80° and 95°F. They are located in S7,T16N,R21E and S12, T16N,R22E. Also, the water flowing from the portal of the Sutro Tunnel is 81° to 83°F (Glancy and Katzer, 1975). The Sutro Tunnel was built to drain the mines of the Comstock Lode. The abnormal temperatures in this mining district are described in the Storey County section.

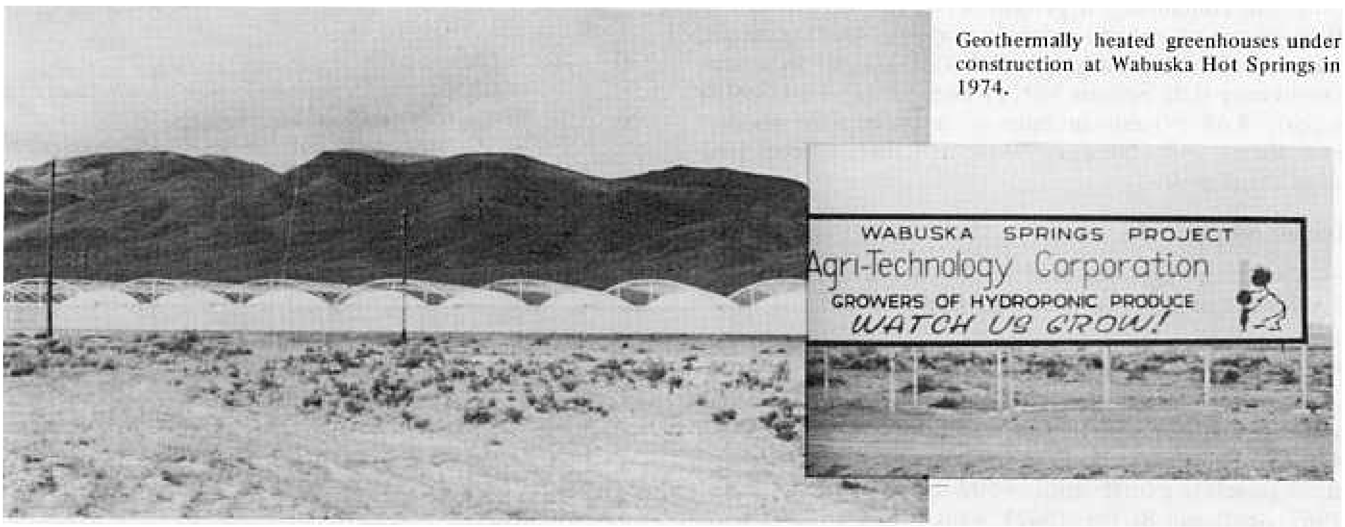
Eldorado Canyon travertine deposit [180]

A travertine terrace has been built up from hot springs, now inactive. The deposit is in the NW/4 SE/4 S36,T16N, R21E about 2.5 miles southeast of Dayton. During active mining on the Comstock Lode, the travertine was burned for lime in several stone kilns (Archbold, N. L., *in* Moore, 1969, p. 39).

MINERAL COUNTY

Wedell Springs [191]

The highest spring temperatures in Mineral County are found at Wedell Springs in the SW/4 S7,T12N,R34E. They



Geothermally heated greenhouses under construction at Wabuska Hot Springs in 1974.

consist of two main springs which range in temperature from 129° to 144°F (Eakin, 1962c). Schrader (1947, p. 146) reports that excellent water for domestic and other purposes was hauled to the mining camp of Rawhide, about 14 miles west of these springs.

Dead Horse Wells [190]

Water from Dead Horse Wells in S21,T12N,R32E is reported to be hot (Miller and others, 1953). This area is about 10 miles west of Wedell Springs and about 4.5 miles southwest of Rawhide. Dead Horse Wells lies on the west margin of a closed basin while Wedell Springs lies on the east margin of this basin.

Sodaville (Soda) Spring [193]

A pair of spring clusters in the NE/4 NE/4 SW/4 and the SW/4 SW/4 SE/4 S29,T6N,R35E near Sodaville (3.5 miles south of Mina) have temperatures up to 101°F. The total flow is 75 gallons per minute, and is unused at present (Van Denburgh and Glancy, 1970; Stearns and others, 1937). White (1955a) reports that the springs emerge from marshy ground and travertine, and have a maximum temperature of 100°F. Mariner and others (1974) have estimated the reservoir temperature at 208°F from a silica geothermometer.

In the 1880's the readily available water supply at Sodaville prompted construction of an ore smelter. A hotel and bathhouses, owned by Martin Brazzanovich, also occupied the site during this period (Myrick, 1962, p. 175).

A hot-springs-type tungsten-manganese deposit (the Black Jack Mine) occurs in pre-Tertiary chert in the NW/4 SE/4 SW/4 S29,T6N,R35E. This locality is about a third of a mile northeast of Sodaville. The deposits consist of veins of bluish-colored chalcedonic quartz, calcite, gypsum (often selenite), iron oxides, and tungsten-bearing psilomelane. The main vein trends approximately N50E, dips 75° southeast, and is up to 3 feet wide (White, 1955a; L. Garside, unpublished data). At one time, travertine probably capped the veins but has since been removed by slight erosion. The veins are believed to be the "roots" of former Pliocene hot springs (R. Roberts, *in* White, 1955a; Kerr, 1946).

Where manganese is high, tungsten also appears to be high. A sample with 40.3 percent manganese and 7.2 percent iron contained 3.0 percent WO_3. Ore that is high in iron, on the other hand, is low in tungsten. Another sample with 1.2 percent manganese and 35.4 percent iron contained only 0.05 percent WO_3 (White, 1955a). Kerr (1946) reports 4.88 percent tungsten in a psilomelane sample, and Warner and others (1959) report 0.0075 percent BeO from the deposit.

Double Spring [189]

A warm spring is reported from S23,T13N,R29E about 7 miles east of Schurz (Stearns and others, 1937).

Hawthorne area [192]

Several water wells in the Hawthorne area have reported water temperatures of 75° to 124°F. The wells are from 400 to 600 feet deep, and the deepest well penetrated sandstone gravels to a total depth of 602 feet (Everett and Rush, 1967; Scott and Barker, 1962). Wells with the higher temperatures seem to be located closer to the frontal fault along the east side of the Wassuk Range.

Other water wells

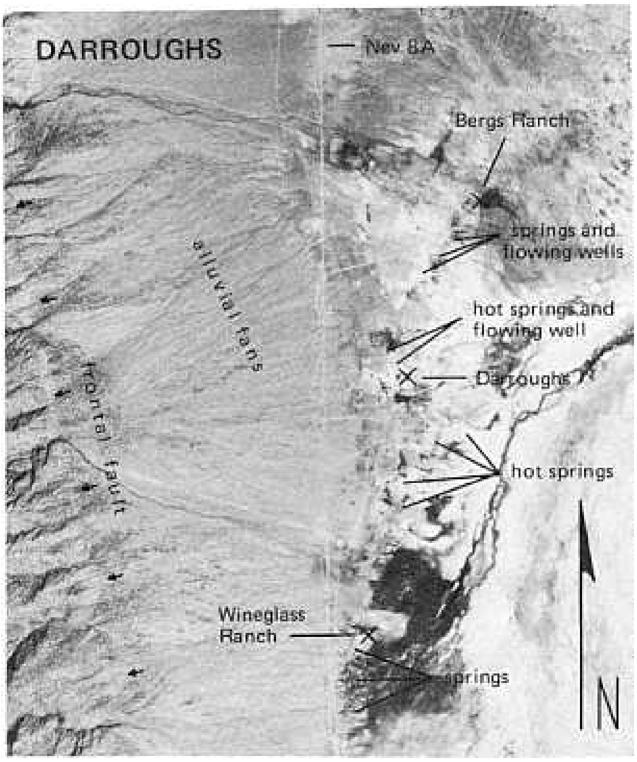
Three other water wells in Mineral County reportedly have anomalous temperatures. Two of these wells are U. S. Bureau of Land Management wells, one in Whiskey Flat (S19,T5N,R31E) and one in Huntoon Valley (S7,T3N, R31E), with reported temperatures of 110° and 78°F, respectively (Everett and Rush, 1967; Van Denburgh and Glancy, 1970). A third well in S32,T2N,R33E has a reported temperature of 113°F (CWRR, 1973).

NYE COUNTY

Darrough's Hot Springs [204]

Darrough's Hot Springs are located in S7,8,T11N,R43E in Big Smoky Valley about 60 miles north of Tonopah. The hot springs discharge several hundred gallons per minute of water that is near the boiling point for that elevation. An 812-foot-deep well drilled in 1962 (and redrilled in 1963) by Magma Power Co. and associates encountered temperatures up to 265°F with a very large flow of water and minor steam (Koenig, 1971). Ranch wells have also hit boiling water at shallow depths. Anomalous radioactivity (75 μR/hr) is reported from near the edge of a fenced pool (Wollenberg, 1974b). Travertine and a trace of siliceous sinter are reported (Mariner and others, 1974).

The springs issue from valley fill on an alluvial fan. The mountain front, about 1.5 miles to the west, is a fault scarp of a major Basin-and-Range fault along the east side of the Toiyabe Range. The amount of displacement on this fault is unknown. Fiero (1968) has suggested that the hot springs are along a fault parallel to this major fault. Best estimates for thermal aquifer temperatures at Darrough's Hot Springs



from several chemical geothermometers are in the 200° to 275°F range. The upper limit of the range was nearly attained in the Magma well. Geophysical data for Darrough's Hot Springs are reported in Kaufmann (1976), Long and others (1976), O'Donnell (1976) and Peterson and Dansereau (1976a).

Other hot springs in Big Smoky Valley [198, 199]

Hot springs at McLeod's Ranch 15 miles north of Darrough's (NE/4 SW/4 S34,T14N,R43E) issue from a large mound in the alluvium and have a relationship to the major Basin and Range fault similar to Darrough's. Big Blue and Charnock Springs are in S16,29,T13N,R44E on the east side of Big Smoky Valley and have temperatures of approximately 80°F. Big Blue Spring is associated with a fault scarp cutting alluvium (Fiero, 1968). Springs reportedly issue from a large mound, and a travertine deposit is reported from an area in the vicinity of S28,T13N,R44E. Thermal waters are also reported from Turk's Ranch (T13N, R43E)? and R. O. Inc. Ranch (T12N,R43E)?.

Springs along Hot Creek Canyon [211]

There are a number of springs along Hot Creek Canyon (T8N,R49–50E), four of which are thermal (fig. 33). The thermal springs have a total discharge of about 850 gpm and temperatures ranging from 72° to 180°F. There are at least nine cold springs interspersed with the thermal springs.

Upper Warm Spring. The westernmost, upstream thermal spring is Upper Warm Spring (SE/4 SW/4 SW/4 S21,T8N, R50E), located just north of the road up the canyon. The spring is used by stock; otherwise it is undeveloped. A flow rate of 32 gpm at 94°F was recorded on March 18, 1967 (Fiero, 1968). It is in an area of Tertiary volcanic rocks underlain by Paleozoic carbonates. There is no evidence of structural control at the surface; however, it is thought to be along a permeable fault zone that allows water to rise from deep circulation within a regional, intrabasin groundwater flow system (Fiero, 1968). Upper Spring, upstream, a quarter of a mile to the southwest, is a cold spring.

Pat Spring. Pat Spring (SE/4 NW/4 SE/4 S21,T8N, R50E) half a mile northeast of Upper Warm Spring had an estimated flow of 50 gpm and a temperature of 72°F on March 19, 1967 (Fiero, 1968). There are two cold springs half a mile downstream from Pat Spring at the Old Page Place; the westernmost, Cress Spring, flows about 10 gpm at 47°F (April 19, 1967; Fiero, 1968); Cold Spring, the easternmost, flows at about the same rate and has a temperature of 43°F (April 19, 1967; Fiero, 1968).

Old Dugan Place Spring. The Old Dugan Place (Warm) Spring (NE/4 NW/4 S25,T8N,R50E) is near the center of the canyon, a quarter of a mile west of the Old Dugan Place (an abandoned ranch) on the north side of the canyon floor. Water issues from several orifices in thin alluvium overlying Paleozoic limestone. It is fenced and ditched to increase the flow into Hot Creek. In September, 1967, a gaging station consisting of a 90° V-notch weir and water-stage recorder was built by the U. S. Geological Survey; preliminary records indicate a steady flow of about 495 gpm. On October 15, 1967, a temperature of 97°F was recorded (Fiero, 1968). A flow rate of 359 gpm at 89°F had previously been measured in 1966(?) (Rush and Everett, 1966). Like other hot springs in this area it is believed to tap water from a deep, regional ground-water flow system. A cold spring between this spring and the Old Dugan Place has a flow of 1½ gpm and a temperature of 66°F on August 14, 1967 (Fiero, 1968).

Upper Hot Creek Ranch. The hot spring at the Upper Hot Creek Ranch (NE/4 SE/4 S33,T8N,R50E) is at the east end of the canyon 600 feet southwest of the ranch house. Discharge occurs from several orifices in thin alluvium overlying Cambrian Tybo Shale. The spring is fenced and ditched to take the discharge to Hot Creek; like the other springs, it contributes to irrigation and stock needs. Preliminary U. S. Geological Survey gaging records in 1967 indicate a flow of 280 gpm at 168°F (Fiero, 1968). A flow of 763 gpm at 160°F was recorded in 1966 Rush and Everett, 1966). A spring about 1 mile to the east, on the "Mine" fault, has an estimated flow of 125 gpm at 70°F (Fiero, 1968).

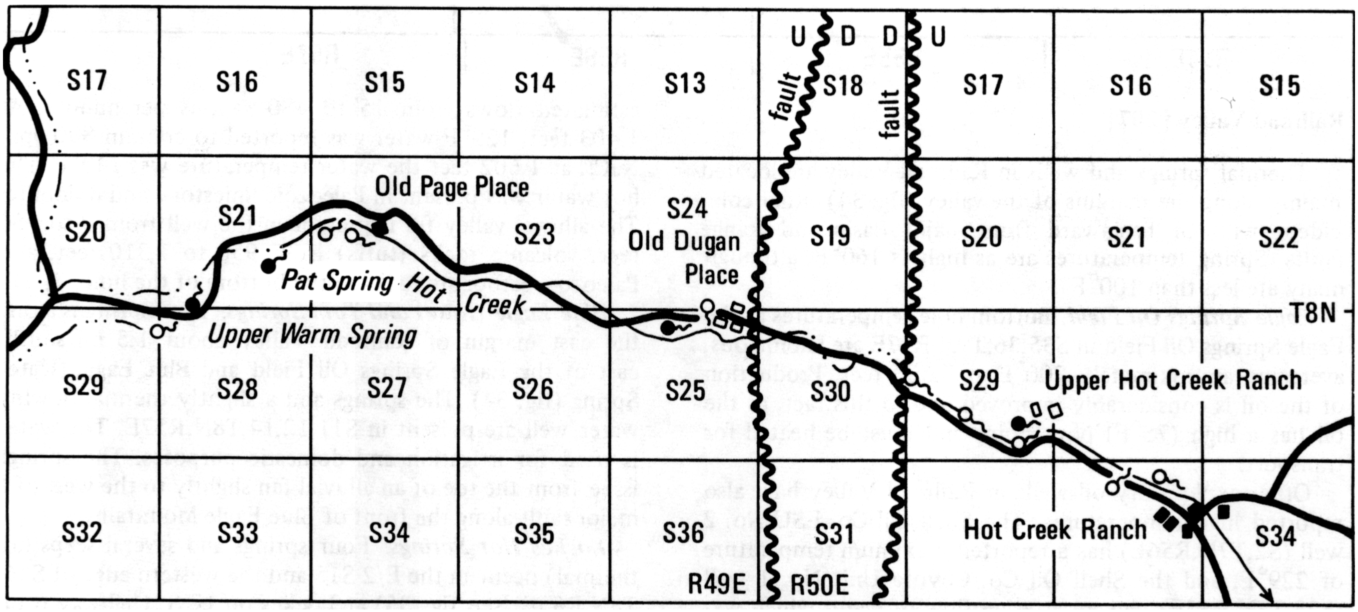
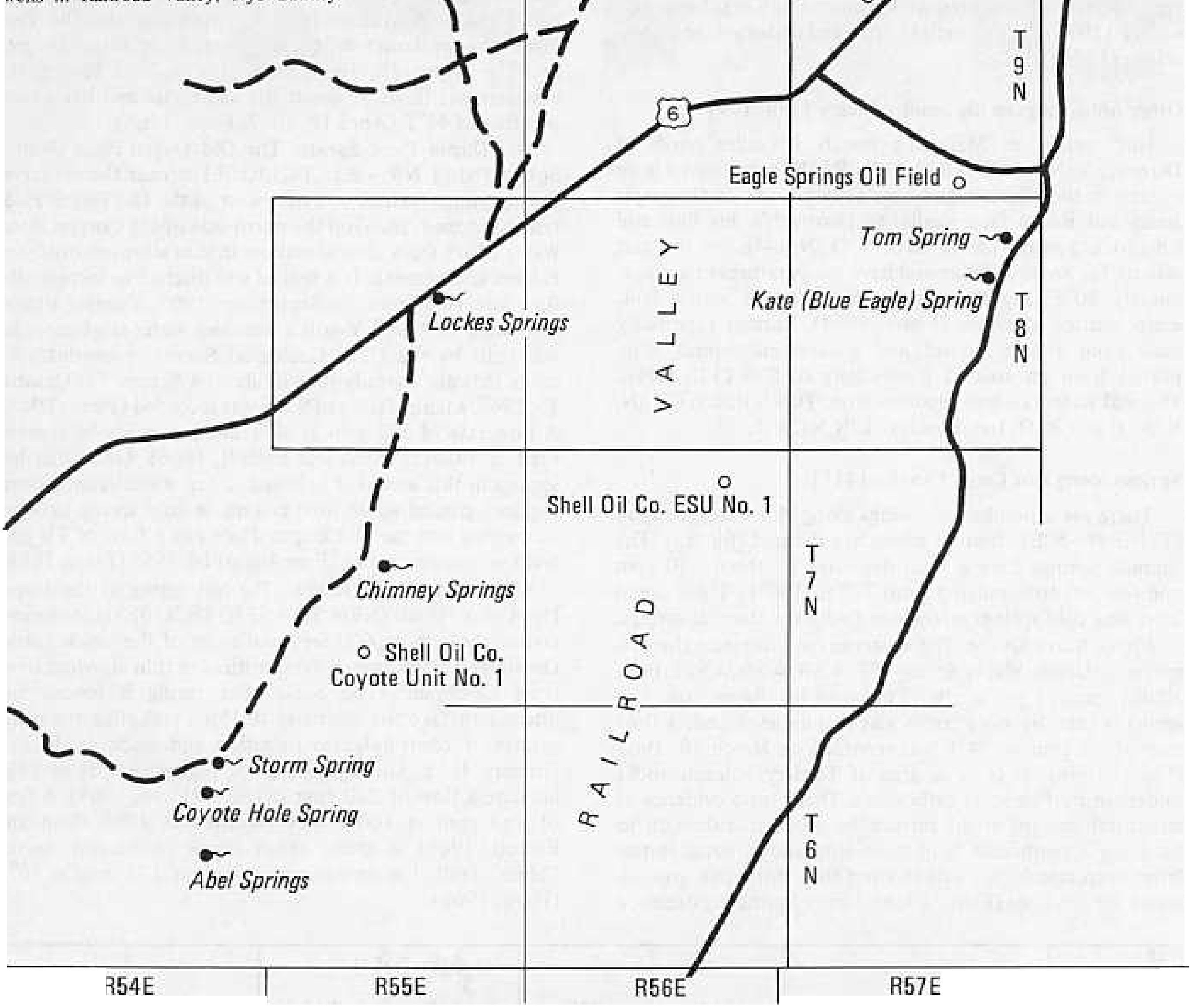


FIGURE 33. Sketch map of springs along Hot Creek, Nye County (thermal springs shown as solid dots).

FIGURE 34. Map of thermal springs and wells in Railroad Valley, Nye County.



Railroad Valley [207]

Thermal springs and wells in Railroad Valley are located mainly along the margins of the valley (fig. 34) either coincident with or basinward from major Basin and Range faults. Spring temperatures are as high as 160°F, although many are less than 100°F.

Eagle Springs Oil Field. Bottom hole temperatures at the Eagle Springs Oil Field in S35,36,T9N,R57E are anomalous, averaging approximately 200°F at 6,000 feet. Production of the oil is considerably improved due to this fact, as the oil has a high (75°F) pour point and must be heated for transport.

Other exploratory oil wells in Railroad Valley have also reported high temperatures. The Shell Oil Co. ESU No. 2 well (S2,T7N,R56E) has a reported maximum temperature of 229°F, and the Shell Oil Co. Coyote Unit No. 1 well (S28,T7N,R55E) had an artesian flow of water which was hot below 1,400 feet. The well was 1,711 feet deep, with estimated flows from 15 to 480 gallons per minute. At 1,403 feet, 129°F water was reported to contain 890 ppm NaCl; at 1,602 feet the water temperature was 140°F. The hot water was present in Paleozoic limestone and dolomite. The alluvial valley fill is present in the well from 0 to 950 feet, volcanic rocks (tuffs) from 950 to 1,310 feet, and Paleozoic carbonate rocks to the bottom of the hole.

Blue Eagle (Kate) and Tom Springs. Tom Spring is along the east margin of Railroad Valley about 1.5 mi southeast of the Eagle Springs Oil Field and Blue Eagle (Kate) Spring (fig. 34). The springs and a slightly thermal flowing water well are present in S11,12,14,T8N,R57E. The water is used for irrigation and domestic purposes. The springs issue from the toe of an alluvial fan slightly to the west of a major fault along the front of Blue Eagle Mountain.

Lockes Hot Springs. Four springs and several seeps (all thermal) occur in the E/2 S15 and the western edge of S16, T8N,R55E (see fig. 35) at Lockes on U. S. Highway 6 on the west side of Railroad Valley. The springs and seeps issue from a low hill of calcareous tufa over half a mile in diameter. Reported water temperatures range from 93° to 101°F and the combined discharge rate is about 1,500 gpm. Analyses run on water from three of the springs by the Center for Water Resources Research (University of Nevada, DRI) were quite similar (Appendix 1). The water is used for irrigation, stock watering, and as a domestic supply for the Titus Ranch. The remaining water flows to ponds about 2½ miles to the southeast which support abundant waterfowls. The springs are in alluvium (valley fill); the nearest bedrock is Tertiary tuff and Paleozoic limestone in the Pancake Range, two miles to the west. The springs "probably rise due to artesian head along a high permeability zone associated with range front faulting" (Fiero, 1968).

Big Spring (NE/4 SW/4 NE/4 S15,T8N,R55E) is atop the tufa hill a quarter of a mile north of the ranch house (fig. 35). It is used for irrigation and domestic needs. The earliest discharge records, February 7, 1934, showed a flow of 900 gpm at a temperature of 99°F (Eakin and others, 1951). On June 30, 1957, T. C. Frantz of the Nevada Fish and Game Commission measured a discharge of 540 gpm at 101°F, using the float method. On November 12, 1966, a flow of 520 gpm at 99° to 101°F was measured (Mifflin, 1968). Monthly pygmy-meter measurements by the U. S. Geological Survey showed an increase from 471 gpm on August 7, 1967, to 582 gpm on November 22, 1967. Although the period recorded is short, this may indicate response of the spring to seasonal recharge (Fiero, 1968).

Reynolds Springs (SW/4 SE/4 NE/4 S15,T8N,R55E) consists of two small pools about 40 feet apart at the base of the tufa hill about a quarter mile northeast of the ranch house. The water is used for pasture irrigation before flowing into the ponds to the southeast. The combined flow of the springs was 300 gpm on February 7, 1934 (Eakin and others, 1951); 300 gpm on June 30, 1957 (Nevada Fish and Game Commission, unpublished report); 323 gpm on Nov-

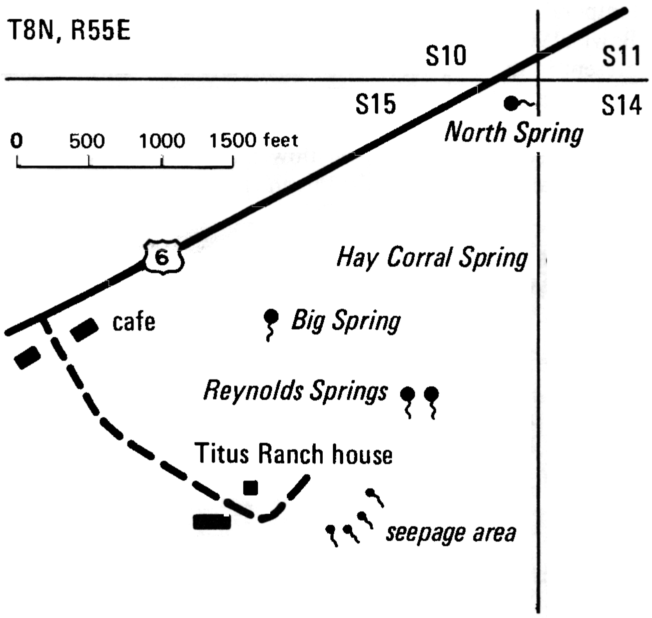
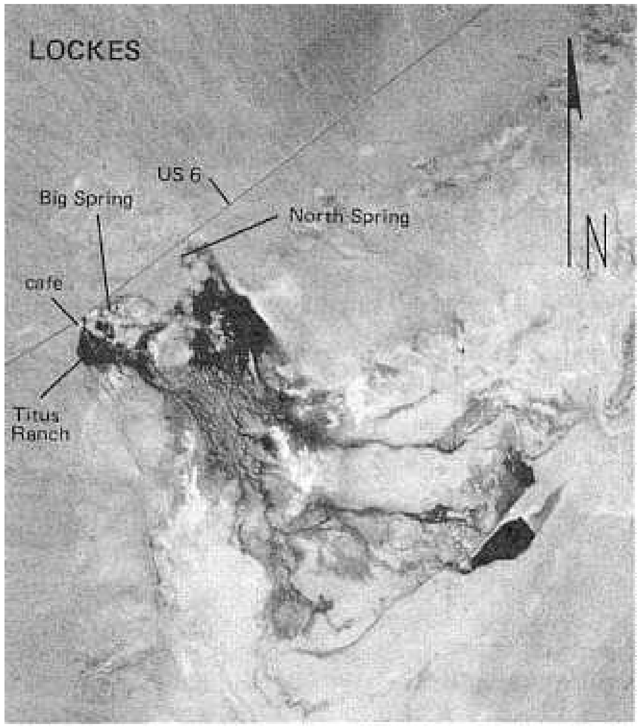


FIGURE 35. Sketch map of Lockes Springs, Nye County (adapted from Nevada Fish and Game unpublished field survey report).



ember 12, 1966 (Mifflin, 1968); and 275 gpm and 287 gpm on September 27 and November 22, 1967, respectively (U. S. Geological Survey measurements reported in Fiero, 1968). The easternmost pool had a temperature of 99°F on November 12, 1966 (Mifflin, 1968).

Hay Corral (Stockyard) Spring (SW/4 NW/4 NW/4 S14, T8N,R55E) is about a mile northeast of the ranch house at the base of the tufa hill. The flow is presently held by an earth dam forming a pool 100 feet in diameter. The water is used for stock watering and irrigation. A flow of about 600 gpm at 93°F was recorded on February 7, 1934 (Eakin and others, 1951); the Nevada Fish and Game Commission recorded a temperature of 95°F on June 30, 1957; the Center for Water Resources Research (University of Nevada) estimated the flow rate as 425 gpm on Novenber 12, 1966.

North (Lockes Hot) Spring (NE/4 NE/4 NE/4 S15,T8N, R55E) flows into a ditch just south of the U. S. Highway 6 fence-line about three-quarters of a mile northwest of the ranch house. Its water is used for pasture irrigation. A flow of about 200 gpm at 95°F was recorded on February 7, 1934 (Eakin and others, 1951); the Nevada Fish and Game Commission recorded a discharge of between 170 and 320 gpm at 94°F on June 30, 1957; U. S. Geological measurements indicated flows of 158 and 165 gpm on August 4 and November 22, 1967, respectively.

There are a number of thermal seeps a short distance east of the ranch house; their flow rates and temperatures are not known. Possibly this is "South Spring," although the name has also been applied to Reynolds Springs.

Chimney Hot Springs. Chimney Hot Springs in S16,T7N, R55E have reported temperatures up to 160°F, the highest spring temperatures in Railroad Valley. The water is used for cattle. Three springs issue from an extensive travertine mound, which is nearly half a mile in diameter and approximately 30 feet high (Fiero, 1968). The springs and mound are located at the base of a bajada about 2 miles from the nearest bedrock outcrop. They rise due to artesian pressure probably along a high permeability zone associated with a range-front fault (Fiero, 1968). The location of Chimney Hot Springs is midway between Lockes Hot Springs to the north and Storm, Coyote, and Abel Springs to the south. All these springs are associated with faulting, and may, in fact lie along the same major fault.

Storm, Coyote, and Abel Springs. A group of warm springs are located in S11,12,13,23,24,T6N,R54E along a fault which cuts the alluvium. The springs range from 84° to 113°F and each is reported to be associated with travertine mounds about 300 feet in diameter and 10 to 15 feet high (Fiero, 1968). All springs are fenced, and Abel Springs is additionally improved by a short buried pipeline to a cattle trough (Fiero, 1968).

Gabbs area [201]

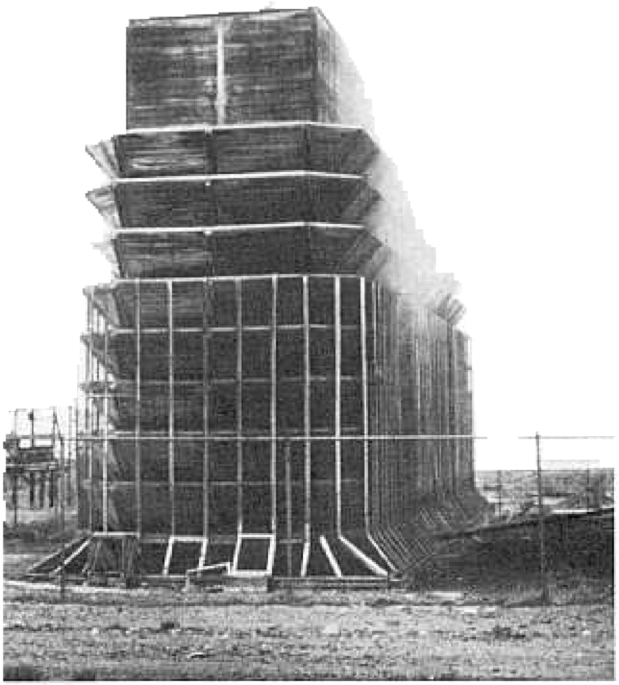
Many water wells drilled for a water supply for the magnesite-brucite mine and mill of Basic, Inc., near the townsite of Gabbs, have abnormally high water temperatures, ranging from 70° to 155°F (Eakin, 1962b). Some must be cooled in cooling towers before use. As the water is reportedly high in fluoride, bottled water is supplied by the local water company for drinking (Nevada State Journal, July 20, 1977). The thermal wells are located in S28,T13N, R36E, and S22,27,28,33,T12N,R36E, in a north-south-trending zone at least 5 miles long. This zone coincides in part with a north-south-trending fault along the west edge of the Paradise Range.

Diana's Punch Bowl–Potts Ranch [200]

Diana's (Dianna's, Devils) Punch Bowl (S22,T14N, R47E) is a cup-shaped depression approximately 50 feet in diameter at the top of a domelike hill of travertine approximately 600 feet in diameter. Warm water in the pool of the bowl is about 30 feet below the rim, while the top of the hill is about 75 feet above the level of Monitor Valley. A small warm spring, approximately 109° to 120°F in temperature, issues from the southwest corner of the travertine dome (Fiero, 1968). Temperatures up to 138°F have been reported, and the estimated minimum reservoir temperature by several chemical geothermometers is 190° to 208°F (Mariner and others, 1974; Hose and Taylor, 1974). Very slightly anomalous radioactivity (16 μR/hr) is reported by Wollenberg (1974b). The thermal area lies on a north-trending, concealed fault in the central part of Monitor Valley (Stewart and Carlson, 1974; Fiero, 1968). Spurr (1905, p. 257) describes a report by J. L. Butler, the discoverer of Tonopah, that the water level had lowered and water became cooler in the years prior to 1905. Also, he reported that more gas was formerly emitted and occasional flames were seen.

Hot Springs at Potts Ranch are approximately 4 miles north of Diana's Punch Bowl, in S1,2,T14N,R47E, also in the central part of Monitor Valley. Maximum temperatures here are 113°F, and the estimated minimum reservoir temperatures are nearly identical to those at Diana's Punch Bowl (190° to 208°F). A number of springs and seeps are present in the area near Potts Ranch, and travertine mounds are present in a few areas. The springs lie along a northeast-trending fault which crosses Monitor Valley here (Stewart and Carlson, 1974). The outflow from the hot springs at Potts Ranch and Diana's Punch Bowl contains a small

Aerial view of Diana's Punch Bowl, Nye County. Depression is approximately 50 feet across (photo by Phillip Hyde).



Cooling tower for well water at Gabbs, Nye County.

Warm-water pool in Diana's Punch Bowl, Nye County.

minnow, the speckled dace (Hubbs and others, 1974). The stream courses from some springs have been ditched to improve their flow (fig. 36).

Warm (Nanny Goat) Springs [220]

Warm Springs is a small restaurant and gasoline station at the junction of U. S. Highway 6 and Nevada State Route 25, about 42 miles east of Tonopah. The springs are located about 100 yards west of the restaurant (S20,T14N,R50E) and emerge through alluvium approximately 30 yards east of the bedrock outcrop. They are located along the trace of a major range-front fault along the west side of Hot

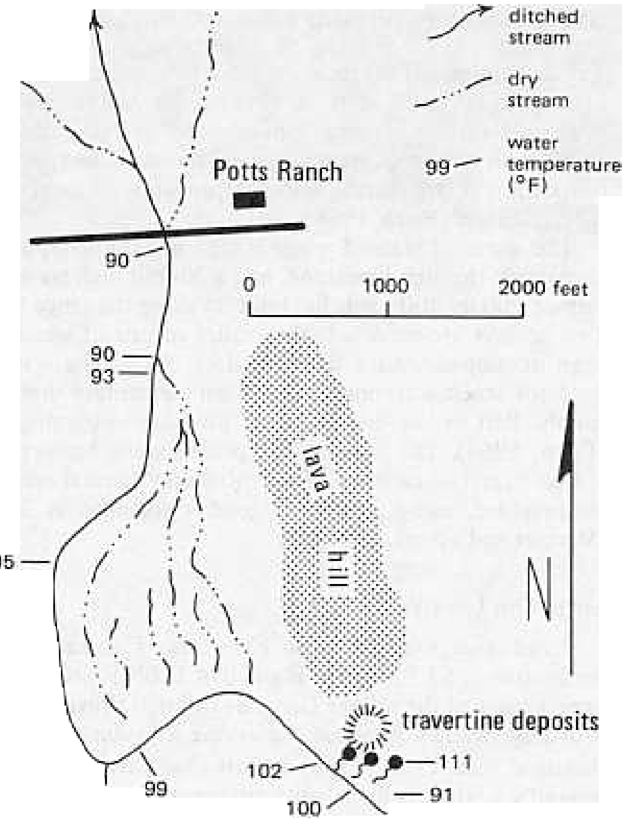
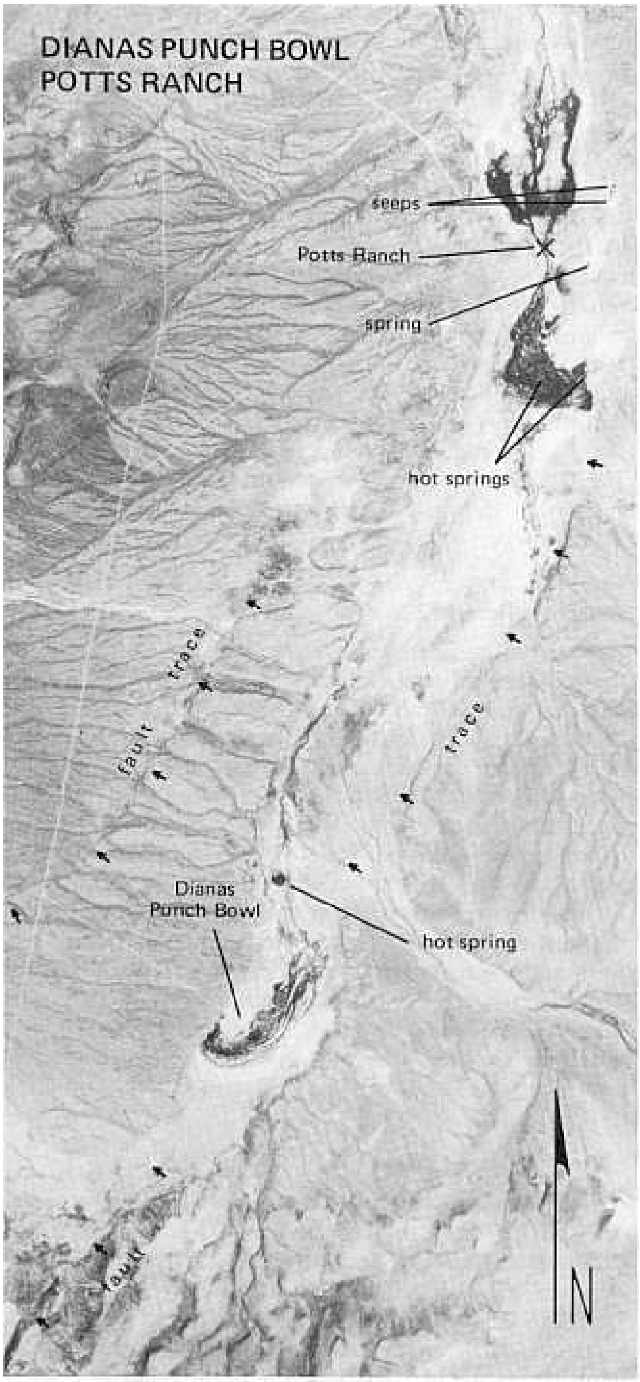
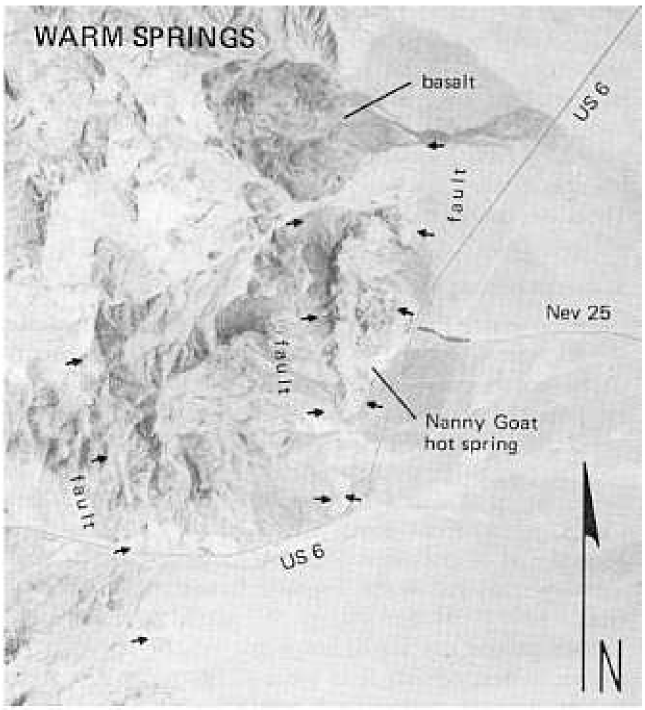


FIGURE 36. Map of warm springs near Potts Ranch, Nye County (after Hubbs and others, 1974).

Creek Valley. Fiero (1968) reports that this fault has as much as 2,000 feet of geologically recent movement, and the location of earthquake epicenters along the fault indicates that it is still active.

The thermal water is believed to rise along a fault zone, predominantly in limestone. Brecciation along the fault, as





well as solution of the limestone, contributes to a relatively high permeability. Most of the spring water probably originates from a regional ground-water system, after circulation to depths as great as several thousand feet. A small proportion of the spring water is probably of local, nonthermal origin (Fiero, 1968).

The water of Warm Springs is high in carbonate, due to its passage through limestone, and a 20-foot-high travertine terrace 200 by 400 yards has built up along the range front. Two springs are reported, the orifice of one of which has been developed with a five-foot deep ditch. The water is used for stock watering and as a supplementary domestic supply. Part of the flow has been used in a swimming pool (Fiero, 1968). The maximum reported water temperature is 140°F, and an estimate of the minimum thermal reservoir temperature, using the silica geothermometer, is 230°F (Mariner and others, 1974).

Little Fish Lake Valley [206]

Warm springs (104° to 108°F) in Little Fish Lake Valley are located in S7,T11N,R49E and S14,T10N,R49E near the lowest parts of the valley. They rise through alluvium which probably overlies Paleozoic limestone at a depth of a few thousand feet. Fiero (1968) reports that a large number of generally north-trending faults are present in the surrounding mountains as well as within the valley alluvium, and it seems likely that these warm springs rise along a high permeability zone created by faulting. They are undeveloped, but are used by stock.

Duckwater [202]

Two main warm spring areas are located near the small community of Duckwater, which is on the Duckwater Indian Reservation in northeastern Nye County. Big Warm Spring or Duckwater Spring is located in S32,T13N,R56E and has a reported temperature of approximately 90° to 91°F (Van Denburgh and Rush, 1974; Mifflin, 1968; Eakin and others, 1951). Little Warm Spring, in S5,T12N,R54E, is approximately the same temperature. Both springs rise in alluvium a short distance west of a north-trending, range-boundary fault (Stewart and Carlson, 1974). The area may have been called the Burrell Hot Springs District in the past. The water is used locally.

Tonopah mining district [221]

In several mines at Tonopah anomalous underground temperatures have been reported. In the Ohio Tonopah shaft, temperatures up to 78°F were found at 766 feet and temperature gradients reportedly vary from 26 to 54 feet per degree Fahrenheit in dry rocks at depths less than 800 feet (Spurr, 1905, p. 263–265; Darton, 1920). Water temperatures up to 106°F were reported by Bastin and Laney (1918, p. 29) from depths of 1,500 to 2,316 feet in the central part of the mining district. Large flows of hot water were encountered in the Tonopah Extension Mines (Broderick, 1949, p. 9), and during this period approximately 3 million gallons per day of hot water were pumped from the deeper mines. At that time some of the water was utilized in a greenhouse to grow fresh vegetables.

Sarcobatus Flat–Beatty [227]

Warm springs and water wells in the vicinity of Beatty are predominantly near U. S. Highway 95 to the north of the town. Two springs are also reported in Oasis Valley 7 miles north of Beatty, and warm-water wells are found in Sarcobatus Flat as far north as Scotty's Junction. The highest spring temperatures are at Hick's (or Amargosa) Hot Spring (S16,T11S,R47E), where the spring flows from alluvium near outcrops of silicified, opalized, and moderately argillized welded tuff (Malmberg and Eakin, 1962). The hottest of five springs (109°F) supplies bathing pools and related facilities. Burrell Hot Spring (S21,T11S,R47E), located 5 miles north of Beatty on U. S. Highway 95, is approximately 1 mile southwest of Hick's Hot Spring which is in S29?,T11S,R48E, between the Thompson and Silicon Mines. An area of intense silicification, opalization, and moderate argillization has been reported, and is believed to be due to the action of thermal waters which are still present at Hick's Hot Spring (Cornwall and Kleinhampl, 1961).

The municipal water supply for Beatty is obtained from Beatty Springs, a group of six springs that issue from alluvium about 1 mile north of town. The springs are about 80 feet higher in elevation than the town and discharge into concrete collection basins which connect to 8-inch city water mains. Reportedly, the springs discharge 100 to 200 gallons per minute of 75°F water (Malmberg and Eakin, 1962).

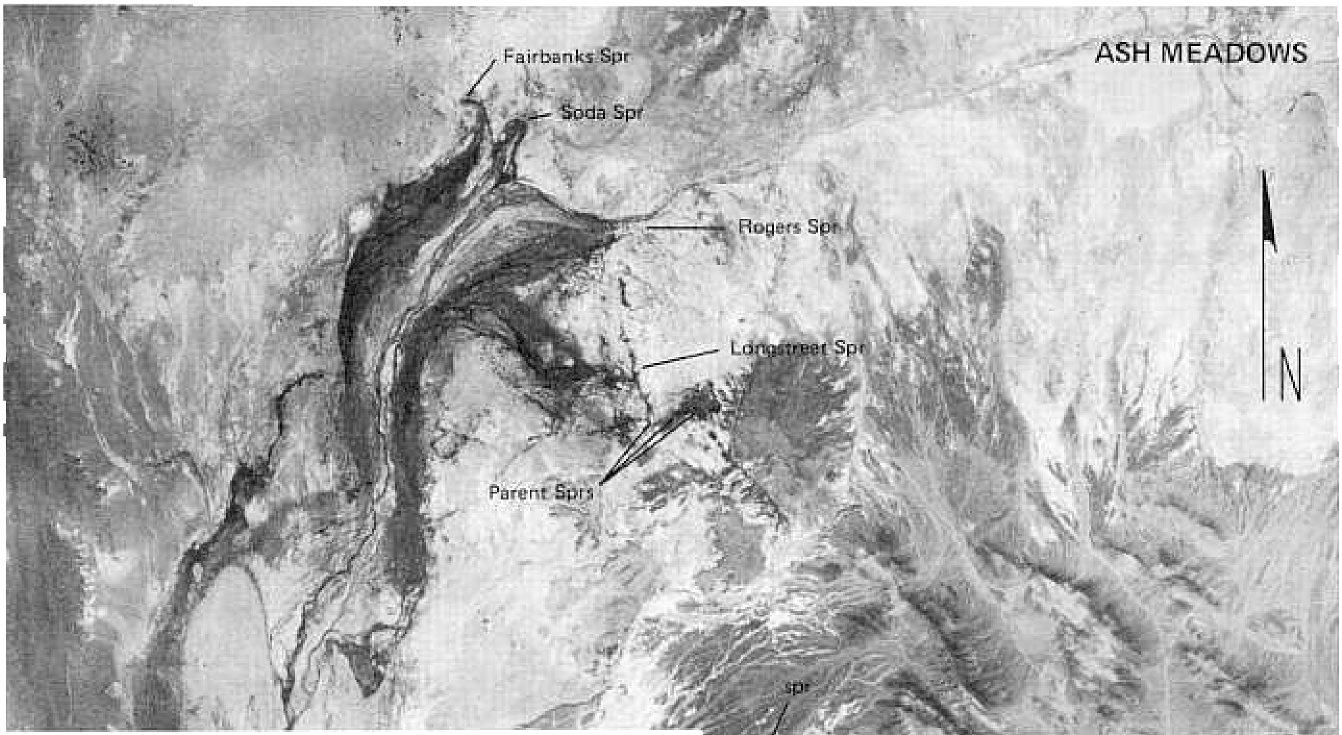
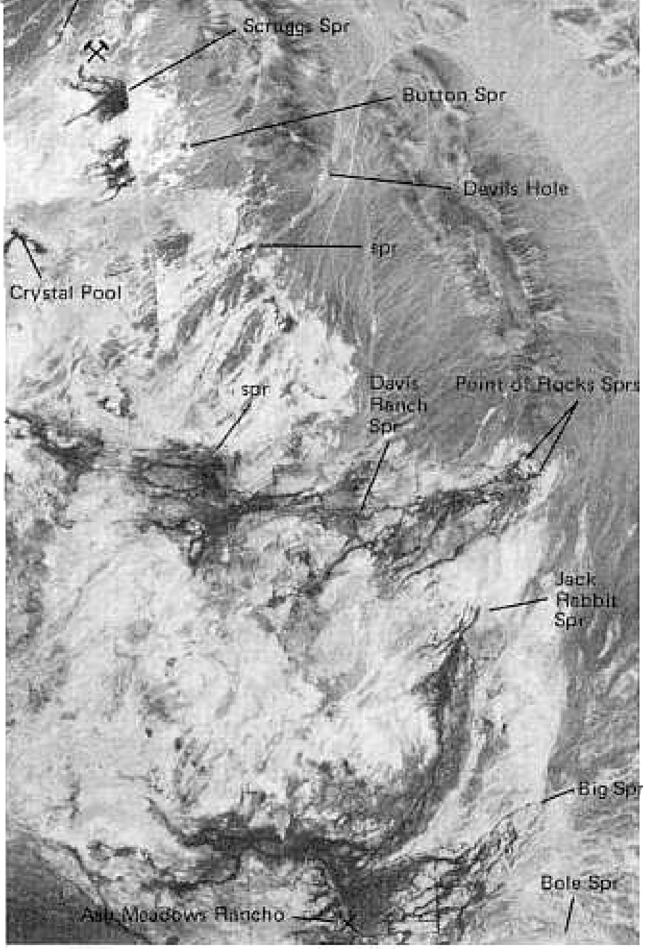
The ground water in Sarcobatus Flat has a relatively uniform temperature of 72°F, which is 16°F higher than the average annual air temperature (Malmberg and Eakin, 1962). This anomalous temperature may be due to the deep circulation that most of the ground water in this area has undergone.

Amargosa Desert [229]

Warm springs and warm water wells are distributed over the southern third of the Amargosa Desert (a few wells are included under this heading in Appendix 1 that are located to the east of the Amargosa Desert). The temperatures reported are mostly less than 90°F, and many wells have temperatures no more than 10 to 15 degrees above the mean annual air temperature. The thermal springs are concentrated in the vicinity of Ash Meadows and the Death Valley National Monument and are almost certainly related to one or more north- and northwest-trending faults along the east side of Ash Meadows. Spring temperatures range from approximately 75° to 93°F, and extensive travertine deposits are present at some springs (Naff, 1973). The source of the spring waters is apparently carbonate aquifers which are exposed in an area to the northeast (Dudley and Larson, 1976).

Pahrump Valley [230]

Several warm springs and a number of warm-water wells are located in Pahrump Valley. The springs include Pahrump (Bennett's) Springs in S14,T20S,R53E; Manse Ranch Springs in S3,T21S,R54E; and Brown's Spring in S15,T22S,R54E, Clark County. Many of the warmer water wells are in the immediate vicinity of these springs, although a few are located elsewhere in the valley.

The mean annual air temperature in Pahrump Valley is 65°F, while spring and well temperatures range from 70° to 82°F. The average temperature gradient in the valley, as determined from water-well data, is approximately 1°F per 85 feet (Malmberg, 1967). All springs with temperatures of 70°F or greater were included in Appendix 1, the same practice followed elsewhere in this report. However, in Pahrump Valley, only water wells having a temperature of 70°F or greater combined with a temperature gradient higher than 1°F per 75 feet were used in this compilation (see fig. 15 for the Las Vegas Basin). Malmberg (1967) suggests that the spring temperature at Bennett's Springs, for example, indicates that the water probably originated from a single water-bearing zone approximately 850 feet deep. The abnormally high ground-water temperatures in Pahrump Valley are probably related to the deep circulation of much of that water.

Other warm springs and wells in Nye County

Most of the thermal springs and wells in Nye County which are not described in the preceding sections are in the northern half of the county. A few deep (1,700–1,800 feet) wells in the Yucca Flat area on the Nevada Test Site are also included in Appendix 1 (see Schaff and Moore, 1964). Water temperatures at the other undescribed springs and wells in Nye County are usually 100°F or less, although a spring in Hot Creek Valley (S30,T7N,R51E) is reported to be 142°F (Hose and Taylor, 1974). Little detailed information is available on these springs and wells in most cases, although a detailed location map is available for Pedro and Reveille Mill Springs (fig. 37).

PERSHING COUNTY

Leach (Pleasant Valley, Nelson's, Guthrie) Hot Springs [235]

Leach Hot Springs are located near the south end of Grass Valley in S36,T32N,R38E, slightly more than 1 mile west of the major frontal fault on the west side of the Sonoma Range. The springs have several other names, including Pleasant Valley, Nelson's, and Guthrie Hot Springs. The spring temperatures reported at Leach are up to boiling, which would be 204°F at that elevation. Tempera-

PERSHING COUNTY (continued)

tures as high as 212°F are reached within 100 feet of the surface (Olmsted and others, 1975) as seen in Figure 38. The estimated thermal aquifer temperature is between 311° and 349°F for the various chemical geothermometers (Mariner and others, 1974). The spring flow is used for stock watering and irrigation at a ranch just west of the springs.

The springs issue from steeply inclined, fault-controlled conduits in Quaternary alluvium and Tertiary sedimentary rocks. Late Paleozoic and early Mesozoic sedimentary and volcanic rocks are exposed east of the springs (fig. 39) and probably underlie the spring area at depths of several hundred feet (Olmsted, 1974; Olmsted and others, 1975).

Leach Hot Springs lie on a prominent 20- to 30-foot-high fault scarp in the alluvium. This scarp is part of a system of faults related to the major north-trending boundary fault along the Sonoma Range. This major fault can be traced for several miles to the north of the springs, and probably continues to the south through Mud Spring and somewhat to the west of the Goldbanks Mining District on the eastern edge of the East Range. In the Goldbanks Mining District, a mercury-bearing silica "apron" of chalcedony and minor opaline silica forms a north-trending, linear mantle over Miocene fanglomerates and silicic tuffs (Dreyer, 1940; Noble and others, 1975). The silica deposition here is of hot springs origin (Dreyer, 1940) and appears very similar to the sinter deposits in the Leach Hot Springs area. However, Noble and others (1975) report that the Goldbank mineralized rocks are intruded and overlain by

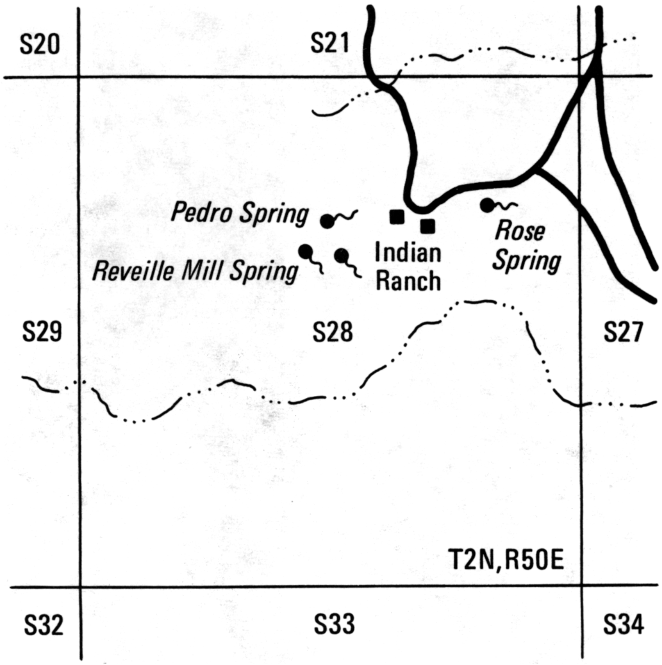
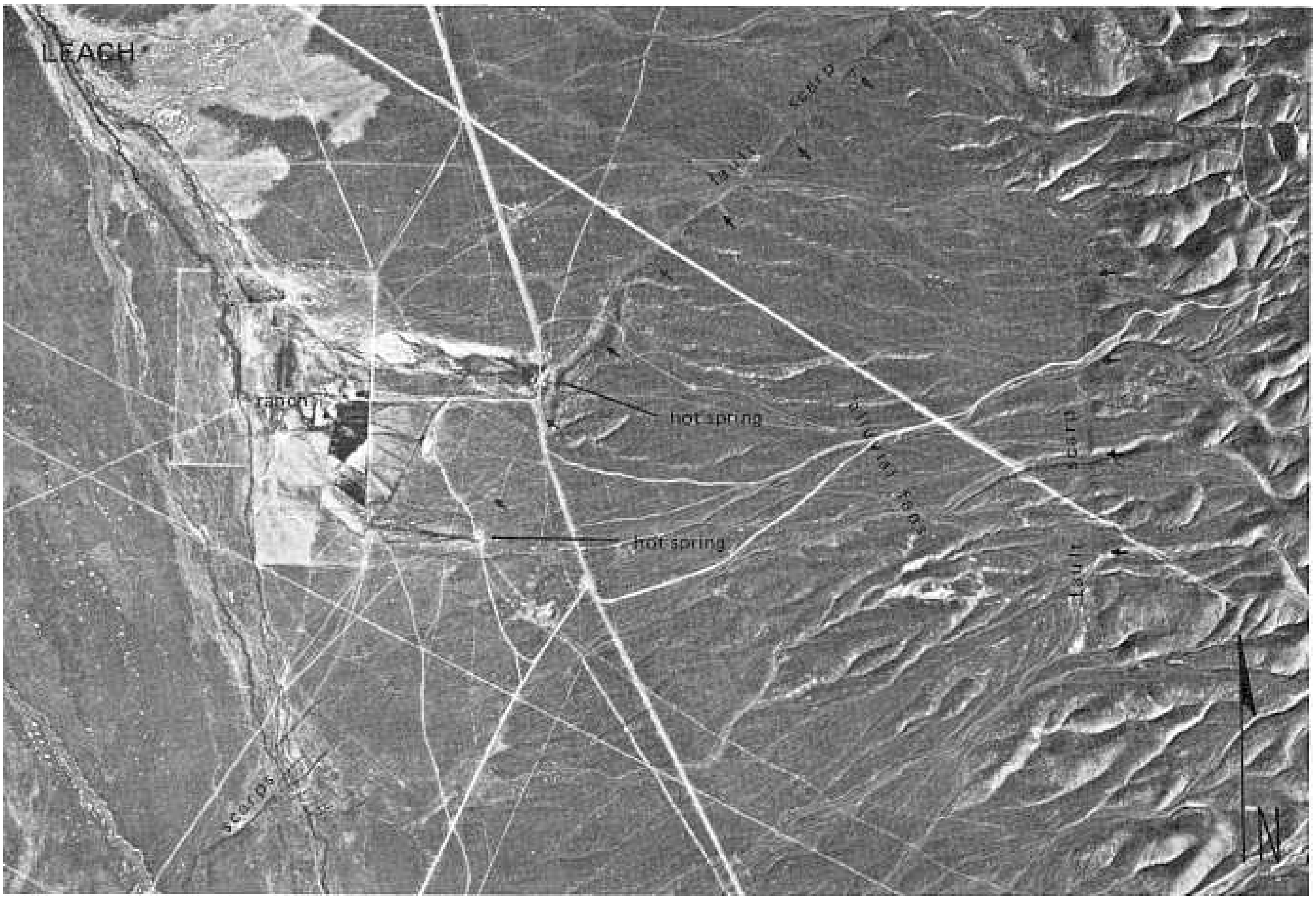


FIGURE 37. Reveille Mill and Pedro Warm Springs, Nye County (from sketch map by Alvin McLane).

12 to 15-m.y.-old basalts and rhyolites, indicating a Miocene age for the Goldbanks deposits. Therefore, it seems likely that the Goldbanks mineralization is a shallow manifestation of the hydrothermal systems which produced the many 14 to 16-m.y.-old precious deposits in northern



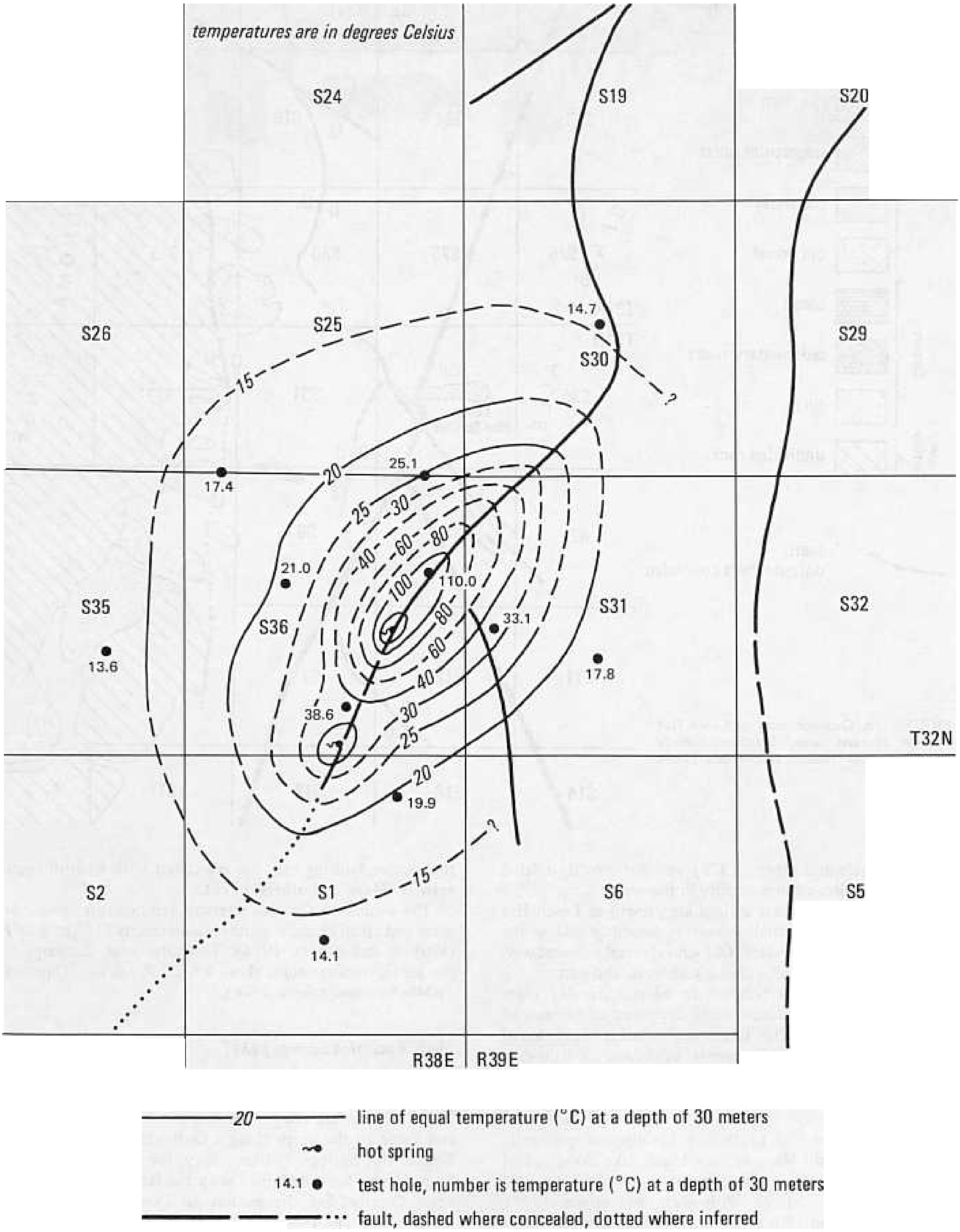
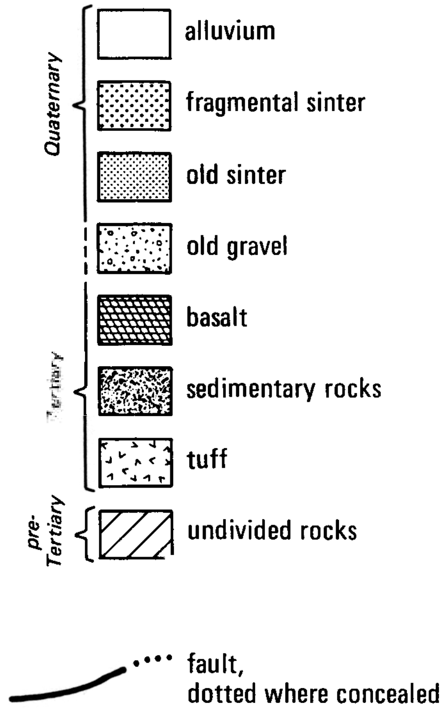


FIGURE 38. Map of Leach Hot Springs thermal area, Pershing County, showing temperatures at a depth of 30 meters, December, 1973 (modified from Olmsted and others, 1975, figs. 31 and 33).



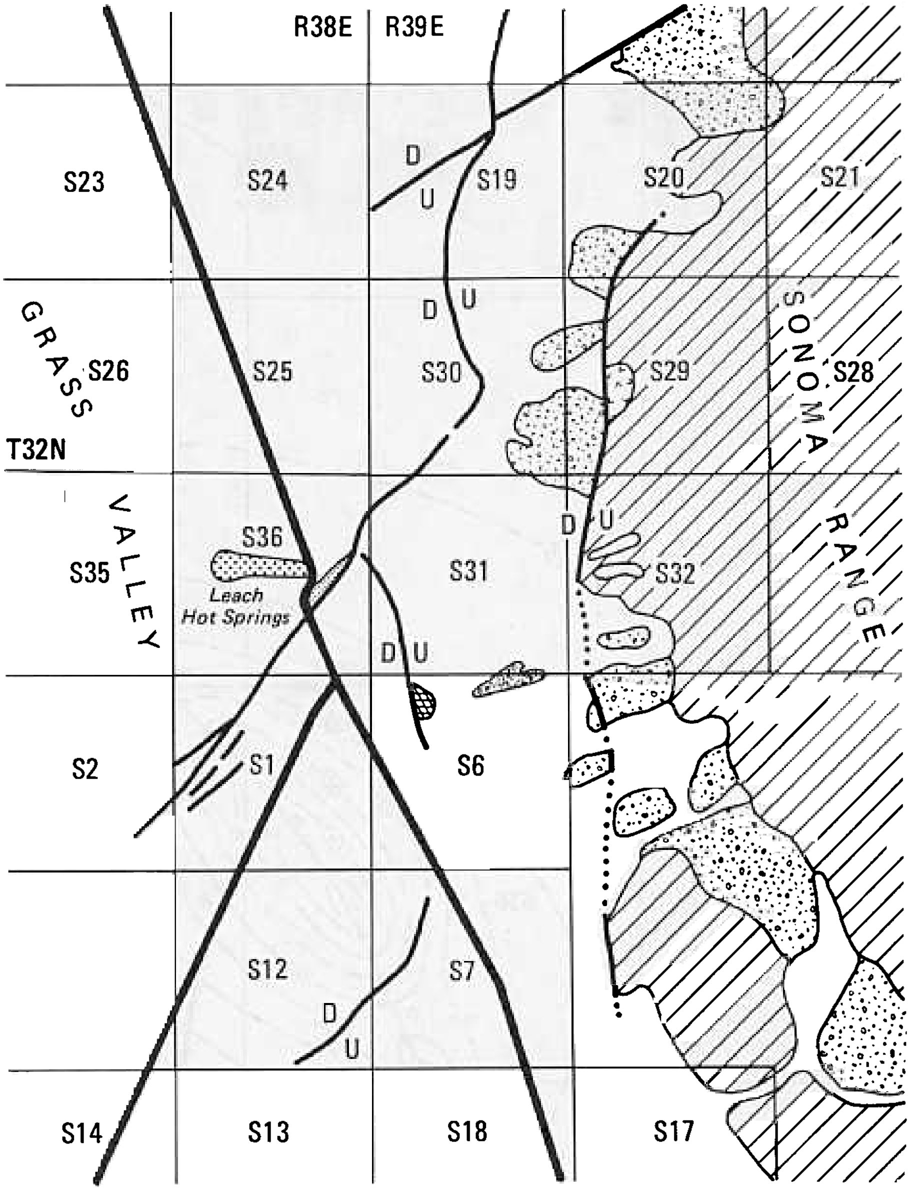


FIGURE 39. Geologic map of Leach Hot Springs thermal area, Pershing County (modified from Olmsted and others, 1975).

Nevada (Noble and others, 1975), and not directly related to the present hot-springs activity in the area.

More than 30 separate springs are present at Leach Hot Springs, and the material depositing presently and in the past is predominately silica. Old sinter, mainly chalcedony, is exposed along a half-mile-long zone to the east of the springs. This sinter is believed to be considerably older than the opaline sinter now being deposited to the east of the springs (fig. 39). This fragmental sinter is composed of pebble- to sand-sized fragments of white to light-gray opaline silica down gradient from the springs. The fragments have been distributed by spring runoff (Olmsted and others, 1975).

The fault system at Leach Hot Springs was apparently established in early Miocene, as a basalt dike along one of the faults in the spring area (fig. 39) is 14 to 15 m.y. old (Noble and others, 1975; Wollenberg and others, 1975). Many of these faults cut some of the alluvial deposits in the valley and act as ground-water barriers. A zone of intersecting lineaments southwest of the springs corresponds to an area of appreciable microearthquake activity, suggesting that active faulting may be associated with hydrothermal activity (Majer and others, 1976).

The estimated thermal reservoir temperature, based on silica and alkali-element geothermometers, is 311° to 349°F (Mariner and others, 1974). The total heat discharge of the geothermal system is about 1.8 x 10^6 cal/sec. (Olmsted, 1974b; Sass and others, 1976).

Black Rock Hot Springs [131]

Springs in S3,10,T35N,R26E just inside the north boundary of Pershing County have temperatures up to 204°F. These are related to springs at Black Rock Point and those to the north along a fault which passes through Double Hot Springs. For simplicity, the springs in Pershing County have been described with the larger group in Humboldt County. See the section on Double Hot Springs–Black Rock Hot Springs. The fault at Black Rock Hot Springs crosses the Black Rock Desert and joins with a basin-margin fault at Trego (see the following description of the Trego area).

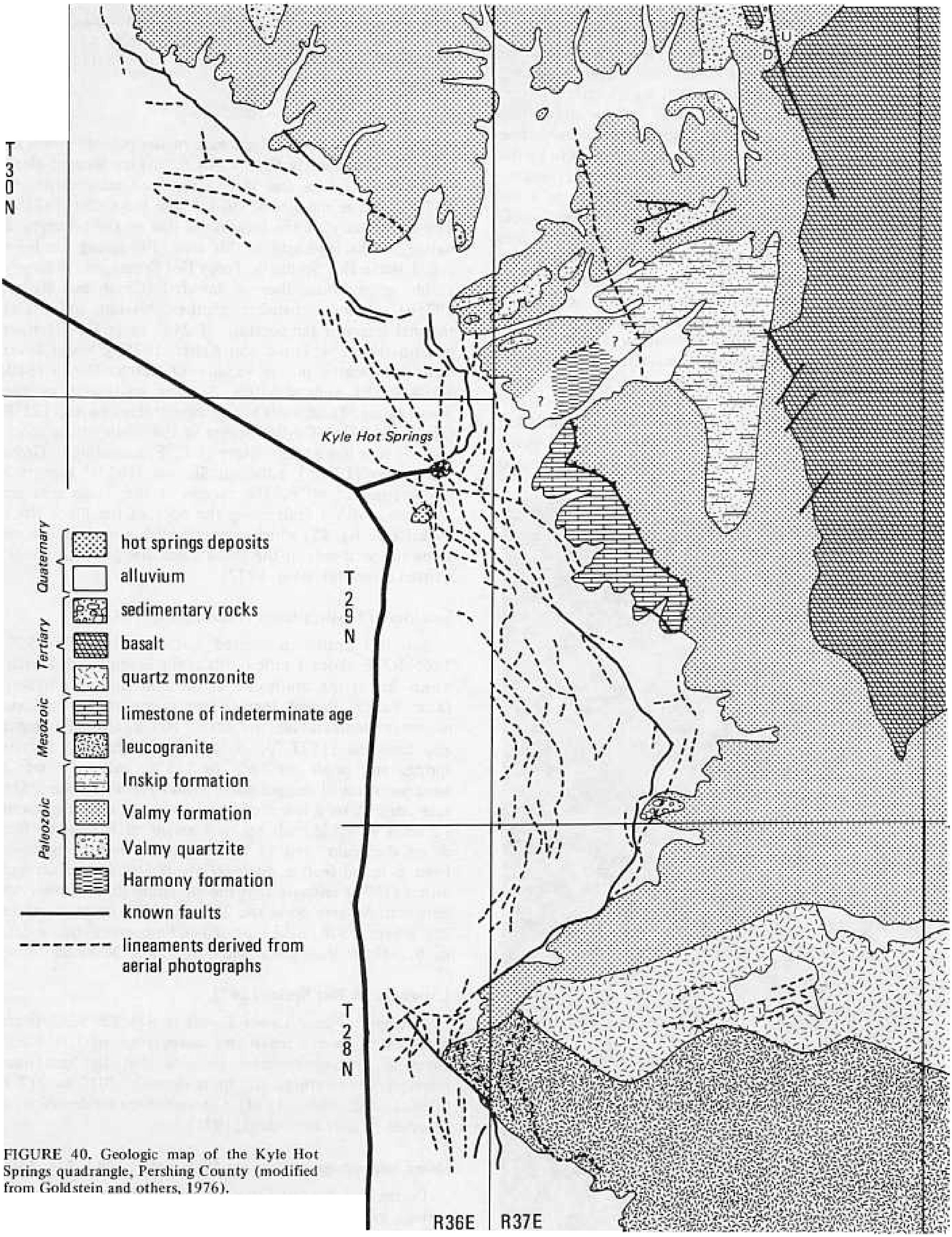
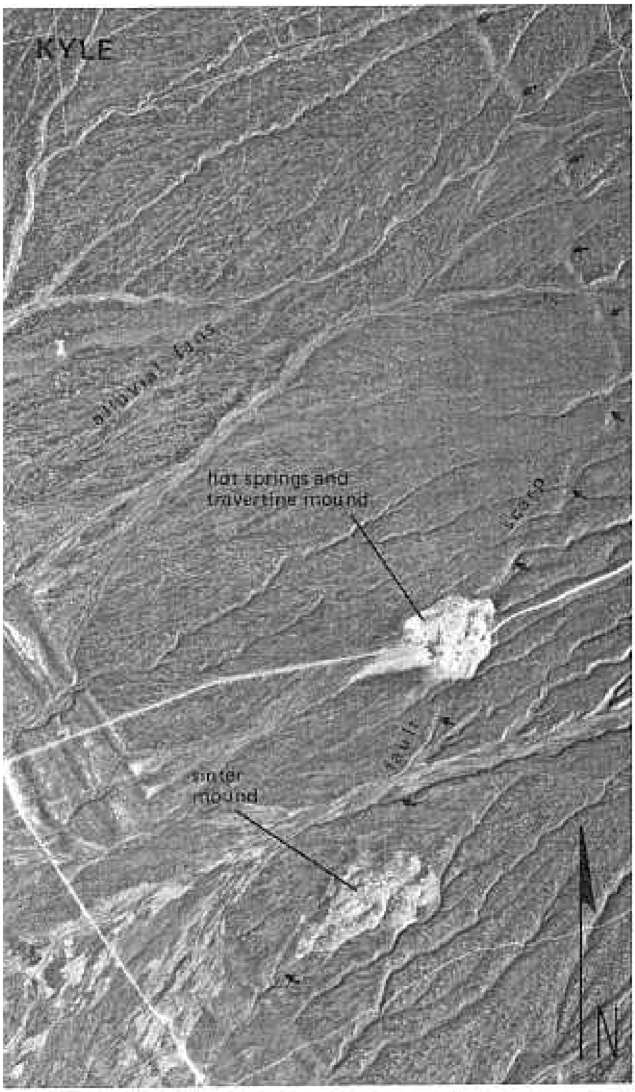


FIGURE 40. Geologic map of the Kyle Hot Springs quadrangle, Pershing County (modified from Goldstein and others, 1976).

Kyle Hot Springs [238]

Kyle Hot Springs are located in S1,12,T29N,R36E. The locality is on the east edge of Buena Vista Valley less than 1 mile west of a mountain-front fault which cuts alluvium (Stewart and Carlson, 1976b). The springs and spring deposits are clearly associated with several intersecting sets of faults (fig. 40). North-trending faults seem to be the principle conduits for thermal water (D. C. Noble, written communication, 1974). The spring area consists of a circular pool 6 feet in diameter which has little if any visible discharge. A low mound of siliceous sinter about 450 feet in diameter is present, and siliceous sinter and sulfur are presently being deposited. The odor of H_2S is noticable. The area has been used in the past as a health resort by a few people from Lovelock and other communities (Loeltz and Phoenix, 1955, p. 30–31). Wollenberg (1974b) reports that the pools are anomalously radioactive (250 to 500 μR/hr). The maximum temperature has been variously reported as 159°F (Loeltz and Phoenix, 1955), 171°F (Mariner and others, 1974) and 204°F (Sanders and Miles, 1974). Mariner and others (1974) report that the spring deposits are mostly travertine with a trace of disseminated silica, and they estimate the thermal-aquifer temperature to be 340° to 381°F by use of the silica and Na-K-Ca geothermometers. D. C. Noble, (written communication, 1974) reports that spring deposits about 0.7 miles southeast of the present Kyle Hot Springs contain considerable amounts of siliceous sinter.



Trego area [233]

Hot springs about 1.8 mi east of the railroad siding of Trego (approximately S31?,T34N,R26E) are located along the railroad tracks and have a reported temperature of 187°F (Mariner and others, 1974; Grose and Keller, 1975b). The uncertainty of the location is due to the unsurveyed nature of the land grid in this area. The spring has been called Butte Hot Spring or Trego Hot Spring, and is clearly visible on airborne thermal infrared (Grose and Keller, 1975b). Various chemical geothermometers indicate a thermal reservoir temperature of 248° to 262°F (Mariner and others, 1974; Grose and Keller, 1975b). Warm water wells are located in the vicinity of Garrett Ranch (S10, T33N,R25E) approximately 2 miles southwest of the Trego siding. These wells have temperatures of up to 125°F (Sinclair, 1963a). Coyote Spring to the north of the ranch about 1 mile has a temperature of 72°F, according to Grose and Keller (1975b), although Sinclair (1963a) reports a temperature of 60°F. The springs at the Trego area are associated with a fault along the edge of the Black Rock Desert (see fig. 41) which connects with a long fault zone along the west side of the Black Rock Range (L. T. Grose, written communication, 1977).

Sou (Seven Devils, Gilbert's) Hot Springs [243]

Sou Hot Springs is located mainly in the SW/4 S29, T26N,R38E about 1 mile north of the Seven Devils Ranch, which lies at the south end of the Sou Hills in northern Dixie Valley. Recent temperature measurements indicate maximum temperatures are about 163°F, although Hague and Emmons (1877, p. 705) reported that the hottest springs and pools are 160° to 185°F, and there was a great variation of temperatures within a short distance. The area consists of a low mound of travertine covering about 12 acres which is built up to a height of at least 60 feet above the plain. Ten to twelve circular hot-spring pools from 6 to 60 feet in diameter are reported. Mariner and others (1974) estimate that the minimum thermal-reservoir temperatures may be in the 212° to 237°F range. Senterfit and others (1976) have reported audiomagnetotelluric data in the Dixie Valley Known Geothermal Resource Area.

Lower Ranch Hot Spring [247]

Hot springs near Lower Ranch in S16,T25N,R39E are reported to have a maximum temperature of 104°F and chemical geothermometers indicate that the minimum reservoir temperatures are approximately 201° to 212°F (Mariner and others, 1974). Calcareous spring deposits are reported (Muller and others, 1951).

Other hot springs in northern Dixie Valley [244, 246, 248]

Cohen and Everett (1963) report that virtually all the springs in Dixie Valley are thermal. Hyder or Cone Hot Springs in S28,T25N,R38E have reported temperatures from 83° to 175°F (Cohen and Everett, 1963), and McCoy

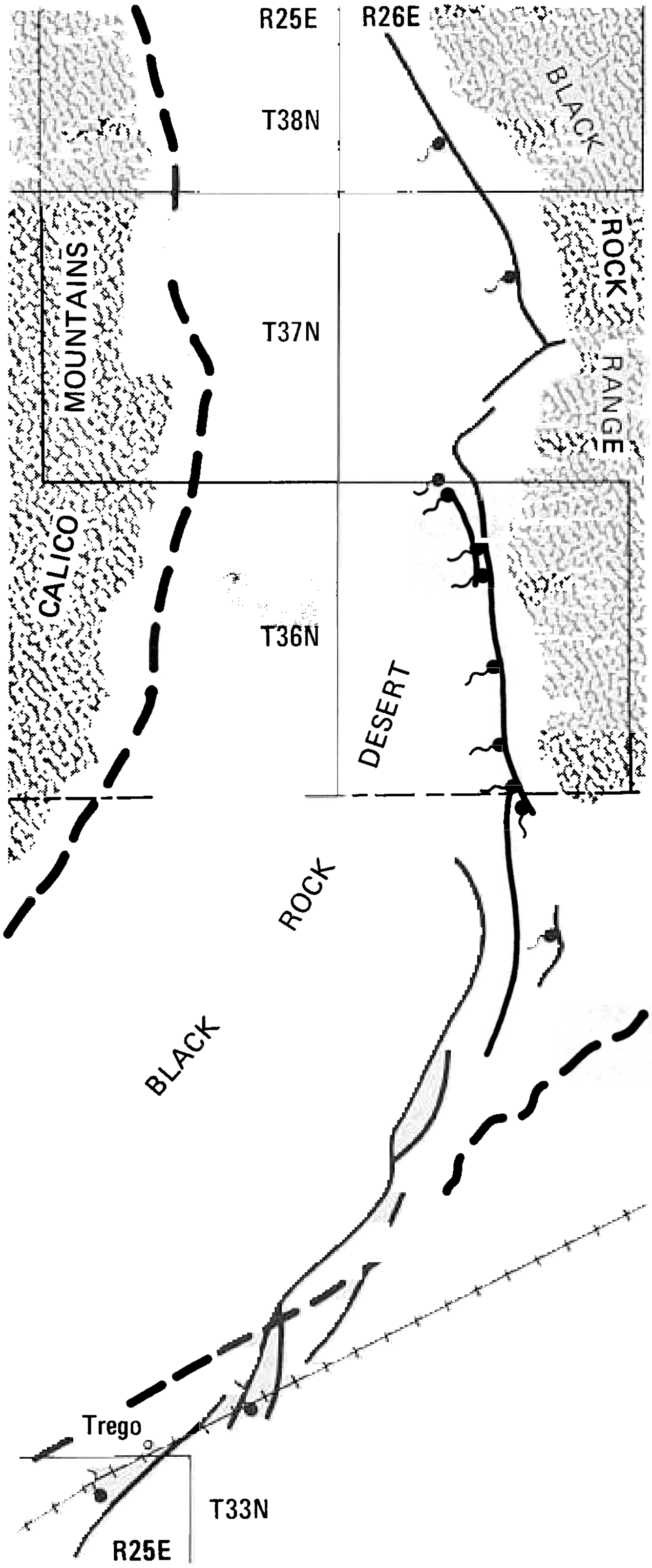


FIGURE 41. Map of Black Rock Fault and associated thermal springs, Humboldt and Pershing Counties (after unpublished map by L. T. Grose, 1975).

Springs in S33,T26N,R39E are approximately 120°F. In addition, a warm spring (83°F) is reported in S19,T25N, R39E near the end of a long line of springs along a northwest-trending fault system which cuts the alluvium and intersects the McCoy Springs area approximately 4.5 miles to the northwest (Stewart and Carlson, 1976b; Cohen and Everett, 1963). Hot springs in southern Dixie Valley are described in the Churchill County section of this report.

Jersey Valley [242]

Springs in S28,29,T27N,R40E along the east side of Jersey Valley have temperatures of 84° and 135°F (Cohen and Everett, 1963; Mariner and others, 1974). The springs appear to lie along a possible projection of a mountain-front fault shown by Stewart and Carlson (1976b). A low hill of travertine and siliceous sinter over half a mile long is present in the spring area in SW/4 SW/4 S28,T27N,R40E (Ferguson and others, 1951b). Estimated thermal aquifer temperatures are 288° and 360°F for the silica and Na-K-Ca geothermometers respectively (Mariner and others, 1974).

Colado [239]

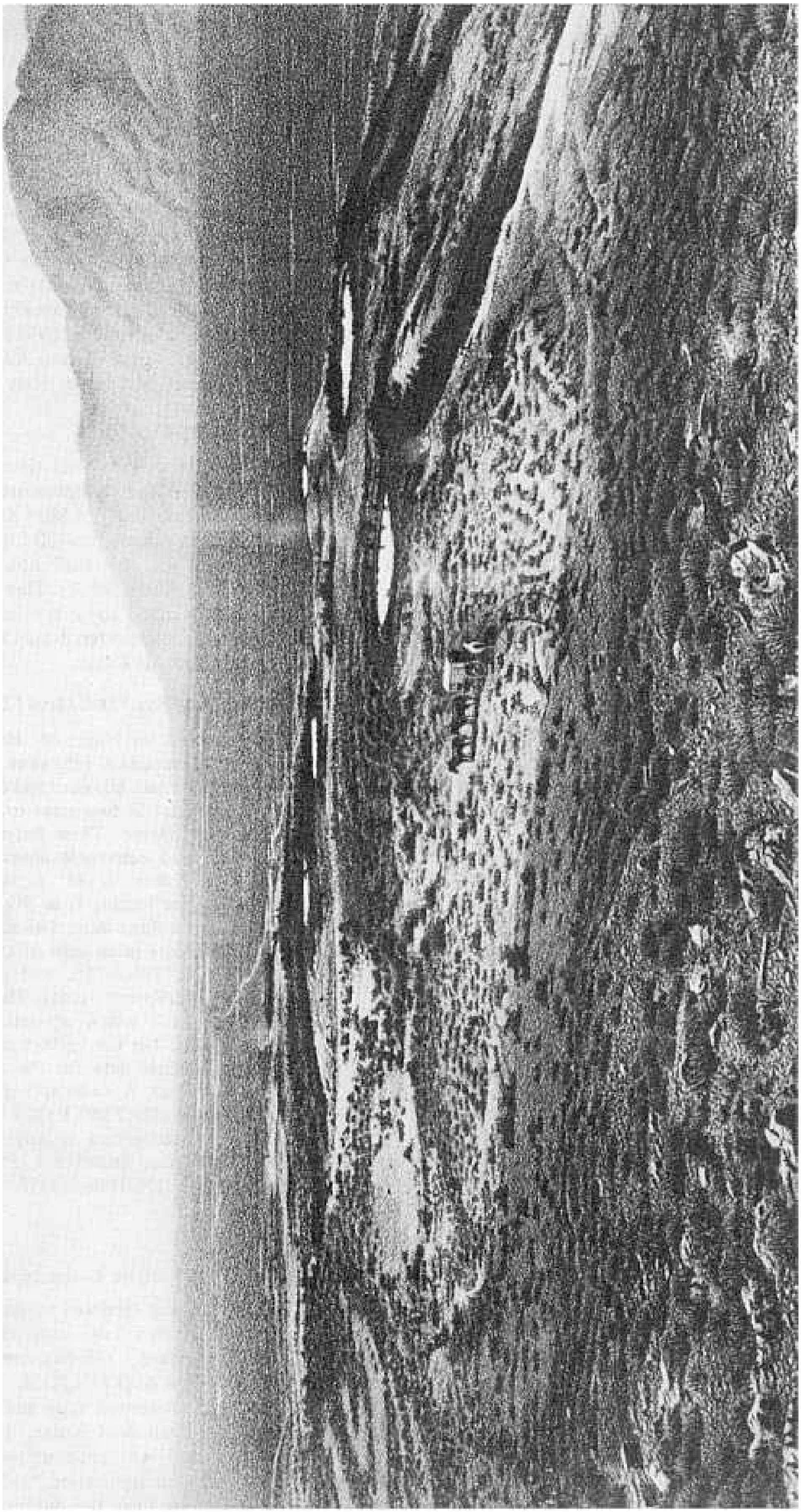
A water well (Mineral Materials well) in SE/4 S33,T28N, R32E has 150°F temperatures; 155°F water was reported in a drill hole in NE/4 SE/4 SE/4 S27,T28N,R32E, and hot water was noted in a 30-foot-deep shaft about 350 feet southwest of this drill hole (Everett and Rush, 1965; Pruss and others, 1961). This area is named for the railroad siding of Colado about 6 miles northeast of Lovelock. The hot waters encountered may be related to faults along the West Humboldt Range.

Humboldt (Rye Patch) area [236]

Humboldt or Humboldt House, 32 miles north of Lovelock, was founded in 1868 as an eating station along the Central Pacific Railroad. Siliceous and calcareous spring deposits occur as low domes in two areas to the south and to the west of Humboldt House. These hot-spring deposits contain sulfur, gypsum, and detectable amounts of mercury (Vanderburg, 1936, p. 17; Russell, 1885, p. 54, 55; Bailey and Phoenix, 1944, p. 107). One locality is in SW/4 SE/4 S33,T32N,R33E, and consists of a sinter mound about 1,000 by 700 feet. The second locality occurs in an area of Quaternary sandstone in NW/4 SW/4 S32,T32N,R33E, and is about 500 feet in diameter (Olcott and Spruck, 1961). The area is about 1 mile west of a major fault which separates Mesozoic rocks and surficial deposits. No hot springs are known in the area. Audio-magnetotelluric data for the area is available in Long and Batzle (1976c). A warm spring was reported from the site of Rye Patch (S20,T30N,R33E) by Crofutt (1872), but it has not been recognized in any more recent studies. Phillips Petroleum Co. drilled a 1,853-foot-deep geothermal test in SE/4 S21,T31N,R33E in 1977. Temperatures up to 325°F were reported.

New York Canyon kaolin deposit [245]

Steam was reported to issue from a development drill hole at the New York kaolin deposit in 1963. The drill hole is approximately 140 feet deep, and is located in the vicinity of SW/4 S1,T25N,R35E. The kaolin deposit is of the shallow, hot-springs type and contains irregular bodies of associated siliceous sinter. The sinter is exposed at the surface and was encountered during drilling (K. Papke, personal communication, 1977). The sinter and thermal water occur near the mountain front along a fault scarp



Sou Hot Springs in Dixie (Osobb) Valley, Pershing County (from lithograph, Hague and Emmons, 1877, plate 20).

which cuts the alluvium. This fault is probably part of a young Basin-and-Range fault shown by Stewart and Carlson (1974) cutting the alluvium in southern Buena Vista Valley.

STOREY COUNTY

Comstock mining district [252]

The silver-gold mines along the Comstock Lode were known for their extremely hot, difficult working conditions (Lord, 1883, p. 389–406); the miners commonly worked in temperatures ranging from 100° to 125°F. Church (1879, p. 289) considered the Comstock mines "to be the hottest in the world." Smith (1943, p. 245) states that "no other mines in the world have encountered such heat and such floods of scalding water."

Because of variations in ventilation, air temperatures in the workings varied considerably over short distances and are difficult to interpret. Rock temperatures also were modified by ventilation and water removal, thus temperatures taken in drill holes or immediately after a rock face was exposed are more useful. As Locke (1912) put it, the "temperatures are deranged by the presence of the mine workings which make possible the presence of the observer."

In a general way rock temperatures in these mines increase 3½°F for every 100 feet of depth (Becker, 1882, p. 230; fig. 42). This gradient persisted for some distance away from the Lode, but water temperatures taken at the face of the Sutro drainage tunnel while it was being driven showed that temperatures rose rapidly as the Lode was approached, even though the depth of the tunnel below the surface remained relatively constant (fig. 43). Water presently flowing from the portal of the tunnel in Lyon County is 83°F (Glancy and Katzer, 1975).

The highest rock temperature recorded was 167° from a dry drill hole on the 3,000-foot level of the Yellow Jacket Mine (diary, Superintendent Thomas G. Taylor). Mr. Cosgrove, foreman of the Yellow Jacket measured rock temperatures of 139½° and 136°F on the 2,200-foot level. Temperatures of about 130°F were recorded at numerous spots at depths of 1,900 to 2,000 feet in the Ophir, Chollar, Potosi, Crown Point, and other mines. All these temperatures were measured in drill holes immediately after a hole was finished. The rock surface temperatures of workings in the same area were 123°F or less.

The highest temperature of any considerable quantity of water was recorded during the flooding of the 3,000-foot level of the New Yellow Jacket shaft in November, 1880 (Becker, 1882, p. 230); 170°F water under considerable pressure was struck in a drill hole at a depth of 3,080 feet in the bottom of the shaft and soon flooded the mine. On February 13, 1882, a flood of 157°F water from the 2,800-foot level of the Exchequer Mine again drowned the pumps in the New Yellow Jacket shaft; all the mines in the vicinity were flooded, the water rising to the level of the Sutro drainage tunnel (annual report, Superintendent Thomas G. Taylor, July 1, 1882). A small flow of water in the east crosscut on the 2,000-foot level of the Crown Mine had a temperature of 157°F (Church, 1879, p. 291). The body of water that flooded the Savage and Hale, and Norcross Mines in 1877(?) still had a temperature of 154°F two years later

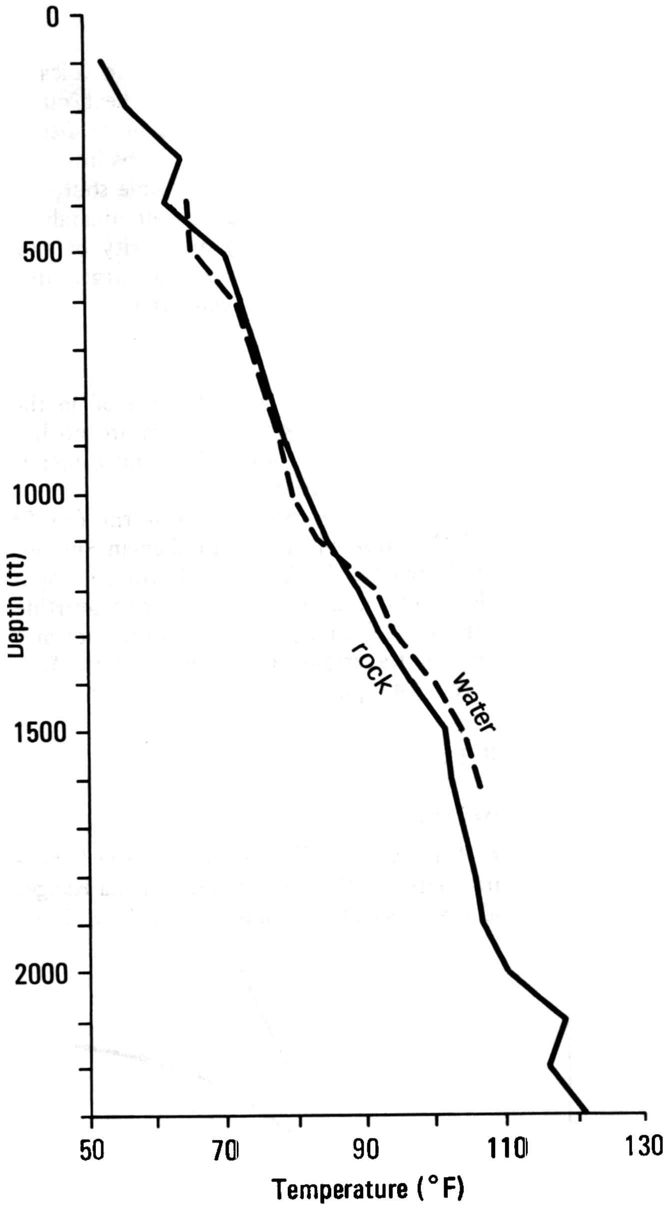


FIGURE 42. Temperatures in the Forman Shaft, Comstock Lode, Storey County (after Becker, 1888). Measured as the shaft was sunk.

(Church, 1879, p. 291) even though over a million tons of water had been removed.

As would be expected, the circulation of water was eccentric. Numerous clay seams sealed off the flow. Cutting such a clay seam frequently released dammed-up bodies of water which flooded the workings. The seams also appear to have greatly inhibited the upward convective flow of the hot water; there were no hot springs along the Lode's surface croppings, and the water encountered in the upper workings was cold, suggesting that the upward flow of hot water was feeble compared to the downward percolation of meteoritic water. The "perched," imprisoned nature of much of the water encountered is illustrated by the fact that once the water level was lowered below the Sutro tunnel, the water never rose to that level again (as long as the workings remained open to observation), even after pumping had stopped. The Comstock Lode obviously did not provide as easy a passageway for the upward flow of hot water as one might expect.

STOREY COUNTY (continued)

The restricted flow strongly suggests that the volcanic and intrusive wall rocks were the source of the heat, rather than the heat being introduced from some more distant source by hot-water flow. Exothermic reactions involving vein materials have been proposed as a possible source of the heat, but the low acidity and relatively unmineralized condition of the water (Appendix 1), and rarity of exothermic reaction products in the vein material suggest that little heat has been generated by this mechanism.

Other areas [249, 250, 251]

Although abundant hot water was encountered in the mine workings on the Comstock Lode, there are no hot springs in the vicinity. In fact, hot springs and evidence of past springs are rare in the entire county.

Waring (1965, Nevada no. 58) lists a warm (73°F) spring in T19N,R23E; probably this is Biddleman Springs, the only springs shown on the Churchill Butte 15′ topographic map. He mentions also a large area of travertine in S2,T17N,R22E (no. 251, pl. 1) and a small terrace and some fissure-filling of travertine in the center of the W/2 S21,T19N,R21E (no. 249, pl. 1).

WASHOE COUNTY

Truckee Meadows area

The Truckee Meadows area (fig. 44) includes the Reno–Sparks urban area between the Carson and Virginia Ranges on the west and east, respectively, and from Peavine Mountain to the north to the Steamboat Hills on the south. In general, the data in Appendix 1 in T17,20N and R19,20N would be generally considered to fall within the Truckee Meadows. This would include also a few warm-water wells in Pleasant Valley, which is technically outside of the Truckee Meadows. This area is just to the south of Steamboat Hot Springs and probably associated with that system. In Appendix 1 most of the water-quality data has been separated into several groups: Lawton Hot Springs, Moana Hot Springs, Steamboat Hot Springs, Pleasant Valley, etc. This separation, in a few cases, has been done somewhat arbitrarily.

Wedekind Mine [274]

In 1903 the Wedekind shaft in the Wedekind Mining District (SW/4 S28,T20N,R20E) encountered hot, acid water at 213 feet. A 150-gallon-per-minute pump was able to hold the water at the 100-foot level. The water was heavily charged with H_2S, and several miners in the bottom of the shaft were overcome by heat and H_2S (Morris, 1903; Overton, 1947, p. 84). No other evidence of thermal ground water is available, as there have been few recent water wells drilled in this area.

Lawton Hot Springs [275]

Hot springs along the Truckee River about 6 miles west of downtown Reno (SW/4 NE/4 S13,T19N,R18E) were named for Sam L. Laughton, who was the proprietor of a spa on the site in the mid-1880's. They were originally called Granite Hot Springs, but the name Lawton was used for a station on a spur of the Southern Pacific Railroad

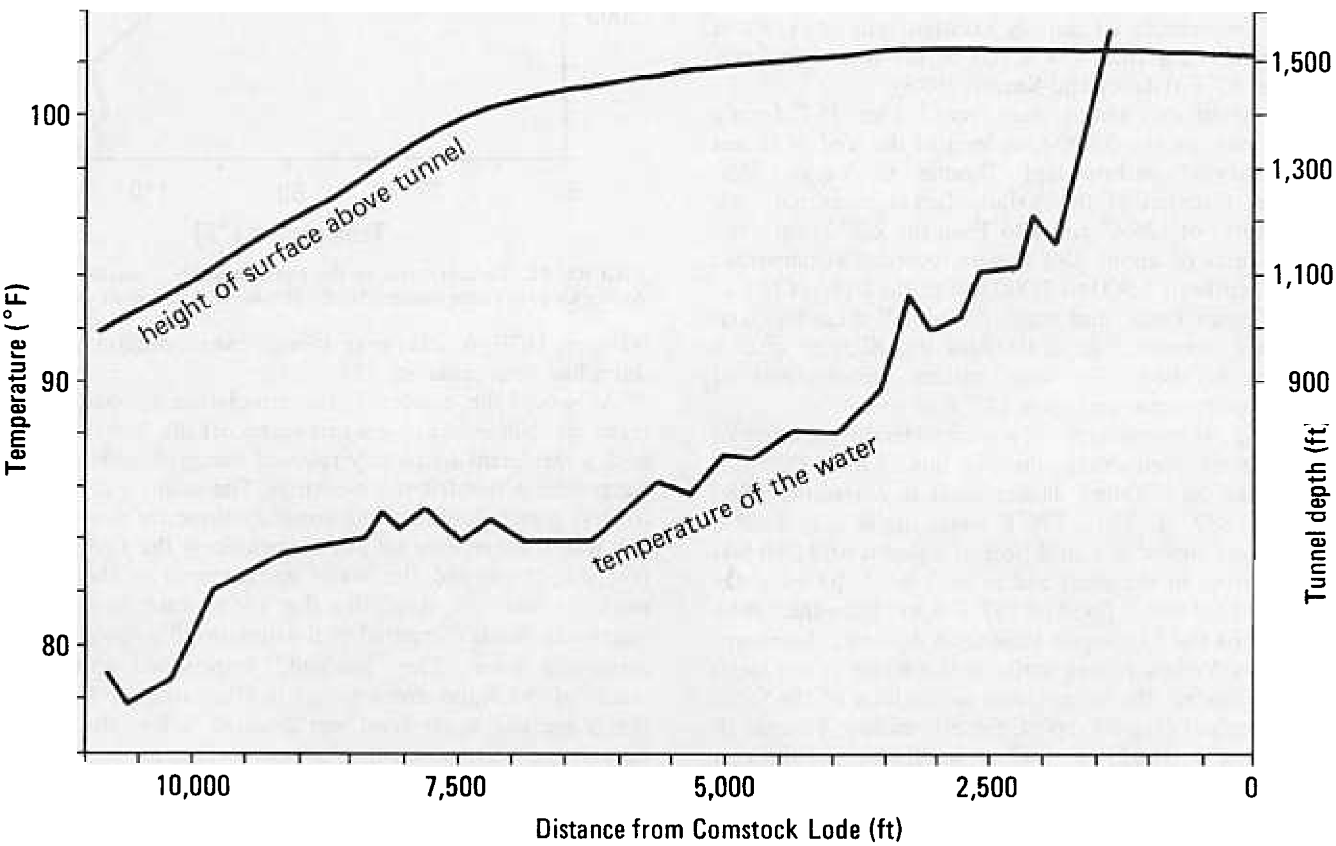


FIGURE 43. Water temperatures in the Sutro Tunnel (after Becker, 1888). Measured as the tunnel was advanced.

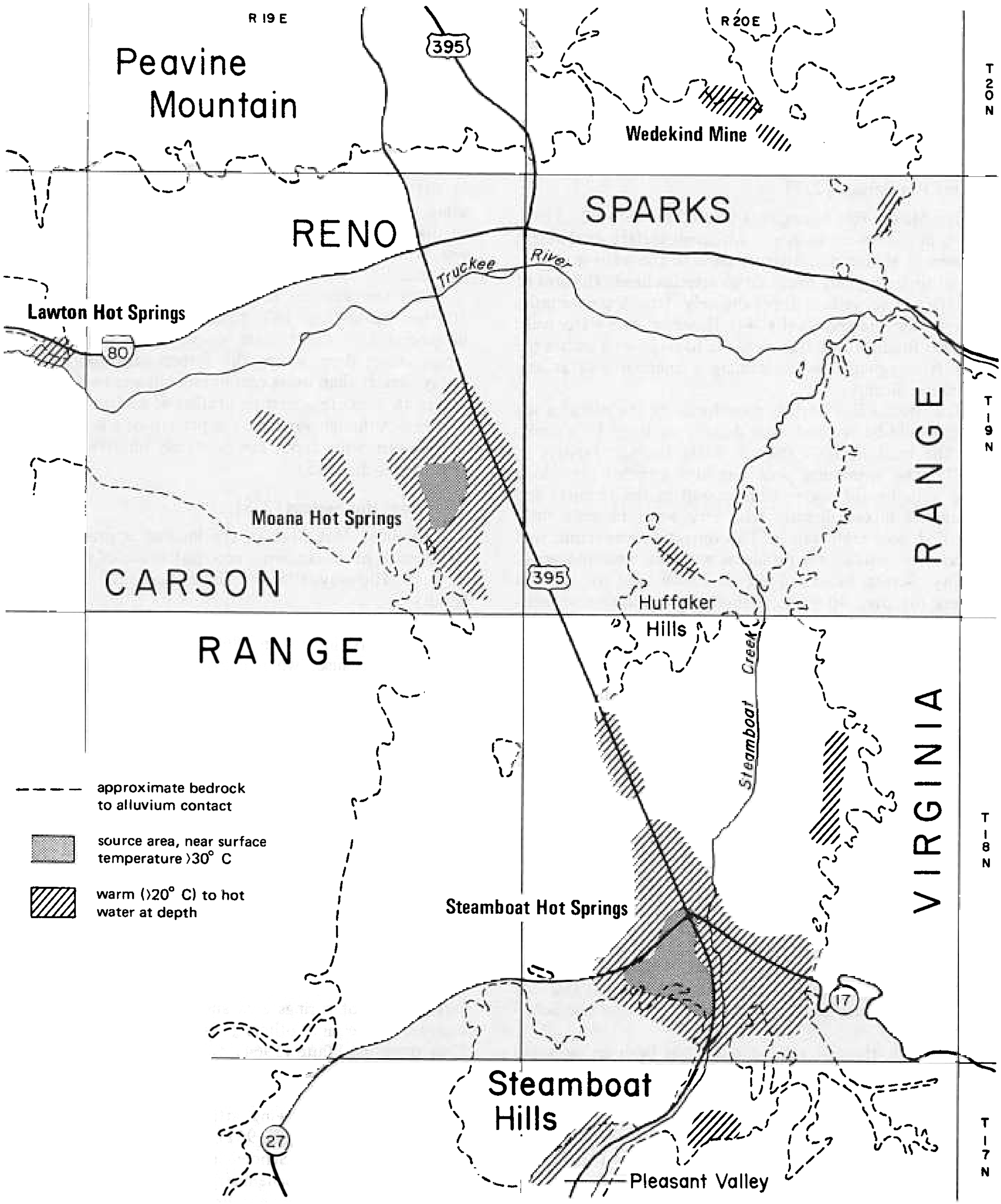


FIGURE 44. Map showing areas of known thermal ground-water occurrence in the Truckee Meadows, Washoe County (modified from Bateman and Scheibach, 1975).

(Carlson, 1974). The springs had a temperature of 120°F, and an artesian well is reportedly 140°F (R. B. Scheibach, written communication, 1975). Lawton Hot Springs lie at the northwestern end of a 12-mile-long zone of thermal ground water which extends from Steamboat Hot Springs to the southeast. The hot water at Lawton Hot Springs is used today in a bathhouse at the River Inn hotel-casino.

Moana Hot Springs [277]

The Moana Hot Springs are located in NE/4 S26,T19N, R19E in southwestern Reno. Although surface discharge is at present almost nonexistent, some of the wells drilled in the surrounding area maintain an artesian head. The area of thermal water wells is approximately 4 to 5 square miles centered on the springs (fig. 44). However, cold water wells are also found within this area, and having a well within the area is no guarantee of striking a thermal well at any particular locality.

The Moana Hot Springs were formerly the site of a spa which could be reached from downtown Reno by a streetcar line built in 1907 (Nevada State Journal, January 2, 1977). The swimming pool was also supplied for a long time with heated water from a well in the vicinity, and water was mixed directly with city water to maintain a specified pool temperature. This operation was terminated because of production problems with the well and water quality. Several homes in the area have used the thermal waters for over 40 years, although the number of wells has increased markedly in the past 10 years as the Reno residential area has expanded. Over 30 homes and three commercial establishments now utilize the geothermal waters for space heating; other uses include the heating of domestic hot water and water for swimming pools. Most of the systems use down-hole heat exchangers, and circulate city water through finned-tube baseboard heaters. Thermostatically controlled pumps are installed in most systems. Bateman and Scheibach (1975) discuss the utilization of the Moana geothermal waters in more detail.

Location of the Moana thermal system is thought to be controlled by north-south-trending faults that parallel the front of the Carson Range to the west (Bateman and Scheibach, 1975; Bonham and Bingler, 1973). Several faults in this area cut glacial outwash deposits of Illinoian age (E. C. Bingler, oral communication, 1977). It has also been noted that there is a striking north-south alignment of those wells with artesian head (past and present) and that the alignment may mark a fault trace (Bateman and Scheibach, 1975).

Although thermal ground water has been encountered in wells over an area of several square miles (fig. 44), the highest temperatures, as well as the area of maximum use for space and domestic hot water heating, is concentrated in an area slightly over 2 square miles (fig. 45). The wells in the Sweetwater Drive–Manzanita Lane area (SE/4 NE/4 S26,T19N,R19E) are usually 100 to 300 feet in depth and many have temperatures of 160° to 185°F. To both the north and west of this area, it has been necessary to drill deeper wells to encounter thermal waters. These hot waters when encountered in drilling are associated with a "blue" clay zone which directly overlies the Tertiary bedrock units here and may be up to 150 feet thick. The hot water is not generally found above this "blue" clay zone (Bateman and Scheibach, 1975). If the water moves upward through faults in the bedrock, this clay zone may act as a relatively impermeable cap, forcing the water to diffuse laterally (and vertically) away from the fault zone. Noticeable increases in water temperature were observed when certain wells were drilled through the contact between the clay and underlying bedrock. The existence of an artesian head only in wells drilled along a certain alignment, presumably a fault, may further support this theory of near-surface operation of the system. Wells drilled into or through the clay at some distance from such an input zone would tend not to display artesian conditions due to the hydraulic head loss involved in moving water laterally through the clays and andesite.

Water temperatures encountered at depths in excess of 100 feet range from 167° to 205°F. Deeper wells do not in general have the highest temperatures, suggesting that temperatures deep within the system may not be appreciably greater than those encountered nearer to the surface. Figure 46 shows temperature profiles of several wells within the area. Although variable, the pattern of a leveling off of temperature with depth can be clearly observed (Bateman and Scheibach, 1975).

Steamboat Hot Springs [278]

Steamboat Hot Springs are located approximately 9 miles south of downtown Reno, just south of the junction of U. S. Highway 395 and State Route 27 (S33,T18N, R20E).

The springs have a long history as a resort and health spa. They were first located in 1860 by Felix Monet. They are so named because, when discovered, escaping steam reportedly produced a noise resembling the puffing of a steamboat. The area had several owners and developments before 1871, when the Virginia and Truckee Railroad was completed to this point and a small town sprang up (Hummel, 1888). A post office was established in 1880 and exists to this day. Some of the resorts have used the names Reno Hot Springs, Mount Rose Hot Springs, or Radium Hot Springs. The deposits of sulfur and cinnabar were first opened up in 1876, and numerous attempts have since been made to mine these deposits (Overton, 1947).

The Steamboat Hot Springs area is the best known and most extensively studied geothermal area in Nevada, and one of the better known thermal areas of the world. The geology and geochemistry have been described in detail by White and others (1964). Other references on the geology of the hot springs area and the surrounding vicinity include: White and others (1946), White (1952, 1953), Thompson and White (1964), Bingler (1975), Bateman and Scheibach (1975), and Tabor and Ellen (1975). The rock alteration has been studied by numerous persons and reported in the following articles: White (1947, 1954), Sigvaldason and White (1962), Schoen and White (1965, 1967), Ehrlich and Schoen (1967). The geochemistry (including isotope geochemistry) and heat flow has been discussed by the following: Brannock and others (1948), White and Brannock (1950a, b), Craig (1953), White and others (1957), White and Craig (1959), White (1957, 1968), and Silberman and White (1975). The mercury, antimony, silver, and gold mineralization has been described in a number of publications, including: Phillips (1871, 1879),

FIGURE 45. Map showing locations of shallow thermal wells in southwest Reno that are used for space heating, domestic hot water, and swimming pools (from unpublished map by R. B. Scheibach, 1974).

Le Conte (1883), Becker (1888, 1889), Lindgren (1905), Jones (1914), Bailey and Phoenix (1944), Gianella and White (1946), White and others (1949), and White (1974).

Geophysical studies are reported in White and others (1964), Hoover, Batzle and Rodriquez (1975), Hoover, O'Donnell, Batzle, and Rodriquez (1975), Long and Brigham (1975b) and Peterson (1975).

Much of the following geologic description is summarized from White (1968), White and others (1964), Thompson and White (1964), and Bateman and Scheibach (1975). Bonham's (1969) summary of White and others (1964) has also been extensively quoted in the following.

The oldest rocks in the Steamboat Springs area are metamorphosed sedimentary rocks which have been intruded by granodiorite (fig. 47). The sedimentary rocks are largely metamorphosed water-lain volcanic tuffs with intercalated beds of sandstone, conglomerate, and limestone. They are probably Triassic in age. Much of the Steamboat Springs area is underlain by granodiorite of probably Cretaceous age. The granodiorite has been hydrothermally altered over most of the area, and near-surface bleaching is prevalent in and adjacent to the thermal areas.

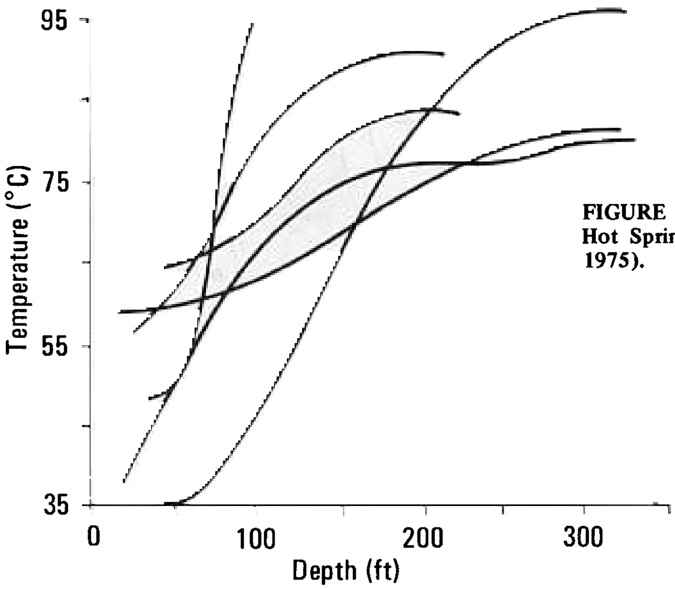
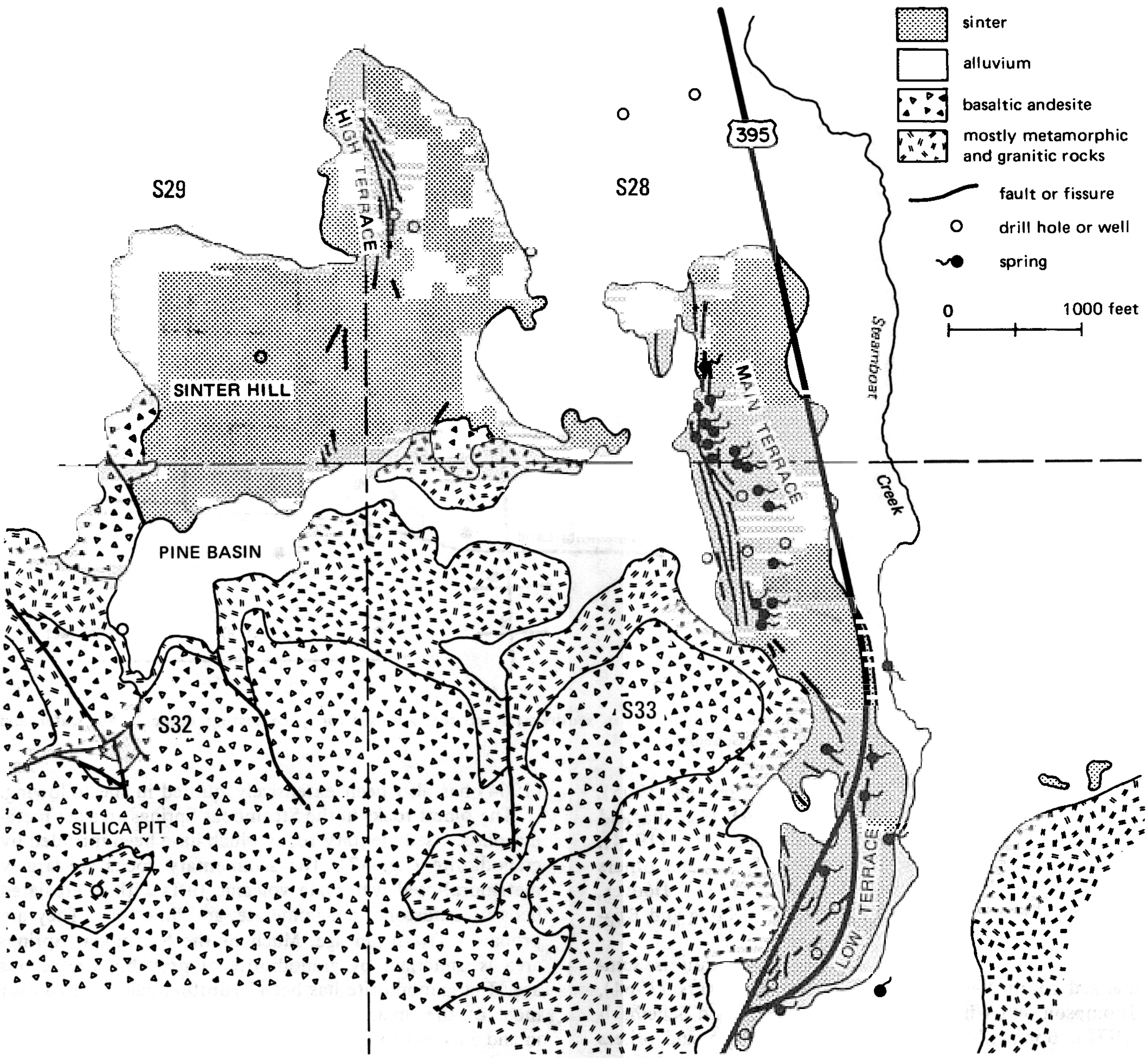


FIGURE 46. Temperature profiles of selected wells in the Moana Hot Springs area, Washoe County (from Bateman and Scheibach, 1975).

FIGURE 47. Generalized geologic map of Steamboat Springs thermal area, T18N, R20E, Washoe County (modified from White and others, 1964).



WASHOE COUNTY (continued)

Flows of soda trachyte, correlated with the Tertiary Alta Formation, crop out at a few localities in the district and have also been recognized in several of the drill holes located within the thermal area. The soda trachyte overlies granodiorite. Two small erosion remnants of an andesite flow are the only rocks of the Kate Peak Formation that crop out in the district. Rocks of the Kate Peak Formation, however, crop out over extensive areas immediately adjacent to the Steamboat Springs district.

Basaltic andesite flows extend over much of the southern and eastern parts of the Steamboat Springs district. The flows overlie granodiorite and alluvial deposits. These prebasaltic andesite pediment gravels and alluvium are present over much of the district. They rarely crop out, because they are usually concealed beneath younger rocks, but they

have been encountered in a number of the drill holes. The oldest deposits of hot-spring sinter are also of prebasaltic andesite age. Several areas of this early hot-spring sinter are present in the district.

The Steamboat thermal area lies on a line connecting several rhyolite domes that occur to the southwest and northeast of the thermal area. These rhyolite domes have been named the Steamboat Hills Rhyolite. The emplacement of the large dome that lies southwest of Steamboat Springs was preceded and accompanied by extensive pyroclastic eruptions that mantled much of the adjacent area with a layer of rhyolite pumice. It has been proposed (White and others, 1964) that another rhyolite intrusive may underlie the hot-spring area.

White and others (1964) have differentiated several different types of Quaternary deposits in the Steamboat Springs district, including pre-Lahontan alluvium, post-basaltic andesite sinter, opaline hot-spring sinter, alluvium of Lahontan age, and Recent alluvium and hot-spring deposits. Their detailed mapping of these Quaternary deposits has contributed greatly to an understanding of the history of the Steamboat Springs area.

The hot-springs system formed in the early Pleistocene, prior to the eruption of the basaltic andesite flows in the Steamboat area. The basaltic andesites have been dated at approximately 2.5 m.y., and the rhyolite domes have given K-Ar ages of 1.15 to 1.52 m.y. Also, hydrothermal potassium feldspar which replaces basaltic andesite gave an age of 1 m.y. (Silberman and White, 1975). Thus, the hot-spring system is seen to have been active, possibly intermittently, for over 2.5 m.y. The source of the energy for the thermal convective system is most probably the rhyolitic magma chamber from which the rhyolitic domes were emplaced (Silberman and White, 1975). It has been estimated that about 0.001 km^3 of new magma would have to be provided each year to supply the heat at Steamboat at the present rate of heat loss.

The thermal waters contain small amounts of metals, including mercury, antimony, silver, and gold and have deposited small amounts of stibnite, gold, and silver, and larger amounts of cinnabar in both hot-spring sinter and in the altered wall rocks adjacent to the hot-spring vents.

The thermal waters at Steamboat are high in Na, Cl, HCO_3, and SiO_2, and have a significant Li content. Also, they are anomalous in As, Sb, Hg, Cs, and B (see Appendix 1). Mercury vapor is commonly detected in the steam from springs and wells. The relative abundance of these highly soluble elements which have a low crustal abundance, coupled with the long life of the geothermal system, creates great problems with maintaining the supply of these elements by rock leaching. White (1974) suggests that the spring waters include a continuing small supply of magmatic water enriched in the previously mentioned constituents. Oxygen isotope data show that there could be no more than 11 percent magmatic water supplied to the hydrothermal system, and it is probably less than 5 percent.

All of the wall rocks in the thermal area have been altered. Near-surface acid bleaching is the most obvious visible effect at the surface, and it has strongly affected the granodiorite and the basaltic rocks. The near-surface acid bleaching extends to depths of 100 feet or more. Below this zone the rocks adjacent to the channelways of migrating thermal waters have been hydrothermally altered. A type of propylitic alteration is prevalent in this zone.

The main terrace at Steamboat Hot Springs is made up of siliceous spring deposits, primarily opaline sinter. It is believed that with time this will change to chalcedonic sinter. A large area of chalcedonic sinter is present in Pine Basin to the southwest of the main terrace and is believed to be the most extensive chalcedonic hot-spring sinter known in the world. It contains disseminated cinnabar. Also, small amounts of siliceous sinter are present about

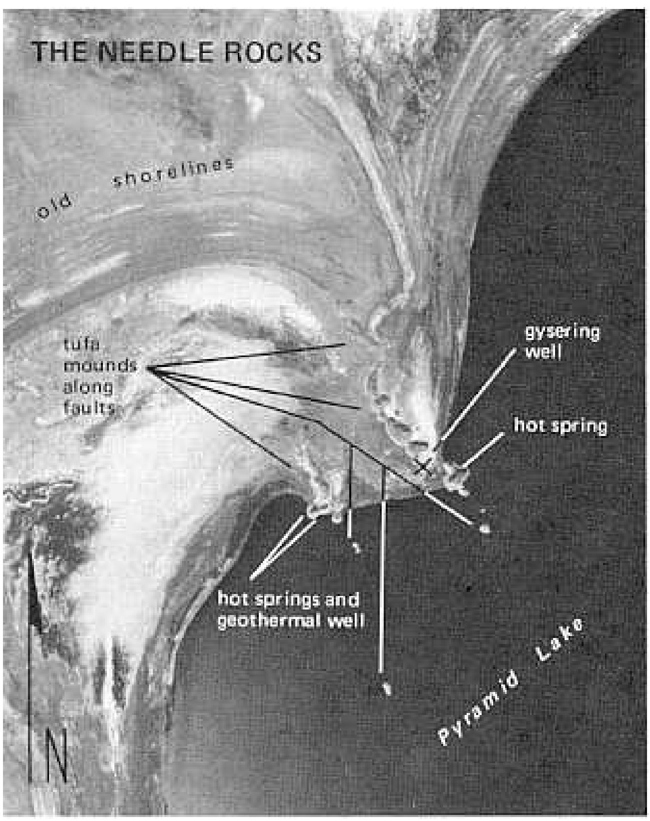
Nevada Thermal Power Co. Steamboat No. 3 geothermal well in Pine Basin at Steamboat Springs, Washoe County.

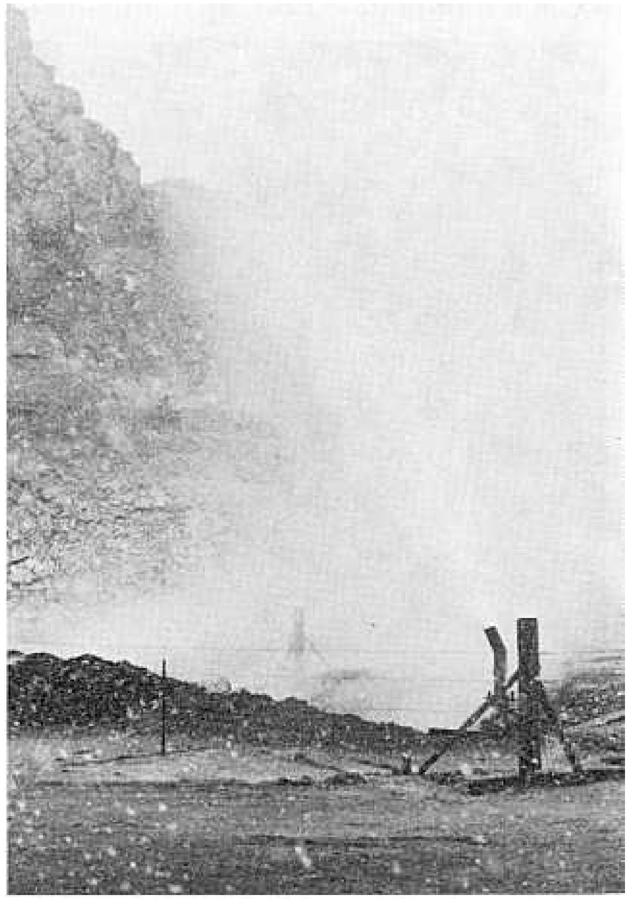
1.5 miles south of Steamboat Hot Springs in C NE/4 S5, T17N,R20E, and a small deposit of spring travertine is located in SW/4 SW/4 SW/4 S5,T17N,R20E on the southeast flank of Steamboat Hills about 100 feet above the floor of Pleasant Valley (Thompson and White, 1964).

The springs at Steamboat are near boiling, and exploration steam wells have reported temperatures as high as 369°F. One well encountered temperatures of up to 280°F at only 160 feet (White, 1968). The hot water is reported to have 5% to 10% steam flashover (Koenig, 1970). Preferred estimated reservoir temperatures from chemical geothermometers are approximately 400°F (Mariner and others, 1974). Six steam wells, ranging in depth from 716 to 1,830 feet were drilled in the late 1950's and early 1960's by Nevada Thermal Power Co. (see Appendix 2). Also, the U. S. Geological Survey drilled eight core holes for a total of 3,316 feet, and, in the past, several other wells have been drilled in the area for spas. Several years ago the hot water from one steam well was used as a flameless source of heat for the manufacture of plastic explosives.

The Needle Rocks [269]

Pyramid Lake is on the Pyramid Indian Reservation, about 30 miles northeast of Reno and lies along the probable trace of the Walker Lane, a major right-lateral strike slip fault zone in western Nevada. The Needle Rocks are at the northeast corner of Pyramid Lake (S12,T26N,R20E and S6,7,T26N,R21E), along north-northeast-trending faults that are presumed to be part of this Walker Lane fault zone (Bonham, 1969). Warm springs are also present at Pyramid Island (S3,T24N,R22E) and on Anaho Island (S16?,T24N,R22E); both localities are also within the Walker Lane fault zone.





Western Geothermal Inc. Needles No. 1 well at Needle Rocks, Washoe County, shortly after drilling in 1965 (photo by Harold F. Bonham, Jr).

Both the Needle Rocks and Pyramid Island are spectacular masses of tufa which were deposited in Pyramid Lake when its level was higher than at present. The collection of tufa into needles, spires, and pyramids is believed to be related to underwater warm springs (Russell, 1885), and divers report that underwater hot springs are present near the Needle Rocks today.

Springs at the Needle Rocks are reported to range from 151°F (Grose and Keller, 1975b) to a maximum of 208°F (Waring, 1965) which is near boiling for that elevation. A number of the springs are shown on the Needle Rocks 7½-minute topographic map. The spring on Anaho Island is reported to be 120°F (Waring, 1965). In the early 1960's Western Geothermal, Inc. drilled 3 geothermal wells at the Needle Rocks. The deepest of these was 5,888 feet, and another was approximately 4,000 feet deep. The maximum recorded temperature was approximately 240°F. From examination of drill cuttings from the deepest well, it is believed that Tertiary basaltic andesites overlie Mesozoic metamorphic rocks at approximately 5,050 feet (H. F. Bonham, written communication, 1964). This well flowed continuously after its completion, but geysered or pulsed, a complete cycle taking about 1 minute. A 35-second eruption, with hot water reaching 30 feet in height above the well, was followed by 32 seconds of diminished activity. During this period the well flowed at a rate of about 100 gallons per minute. A thin film of siliceous sinter (geyserite) collected on the well casing during this time; a slight odor of H_2S was also noted (H. F. Bonham, Jr., written com-

Western Geothermal Inc. Needles No. 1 well at Needle Rocks, Washoe County, in 1971.

munication, 1964). Mariner and others (1974) report that their best estimate of the thermal reservoir temperature is 279°F, using the silica (adiabatic) geothermometer.

Ward's (Fly Ranch, Hualapai Flat) Hot Springs [258]

Ward's or Fly Ranch Hot Springs are located in Hualapai Flat about 15 miles north of Gerlach (mainly in S1,2,T35N, R23E). The springs are the largest in northwestern Nevada, discharging into 30 to 40 pools over an area of 75 acres. The surface flow is used for irrigation (Sinclair, 1962b). A number of warm-water wells are also present in the area (Harrill, 1969).

The oldest rocks in the Hualapai Flat area are Permian and Triassic metavolcanic and metasedimentary rocks (fig. 48) that have been tentatively correlated by Bonham (1969) with the Happy Creek volcanic series in Humboldt County. Cretaceous granodiorite intrudes the sequence to the south in the Granite Range. In the vicinity of Hualapai Flat, the Tertiary is represented by a sedimentary unit of tuffaceous sands and air-fall tuffs; this is overlain by a finely crystalline, black basalt. Elsewhere in the vicinity andesitic to rhyolitic flows and tuffs also underlie the basalt. Grose and Keller (1975b) also describe a number of different Quaternary units.

North and north-northeast-trending normal faults cut all of the lithologic units, and Late Quaternary fault scarps and tectonic cracks transect the floor of Hualapai Flat, which is a small structural-topographic basin (Sperandio and Grose, 1976). Many of the normal faults occur along the western side of Hualapai Flat and have their eastern sides downthrown. Displacements appear to be dip slip, amounting to tens to hundreds of feet on any one fault, but totaling several thousand feet between the Tertiary volcanic rocks and Cretaceous granodiorite along the southwest margin of Hualapai Flat (Grose and Keller, 1975b).

The faults at Hualapai Flat are believed to be part of a regional and probably deep-seated fault zone that may extend 40 to 45 miles from Winnemucca Lake north along the west side of the Selenite Range, through Gerlach Hot Springs, along the east side of the Granite Range, along the west side of Hualapai Flat, and northward to High Rock Lake. Sperandio and Grose (1976) suggest that the localization of the thermal anomaly at Ward's Hot Springs is probably due to deep hydrocirculation along deep-seated fractures where the north-south fault zone intersects a major northwest-trending fracture system that terminates the north end of the Granite Range west of Hualapai Flat. Quaternary alluvial units in Hualapai Flat record rifting, normal faulting, and subsidence in Late Quaternary (Grose and Keller, 1975a). These features indicate extension of the area, generally along a northwest-southeast axis. The development of the thermal system at Ward's Hot Springs is favored by this extensional tectonic regime, and the major spring area is located on the upthrown side of a 4-mile long fault scarp that has a maximum relief of 30 feet.

Spring deposits at Ward's Hot Springs consist of both siliceous sinter and calcaerous travertine (Sinclair, 1962b).

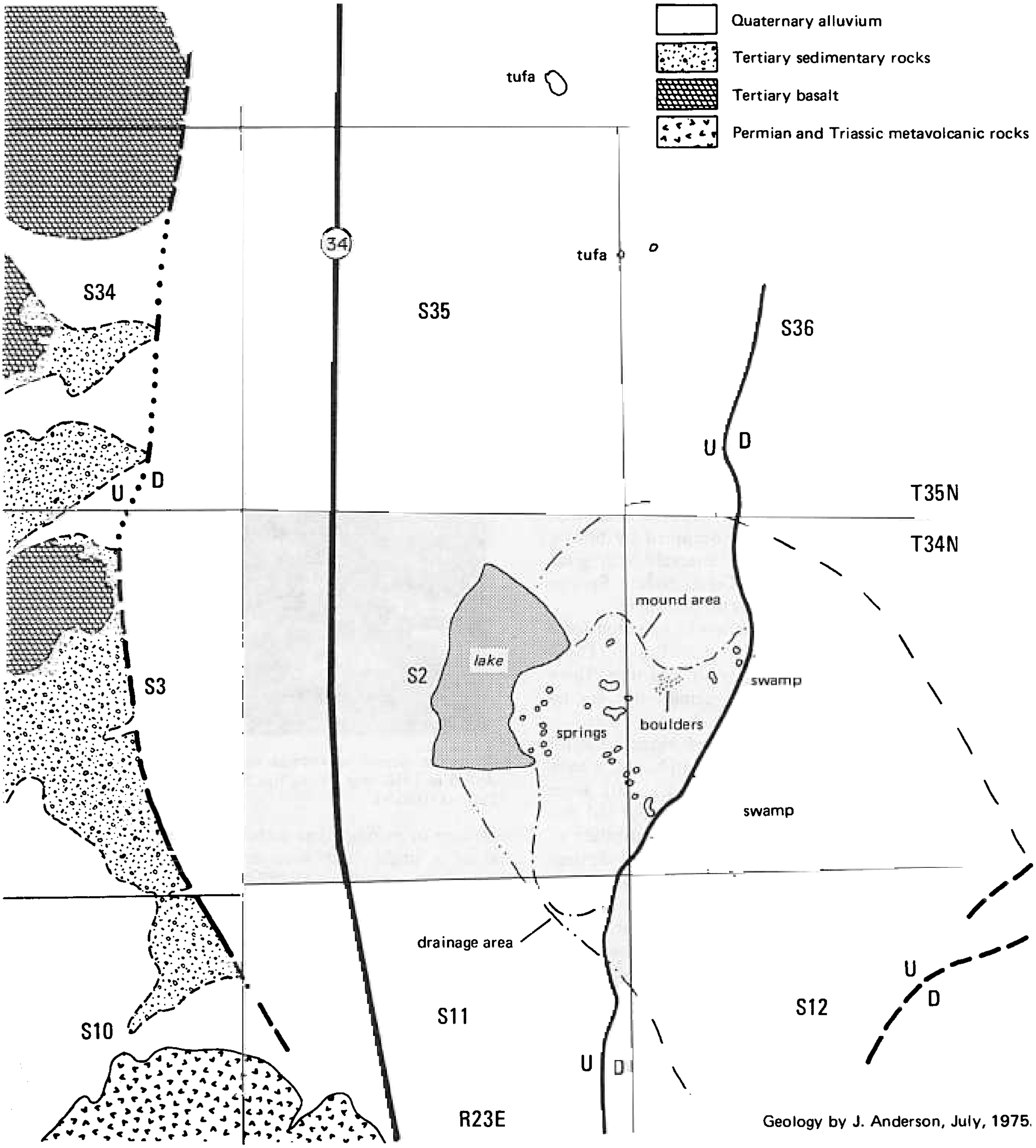


FIGURE 48. Geologic map of the Fly Ranch thermal area, T34 and 35N,R23E, Washoe County (after Grose and Keller, 1975b).

A shallow well (the "Geyser Well") was drilled in the hot-spring area in 1916 and has been discharging steam and boiling water since that time. The water is highly mineralized and precipitation of the chemical constituents at the surface has created a tower of travertine 15 feet high. Water temperatures in wells and springs of the hot-springs area and vicinity range from near normal to over 220°F (Appendix 1), and Mariner and others (1974) report a 257°F estimated minimum thermal reservoir temperature using the silica geothermometer.

Granite Ranch [259]

A thermal area of unknown extent is present near the south end of Hualapai Flat about 1 mile south of Granite Ranch in S35,T34N,R23E and S2,T33N,R23E. A presently abandoned water well in the area first hit hot water, and in 1965(?) Western Geothermal, Inc. drilled an 800-foot geothermal test in the area (see Appendix 2). Additionally, thermal water was encountered in temperature test holes drilled by Cordero (now Sunoco Energy Development Co.) and the U. S. Geological Survey. The temperature profile in the Cordero test hole indicates a reversal in thermal gradient below a depth of 150 feet, which suggests a lateral flow of thermal water through an aquifer at that depth. The thermal water presumably moves into the aquifer from much greater depth along a concealed conduit, probably a fault (Olmsted and others, 1975, p. 128).

Gerlach area [261]

The Gerlach thermal area is at the south end of the Granite Range in the southern Black Rock Desert (fig. 49). It includes two major groups of springs, Great Boiling Springs in S10,15,T32N,R23E about 0.8 mile northwest of Gerlach and Mud Springs in S16,T32N,R23E about 1.1 miles west of Gerlach. These areas have been described together for simplification, but water quality and temperature data in Appendix 1 are subdivided into the separate spring areas.

The springs were first described by Frémont (1845) who reported them as "The most extraordinary locality of hot springs we had met during the journey." He mentioned that one large, circular pool was entirely occupied by boiling water, which boiled up at irregular intervals with great noise. Presumably this was at the Great Boiling Springs area. Frémont measured temperatures up to 208°F.

It has been reported that a borax works operated for a short time at Gerlach Hot Springs, but Papke (1976) believes that this information is probably not true. There is not a large amount of boron in the spring water, and no borates can be found at the site.

Great Boiling Springs have been used extensively for bathing for a number of years and a bathhouse, steamhouse, and warm pools are at the site today (fig. 50). Some pools are too hot for swimming; a 19-year old girl was scalded to death in one of these in 1973, an indication of the danger inherent in geothermal areas. Mud Springs (fig. 51) has mainly been used for stock watering and irrigation.

The hot springs issue from unconsolidated lacustrine and alluvial deposits, and hydrothermally altered granodiorite crops out nearby (fig. 49). Both the unconsolidated deposits and the granodiorite are hydrothermally altered along a fault west of Great Boiling Springs and in places are difficult to distinguish from each other. To the west of the thermal areas, the southern end of the Granite Range consists of relatively uniform medium-crystalline granodiorite which contains several scattered, somewhat elongate inclusions of diorite or gabbro. The thermal water has probably been in contact with granodiorite and related plutonic rocks of the Granite Range throughout most of its path from probable recharge areas high in the range to where it rises into the unconsolidated deposits beneath the springs (Olmsted and others, 1975).

The hot-spring clusters are associated with northeast-trending Basin and Range faults along the east side of the Granite Range (fig. 49). Fault scarps that are inches to several feet high appear to control the location of the spring clusters. The west side is usually the upthrown side on these faults (Grose and Keller, 1975b), and some offset deposits are as young as Holocene. Some faults in lacustrine and alluvial fan deposits near the hot springs may represent

Travertine deposit developed over "Geyser Well," a water well drilled in 1916 near Ward's Hot Springs, Washoe County (photo by Patricia Garside).

rupture of incompetent materials in response to movement along a single fault zone in the underlying granodiorite (Olmsted and others, 1975). An upfaulted block of altered granodiorite between the Great Boiling Springs and the Granite Range is believed to represent an exposed part of an ancestral Gerlach Hot Spring system. Several geophysical studies (Grose and Keller, 1974a, 1975b; Long and others, 1975; Christopherson and others, 1977) also provide data that may be useful in structural and geologic interpretations. Sperandio and Grose (1976) suggest that the Gerlach thermal area may be along a deep-seated, north-south fault zone which extends from Winnemucca Lake to High Rock Lake (see section on Ward's Hot Springs).

The spring deposits of the Gerlach thermal springs are predominantly siliceous sinter, and the concentration of dissolved solids in the waters is high in comparison with most other hot-spring waters in northern and central Nevada (Mariner and others, 1974). Some spring deposits are reported to be anomalously radioactive (60 to 65 μR/hr), according to Wollenberg (1974b). Also, the Great Boiling Spring area is well known for its mud volcanoes and other mud vent activity (Russell, 1885, p. 52; White, 1955b). The mud volcanoes have been reported to erupt clots of mud to heights of at least 100 feet. They are characterized by sporadic and apparently unpredictable intervals of activity separated by very much longer intervals of quiescence (White, 1955b).

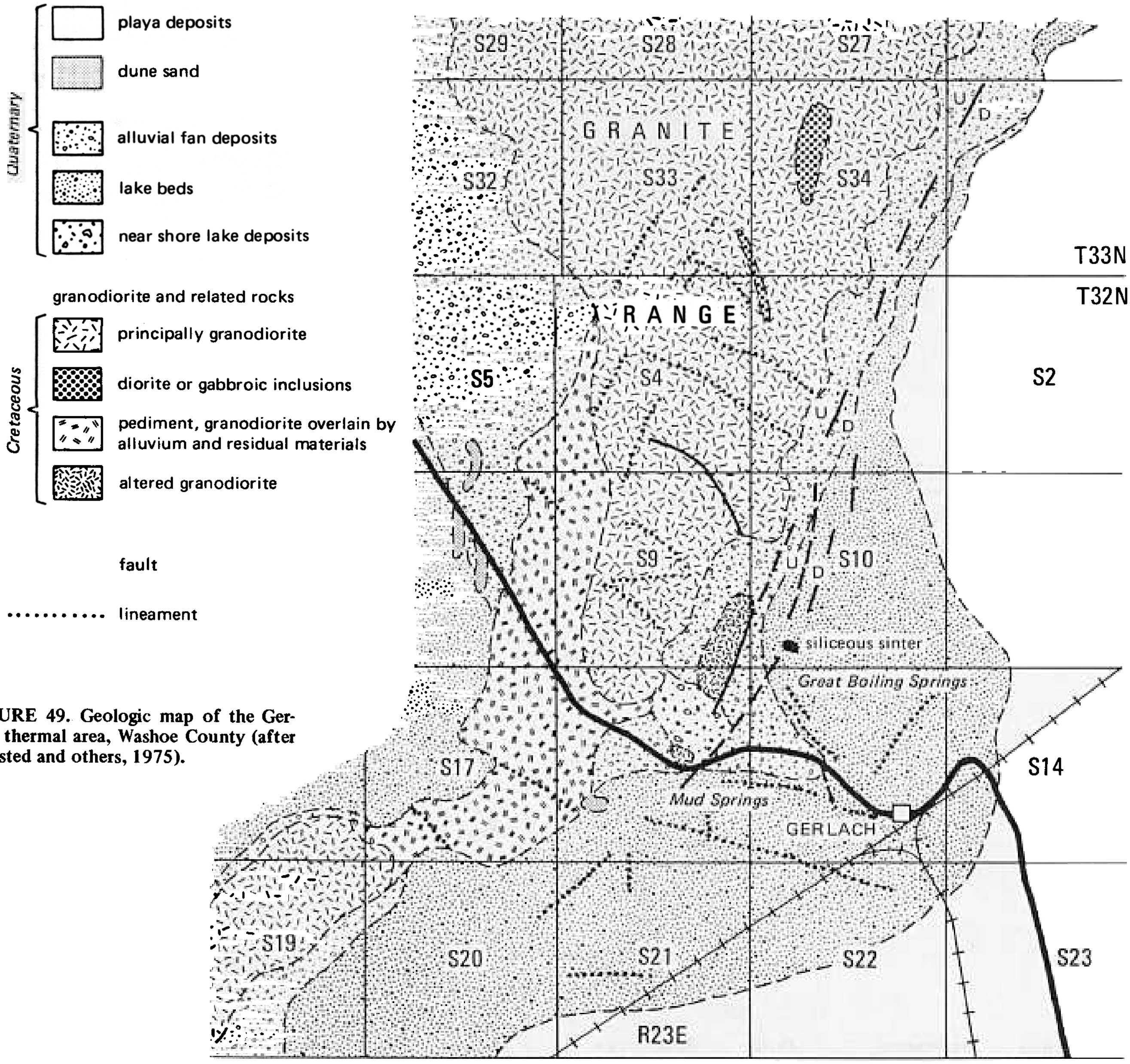
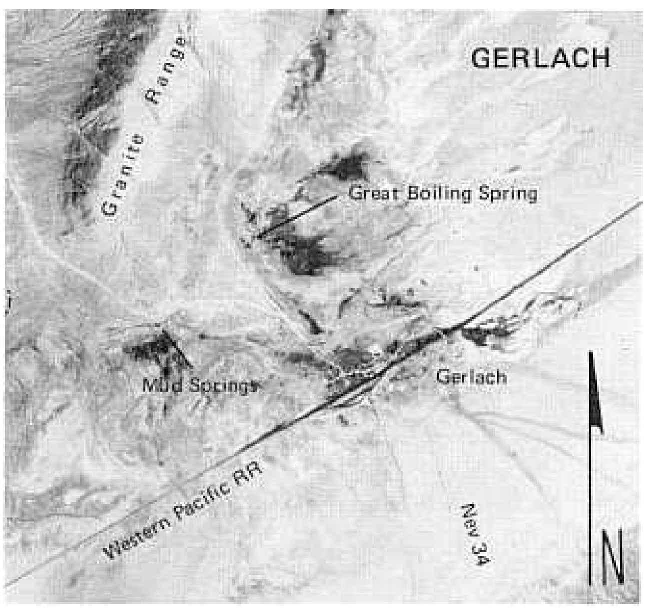


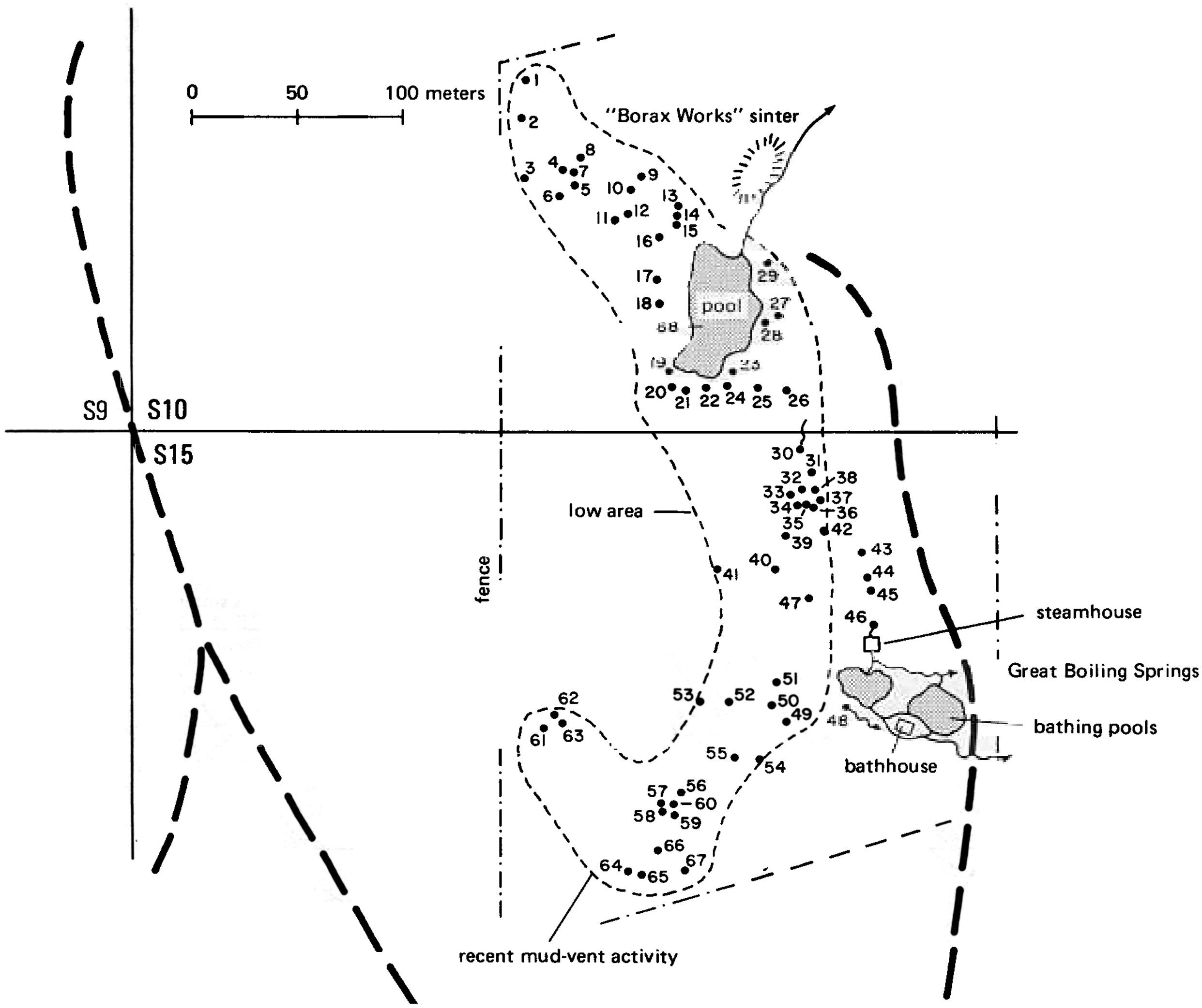
FIGURE 49. Geologic map of the Gerlach thermal area, Washoe County (after Olmsted and others, 1975).

The temperatures measured in springs and pools range up to a maximum of 208°F (Grose and Keller, 1975b) and shallow subsurface measurements are over 248°F or 120°C (fig. 52). In addition to shallow temperature-gradient holes drilled by the U. S. Geological Survey in 1973, Cordero (now Sunoco Energy Development Co.) drilled several gradient holes to depths of 300 to 600 feet in 1972. Mariner and others (1974) have estimated the reservoir temperature at 333°F using the silica-quartz geothermometer and 347°F using the sodium-potassium geothermometer.



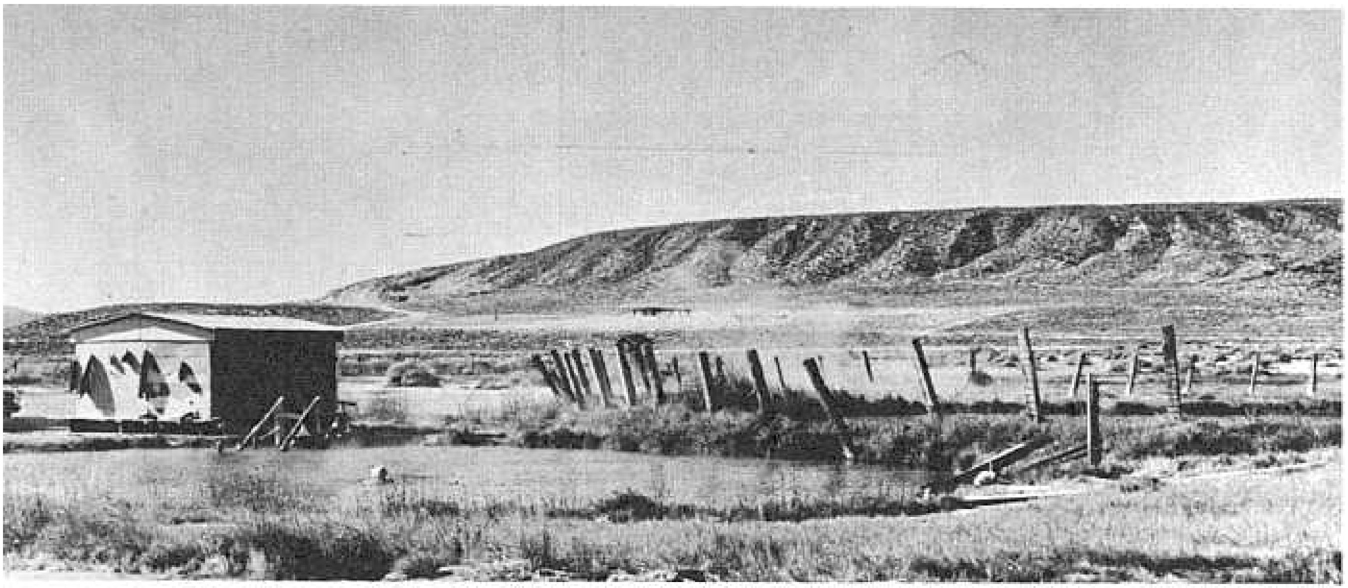
San Emidio Desert (Mud Flat) [265]

An altered zone up to 100 feet wide and two miles long is present in S9 and 16,T29N,R23E (unsurveyed) along the east side of the San Emidio Desert. Cinnabar, sulfur, gypsum, siliceous sinter, opal, chalcedony, quartz, kaolinite and other alteration minerals occur in sands and gravels of Pleistocene age along the north-south zone. These altered deposits are covered by younger, unaltered alluvial

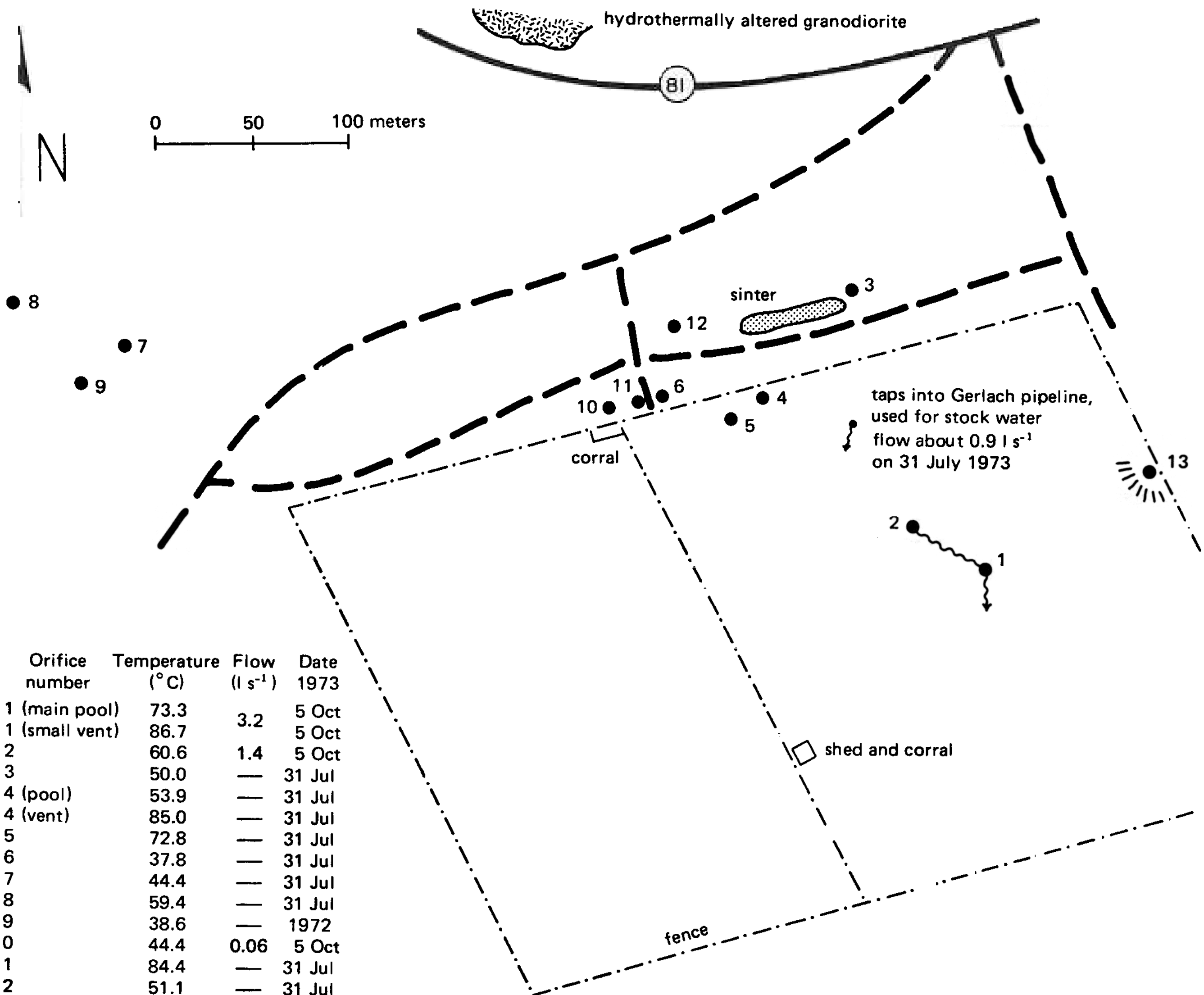


Orifice number	Temperature (°C)	Orifice number	Temperature (°C)	Orifice number	Temperature (°C)	Orifice number	Temperature (°C)
1	60.6	18	50.6	35	27.2	52	44.4
2	40.0	19	96.1 (boiling)	36	50.6	53	34.4
3	49.4	20	48.3	37	48.9	54	70.0
4	42.2	21	59.4	38	64.4	55	77.8
5	50.0	22	40.6	39	52.2	56	58.9
6	33.3	23	48.3	40	35.6	57	86.7
7	36.7	24	33.3	41	58.9	58	47.8
8	43.3	25	48.3	42	28.9	59	43.3
9	72.2	26	61.7	43	43.3	60	55.6
10	50.5	27	33.3	44	56.7	61	66.1
11	31.7	28	42.8	45	59.4	62	73.3
12	33.9	29	47.8	46	86.7	63	67.8
13	70.0	30	63.3	47	51.1	64	57.7
14	36.7	31	74.4	48	92.2	65	57.7
15	35.6	32	29.4	49	51.1	66	61.1
16	36.7	33	48.9	50	61.1	67	32.2
17	57.8	34	53.3	51	60.0	68	58.3

FIGURE 50. Sketch map of Great Boiling Springs, S10 and S15,T32N,R23E (after Olmsted and others, 1975).



Bathhouse and swimming pool at Gerlach Hot Springs (Great Boiling Springs), Washoe County.



Orifice number	Temperature (°C)	Flow (l s⁻¹)	Date 1973
1 (main pool)	73.3	3.2	5 Oct
1 (small vent)	86.7		5 Oct
2	60.6	1.4	5 Oct
3	50.0	—	31 Jul
4 (pool)	53.9	—	31 Jul
4 (vent)	85.0	—	31 Jul
5	72.8	—	31 Jul
6	37.8	—	31 Jul
7	44.4	—	31 Jul
8	59.4	—	31 Jul
9	38.6	—	1972
10	44.4	0.06	5 Oct
11	84.4	—	31 Jul
12	51.1	—	31 Jul
13	65.6	—	31 Jul

Note: Orifices not flowing were partly clogged with silt. Dug down 0.3-1.0 m with shovel. Silt acted as insulator. Temperatures initially measured at orifices 3 (75.5° C), 7 (48.3° C), and 8 (67.2° C) were significantly hotter than temperatures measured after digging.

FIGURE 51. Sketch map of Mud Springs in S16,T32N,R23E, Washoe County (after Olmsted and others, 1975).

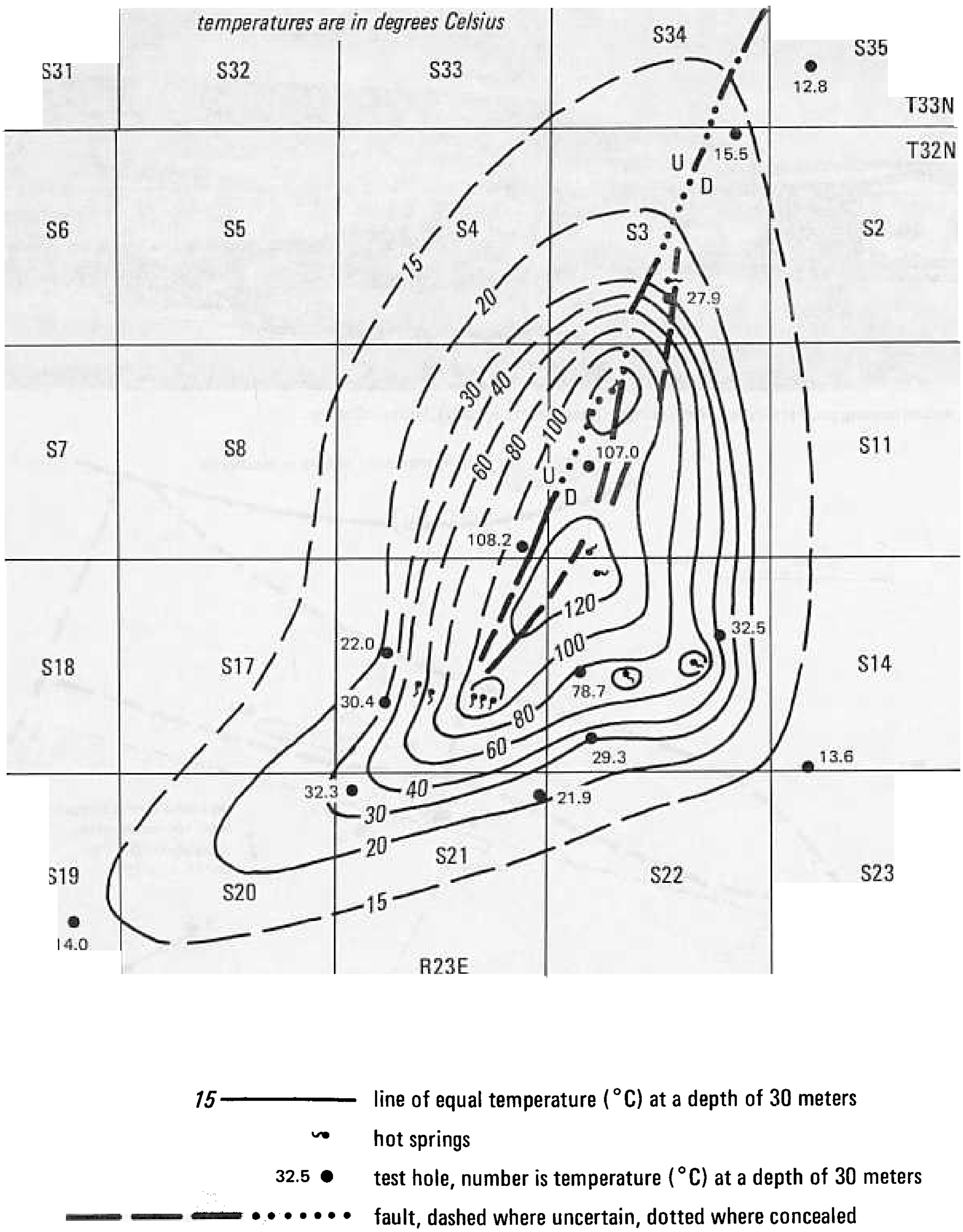


FIGURE 52. Map of the Gerlach thermal area, Washoe County, showing temperature at a depth of 30 meters, October, 1973 (from Olmsted and others, 1975).

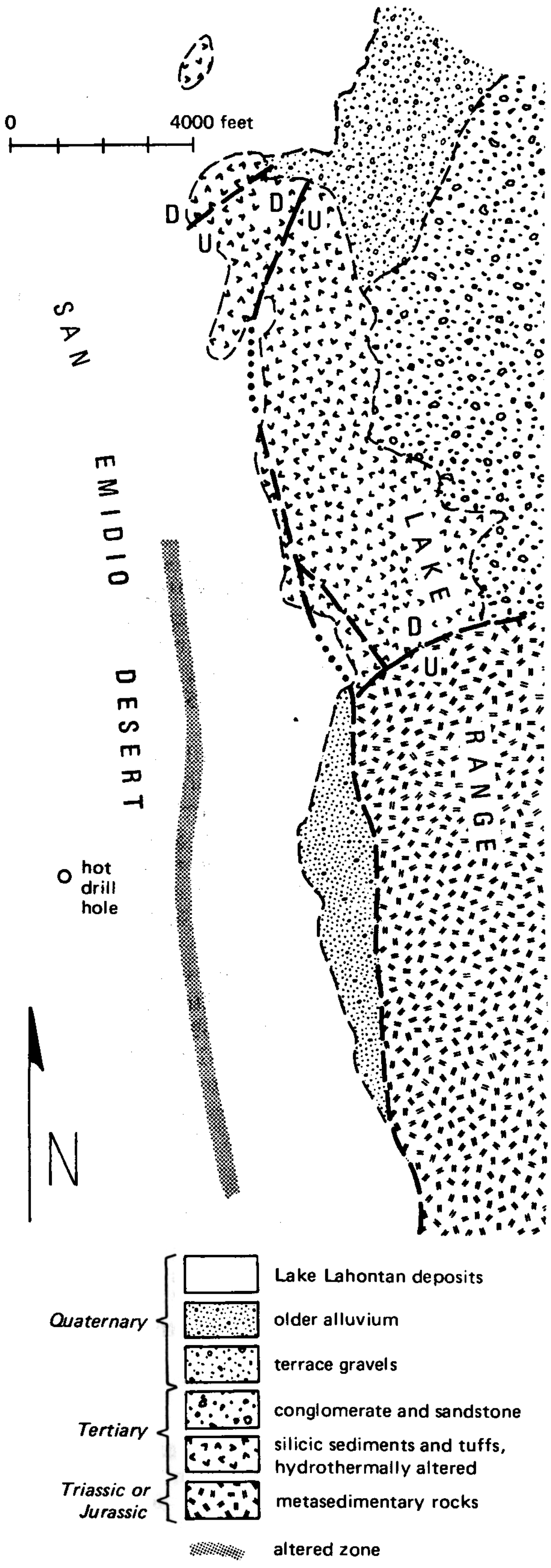


FIGURE 53. Geologic sketch map of the San Emidio cinnabar prospect, Washoe County (after Bonham, 1969).

and lacustrine deposits (Bonham, 1969). The alteration and mineralization represent the deposits of hot springs which were probably more active in the past. The zone is near the high-water level of Lake Lahontan, to which the mineralization may be related in some way (Papke, 1969).

The zone is still thermally active, and the ground is often warm 2 to 3 feet below the surface. Water standing in shallow bore holes is up to 128°F 3 feet below the ground surface, and a flowing spring or old well in S9 is approximately 86°F. Also, a drill hole encountered boiling water at 87 feet in 1955 in this same section (fig. 53), according to T. A. Alberg (written communication, 1975). Chevron Oil Co. drilled a 4,013-foot geothermal test to the west of this area (S8,T29N,R23E) in 1975. No information is available on the temperatures encountered. Peterson and Dansereau (1975) have reported principal facts for gravity stations in the San Emidio Known Geothermal Resource Area.

Bowers Mansion (Franktown) Hot Spring [280]

Bowers Mansion is a recreational park located to the west of Washoe Lake and developed around a mansion built in 1864 by Sandy Bowers, a prosperous miner on the Comstock Lode. The restored two-story sandstone structure is operated by the Washoe County Department of Parks and Recreation. Two swimming pools are open to the public during the summer season.

The hot spring has been utilized for the swimming pools in the past, but is now used for irrigation (Peterson, 1976). In 1962 an attempt to drill a cold-water well encountered 117°F water at 207 feet, and this well now supplies the thermal water for an olympic-size pool and a 15- by 25-foot pool for younger children. The pool waters are reduced to 76° to 78°F by addition of 54°F water from Riter Springs, about 5,500 feet northwest of the mansion.

The hot spring issues from the granodiorite-alluvium contact, which is an obvious fault scarp along the east side of the Carson Range. The hot water well probably intersects this same normal fault at depth. The geology of the area has been mapped by Tabor and Ellen (1975).

WHITE PINE COUNTY

Monte Neva (Melvin, Goodrich) Hot Springs [288]

The Monte Neva (Melvin, Goodrich) Hot Springs in SW/4 S24, NW/4 S25,T21N,R63E on the west edge of Steptoe Valley, are by far the hottest in White Pine County. Although a temperature of 193°F was reported by Stearns and others (1937, no. 98) other observers reported the temperature as 174°F in 1917 (Clark and others, 1920, p. 47), again in 1966 (Mifflin, 1968), and in 1974 (Hose and Taylor, 1974).

There is one main spring plus several smaller ones, all issuing from alluvium. The main spring flowed 625 gpm in 1917 (Clark and others, 1920, p. 47). A 20- to 40-foot-high mound of travertine, covering about 12 acres, has been built up. Mineral water is presently being deposited, and considerable CO_2 (?) gas is escaping from the springs.

Magma Power Co. drilled a 402-foot well at the springs in 1965. Hot water but no steam was encountered; the maximum temperature reported, was 190°F (Koenig, 1971). Audiomagnetotelluric data for the geothermal area is reported in Long and Batzle (1976a).

WHITE PINE COUNTY (continued)

Cherry Creek (Young's) Hot Springs [284]

The Cherry Creek (Young's) Hot Springs on the west side of Steptoe Valley, in the north part of T23N,R63E, are the second-hottest springs in White Pine County. There are three small springs, which had temperatures of 188°F, 124°F, and 135°F, and a total flow of 3.6 gpm in August 1918 (Clark and others, 1920, p. 48, 49). In 1918, the water was being used to supply a bathhouse. Small amounts of gas (CO_2) escape from the springs; one is slightly radioactive (Davis, 1954, p. 21).

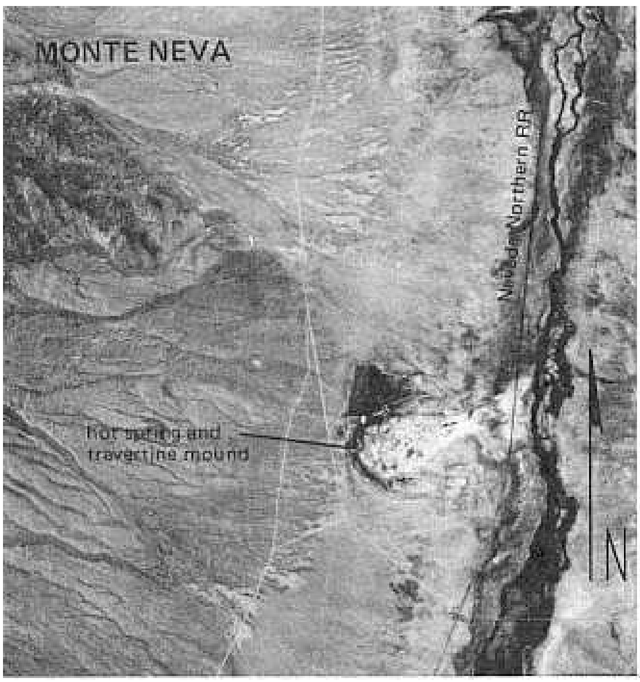
Waring (1965, no. 96) reports that Shellbourne Hot Springs are "about 100 feet from Cherry Creek Hot Springs," consist of two springs, have a temperature of 124°F and are used for bathing and irrigation. If this location is correct, they should be considered part of the Cherry Creek Springs. Some miles to the southeast are the Upper and Lower Schellbourne warm springs (see below). An 8,406-foot-deep exploratory oil well in S19,T24N,R64E (Shell Oil Co. Steptoe Unit No. 1) reported a maximum temperature of 304°F. This well is 7 miles northwest of Cherry Creek Hot Springs.

Williams Hot Springs [294]

Apparently the third-hottest group of springs in White Pine County are the Williams Hot Springs at the intersection of S29,30,31,32,T13N,R60E. There are two springs with temperatures of 124° to 128°F and flow rates reported at 50, 50–135, and 185 gpm. The water is used for irrigation (Stearns and others, 1937, no. 103; and Maxey and Eakin, 1949).

Other springs in Steptoe Valley

Most of the hot springs, including the two hottest groups in White Pine County, occur along the margins of Steptoe Valley. The Monte Neva and Cherry Creek Springs are described above. A spring (name unknown) with a flow rate of 450 gpm and temperature of 83°F is reported (Snyder, 1963) in S31,T24N,R65E, on the east edge of the valley.



Collar and Elbow Springs [282]. The Collar and Elbow Spring is at the north end of Steptoe Valley in S33,T26N, R65E. It had a temperature of 92°F and flow rate of 18 gpm on August 2, 1918. It is in old lake beds and has formed a "tufa" mound (Clark and others, 1920, p. 44, 49).

Schellbourne Springs [288]. There are two hot springs in Schellbourne Pass in the Schell Creek Range on the east flank of Steptoe Valley. The Lower Schellbourne Warm Spring has a temperature of 77°F and issues from the alluvial fan at the mouth of the canyon in S12,T22N,R64E. The Upper Schellbourne Spring has a temperature of 73.5°F; it is near or on a fault in SE/4 NW/4 S8,T22N, R65E. Both reportedly flowed at 450 gpm in 1966 (Mifflin, 1968).

Campbell Ranch (North Group) Springs [291]. Numerous springs ranging in temperature from 58°F to 76°F occur in a line at the foot of the steep alluvial fan, nearly parallel to the Egan Range, These springs have also been called the Campbell Springs or North Group Springs.

McGill–Schoolhouse zone [292]. There are springs for a distance of about 5 miles along the base of the steeper alluvial slope paralleling the Duck Creek Mountains on the east side of Steptoe Valley. The springs increase in temperature from north to south. Schoolhouse Spring at the north end of this zone, in the NW/4 SE/4 S3,T18N,R64E, had a temperature of 76°F and flow rate of 450 gpm on July 5, 1918 (Hardman and Miller, 1934).

The McGill Warm Springs at the south end of the zone range up to 84°F in temperature and flow 4,500 gpm (Clark and others, 1920). There are three main springs; a pool has been excavated at the largest. Several additional springs apparently are covered by tailings from the huge Kennecott Copper Corp. mill. The water is used in the mill and in a municipal swimming pool (Eakin and others, 1967).

Ely–Lackawanna zone [293]. Hot springs occur just north of Ely along the west edge of Steptoe Valley. The northernmost five springs in NE/4 S3,T16N,R63E, are called the Lackawanna Hot Springs. They flow 135 gpm and have temperatures variously reported as 70°F and 90° to 95°F. In 1966 the water was being used in the Silver King Mines mill. (Eakin and others, 1967; and Holmes, 1966, p. 21).

The Ely Warm Springs, to the south in section 10, had a flow rate of 22 gpm and temperature of 85° in April 1918. There are no spring deposits at the springs, but "tufa" occurs nearby (Clark and others, 1920, p. 43, 46). In some cases "Ely Warm Springs" has been used for all the springs in this zone including the Lackawanna Springs.

Other White Pine County thermal springs

Giocoechea (Simonsen) Warm Springs [287]. The Giocoechea Warm Springs (Simonsen Warm Springs; Warm Springs Ranch; Moore's Ranch Springs) are in Newark Valley in the NE/4 NE/4 S1,T22N,R56E and S36,T23N, R56E. Reported temperatures range up to 76°F and flow rates from 900 to 270 gpm. The springs form several ponds in alluvium and sand dunes; their levels are up to 20 feet above the general water table in the area. The water is used for irrigation. (Eakin, 1960, p. 12; Snyder, 1963; Waring, 1965, no. 102a; Lamke and Moore, 1965; Mifflin, 1968).

Big Blue Spring [294]. Nothing is known about the Big Blue Spring in S23,T14N,R56E except that the water is warm and has been used for bathing (Stearns and others, 1937, no. 103).

Preston Springs [296]. There are a number of warm springs near Preston in T12N,R61E. These springs include the Preston Big Spring in SW/4 NE/4 S12, Nicholas Spring in SW/4 SE/4 S12, Arnoldsen Spring in SE/4 S12, and Cold Spring in SW/4 NW/4 S12. All the springs issue from alluvium. Temperatures vary from 70° to 72°F, flow rates from 630 to 5,700 gpm. Williams Hot Spring, the third-hottest spring in White Pine County, is 8 miles to the west.

Warm Sulphur Springs. Stearns and others, (1937, no. 106) locate Warm Sulphur Springs in T11N,R65E at the head of Warm Creek, in the south end of Spring Valley. The water is "warm," flows at 972 gpm, and is used for irrigation. Its exact location could not be determined.

Others. Stearns and others (1937, no. 99) mention a "warm" spring at the east base of the Kern Mountains in about T21N,R70E. There are also one or more warm springs at the head of Big Spring Creek (Stearns and others, 1937, no. 107, 107a; Waring, 1965; and Maxey and Mifflin, 1966). Temperatures up to 64°F and flow rates of 4,570 gpm are reported. The USGS Lund 1° x 2° sheet suggests that the spring or springs are in S33,T10N,R70E.

Water wells

Four water wells, all in Spring Valley, are known to have temperatures higher than one might expect. Only the 600-foot-deep flowing Lawrence Henroid well at the north end of the valley in S31,T23N,R66E had a significantly higher temperature—89°F; the nearby Hans L. Anderson well also is artesian, is 1,040 feet deep, and has a temperature of 79°F.

Two Bureau of Land Management artesian wells (396 and 407 feet deep) at the south end of the valley in S2, T12N,R67E and S35,T13N,R67E have water temperatures of 75° and 73° respectively (Rush and Kazmi, 1965).

APPENDIX 1
NEVADA THERMAL WATER DATA

This appendix is a listing of the available data on Nevada thermal waters. A somewhat arbitrary lower limit of 70°F was established; waters of lakes and streams heated above 70°F by the normal surface air temperature are not included. The temperatures reported can be converted from Fahrenheit to Celsius by use of Appendix 3.

The names of geothermal areas are usually those of the largest, best known hot spring or a well-known geographic feature in the area. Alternate names are also listed. The names used for individual springs or wells are usually from the cited reference.

The location of the spring, well, drill hole or mine shaft is given using the section-township-range system; more detailed locations within a section use the quarter-quarter-quarter system (for example: NE/4 SE/4 NW/4 S5,T20N,R30E indicates that the occurrence is located within approximately a 10-acre parcel which is the northeast quarter of the southeast quarter of the northwest quarter of section 5, Township 20N, Range 30E). Locations by section-township-range were estimated in a few cases by projecting the land grid from adjacent areas. The available topographic maps were often used to refine location data.

The discharge in gallons per minute (gpm) from springs or flowing wells is reported if given in the original reference. The date given is usually that for the temperature or discharge measurement. The analytical results reported were usually rounded to three significant figures, and were reported in parts per million (ppm) unless otherwise stated. Some older analyses which were originally in grains per gallon or reported as compounds were converted to the ionic constituents, expressed in parts per million (ppm). For the range of values in this appendix, ppm are essentially equal to milligrams per liter (mg/l), and ppb (parts per billion) are equivalent to micrograms per liter (µg/l). The values reported for total dissolved solids are those in the cited references; these can be either the sum of the ionic constituents or the value obtained by evaporation to dryness. The pH is reported in this appendix to two significant figures.

The specific conductance is a measure of the ability of water to conduct an electrical current and is expressed in micromhos per centimeter (µmhos/cm) at 25°C (77°F). Because the specific conductance is related to the number and specific chemical types of ions in solution, it can be used to approximate the salinity of the water. In general, the specific conductance times 0.65 ± 0.5 equals the total dissolved solids (in ppm).

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
CARSON CITY																				
[1] Carson Hot Springs																				
springs SE¼NE¼S5,T15N,R20E	120	75	30Mar65	–	–	2.6	0.4	96		36	28	96	29	–	–	–	–	506	9.3	Worts & Malmberg, 1966
springs SE¼NE¼S5,T15N,R20E	–	60	–	44	–	6	2	104		41	27	84	34	–	–	–	326	–	–	Adams, 1944
	Remarks: Fe + Al = tr.																			
springs SE¼NE¼S5,T15N,R20E	108	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 59
[2] Nevada State Prison Spring SE¼S16,T15N,R20E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 59A
[3] Pinyon Hills																				
well S23,T15N,R20E	114	–	19Jan75	–	0.01	275	3	254		29	6	135	33	4.3	–	–	–	–	8.6	CWRR, 1973
	Remarks: Depth – 172 ft.																			
well S23,T15N,R20E	112	–	14May71	–	0.01	–	–	71		10	–	112	20	1.6	0.5	–	–	–	–	CWRR, 1973
	Remarks: Depth – 127 ft.																			
Wheat well SE¼S23,T15N,R20E	113	–	1960	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Peggy Wheat, personal communication, 1975
Pinyon Hills suburban area wells SE¼S23,T15N,R20E	hot	–	–	–	0.4	280	–	200	–	–	–	900	–	4.2	–	–	1500	–	–	Glancy & Katzer, 1975
	Remarks: Analysis is the general composition of hot, mineralized ground water in the area (Nevada Bureau Environmental Health Memo, 7 Jun 71).																			
well S25,T15N,R20E	90	–	28Jan71	–	–	13	–	–	–	–	–	–	–	1.7	–	–	366	–	–	CWRR, 1973
	Remarks: Depth – 200 ft.																			
CHURCHILL COUNTY																				
[4] Senator Fumaroles NE¼S31,T25N,R37E	boiling	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lawrence, 1971
	Remarks: Steam vents; water table at 60 ft.																			
springs T24N,R36E	warm	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 70
	Remarks: Northwest side of Salt Marsh (Dixie) Valley; the exact location of these springs is unknown, possibly in the vicinity of Senator Fumaroles.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
CHURCHILL COUNTY (continued)																				
[5] Dixie Comstock Mine S14,T23N,R35E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Vanderburg, 1940, p. 48
Remarks: Intense heat and large volume of hot water encountered in workings at less than 75 ft.																				
spring T23N,R35E	hot	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 71
Remarks: This locality may be in the vicinity of the Dixie Comstock Mine.																				
[6] Dixie Hot Springs																				
Dixie Valley Hot Springs SE¼S5 & NE¼S8,T22N,R35E	162	53	1973	115	–	3.2	0.02	190	6.5	111	11	111	126	16.3	–	0.89	–	914	8.6	Mariner & others, 1974
Remarks: Li = 0.38; numerous hot springs and nearby cold springs.																				
spring SE¼S5 & NE¼S8,T22N,R35E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
Remarks: Al = 0.015, P = 0.06, Rb = 0.07, Ce = 0.1, Hg = 0.0010, δD(‰) = –126.1, δO^{18}(‰) = –15.89.																				
spring T22N(?),R35E	warm	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 71A
Remarks: Probably Dixie Hot Springs. Five miles south of Waring's spring No. 71.																				
[7] well SW¼S36,T21N,R34E	73	1000?	23Jul63	0.54	0.01	16	2.2	68	3.0	86	0	80	26	6.0	1.1	0.3	3	435	7.6	Cohen & Everett, 1963
Remarks: Depth – 200 ft.; flowing?																				
[8] well NW¼S19,T21N,R35E	70	25	21Aug51	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Cohen & Everett, 1963
Remarks: Depth – 200 ft.; flowing.																				
well NE¼S20,T21N,R35E	71	40	1May52	63	0.04	12	0.9	72	2.0	98	0	60	21	6.9	0.9	0.08	287	381	8.2	Cohen & Everett, 1963
Remarks: Depth – 162 ft.; flowing.																				
well NE¼S20,T21N,R35E	71	15	22Aug51	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Cohen & Everett, 1963
Remarks: Depth – 212 ft.; flowing.																				
well NE¼S20,T21N,R35E	71	–	1May52	–	0.04	12	0.9	–	–	98	–	60	21	6.9	0.9	–	287	–	8.2	CWRR, 1973
[9] Tom Ormechea well SE¼S6,T20N,R38E	76	50	1950	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Everett, 1964
Remarks: Depth – 100 ft.; flowing.																				
[10] Brady's (Springer's, Fernley) Hot Springs																				
springs S12,T22N,R26E	158-209	50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 72
Remarks: Fumaroles and hot springs.																				
springs S12,T22N,R26E	–	–	–	278	–	31	–	774	66	–	–	355	967	–	–	–	–	–	–	Russell, 1885
Remarks: Al = 1, Li = tr.																				
springs S12,T22N,R26E	194	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Koenig, 1970
Remarks: All waters sampled are sodium chloride-type.																				
Magma Power Co. and Vulcan Thermal Power Co. wells S12,T22N,R26E	334	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1965, p. 7
geothermal well CS12,T22N,R26E	–	–	1960	242	0.08	53	1.2	780	65	162	–	377	978	7.6	0.4	6.8	2600	4090	7.3	Harrill, 1970
Remarks: Al = 0.52; Mn = 0.00; Cu = 0.00; Pb = 0.00; Zn = 0.00; Li = 1.8; As = 0.15; PO_4 = 0.22 (the name of the well sampled is not known).																				
Union Oil Co. SP-Brady's No. 1 well NE¼SW¼SE¼S1,T22N,R26E	371	–	11Jun74	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	unpublished data, NBMG
Remarks: Depth – 7275 ft; geothermal well.																				
Magma Power Co. Brady No. 4 well SE¼NW¼S12,T22N,R26E	–	–	–	190	–	33	tr	813	6	13	56	336	986	5	–	0.3	2440	2100	8.8	Middleton, no date
Remarks: H_2S = 3; NH_3 = 0.02; CO_2 = 0; Ti, Mn, Cu, Li = tr. Geothermal well; depth – 723 ft.																				
Magma Power Co. Brady No. 4 well (condensate) SE¼NW¼S12,T22N,R26E	–	–	–	49	–	9	–	277	–	–	–	–	352	–	–	0.2	860	850	5.5	Middleton, no date
Remarks: H_2S = 7; NH_3 = 0.08; CO_2 = 92.																				
Magma Power Co. Brady No. 5 well SW¼NE¼S12,T22N,R26E	–	–	–	166	–	14	tr	738	5	–	–	282	834	<1	–	0.2	2130	1800	6.4	Middleton, no date
Remarks: H_2S = 5; NH_3 = 0.05; CO_2 = 35; Mn, Ti, Cu, Li = tr. Geothermal well; depth – 593 ft.																				
Magma Power Co. Brady No. 5 well (condensate) SW¼NE¼S12,T22N,R26E	–	–	–	5	–	1	–	1	–	–	–	0.1	0.5	–	–	0.1	15	20	5.2	Middleton, no date
Remarks: H_2S = 16; NH_3 = 0.14; CO_2 = 78.																				
[11] Eagle Salt Works Spring S34,35,T22N,R26E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 73
Remarks: Several springs. Location in reference is T20N,R27E, which is probably incorrect.																				
springs S34,35,T22N,R26E	–	–	–	259	–	32	2	839		61	19	334	955	–	–	–	2495	–	–	Adams, 1944
Remarks: Fe + Al = tr; no location given in reference.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
CHURCHILL COUNTY (continued)																				
[12] Desert Peak area																				
Phillips Petroleum Co. Desert Peak No. 21-2 well NE¼NE¼S21,T22N,R27E	390	–	Feb77	–	–	–	–	–	–	–	–	–	–	–	–	–	7500	–	–	unpublished data, Phillips Petroleum Co.
	Remarks: Depth – 3192 ft.; geothermal well.																			
[13] Soda Lakes-Upsal Hogback thermal area																				
well CDAH-2A NE¼SW¼NW¼S22,T20N,R28E	88	–	6May77	56	–	26	9	940	100	354	–	22	1400	0.8	0.2	6.1	–	4980	–	unpublished data, USGS
	Remarks: Depth – 87 ft.; Li = 1.7, Br = 3.8.																			
well? S28,T20N,R28E	210	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hose & Taylor, 1974
	Remarks: Orifice covered by concrete.																			
well NW¼SW¼SW¼S28,T20N,R28E	boiling	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Morrison, 1964, p. 117
	Remarks: Depth about 60 ft.																			
well CDAH-37 NE¼SW¼SE¼S28,T20N,R28E	135	–	6May76	–	–	360	46	1800	160	305	–	2500	1800	0.6	0.10	3.4	–	10000	–	unpublished data, USGS
	Remarks: Depth – 45 ft.; Li = 2.0, Br = 6.8.																			
well CDDH-30A SW¼SE¼SW¼S28,T20N,R28E	102	–	4May76	130	–	100	2.4	1100	50	181	–	480	1400	0.6	0.0	5.3	–	5630	–	unpublished data, USGS
	Remarks: Depth – 133 ft; temperature given as 102°C. Li = 1.7, Br = 4.5.																			
well BRCDDH-14A NW¼NE¼SE¼S28,T20N,R28E	144	–	27Jul77	170	–	170	0.8	1650	50	106	0	68	2800	1.9	–	13.5	–	8960	–	unpublished data, USGS
	Remarks: Depth – 523 ft; temperature given as 144°C. Ar = 0.15, Li = 3.0, Br = 10.																			
well CDDH-32A SE¼SW¼NW¼S28,T20N,R28E	136	–	6May76	71	–	140	17	1300	90	205	–	450	1900	0.5	0.3	3.3	–	7110	–	unpublished data, USGS
	Remarks: Depth – 148 ft; Li = 2.3, Br = 8.0.																			
well CDDH-31 NW¼NE¼NE¼S32,T20N,R28E	95	–	5May76	2.6	–	53	17	960	74	350	–	300	1300	1.0	0.1	3.4	–	5130	–	unpublished data, USGS
	Remarks: Depth – 127 ft; Li = 1.6, Br = 4.2.																			
spring north of Soda Lake	70	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Thompson & West, 1881
	Remarks: Water has high soda content.																			
Big Soda Lake SE¼NE¼S7,T19N,R28E	86	–	1967	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Breese, 1968, p. 25
	Remarks: Some warm springs apparently enter the bottom of Big Soda Lake near its center, which is over 200 ft deep.																			
[14] Stillwater thermal area																				
Elmer Weishaupt Ranch well S1,T19N,R30E	88	flowing	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Morrison, 1964, p. 115
	Remarks: Depth – 200 ft; cased to 150 ft. Gas analysis: Sample 1– 27 Nov 27 – CO_2 = 0.8%, CH_4 = 61.8%, CaH_6 + higher hydrocarbons = 1.4%, N = 35.4%, O = 0.6%; Sample 2 – 3 Jan 47 – CO_2 = 1.65%, CH_4 = 47.18%, C_2H_6 + higher hydrocarbons = 10.45%, N = 40.72%, O = 0.0%. Water used for domestic purposes.																			
O'Neill Geothermal Inc. (Oliphant) Reynolds No. 1 well NE¼SW¼SW¼S6,T19N,R31E	277	–	1964	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	unpublished data, NBMG
	Remarks: Depth – 4237 ft; geothermal well.																			
well SW¼S7,T19N,R31E	205	–	–	170	–	108	1.7	1480	42	90	<1	190	2200	5.0	–	15	–	6910	–	Mariner & others, 1974
	Remarks: Li = 1.94; well is flowing.																			
well SW¼S7,T19N,R31E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
	Remarks: Well is flowing; N = 3.4, Rb = 0.22, Ce = 0.2, Sr = 5.7, δD(‰) = –110.2, δO^{18}(‰) = – 12.36.																			
well SW¼SE¼S7,T19N,R31E	boiling	–	23Nov71	–	–	91	1	1400		104	0	190	2080	–	–	–	–	7420	7.5	Glancy & Katzer, 1975
	Remarks: Depth – 204 ft.																			
L. H. Greenwood's store well S7,T19N,R31E	190	flowing	27Oct46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Morrisan, 1964
	Remarks: Depth – 230 ft; cased to 100 ft. Gas analysis: Sample 1 – CO_2 = 1.75%, CH_4 = 6.48%, C_2H_6 + higher hydrocarbons = 4.38%, N = 87.39%, O = 0%; Sample 2 – CO_2 = 1.72%, CH_4 = 12.08%, C_2H_6 + higher hydrocarbons = 0.81%, N = 84.90%, O = 0.49%. Noncombustible gas accumulates in a heat radiator.																			
[15] Churchill Drilling Corp. T.C.I.D. No. 1 well SE¼NW¼NW¼S15,T22N,R30E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	R. Forest, oral communication, 1974
	Remarks: Depth – 3758 ft; reportedly perforated 3125–3150 ft. Exploratory oil and gas well. Well was flowing hot water in 1974.																			
[16] U. S. Bureau Reclamation heat flow hole NE¼SW¼NW¼S10,T22N,R31E	77	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Olmsted & others, 1975
	Remarks: Depth – 500 ft.																			
[17] test hole AH-13 SW¼NE¼NW¼S7,T21N,R29E	72	–	16May73	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Olmsted & others, 1975
[18] well N½S7,T17N,R30E	158	–	13Mar77	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	C. W. Klein, oral communication, 1977
	Remarks: Flowing. Possibly in S½S6.																			
[19] test hole DH-1 SW¼S17,T16N,R29E	72	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Olmsted & others, 1975

CHURCHILL COUNTY (continued)

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
[20] Eightmile Flat																				
Kerr-McGee Eightmile Flat hole no. 1 NW¼NW¼S12,T17N,R30E	hot		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	unpublished, NBMG
Remarks: Depth – 500 ft; hit very hot water at 400 ft. Cuttings and log available at NBMG; drilled for saline minerals.																				
Borax Spring NE¼S14,T17N,R30E	178		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 74
Remarks: See Russell, 1885, pl. 8.																				
[21] Lee Hot Springs																				
springs SW¼NW¼S34,T16N,R29E	boiling	10	18Aug70	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Glancy & Katzer, 1975
springs CNW¼S34,T16N,R29E	172	25	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 74A
well CNW¼S34,T16N,R29E	196		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Don Miller, personal communication, 1977
Remarks: Temperature taken 3 ft below surface. This well is source of hot water presently flowing from Lee Hot Springs.																				
Allen's Hot Springs NW¼NE¼S34,T16N,R29E	–	–	14Jul47	–	–	49	16	431	–	132	17	440	374	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
Remarks: This analysis may be from Lee Hot Springs.																				
Allen's Hot Springs NW¼NE¼S34,T16N,R29E	–	–	13Nov44	–	–	68	18	416	–	122	–	491	379	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
Remarks: This analysis may be from Lee Hot Springs.																				
Allen's Hot Springs NW¼NE¼S34,T16N,R29E	–	–	29Jul40	–	–	41	0	464	–	126	–	446	385	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
Remarks: This analysis may be from Lee Hot Springs.																				
spring	190	34	1973	180	–	44	0.6	450	26	114	<1	470	380	7.9	–	2.4	–	2430	7.4	Mariner & others, 1974
Remarks: Li = 0.70.																				
spring lat. 39°12'N, long. 118°43'W	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
Remarks: Al = 0.027, N = 0.22, P = 0.04, As = 0.04, Br = 1, I = 0.1, Rb = 0.22, Ce = 0.1, Sr = 1.0, Fe <0.02, Mn = 0.06, Cu = 0.01, Hg = < 0.0001, δD(‰) = –125.8, δO^{18}(‰) = –13.21.																				
[22] spring S6,T16N,R32E	hot		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 75
Remarks: Several springs; water smells of H_2S. On Fourmile Flat.																				

CLARK COUNTY

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
[23] well 75-73 (test well 3) 36°48'40", 115°51'50"	100	–	10May62	24	0	51	21	83	7.6	328	0	84	23	1.5	0.9	–	444	710	7.3	Schaff & Moore, 1964
Remarks: Depth – 1853 ft. Aquifer is Paleozoic carbonate rock. Al = 0.03, Li = 0.12, PO_4 = 0.																				
[24] Bunkerville area																				
Hafen Dairy well SE¼SE¼SE¼S13,T13S,R70E	70	–	15Nov67	–	–	244	126	522		209	–	1320	510	–	–	–	3100	4000	8.0	Glancy & Van Denburgh, 1969
Remarks: Depth – 60 ft.																				
Bruna Biasi well SW¼S34,T13S,R70E	70	–	11Nov67	–	–	310	169	631		341	–	1510	701	–	–	–	3900	4900	7.8	Glancy & Van Denburgh, 1969
Remarks: Depth – 118 ft.																				
well SW¼SW¼S35,T13S,R70E	75	–	10Nov67	–	–	38	29	–	–	–	–	128	42	–	–	–	460	730	–	Glancy & Van Denburgh, 1969
Remarks: Depth 300 ft.																				
Bunkerville Water Users Association well SW¼SW¼SE¼S35,T13S,R70E	77	–	10Nov67	–	–	28	28	–	–	–	–	72	22	–	–	–	350	560	–	Glancy & Van Denburgh, 1969
Remarks: Depth – 300 ft.																				
Mesquite Farmstead well SE¼SW¼S20,T13S,R71E	73	–	1952	32	–	37	19	55		141	–	109	38	–	8.8	–	369	568	–	Glancy & Van Denburgh, 1969
Remarks: Depth – 210 ft.																				
Mesquite Farmstead Water Association well NE¼NW¼NW¼S29,T13S,R71E	70	–	14Jan52	35	–	36	15	–	–	148	–	73	–	–	9.3	–	300	486	–	Glancy & Van Denburgh, 1969
Remarks: Depth – 225 ft.																				
[25] Moapa area																				
Clarence Lewis well NW¼NE¼S8,T14S,R65E	80	360	1949	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1964
Remarks: Depth – 57.5 ft; flowing.																				
Woodruff and Perkins well NW¼SE¼S8,T14S,R65E	82	285		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1946
Remarks: Open dug well; flowing.																				
well SW¼SW¼SW¼S15,T14S,R65E	90	–	25Jun68	–	–	65	27	–	–	265	–	186	64	–	–	–	–	–	7.7	CWRR, 1973
Muddy River Springs CNE¼S16,T14S,R65E	90	3240	15Apr63	31	–	65	28	99	10	288	0	174	60	2.4	2.3	0.3	614	985	7.7	Eakin, 1964
Remarks: Largest thermal spring in Nevada.																				
springs T14S,R65E	90	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 150
Remarks: Several springs; water used for bathing.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
CLARK COUNTY (continued)																				
Muddy Spring CNE¼S16,T14S,R65E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Remarks: Tritium ≤4 T.U.; $-\delta C^{14}$ = 912 ± 13(19,500 ± yrs. B.P.); in alluvium.																				
Peterson (Pederson) Spring NW¼S16,T14S,R65E	90	–	19Jan74	245	0.01	75	26	107	8.8	284	0	189	59	2.13	1.9	–	854	1012	7.9	Sanders & Miles, 1974
Remarks: PO_4 = 0.2, As = 0.002, Ba = 0.1, Cu = 0.02, Pb = 0.02, Sr = 0.774, Zn = 0.82, Ni = 0.02, Li = 0.17, NH_4 = 0.2, Be <0.005, Cu <0.02, Pb <0.02, Cr <0.02, Ag <0.02, Ba = 0.06, Bi <0.1, Cd = .005, Cs = 1.00, Hg <0.5μg/l, Mn = .01, Ni = .02, Rb = 0.54, Sb = <0.1, Se <1.0μg/l, Sn <0.05.																				
Muddy River Springs S9,15,16,T14S,R65E	90	–	1968	–	–	65	27	–	–	264	–	180	68	–	–	–	–	–	7.7	CWRR, 1973
Remarks: Over 40 similar analyses from six different springs reported (this analysis is a rough average of the 40).																				
well NE¼NE¼S16,T14S,R65E	90	–	1968	–	–	66	28	–	–	266	–	187	68	–	–	–	–	–	7.7	CWRR, 1973
Remarks: Average of 4 analyses.																				
Moapa (Iverson's) Warm Springs NW¼NE¼NE¼S21,T14S,R65E	90	–	–	42	1	98	26	75		281	0	184	66	–	–	–	617	–	–	Adams, 1944
Remarks: Fe + Al = tr.																				
Moapa (Iverson's) Warm Springs NW¼NE¼NE¼S21,T14S,R65E	90	1696	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Moapa (Iverson's) Warm Springs NW¼NE¼NE¼S21,T14S,R65E	90	1020	12Sep63	29	–	70	26	101	11	274	0	179	64	2.3	2.2	0.3	620	964	7.5	Eakin, 1964
Remarks: In alluvium. Several springs. Water used for bathing and irrigation.																				
[26] W. Wipple well NW¼NE¼S34,T15S,R67E	75	–	11Oct49	36	–	106	54	177		371	–	421	92	–	0.6	–	1070	1610	–	Rush, 1968c
Remarks: Depth – 87 ft.																				
[27] Test Well 10 NE¼NE¼S1,T16S,R54E	81	–	28Jun64	15	0	41	17	7.6	1.0	200	0	14	5.3	0.2	1.6	0.08	238	350	7.2	Naff, 1973
Remarks: Al = 0.12, Mn = 0, PO_4 = 0.																				
well S1,T16S,R54E	81	–	23Feb63	–	0.03	37	18	–	–	194	–	15	6.7	–	2.1	–	177	–	7.7	CWRR, 1973
Remarks: PO_4 = 0.06.																				
well S1,T16S,R54E	81	–	28Jun64	–	–	41	17	–	–	200	–	14	5.3	0.2	1.6	–	200	–	7.2	CWRR, 1973
[28] Indian Springs area																				
Indian Spring S16,T16S,R56E	78	410	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 151
Remarks: Water supply for railroad and for irrigation.																				
spring NW¼NE¼S14,T16S,R56E	79	–	23Oct64	–	–	50	20	–	–	239	–	16	3.7	0.1	1.1	–	223	–	7.3	CWRR, 1973
spring NW¼NW¼S16,T16S,R56E	79	324	15Dec12	17	–	48	15	31	–	239	0	28.0	5.0	–	–	–	330	–	–	Hardman & Miller, 1934
spring NW¼NW¼S16,T16S,R56E	79	410	15Dec12	17	0.16	48	15	21	9.7	239	0	28	5	–	0	–	330	–	–	Carpenter, 1915
Remarks: Water supply for railroad; also used for irrigation.																				
spring NW¼NW¼S16,T16S,R56E	79	408	5Aug27	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Remarks: (epm) Na + K = 1.37; Ca + Mg = 5.94; Cl + SO_4 = 1.73.																				
spring NW¼NW¼S16,T16S,R56E	–	400	18Mar46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965
spring NW¼NW¼S16,T16S,R56E	–	500	1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush, 1970
Remarks: Issues from alluvium.																				
Indian Springs NW¼NW¼S16,T16S,R56E	79	–	23Oct64	13	0	50	20	4.5	1.1	238	0	16	3.7	0.1	1.1	0.14	335	401	7.4	Naff, 1973
Remarks: Al = 0.04, Mn = 0, PO_4 = 0.																				
[29] spring SW¼SE¼S1,T16S,R67E	70	–	12Oct49	54	–	153	104	256		338	–	805	175	–	5.4	–	1720	2420	–	Rush, 1968c
Remarks: Seep.																				
[30] springs (Virgin River Narrows) S6(?),T17S,R69E	75	270	19Aug32	16.0	–	441	128	3177	–	509	–	1283	401	–	–	–	3249	–	–	Hardman & Miller, 1934
Remarks: A large number of springs here in the narrows of the Virgin River have quite uniform temperatures, varying from 75° to 80°F.																				
[31] Rogers Springs area																				
Blue Point Spring NW¼NE¼S7 & SW¼SE¼S6,T18S,R68E	81	400	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Blue Point Spring NW¼NE¼S7 & SW¼SE¼S6,T18S,R68E	82	150	1945	–	–	472	167	317		122	–	1910	355	–	–	–	3300	–	–	Rush, 1968c
Remarks: Issues from junction of 2 faults.																				
Rogers Spring S12,T18S,R67E	warm	–	1966	17	0.02	443	140	296	22	166	–	1680	334	1.5	0.8	1.2	3020	3750	7.3	Rush, 1968c

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
CLARK COUNTY (continued)																				
Rogers Spring NE¼NE¼S13,T18S,R67E	86	–	4Feb74	18	<0.02	430	128	284	18	170	0	1747	328	1.52	1.3	–	3040	3960	7.5	Sanders & Miles, 1974
	Remarks: Li = 0.67, PO_4 = 0.1, As = 1.5µg/l, Ba = 0.4, Pb = 0.07, Mn = 0.01, Sr = 4.9, Zn = 0.02, Ni = 0.02, Cd = 0.007, NH_4 <0.2, Be <0.005, Cu <0.02, Sn <0.05, Cr <0.02, Ag <0.02, Bi <0.1, Cs = 1.60, Hg = 0.5µg/l, Rb = .138, Sb <0.1, Se <1.0µg/l. Near Stewart Point, North Shore Road, Lake Mead. Public bathing. Picnic area.																			
Rogers Spring S12,T18S,R67E	warm	–	–	–	–	451	149	395		185	–	1670	343	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
Rogers Spring SE¼SE¼S12,T18S,R67E	81	880	1950	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 12.75, Ca + Mg = 34.73, Cl + SO_4 = 43.37, tritium ≤5 T.U., $-\delta C^{14}$>927 t>21,000 yrs. B.P.t.																			
Rogers Spring SE¼SE¼S12,T18S,R67E	–	780-880	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush, 1968c
Rogers Springs	81	900	28Sep12	24.0	–	428	151	220	–	159	0	1638	331	–	–	–	3266	–	–	Hardman & Miller, 1934
[32] White Rock Spring NE¼NE¼S33,T20S,R58E	78	1450 963	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	390	–	Hughes, 1966
[33] Las Vegas Valley																				
wells S36,T19S,R62E	80-84	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Godwin & Johnson, 1967
Kyle Spring SW¼SE¼S15,T20S,R61E	75	–	16Sep12	8	0.01	53	27	26		251	–	33	55	–	2	–	258	–	–	Maxey & Jameson, 1948
North Las Vegas Airport well S18,T20S,R61E	158(?)	–	20Nov75	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	unpublished data, USGS
	Remarks: Depth – 500 ft. This temperature was given as 70°C but appears to have been 70°F (the temperature of water wells in this area were taken monthly from Aug 77 through Mar 76; temperatures taken in Sep & Nov range from 61–70°C, those for other months from 17–23°C. The N. Las Vegas Airport well had temperatures of 70°C in Sep & Nov and 22°C in all the other months; 22°C = 70°F indicating that the 70° reading should have been 70°F).																			
City of North Las Vegas well SE¼SW¼SE¼S22,T20S,R61E	73	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
	Remarks: Depth – 250 ft.																			
Tony Bruno well SW¼NW¼SW¼S23,T20S,R61E	73	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
	Remarks: Depth – 210 ft.																			
Las Vegas Springs	73	2600	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Young, 1965, No. 152
	Remarks: Two springs; water used for domestic and industrial purposes and irrigation.																			
Las Vegas Springs (Joe Brown Well) SW¼NE¼SE¼S31,T20S,R61E	79	950-1700	16May52	14	0.05	48	25	8.1	3.6	222	0	51	6.5	0.2	1.0	–	266	447	7.9	Scott & Barker, 1962
	Remarks: Mn = 0.0.																			
Las Vegas Springs (Joe Brown Well) SW¼NE¼SE¼S31,T20S,R61E	73	–	23Sep12	13	tr	56	23	11	6	239	0	43	2.0	–	6	–	267	–	–	Carpenter, 1915
Las Vegas Springs (Joe Brown Well) SW¼NE¼SE¼S31,T20S,R61E	79	950-1700	16May52	13	0.03	50	25	8.0	3.5	229	0	52	3.8	0.3	1.5	–	260	452	7.8	Scott & Barker, 1962
	Remarks: Al = 0.0, Mn = 0.0, Ra = 0.3µµc/l., U = 2.0µg/l.																			
Las Vegas Springs SE¼SE¼S30 & NE¼NE¼ S31,T20S,R61E	–	0	1963	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965
	Remarks: Three springs; Big, Little, and Open.																			
Las Vegas Springs SE¼SE¼S30 & NE¼NE¼ S31,T20S,R61E	73	0	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Las Vegas Springs SE¼SE¼S30 & NE¼NE¼ S31,T20S,R61E	–	1400	1924-1946	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
James Filbey well NW¼SE¼S32,T20S,R61E	79	–	24Aug38	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Livingston, 1940
	Remarks: Depth – 616 ft; flowing in 1938.																			
J. H. Umbaugh well SW¼NE¼S6,T21S,R61E	73	–	12Sep38	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Livingston, 1940
	Remarks: Depth – 222 ft; flowing in 1938.																			
L. M. Pinjuv well SW¼NE¼S6,T21S,R61E	73	–	12Sep38	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Livingston, 1940
	Remarks: Depth – 270 ft; flowing in 1938.																			
W. N. Hinson well SW¼NE¼S6,T21S,R61E	73	–	12Sep38	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Livingston, 1940
	Remarks: Depth – 275 ft; flowing in 1938.																			
A. J. and L. C. Wood well NW¼NW¼NW¼S26,T21S,R61E	79	–	13Nov45	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
	Remarks: Depth – 595 ft.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
CLARK COUNTY (continued)																				
W. L. and B. Jenison well SW¼SW¼SW¼S27,T21S,R61E Remarks: Depth – 263 ft.	73	–	21Aug44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
W. L. and B. Jenison well SW¼SW¼SW¼S27,T21S,R61E Remarks: Depth – 263 ft.	75	–	17Oct44	–	–	61	31	20		253	0	101	11	–	–	–	478	–	–	Maxey & Jameson, 1948
Tollackson well SW¼NW¼NE¼S34,T21S,R61E Remarks: Depth – 246 ft.	73	–	6Jan47	–	–	64	30	11		223	–	107	6	0.3	3.9	–	332	560	–	Maxey & Jameson, 1948
Tollackson well SW¼NW¼NE¼S34,T21S,R61E Remarks: Depth – 246 ft.	75	–	12Apr44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Roy Wood Martin Estate well NW¼SW¼SW¼S35,T21S,R61E Remarks: Depth – 300 ft.	77	–	28Apr44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
J. R. Bond well SW¼SW¼SW¼S29,T21S,R62E Remarks: Depth – 404 ft.	81	–	13Jul42	25	–	110	50	29		215	tr	327	20	–	–	–	715	–	–	Maxey & Jameson, 1948
U. G. Campbell well NW¼NW¼SE¼S30,T21S,R62E Remarks: Depth – 390 ft.	77	–	24Aug44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
U. G. Campbell well NW¼NW¼SE¼S30,T21S,R62E Remarks: Depth – 390 ft.	77	–	4Aug42	12	–	110	42	18		160	0	315	20	–	–	–	602	–	–	Maxey & Jameson, 1948
U. G. Campbell well NW¼NW¼SE¼S30,T21S,R62E Remarks: Depth – 405 ft.	77	–	24Aug44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Chris Wilson well SE¼SW¼NW¼S30,T21S,R62E Remarks: Depth – 455 ft.	79	–	26Jun46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
John Graham and Tip Rowe well NW¼SW¼SE¼S1,T22S,R61E Remarks: Depth – 503 ft.	79	–	9Apr46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
well NE¼SE¼SW¼S1,T22S,R61E Remarks: Depth – 230 ft.	79	–	9Apr46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
J. K. Houssels well NW¼NW¼SW¼S1,T22S,R61E Remarks: Depth – 340 ft.	79	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
John Graham and Tip Rowe well SE¼NE¼SW¼S1,T22S,R61E Remarks: Depth – 505 ft.	79	–	9Apr46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
J. K. Houssels well NW¼SW¼NW¼S1,T22S,R61E Remarks: Depth – 340 ft.	79	–	5Dec43	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
J. K. Houssels well NW¼SW¼NW¼S1,T22S,R61E Remarks: Depth – 455 ft.	79	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
J. K. Houssels well NW¼SW¼NW¼S1,T22S,R61E Remarks: Depth – 225 ft.	79	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Henry Wick well SW¼SW¼SW¼S2,T22S,R61E Remarks: Depth – 600 ft.	84	–	7Feb46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
H. F. Reed well SW¼NW¼SW¼S2,T22S,R61E Remarks: Depth – 600 ft.	79	–	15Aug44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
M. M. Sweeney well NW¼NE¼NW¼S2,T22S,R61E Remarks: Depth – 350 ft.	75	–	13Apr44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Lawrence Warden well SE¼NW¼NE¼S2,T22S,R61E Remarks: Depth – 290 ft.	77	–	9Apr46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Nate Mack well NE¼NW¼NE¼S2,T22S,R61E Remarks: Depth – 200 ft.	79	–	13Apr44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
L. H. Irvin well NE¼NW¼NE¼S2,T22S,R61E Remarks: Depth – 200 ft.	79	–	13Apr44	–	–	134	57	2.3		198	0	353	30	–	–	–	775	1090	–	Maxey & Jameson, 1948
Henry Wick well NE¼SE¼SE¼S3,T22S,R61E Remarks: Depth – 335 ft.	84	–	15Jun45	–	–	158	53	0.7		176	9.0	441	0.5	–	–	–	838	1140	–	Maxey & Jameson, 1948
Henry Wick well NE¼SE¼SE¼S3,T22S,R61E Remarks: Depth – 335 ft.	84	–	11Feb46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
H. Nickerson well NE¼NE¼SW¼S3,T22S,R61E Remarks: Depth – 395 ft.	84	–	3Jul41	21	–	150	44	40		171	0	453	22	–	–	–	863	–	–	Maxey & Jameson, 1948

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
CLARK COUNTY (continued)																				
H. Nickerson well NE¼NE¼SW¼S3,T22S,R61E	84	–	15Jan44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Remarks: Depth – 395 ft.																				
H. H. Hair well NE¼SE¼NW¼S3,T22S,R61E	82	–	15Aug44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Remarks: Depth – 374 ft.																				
T. P. And G. G. Water well NW¼SE¼NE¼S3,T22S,R61E	84	–	11Feb46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Remarks: Depth – 565 ft.																				
Gladstone Corporation well NE¼SE¼NW¼S10,T22S,R61E	90	–	18Sep12	30	–	155	50	15		205	0	405	35	–	–	–	857	600	–	Maxey & Jameson, 1948
Remarks: Depth – 325 ft.																				
Gladstone Corporation well NE¼SE¼NW¼S10,T22S,R61E	91	–	13Feb44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Remarks: Depth – 325 ft.																				
well SW¼SW¼NW¼S16,T22S,R61E	106	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Malmberg, 1965
Remarks: Depth – 200 ft.																				
well NW¼NW¼S21,T22S,R61E	106	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Malmberg, 1965
Remarks: Depth – 460 ft.																				
T. A. Wells well SW¼NW¼SW¼S1,T22S,R62E	91	–	27Mar46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Remarks: Depth – 1135 ft. Flow of water from above 670 ft. Driller reported "shale" from 670 ft to total depth.																				
T. A. Wells well SW¼NW¼SW¼S1,T22S,R62E	–	–	15Mar45	–	–	106	20	436		84	0	1027	112	–	–	–	1785	2480	–	Maxey & Jameson, 1948
A. G. Klinger well NW¼SE¼SW¼S9,T22S,R62E	75	–	30Aug44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Remarks: Depth – 125 ft.																				
[34] National Park Service, Callville Bay Campground well NW¼SE¼S9,T21S,R65E	84	–	12Oct67	38	0.00	298	113	828		98	–	1200	1190	1.5	–	–	3720	–	7.0	Rush, 1968c
Remarks: Depth – 200 ft. Salt water.																				
[35] Brown's Spring NE¼SE¼S15,T22S,R54E	75	0.2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	460	–	Hughes, 1966
[36] Black Canyon																				
spring(?) SW¼SW¼NE¼S32,T22S,R65E	145	–	11Feb76	45	0.01	200	4.5	480	12	84	0	780	480	4.1	–	1.0	–	3500	8.2	unpublished data, USGS
Remarks: Mn = 0.72.																				
spring NW¼SW¼NW¼S32,T22S,R65E	91	314	15Jan76	44	0.000	160	5.8	410	11	90	0	720	380	–	–	1.0	–	3000	8.2	unpublished data, USGS
Remarks: CO_2 = 0.9.																				
spring(?) NE¼SE¼NW¼S32,T22S,R65E	117	–	11Feb76	54	0.01	140	10	290	10	136	0	610	180	4.1	–	0.66	–	2150	8.2	unpublished data, USGS
Remarks: CO_2 = 1.4; Mn = 0.02.																				
spring SE¼NW¼SW¼S5,T23S,R65E	86	224	15Jan76	40	0.01	290	4.8	680	17	41	0	730	1000	3.9	–	1.4	2790	5600	7.9	unpublished data, USGS
Remarks: CO_2 = 0.8; two hot springs in a side canyon ¼ mile west of Colorado River, and a third to the east-northeast on the Arizona side of the river (shown on Ringboldt Rapids 7½' sheet).																				
spring SE¼SE¼SW¼S8,T23S,R65E	81	45	15Jan76	34	–	290	10	650	15	48	0	660	1100	0.01	–	1.2	2790	5200	7.8	unpublished data, USGS
Remarks: CO_2 = 1.2; hot spring is in side canyon, ½ mile west of Colorado River (shown on Ringboldt Rapids 7½' sheet).																				
spring NE¼SW¼NW¼S21,T23S,R65E	78	5	15Jan76	25	0.01	37	6.9	160	3.1	79	0	180	180	1.4	–	0.7	–	1040	7.6	unpublished data, USGS
Remarks: CO_2 = 3.2; there is a hot spring slightly over 1 mile north of this spring along the Colorado River, in Arizona (SW¼NW¼S26,T30N,R23W).																				
[37] well S29,T24S,R63E	83	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Godwin & Johnson, 1967
[38] well NW¼NW¼NW¼S13,T25S,R60E	81	–	1Jul68	–	0.22	110	94	288		98	–	85	790	–	–	–	1538	–	7.9	CWRR, 1973
Remarks: Depth – 400 ft.																				
[39] well S9,T30S,R63E	87	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Godwin & Johnson, 1967
[40] U. S. Bureau of Land Management Tenmile Well NW¼S9,T31S,R65E	88	–	29Apr65	–	–	3.8	0.9	67		114	5	24	22	–	–	–	–	334	8.5	Rush & Huxel, 1966
Remarks: Depth – 825 ft.																				
[41] well NW¼S24,T32S,R66E	81	–	19Jan71	–	0.16	75	22	81		162	–	171	100	0.6	7.0	–	–	–	–	CWRR, 1973
Remarks: Depth – 500 ft.																				
DOUGLAS COUNTY																				
[42] Hobo Hot Springs																				
spring SE¼SE¼S23,T14N,R19E	114	10-15	3May60	47	0.03	6	0.7	125	1.7	51	17	109	74	7.1	0	1.5	415	662	8.9	Glancy & Katzer, 1975
Remarks: Mn = 0.00; As = 0.00; PO_4 = 0.01.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
DOUGLAS COUNTY (continued)																				
[43] spring NW¼NW¼S19,T14N,R20E	90	–	7Oct70	–	0.02	2	–	120		93	20	–	–	7.6	–	–	372	–	8.4	CWRR, 1973
spring NW¼NW¼S19,T14N,R20E	84	–	7Oct70	–	0.01	3	–	126		98	–	90	0	7.7	–	–	372	–	8.8	CWRR, 1973
spring NW¼NW¼S19,T14N,R20E	81	–	7Oct70	–	0.03	2	–	124		98	18	83	–	7.5	–	–	373	–	8.7	CWRR, 1973
spring NW¼NW¼S19,T14N,R20E	76	–	7Oct70	–	0.01	8	–	121		107	12	84	–	7.7	–	–	381	–	8.9	CWRR, 1973
[44] Saratoga Hot Springs																				
spring SE¼SE¼SW¼S21,T14N,R20E	122	350	14May70	20	–	172	0	160		4	7	678	39	–	–	–	429	1500	9.0	Glancy & Katzer, 1975
[45] Walley's Hot Springs area																				
spring SE¼SW¼S21,T13N,R19E	–	600	1961-64	60	–	9.6	0.5	137	2.9	40	2.7	200	46	5.0	0.3	–	492	–	9.0	Lamke & Moore, 1965
	Remarks: Li = 0.19, OH = 0.2, PO_4 = 0.06.																			
spring SE¼SW¼S21,T13N,R19E	–	–	before 1944	55	–	12	tr	141		146	19	94	42	–	–	–	480	–	–	Adams, 1944
	Remarks: Fe + Al = tr.																			
spring SE¼NW¼NE¼S22,T13N,R19E	–	–	13Dec56	–	–	11	1.1	150	3.1	5.5	24	233	48.3	–	–	0.82	544	761	9.4	U. S. Bureau Reclamation, unpublished data
springs SE¼SW¼S21,T13N,R19E	136-160	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 60
(Genoa) Hot Springs NW¼NE¼S22,T13N,R19E	–	–	22Jan74	54	0.08	14	0.4	118	2.2	58	0	180	36	4.1	0.1	–	437	644	8.9	Sanders & Miles, 1974
	Remarks: Li = 0.19, As = 0.001, Pb = 0.02, Mn = 0.01, Sr = 0.064, Zn = 0.77, Ni = 0.02, Cr = 0.02, NH_4 <0.2, PO_4 <0.1, Be <0.005, Cu <0.02, Mn <0.01, Cd <0.005, As <0.05µg/l, Ba <0.04, Bi <0.1, Pb = 0.02, Hg <0.5µg/l, Se <1.0µg/l, Ag <0.02, Cs = 0.80, Rb = .041, Sb = 0.041, Sn <0.05, Ta = 0.064.																			
spring NE¼S22,T13N,R19E	142	20	1973	58	–	10	0.01	145	3.6	50	9	235	44	4.9	–	1.2	–	726	8.8	Mariner & others, 1974
	Remarks: Li = 0.20.																			
spring NE¼S22,T13N,R19E	–	–	–	–	<0.02	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
	Remarks: Al = 0.032, N = 0.12, P= 0.04, Sr = 0.30, Cu = <0.02, Hg = 0.0003, δD(‰) = −119.5, δO^{18}(‰) = −15.55.																			
spring	145	–	10Nov59	61	0.01	9.6	0.5	137	2.9	12	24	200	46	5.0	–	–	499	730	9.0	unpublished data, USGS
	Remarks: Li = 0.2.																			
spring	–	–	1911?	49	–	11	–	–	5.2	8	151	183	50	–	–	6.3	–	–	–	Lindgren, 1911, p. 189
	Remarks: Al_2O_3 = 0.5, NH_4 = 0.04.																			
spring SW¼NW¼SW¼S22,T13N,R19E	146	–	10Nov59	61	0.01	9.6	0.5	137	2.9	12	24	200	46	5.0	0.3	–	492	730	9.1	Glancy & Katzer, 1975
	Remarks: PO_4 = 0.06.																			
U. S. Steel Corp. wells NE¼S22,T13N,R19E	181	–	1962	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Koenig, 1970
	Remarks: Twenty holes, depth – 100–1258 ft; the maximum temp. (181°F) was hit when crossing the range fault at 64 ft.																			
[46] Doud Spring SE¼SW¼S20,T11N,R21E	70	180	7May70	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Glancy & Katzer, 1975
ELKO COUNTY																				
[47] springs SW¼SW¼S11,T47N,R65E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Delaplain 15-minute quad
[48] well NW¼SW¼S18,T47N,R65E	100	–	24Jan68	20	–	37	8.6	17	8.4	184	0	20	1.8	0.7	0.6	0	205	332	7.9	Moore & Eakin, 1968
	Remarks: Depth – 126 ft; PO_4 = 0.01.																			
[49] spring SE¼NW¼S9,T47N,R67E	86	–	1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hose & Taylor, 1974
[50] warm spring at Mountain City T46N,R53E	warm	–	12Nov37	–	–	36	–	12	–	68	–	5	8	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
[51] spring SW¼NW¼S14,T46N,R56E	104	55	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 22
	Remarks: Several springs.																			
[52] Goose Creek area																				
Nile Spring SW¼S30,T47N,R70E	109	–	1973	31	–	40	11.5	10	5.6	149	–	37	8.7	0.4	–	<0.02	–	321	7.2	Mariner & others, 1974
	Remarks: Li = <0.2; Na-K-Ca thermal reservoir estimate (111°F) near spring temperature.																			
Nile Spring SW¼SW¼S30,T47N,R70E	106	6	1921	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Piper, 1923; Waring, 1965, No. 24
	Remarks: A travertine terrace deposited by the spring crops out over 2 to 3 acres.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
ELKO COUNTY (continued)																				
Trout Creek Ranch well SE¼SW¼S2,T46N,R69E	70	flowing	3Oct56	27	0.06	30	8.0	8.5	5.4	132	0	11	3.9	0.4	0	–	166	261	7.9	Moore & Eakin, 1968
	Remarks: Depth – 246 ft; PO_4 = 0.																			
Gamble's Hole SE¼S10,T46N,R69E	103	8	Nov21	32	0.06	31	8.9	15		147	0	15	3.2	–	0.22	–	173	–	–	Piper, 1923, p. 60-63; Waring, 1965, No. 25
	Remarks: There are several thermal wells and springs to the northeast of this area in Idaho and Utah.																			
spring SE¼SW¼SE¼S10,T46N,R69E	93	–	10Nov76	23	–	29	8.1	9.6	4.6	144	0	13	3.3	0.4	–	–	162	240	7.2	unpublished data, USGS
	Remarks: Sr = 0.36.																			
Trout Creek Ranch well NW¼NE¼S15,T46N,R69E	110	–	3Sep56	21	0.18	16	5.7	24	5.6	118	1	22	2	0.6	0	–	157	242	8.3	Moore & Eakin, 1968
	Remarks: Depth – 247 ft; PO_4 = 0; flowing well.																			
[53] Gray Rock Mine T46N,R58E	80	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Camozzi, 1942
	Remarks: At Jarbidge. Average water temperature from 1100 foot shaft. Temperature gradient 1°F/75 feet.																			
[54] San Jacinto Ranch (Mineral) Spring																				
spring S23,T46N,R64E	148	–	28Jun41	–	–	69	15	124	–	528	0	42	19	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
spring NW¼NW¼S23,T46N,R64E	78	–	24Jan68	18	0	25	8.6	13	3.9	132	0	11	3.9	0.5	0.1	0	149	245	8.1	Moore & Eakin, 1968
	Remarks: PO_4 = 0; several springs and shallow wells.																			
spring S23,T46N,R64E	–	–	May47	–	–	54	17	83	–	254	14	107	30	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
spring NW¼NW¼S23,T46N,R64E	78-126	1290	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 22B
[55] Rizzi Ranch Hot Spring																				
spring S20,T45N,R54E	–	–	27Aug48	–	–	54	16	104	–	351	36	52	17	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
	Remarks: Reference gives location as T46N,R53E.																			
spring SW¼S20,T45N,R54E	104-106	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 21
	Remarks: 4 springs; water used for bathing.																			
spring S29,T45N,R54E	106	–	1973	23	–	29	7.7	110	8.3	380	–	36	4.4	3.4	–	0.22	–	624	7.4	Mariner & others, 1974
	Remarks: Li = 0.4; SSE of Potsville; estimated minimum reservoir temperature (silica) = 187°F.																			
[56] Mineral Hot (Contact Mineral) Spring																				
spring S16,T45N,R64E	133	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 22A
spring S16,T45N,R64E	140	–	1973	83	–	1.6	<0.01	75	2.2	108	–	45	15	8.9	–	0.47	–	344	9.1	Mariner & others, 1974
	Remarks: Li = <0.2; mixed waters; thermal reservoir temp. est. = 260–264°F.																			
[57] springs S19(?),T43N,R51E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Wilson Reservoir 15-minute quad
	Remarks: Several springs in several sections; the canyon is Warm Springs Creek.																			
[58] Wild Horse Hot Spring SE¼SE¼S4,T43N,R55E	129	–	1973	40	–	48	12	130	22	482	–	40	14	5.2	–	0.69	–	818	7.2	Mariner & others, 1974
	Remarks: Li = 0.5; estimated thermal reservoir temp. = 198°F.																			
[59] Hot Creek Springs																				
springs S32,T43N,R60E	–	450	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965
	Remarks: Ten springs in CNW¼S34,T43N,R60E on the Hot Creek 7½-minute quad.																			
H. D. Ranch Spring T43N,R60E	142-154	600	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 30D
	Remarks: Many springs; deposits of tufa; probably in NE¼NE¼S34.																			
[60] Hot Sulphur Springs																				
spring NE¼S8,T41N,R52E	194	–	1973	84	–	49	13	390	41	1180	–	18	40	7.2	–	0.77	–	1760	7.0	Mariner & others, 1974
	Remarks: Li = 0.7.																			
springs NE¼S8,T41N,R52E	194	–	–	165	–	12	0.3	160	16	345	–	61	22	10	–	1.2	–	753	7.3	Mariner & others, 1975
	Remarks: Li = 0.8, δD(‰) = −134.9, δO^{18}(‰) = −16.78.																			
springs NE¼S8,T41N,R52E	hot	900-1350	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1962b
[61] Wine Cup Ranch																				
Wine Cup Ranch Spring NE¼S25,T41N,R64E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Wells 2-degree sheet
well NW¼NW¼SE¼S25,T41N,R64E	138	–	21Jan67	–	–	49	17	139		426	18	69	30	–	–	–	–	850	8.4	Rush, 1968b
	Remarks: Depth – 68 ft (?). Hot water is piped to the ranch buildings and a swimming pool. The well is reportedly near a fault.																			
well NW¼NW¼SE¼S25,T41N,R64E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush, 1968b
	Remarks: Depth – 59 ft (?).																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
ELKO COUNTY (continued)																				
[62] well SE¼S15,T41N,R67E	71	–	21Jun67	–	–	32	8.3	41		160	–	42	20	–	–	–	–	373	8.0	Rush, 1968b
[63] Petaini Springs SW¼S6,T40N,R53E	warm	1350-1800	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1962b
	Remarks: Stable discharge rate. Measured flow rate may be low due to loss between springs and measuring point.																			
[64] **Thousand Springs**																				
spring NE¼NW¼NE¼S4,T40N,R69E	111	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hose & Taylor, 1974
	Remarks: Travertine deposit.																			
Gamble Ranch Spring S5,T40N,R69E	–	900	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965
Gamble Ranch Spring SW¼NW¼S8,T40N,R69E	69	1350	25Sep65	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 0.48; Ca + Mg = 3.82; Cl + SO_4 = 1.06.																			
spring T41N,R69E	boiling	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 27
	Remarks: Probably located in T40N,R69E.																			
spring CNW¼S14,T40N,R69E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Montello 7½-minute quad
	Remarks: Warm springs.																			
Gamble Ranch Well No. 4 NW¼S16,T40N,R69E	76	–	21Jun67	–	–	74	27	93		278	–	103	117	–	–	–	–	885	8.2	Rush, 1968b
	Remarks: Depth – 210 ft.																			
[65] spring S36(?),T39N,R45E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 20
[66] spring S18,T39N,R59E	117	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hose & Taylor, 1974
	Remarks: Travertine deposit.																			
[67] Warm Creek S2 & 3,T39N,R53E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mahala Creek West 7½-minute quad (prelim.)
	Remarks: A tributary of Gance Creek called Warm Creek flows through Sect. 2 and 3; it is fed by springs in both sections; map does not say they are warm.																			
[68] spring N½S22 & S½S15,T39N,R59E (unsurveyed)	hot	350	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965; Waring, 1965, No. 28
[69] Hot Lake N½NW¼S25,T38N,R46E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Squaw Valley Ranch 7½-minute quad
	Remarks: Small (approx. 8 acre) lake.																			
[70] spring NE¼NE¼SE¼S11,T38N,R48E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Willow Creek Reservoir 7½-minute quad
	Remarks: This spring is the source for Hot Creek. It is not known if the spring is hot.																			
[71] spring SW¼SE¼S14,T38N,R59E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 29
	Remarks: On the Cress Ranch.																			
[72] spring NE¼SW¼S11,T38N,R59E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Twin Buttes 7½-minute quad (prelim.)
spring SE¼SW¼S11,T38N,R59E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Twin Buttes 7½-minute quad (prelim.)
[73] **Humboldt Wells**																				
Twelvemile Spring NW¼NE¼NE¼S27,T39N,R67E	102	800	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 30B
spring NE¼S17,T38N,R62E	142	–	1973	105	–	75	37	300	31	1135	–	32	27	7.2	–	0.89	–	1650	7.3	Mariner & others, 1974
	Remarks: Li = 0.8.																			
spring NE¼S17,T38N,R62E	131	–	–	86	–	48	13	370	46	1230	–	12	37	7.4	–	0.73	–	1820	6.6	Mariner & others, 1975
	Remarks: Li = 0.72, Al = 0.002, Rb = 0.32, Mn = 0.09, Cu <0.01, Hg = <0.0001, δD(‰) = –136.6, δO^{18} = –16.95, gas (volume %): O_2 + Ar = 2%, N_2 = 4, CH_4 <1, CO_2 = 93.																			
spring SE¼NW¼NE¼S17,T38N,R62E	113-122	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 30A
	Remarks: Three springs; large deposit of travertine.																			
spring SE¼NW¼NE¼S17,T38N,R62E	120-135	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bradberry & Associates, 1964
Sulphur Spring SE¼SE¼SE¼S20,T38N,R62E	98	50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 30
	Remarks: Contains much H_2S.																			
Sulphur Spring SE¼SE¼SE¼S20,T38N,R62E	98	40	1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Oesterling, 1962
Three Mile Spring NE¼NE¼SE¼S20,T38N,R62E	115	1	1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Oesterling, 1962
	Remarks: Smells of sulfur.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
ELKO COUNTY (continued)																				
spring S20,T38N,R62E	122	–	1973	165	–	12	0.3	160	16	345	–	61	22	10	–	1.2	–	753	7.3	Mariner & others, 1974
Remarks: Li = 0.8.																				
spring E½S20,T38N,R62E	97	–	–	76	0.04	51	13	340	36	1150	–	29	34	7.0	–	0.8	–	1740	6.3	Mariner & others, 1975
Remarks: Li = 0.65, Al = 0.004, Rb = 0.30, Mn = 0.12, Cu <0.01, Hg = 0.0002, δD(‰) = −136.6, δO^{18} = −16.95. Gas (volume %): O_2 + Ar = 6, N_2 = 34, CH_4 = 1, CO_2 = 62.																				
spring SE¼S20,T38N,R62E	140	–	–	110	0.02	78	36	300	30	1210	–	24	26	6.1	–	0.77	–	1730	6.6	Mariner & others, 1975
Remarks: Li = 0.75, Al = 0.001, Rb = 0.25, δD = −134.7. Gas (volume %): O_2 + Ar = 1, N_2 = 3, CH_4 = 2, CO_2 = 96.																				
spring SE¼SE¼SW¼S29,T38N,R62E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Oxley Peak 7½-minute quad
Railroad Spring S29,T37N,R62E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Oesterling, 1960
[74] warm springs NE¼SE¼S26,T37N,R58E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Morgan Hill 7½-minute quad
[75] Pan American Petroleum Corp.-Cobre Minerals Corp. No. 1 well SW¼SE¼S3,T37N,R67E	170	–	1968	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Nevada Bureau of Mines and Geology files
Remarks: Oil well (dry hole); depth – 5284 ft; bottom hole temperature of 170°F was reported at 4600 feet during drilling.																				
[76] Ralph's Warm Springs area																				
springs S28,T36N,R64E	65	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin & others, 1951
Remarks: Water issues from several pools and seeps along a nearly 1 mile-long segment of the lower part of the alluvail slope.																				
spring S33,T36N,R64E	70	1193	26Sep65	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Remarks: (epm) Na + K = 0.69; Ca + Mg = 3.06; Cl + SO_4 = 0.68. Several pool springs.																				
spring S33,T36N,R64E	warm	375	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bradberry & Associates, 1964
springs S34,T36N,R64E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bradberry & Associates, 1964
spring (seep) NE¼NE¼NW¼S4,T35N,R64E	80	–	1960	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Wilson, 1960c
spring SE¼NE¼NW¼S4,T35N,R64E	86	50	1960	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Wilson, 1960c
spring T34N,R62E	warm	250	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 34
Remarks: Probably Ralph's Warm Springs.																				
[77] Johnson Ranch Spring S28,T36N,R66E	73	30	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 30C
[78] Elko Hot Springs area																				
City of Elko well (old well no. 13) SE¼S10,T34N,R55E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin & others, 1951
Remarks: Depth – 425 ft?; cold water was encountered between 390 ft and 400 ft but hot mud invaded the casing at 425 ft and the well was abandoned.																				
City of Elko well no. 12 SW¼S11,T34N,R55E	75	–	23Dec46	81	–	36	12	20		139	3	27	35	–	–	–	269	–	–	Eakin & others, 1951
Remarks: Depth – 570 ft.																				
Western Pacific R. R. Co. well SW¼S15,T34N,R55E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin & others, 1951
Remarks: This well encountered warm water between 345–360 ft which flowed at the surface at 7 gpm.																				
Western Pacific R. R. well SW¼S15,T34N,R55E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin & others, 1951
Remarks: Depth – 281 ft; well abandoned and filled when hot caving material entered the hole.																				
Hot Hole (spring) NE¼S21,T34N,R55E	133	20	1973	65	–	60	15.5	120	39	488	1	72	16	1.9	–	0.70	–	908	7.2	Mariner & others, 1974
Remarks: Li = 0.33.																				
Hot Hole NE¼S21,T34N,R55E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
Remarks: Al = 0.002, N = 0.46, P = 0.06, Rb = 0.10, Sr = 3.4, Mn = 0.02, Cu = 0.04, Hg = 0.0003, δD(‰) = −144.7, δO^{18}(‰) = −15.31.																				
Sulphur (White Sulphur, Humboldt) Hot Springs SE¼SE¼S21,T34N,R55E	150-190	450	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin & others, 1951
Sulphur (White Sulphur, Humboldt) Hot Springs SE¼SE¼S21,T34N,R55E	192	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 32
Sulphur (White Sulphur, Humboldt) Hot Springs SE¼SE¼S21,T34N,R55E	–	450	before 1944	66	–	56	10	150		468	0	71	16	–	–	–	600	–	–	Adams, 1944
Remarks: Fe + Al = tr.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
ELKO COUNTY (continued)																				
[79] spring SW¼SE¼S31,T34N,R59E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Soldier Peak 7½-minute quad
springs T33N,R58E(?)	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 33
	Remarks: Several springs; 8 miles southwest of Fort Halleck. This may be the spring in S31,T34N,R59E (above).																			
[80] Hot springs near Carlin																				
spring S33,T33N,R52E	174	–	1973	70	–	60	15	45	16	335	–	52	12	–	–	–	–	625	7.6	Mariner & others, 1974
spring S33,T33N,R52E	boiling	300	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bradberry & Associates, 1964
spring SE¼SW¼S5,T32N,R52E	warm	400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bradberry & Associates, 1964
[81] Hot Sulfur Springs																				
springs S8,T33N,R53E	98	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 31
springs NW¼S8,T33N,R53E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bradberry & Associates, 1964
	Remarks: Seven hot springs in a northwest-trending line for one-third mile.																			
[82] warm springs SW¼SW¼SE¼S12,T33N,R61E	warm	2000	1950	35	–	52	20	63		334	–	39	23	1.0	0.8	0.10	398	640	–	Eakin & others, 1951
	Remarks: 2 springs.																			
[83] Sulphur Hot Springs																				
spring NW¼S11,T31N,R59E	199	20	1973	210	–	1.0	0.03	135	8.9	244	15	40	23	17.7	–	0.20	–	601	8.5	Mariner & others, 1974
	Remarks: Li = 0.46.																			
spring NE¼NW¼S11,T31N,R59E	162	–	–	72	–	18	5.8	106		242	–	59	12	8.0	0.5	0.04	400	660	–	Eakin & others, 1951
spring NW¼S11,T31N,R59E	113	132	1973	230	–	1.6	0.02	150	9.8	247	12	40	4	19.0	–	0.23	–	652	8.6	Mariner & others, 1974
	Remarks: Li = 0.51; temperature taken at the outlet of Stonier Lake.																			
spring NW¼S11,T31N,R59E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
	Remarks: Al = 0.17, N = 0.20, P = 0.02, Rb = 0.12, Sr = 0.05, Hg = 0.0015, δD(‰) = −130.1, δO^{18}(‰) = −16.09. Gas (volume %): O_2 + Ar = 6, N_2 = 93, CH_4 = 1, CO_2 <1.																			
Miller's Hot Springs T30N,R59E	170	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 35
	Remarks: Possibly Sulphur Hot Springs (S11,T31N,R59E).																			
springs NW¼S11,T31N,R59E	205 max.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	599	–	Olmsted & others, 1975
	Remarks: 76 water samples from within 150 yards or less of the main pool; specific conductance is an average.																			
[84] Smith Ranch Spring																				
spring NW¼S2,T27N,R58E	149	–	1973	50	–	45	12	58	14	377	–	24	6.5	–	–	–	–	600	8.0	Mariner & others, 1974
	Remarks: Na-K-Ca estimated reservoir temperature 187°F.																			
spring NW¼S2,T27N,R58E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin & others, 1951
	Remarks: Numerous springs (Franklin Lake SW 7½-minute quad).																			
spring CW½S2,T27N,R58E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin & others, 1951
	Remarks: Three springs (Franklin Lake NW 7½-minute quad) issue from valley fill a short distance from bedrock outcrop.																			
spring S2,T27N,R58E	hot	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 34A
ESMERALDA COUNTY																				
[85] Fish Lake Valley																				
Fish Spring NW¼SW¼S25,T2N,R35E	75	–	25May57	–	–	13	4	65		158	1	38	7	1.5	–	.42	–	363	8.3	Rush & Katzer, 1973
spring SW¼SW¼SW¼S28,T2N,R36E	81	1±	–	–	–	–	–	–	–	–	–	–	578	–	–	–	–	3900	–	Van Denburgh & Glancy, 1970, p. 61
Gap Spring SW¼S32,T2N,R36E	73	10±	24May57	23	0.80	38	38	792	60	720	0	323	860	3.2	0	9.8	2500	4280	7.9	Van Denburgh & Glancy, 1970
	Remarks: Hardness ($CaCO_3$) = 254; As = 0.20, PO_4 = 0.4.																			
Sand Spring SE¼SE¼S27,T1N,R34E	74	–	25May57	–	–	1.1	0.6	31		50	0	22	2	0.2	–	.02	–	144	7.2	Rush & Katzer, 1973
R. G. Pennebaker well SW¼SW¼S9,T1N,R35E	74	–	25May57	–	–	17	2.7	34		128	0	12	3	0.2	–	.06	–	240	7.9	Rush & Katzer, 1973
	Remarks: Depth – 300 ft.																			
well NE¼NW¼S16,T1N,R36E	77	–	15Mar71	–	–	5	0	300		251	7	78	260	–	–	–	–	1500	8.4	Rush & Katzer, 1973

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
ESMERALDA COUNTY (continued)																				
well SW¼NW¼S20,T1N,R36E	77	–	25May57	–	–	48	7.4	258		601	0	98	70	4.2	–	–	–	1330	7.1	Rush & Katzer, 1973
Nevada Oil and Minerals V.R.S. No. 1 well SW¼NE¼NE¼S16,T1S,R36E	318	–	16Nov70	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Nevada Oil & Gas Conservation Commission, unpub. data
	Remarks: Depth - 9178 ft; well is an abandoned oil test.																			
well NE¼S19,T1S,R36E	77	–	29Nov49	–	0.17	49	9.6	268		614	–	120	74	4.3	–	–	940	–	7	CWRR, 1973
[86] Southern Big Smoky Valley																				
well NW¼S14,T1N,R37E	71	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush & Schroer, 1970
	Remarks: Depth – 546 ft.																			
Emigrant well NW¼S6,T1N,R38E	80	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush & Schroer, 1970
	Remarks: Depth – 324 ft; first water encountered at 308 ft.																			
Fishlake Livestock Co. well SE¼SE¼S5,T1S,R39E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush & Schroer, 1970
	Remarks: Depth – 520 ft; 10 gal/hr seep of hot water was reported at 165 ft; the well is reported to have been destroyed.																			
[87] Big Divide Mine NW¼SW¼S26,T2N,R42E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	oral communication, Norman Coombs, 1973
	Remarks: Hot water hit below the 1800-foot level.																			
[89] Pearl Hot Springs																				
springs SE¼NW¼SW¼S25,T1S,R40E	98	–	19Jan67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	CWRR, 1973
	Remarks: Unsurveyed township																			
[90] Alkali Springs																				
springs NW¼S26,T1S,R41E	140	50	18Jan67	–	–	46	4.6	349		348	–	492	68	–	–	–	–	1840	8.1	Rush, 1968a
springs NW¼S26,T1S,R41E	120-140	59	before 1907	42	–	46	–	282	–	142	–	501	64	–	–	–	–	–	–	Ball, 1907
	Remarks: Fe + Al = 4. Temperature 120°F at tunnel mouth; 140°F at tunnel breast.																			
springs NW¼S26,T1S,R41E	120-140	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 112
springs SE¼NE¼S26,T1S,R41E	120	40	1913?	42	–	46	–	282		70	–	500	65	–	–	–	1010	–	–	Meinzer, 1917
	Remarks: Fe + Al = 3.																			
springs	140	45	1905?	42	–	46	–	282	–	142	–	501	64	–	–	–	–	–	–	Ransome, 1909, p. 143
	Remarks: Fe + Al = 3.																			
[91] Silver Peak Hot (Waterworks) Springs																				
springs CSE¼S15,T2S,R39E	69-118	500	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 111
[92] spring NW¼S6,T11S,R43E	77	–	20Jan67	–	–	9.6	2.4	238		–	–	–	47	–	–	–	–	–	–	CWRR, 1973
EUREKA COUNTY																				
[93] Horseshoe Ranch Springs																				
springs S32,T32N,R49E	136	30	–	58	–	22	5.8	136	17	378	0	62	27	5.0	–	0.81	–	–	7.0	Roberts, Montgomery & Lehner, 1967
	Remarks: Li = 0, NH_4 = 6.4.																			
springs S32,T32N,R49E	125-132	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 88
spring 1 mi from Beowawe	–	–	22Feb37	–	–	28	tr	151	–	393	–	60	9	–	–	0.9	–	–	–	Miller, Hardman & Mason, 1953
[94] Beowawe Geysers																				
spring SE¼S8,T31N,R48E	208	26	1973	320	–	1.0	<0.1	230	16	321	32	130	69	17	–	2.1	–	1020	9.0	Mariner & others, 1974
	Remarks: Li = 1.3.																			
well SW¼SW¼SW¼S9,T31N,R48E	77	–	–	125	–	16	1.4	220	17	440	–	100	49	11	–	1.7	757	1090	7.6	Olmsted & Rush, 1977
	Remarks: Li = 1700μg/l.																			
spring S17,T31N,R48E	190	–	–	330	–	1.0	–	210	8	–	–	–	56	–	–	–	–	–	–	Wollenberg & others, 1977
	Remarks: U <0.2μg/l, Ba = 50μg/l, W = 150μg/l, Br = 135μg/l, Sb = 13μg/l, Mo = 19μg/l, Rb = 145μg/l, Cs = 200μg/l, As = 40μg/l, Fe <70μg/l, , Se <0.02μg/l, Mn <3μg/l.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
EUREKA COUNTY (continued)																				
acidic spring S17,T31N,R48E	172	–	–	300	–	3	–	250	31	–	–	–	42	–	–	–	–	–	–	Wollenberg & others, 1977
Remarks: U = 0.5μg/l, Ba = 190μg/l, W = 12μg/l, Br = 120μg/l, Sb = 5μg/l, Mo = 3μg/l, Rb = 215μg/l, Cs = 115μg/l, As <15μg/l, Fe = 670μg/l, Sc = 0.7μg/l, Mn = 115μg/l.																				
hot spring S17,T31N,R48E	183	–	10Mar74	345	.09	9	0.82	229	14.2	0	152	128	67	18.7	<0.1	–	964	1006	9.7	Sanders & Miles, 1974
Remarks: PO_4 <0.1, NH_4 = 0.5, Ag <.02, As = 2.2μg/l, Ba <0.04, Be <0.005, Bi <0.1, Cd = 0.01, Cr <0.02, Cs = 1.04, Cu <0.01, Hg <0.5μg/l, Li = 2.59, Mn = .014, Ni = 0.05, Pb = 0.06, Rb = 0.266, Sb <0.1, Se <1.0μg/l, Sn = 0.05, Sr = 0.015, Zn = 2.32.																				
spring S17,T31N,R48E	205	–	–	444	–	<1	<1	241	29	148	161	78	44	–	–	2.2	1100	–	9.5	White, 1964
spring S17,T31N,R48E	190	–	–	–	–	–	–	207	–	–	–	–	56	–	–	–	–	–	–	Wollenberg & others, 1975
Remarks: U = <0.26 ppb; W = 147 ppb; Mo = 19 ppb; Sb = 13 ppb; Ba 61 ppb.																				
spring S17,T31N,R48E	boiling	–	–	–	–	–	–	268	–	–	–	–	64	–	–	–	–	–	–	Wollenberg & others, 1975
Remarks: Steam sample. U <0.16 ppb; W = 132 ppb; Mo = 12 ppb; Sb = 10 ppb; Ba = 50 ppb. Duplicate analysis agrees closely.																				
hot spring S17,T31N,R48E	–	–	–	413	–	tr	0	216		244	84	84	30	–	–	–	–	–	–	Nolan & Anderson, 1934
Remarks: Al + Fe = tr.																				
small geyser S17,T31N,R48E	170	–	–	449	tr	2	0	239	33	129	173	97	47	11	–	7	–	–	–	Nolan & Anderson, 1934
Remarks: Al = 0, As = 0, NH_4 = 4, S_2O_3 = 1, H_2S = 0. Several species of diatoms live in the warm pools.																				
pool below terrace S17,T31N,R48E	205	–	–	373	0.04	0.8	0	230	16	116	149	89	30	15	0.4	2.0	–	–	9.5	Roberts, Montgomery & Lehner, 1967
Remarks: Al = 0, Mn = 0, Li = 1.3, NH_4 = 0.5, Br = 0.4, H_2S = 5.5, Sr = 0, I = 0.																				
geyser S17,T31N,R48E	–	–	–	418	–	tr	–	282		512	tr	91	70	–	–	–	–	–	–	Nolan & Anderson, 1934; Waring, 1965, No. 77A
Remarks: Al + Fe = tr.																				
Beowawe Hot Springs	–	–	–	413	–	tr	0	216		244	84	–	30	–	–	–	1081	–	–	Adams, 1944
Remarks: Fe + Al = tr.																				
hot springs	–	–	–	418	–	tr	0	282		512	tr	91	70	–	–	–	–	–	–	Adams, 1944
Remarks: Fe + Al = tr.																				
Flame Geyser	–	–	22Aug45	–	–	32	8	164	–	351	34	53	48	–	–	2.2	–	–	–	Miller, Hardman & Mason, 1953
steam well NW¼S17,T31N,R48E	–	–	1973	500	–	1.3	0.2	250	38	505	81	64	70	<0.05	–	2.5	–	1490	9.4	Mariner & others, 1974
Remarks: Li = 2.1.																				
well S17,T31N,R48E	steam	–	–	490	–	1.5	–	280	40	–	–	–	67	–	–	–	–	–	–	Wollenberg & others, 1977
Remarks: From most northerly blowing well; U <0.07μg/l, Ba = 50μg/l, W = 135μg/l, Br = 145μg/l, Sb = 11μg/l, Mo = 11μg/l, Rb = 320μg/l, Cs = 220μg/l, As = 33μg/l, Fe <90μg/l, Sc <0.02μg/l, Mn <3μg/l.																				
Sierra Pacific Power Co. well S17,T31N,R48E	385	–	1964	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Roberts, Montgomery & Lehner, 1967
Remarks: Depth – 1500 ft.																				
steam well S17,T31N,R48E	boiling	–	19Sep73	458	0.05	10	0	263	31	0	288	127	62	16	<0.1	–	1256	1211	9.9	Sanders & Miles, 1974
Remarks: PO_4 <0.1, NH_4 = 0.9, Ag <0.004, As = 21μg/l, Ba <0.10, Be <0.005, Bi <0.10, Cd <0.002, Cr <0.04, Cs = 1.02, Cu < 0.004, Hg <0.2μg/l, Li = 3.2, Mn <0.01, Nb <10, Ni = 0.03, Pb <0.02, Rb = 0.63, Sb <0.2, Se <1μg/l, Sn <0.2, Sr = 0.04, Ta <5, Zn = 0.01.																				
Nevada Thermal (Magma Power Co.) No. 2 well NW¼S17,T31N,R48E	boiling	–	12Sep60	534	–	0.8	0.2	332	30	39	224	90	49	15	0.0	2.4	1200	1130	9.7	White, 1964
Remarks: Al = 0.66, Fe = 0.00, As = 0.00, Sr = 0.21, Li = 1.6, NH_4 = 0.4, I = 0.0, PO_4 = 0.06, Br = 0.0. Sample may be 10 percent evaporated by boiling.																				
Vulcan Thermal Power Co. Vulcan No. 1 well NW¼SE¼SW¼NW¼ S17,T31N,R48E	414	–	1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	unpublished data, Sierra Pacific Power Co.
Remarks: Depth – 638 ft.																				
[95] Raine Ranch(?) springs S6,7,T31N,R52E	warm	100+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bradberry & Associates, 1964
[96] Hot Springs Point (Crescent Valley)																				
Crescent Valley Hot Springs SW¼S1,T29N,R48E	138	100	18Jun48	73	0.03	53	43	319		980	–	117	44	5.9	0.0	0.4	1140	1750	–	Zones, 1961b
spring SW¼S1,T29N,R48E	124	0	1960	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Wilson, 1960b
spring NE¼S1,T29N,R48E	124	15	1960	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Wilson, 1960b
spring SW¼S2,T29N,R48E	136	8	1960	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Wilson, 1960b
springs SE¼SE¼S2 & NE¼NE¼ S11,T29N,R48E	138	40	–	72	0.04	54	38	277	51	928	0	116	49	6.9	3.3	1.6	–	–	6.8	Roberts, Montgomery & Lehner, 1967
Remarks: Mn = 0.09, Li = 1.0, PO_4 = 0; water analysis is reported to be from springs in S11.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
EUREKA COUNTY (continued)																				
spring NW¼S11,T29N,R48E	129	33	1973	67	–	33	35	230	58	913	<1	7	1	6.6	–	2.1	–	1730	6.6	Mariner & others, 1974
	Remarks: Li = 1.1.																			
spring NE¼S11,T29N,R48E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
	Remarks: Al = 0.008, N = 3.2, P = 0.01, Br = 0.2, I = 0.02, Rb = 0.29, Ce = 0.1, Sr = 1.3, Cu = 0.04, Hg = <0.0001, δD(‰) = −125.8, δO^{18} = −13.21; gas (volume %): O_2 + Ar = 9, N_2 = 31, CH_4 <1, CO_2 = 60.																			
springs SE¼SE¼S2 & NE¼NE¼ S11,T29N,R48E	122	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 88A
Magma Power Co. Hot Springs Point No. 1 well S1,2 or 11, T29N,R48E	166	–	1965	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Koenig, 1970
	Remarks: Depth – 410 ft.																			
[97] spring NW¼NW¼NE¼S10,T28N,R49E	186	2.5	1960	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Wilson, 1960a
[98] Hot Creek Springs																				
spring NW¼S12,T28N,R52E	79	1585	1973	20	–	46	23.5	10	2.1	226	1	27	4.6	<0.1	–	0.03	–	408	7.3	Mariner & others, 1974
	Remarks: Li = 0.02.																			
springs SW¼NW¼S12,T28N,R52E	84	5900	27Sep65	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968; Waring, 1965, No. 89
	Remarks: (epm) Na + K = 0.53; Ca + Mg = 3.77, Cl + SO_4 = 0.74.																			
springs SE¼NW¼S12,T28N,R52E	–	1800-2250	1960	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1961b
[99] Carlotti Ranch (Sulfur) Springs																				
springs SE¼S24,T28N,R52E	95-102	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 90
[100] Bruffey's (Mineral Hill) Hot Springs																				
spring S14,T27N,R52E	150	50	–	58	–	52	16	39	8.7	287	0	27	14	0.7	0.1	0.25	–	–	7.0	Roberts, Montgomery & Lehner, 1967
	Remarks: Mn = 0; Ba = 0; Li = 0.2.																			
springs S14,T27N,R52E	108-152	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 90A
[101] Flynn Ranch Springs																				
springs S5,T25N,R53E	69-78	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 91
[102] Walti Hot Springs																				
spring W½S33,T24N,R48E	163	–	–	75	0.02	60	13	48	15	282	0	62	13	2.4	0.1	0.17	–	–	6.9	Roberts, Montgomery & Lehner, 1967
	Remarks: Mn = 0; Li = 0; PO_4 = 0.1.																			
spring S33,T24N,R48E	160	–	17Jun65	–	–	57	12	70		315	0	65	14	–	–	–	–	–	7.1	Everett & Rush, 1966
spring SW¼S33,T24N,R48E	162	79	1973	68	–	56	12	44	14	264	<1	64	12	2.5	–	0.12	–	592	6.5	Mariner & others, 1974
	Remarks: Li = 0.3.																			
spring W½S33,T24N,R48E	160	897	17Jun65	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 3.04; Ca + Mg = 3.82; Cl + SO_4 = 1.75.																			
springs S33,T24N,R48E	hot	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 93
[103] Shipley (Big Shipley, Sadler) Hot Springs																				
springs NE¼SE¼S23,T24N,R52E	103-106	5000	1960	40	0.01	57	21	29	5.9	279	0	35	21	0.2	0	0.26	346	540	7.2	Eakin, 1962a; Waring, 1965, No. 91B
	Remarks: Mn = 0; Li = 0; PO_4 = 0.1.																			
springs NE¼SE¼S23,T24N,R52E	94	3000	16Apr63	30	0	55	21	30	6	288	0	33	17	0.5	0.6	0.1	330	529	7.6	Harrill, 1968
springs NE¼SE¼S23,T24N,R52E	106	6750	18Sep52	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 1.52; Ca + Mg = 4.57; Cl + SO_4 = 1.29.																			
[104] Siri Ranch Spring																				
spring NW¼SW¼S6,T24N,R53E	81	5800	11Jul66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 0.76; Ca + Mg = 4.00; Cl + SO_4 = 0.89.																			
spring NW¼SW¼S6,T24N,R53E	87	300	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 91A

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
EUREKA COUNTY (continued)																				
water well SW¼NE¼S6,T24N,R53E	95	–	5May66	25	0	51	20	15	3.4	255	0	25	10	0.4	0.5	0	276	449	8.0	Harrill, 1968
[105] Sulfur Springs																				
springs NW¼S36,T23N,R52E	74	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 91C
[106] Thompson Ranch Spring																				
spring NW¼SE¼S3,T23N,R54E	69	950	1Apr66	19	0.01	73	22	23	5.1	318	0	51	6.5	0.4	1.1	0	358	583	7.8	Harrill, 1968
Jacobson Ranch Springs NW¼SE¼S3,T23N,R54E	71-75	900	11Jul66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968; Waring, 1965, No. 91D
Remarks: (epm) Na + K = 1.14; Ca + Mg = 5.03; Cl + SO_4 = 1.47.																				
[107] Bartine Hot Springs																				
springs NE¼NE¼S5,T19N,R50E	105, 108	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 93A
Bartine Ranch water well no. 4 NE¼S17?,T19N,R50E	116	33	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Information from Fred Bartine
Remarks: Depth – 485 ft; artesian.																				
[108] Klobe (Bartholomae) Hot Springs																				
spring NW¼SE¼S28,T18N,R50E	130	450	15Apr64	87	0.02	2.2	1.7	6.5	0.7	126	10	18	6.5	4.0	0	0.08	–	–	8.5	Roberts, Montgomery & Lehner, 1967
Remarks: Mn = 0; Li = 0; PO_4 = 0.																				
spring NW¼NW¼SE¼S28,T18N,R50E	153	49(1966)	18Sep73	82	0.04	10.3	.002	66	1.0	66.4	40.5	16.2	11	4.8	<0.1	–	265	304	9.4	Sanders & Miles, 1974
Remarks: Li = 0.11, As = 0.024, Ba = 0.1, NH_4 <0.1, PO_4 <0.1, Be <0.005, Cu <0.004, Pb <0.02, Mn <0.01, Sr <0.02, Ni <0.02, Cd <0.002, Cr <0.04, Ag <.004, Bi <0.10, Cs = .24, Hg <0.2µg/l, Nb <10.0, Rb <0.02, Sb <0.2, Se <.001, Sn <0.2, Ta <5.0, Zn <0.01. In Antelope Valley, 8 mi S of U. S. Hwy. 50. Spring flows from vertical 12" steel pipe approximately 50 ft SW of corral. Orifice is in alluvium 2 mi E of Monitor Range. Spring may be associated with buried range front fault.																				
spring SE¼S28,T18N,R50E	129	–	1973	85	–	1	<0.1	64	0.7	144	–	18	6.3	–	–	–	–	295	9.3	Mariner & others, 1974
spring NW¼NW¼SE¼S28,T18N,R50E	156	49	21Dec66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
spring NW¼SE¼S28,T18N,R50E	142	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 93B
Hot Spring Ranch water well NW¼NW¼S28,T18N,R50E	158	–	21May64	–	–	0	0	71	–	94	26	22	7.1	–	–	–	–	315	9.0	Rush & Everett, 1964
Remarks: Well drilled in Klobe (Clobe) Hot Spring.																				
Hot Spring Ranch water well NW¼NW¼SE¼S28,T18N,R50E	158	3	21Dec66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Remarks: Flowing well; depth – 39.5 ft.																				
Hot Spring Ranch water well NW¼NW¼SE¼S28,T18N,R50E	72	–	21May64	–	–	0	0	72	–	92	29	22	7.3	–	–	–	–	319	9.1	Rush & Everett, 1964
Remarks: Depth – 35 ft.																				
"cold" spring NW¼NW¼SE¼S28,T18N,R50E	70	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Bartholomae Corp. water well SW¼S18,T18N,R51E	74	14	1949	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush & Everett, 1964
Remarks: Depth – 670 ft; flowing.																				
Bartholomae Corp. water well NW¼S30,T18N,R51E	72	200	16Apr64	–	–	24	7.8	36	–	135	12	28	7.0	–	–	–	–	319	8.7	Rush & Everett, 1964
HUMBOLDT COUNTY																				
[109] Cordero Mercury Mine																				
Cordero Mining Co. well SE¼S28,T47N,R37E	140	–	–	57	tr	36	10	62		195	–	56	34	–	–	–	365	500	–	Visher, 1957
Remarks: Depth – 442 ft.																				
Cordero Mining Co. well SE¼S28,T47N,R37E	125	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Holmes, 1966
Remarks: Hot water is pumped from a 600 ft deep well at 10 gpm for domestic uses; it is augmented by 8 gpm of cold water.																				
Cordero Mining Co. well S28,T47N,R37E	138	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1955a; Waring, 1965, No. 6A
Remarks: Depth – 580 ft.																				
Cordero Mining Co. well S28,T47N,R37E	118	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.6	White, 1955; Waring, 1965, No. 6A
Remarks: Depth – 550 ft.																				
Noque's Nevada well NE¼NE¼SE¼S17,T47N,R38E	92	–	16Jun77	110	0.00	5.8	0.2	58	12	119	–	26	14	2.6	2.4	0.37	322	323	–	unpublished data, USGS
Remarks: Depth – 701 ft.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
HUMBOLDT COUNTY (continued)																				
[110] **Bog Hot Springs**																				
spring SW¼NW¼S7,T46N,R28E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Railroad Point 15' quad
Bog Hot Springs NE¼NW¼S18,T46N,R28E	132	1000	6May61	51	–	0.4	0	78	0.6	113	6	41	15	2.0	0.5	0.66	262	345	8.4	Sinclair, 1963c
Remarks: Two springs, probably associated with an active fault zone.																				
spring 12 mi west of Pine Forest Range	108	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 1
spring 6 mi southwest of Denio	130; 190	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 2
Remarks: Location given is closer to Baltazor Hot Springs.																				
spring NW¼S18,T46N,R28E	129	1057	1973	57	–	0.2	<0.1	81	1.0	116	11	45	15	1.7	–	0.91	–	336	9.1	Mariner & others, 1974
Remarks: Li = 0.03.																				
spring NW¼S18,T46N,R28E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
Remarks: Al = 0.016, N = 0.10, P = 0.07, As = 0.02, Br = 0.2, Sr = 0.05, Fe = 0.03, Cu = 0.01, Hg = 0.0001, δD(‰) = −124.3, δO^{18}(‰) = −15.30. Gas (volume %): O_2 + Ar = 9, N_2 = 91, CH_4 <1, CO_2 <1.																				
2 springs S18,T46N,R28E	131	20	19Feb74	.60	.09	.14	.02	89	1.5	79.9	21.9	47	30	2.06	1.6	–	293	386	9.0	Sanders & Miles, 1974
Remarks: PO_4 = 0.2, NH_4 <0.2, Ag <0.02, As = 1.2μg/l, Ba <0.04, Be <0.005, Bi <0.1, Cd <0.01, Cr <0.02, Cs = .26, Cu <0.01, Hg <0.5μg/l, Li = .051, Mn = .010, Ni <0.02, Pb = .06, Rb = .021, Sb <0.1, Se = <1.0μg/l, Sn <0.05, Sr = 0.005, Zn = 0.602.																				
Bog Hot Springs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Cathrall & others, 1977
Remarks: Algae from spring contained Fe = 3.3%, Mg = 0.3%, Ti = 0.5%, Na = 0.5%, Mn = 650, B = 325, Ba = 46, Be = 1.3, Cr = 650, La = 20, Mo = 5, Sn = 7, Sr = 20, V = 130, Y = 13, Zr = 20, Cd = 0.3, Co = 4, Cu = 20, Pb = 8, Bi = 0.1, Au = 0.0009, Te = 0.003, As = 22, Sb = 0.5, Hg = 1, Se = 0.5, Ag <0.1, W <50, Zn = <100, Li <200.																				
Bog Hot Spring 41°55'25"N, 118°48'16"W	129	–	1970	56	–	0	0	77	0.9	125	0	46	15	1.7	–	0.71	259	–	–	Cathrall & others, 1977
Remarks: Li = 0.02, Sb = 0.004, As = 0.033, Hg = 0.0000.																				
[111] **Baltazor (Continental) Hot Springs**																				
spring NW¼S13,T46N,R28E	176	26	1973	160	–	8.4	<0.1	180	8.7	139	2	220	48	7.1	–	2.9	–	947	8.0	Mariner & others, 1974
spring S13,T46N,R28E	200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	personal communication, Steve Kleeberger, 1973
Continental Hot Springs SE¼NW¼S13,T46N,R28E	hot	200	1963	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair, 1963c
water well NW¼S13,T46N,R28E	194	7	1973	150	–	10	0.1	180	8.2	156	<1	230	47	6.8	–	2.1	–	934	7.5	Mariner & others, 1974
Remarks: Li = 0.22. Flowing.																				
spring SE¼NW¼S13,T46N,R28E	178	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 3
Baltazor Hot Spring 41°55'18"N, 118°42'33"W	181	–	1970	130	–	14	0.2	180	8.6	163	0	220	48	6.6	–	2	690	–	–	Cathrall & others, 1977
Remarks: Li = 0.20, Sb = 0.007, As = 0.0007.																				
[112] Virgin Valley Campground No. 1 well CW½S2,T45N,R26E	90	–	1970	32	–	3.7	0	29	0.4	64	0	12	4.7	1.8	–	0.08	115	–	–	Cathrall & others, 1977
Remarks: Li = 0.03, Sb = 0.002, As = 0.007, Hg = 0.0000; showers in campground are supplied by a hot artesian well.																				
[113] McGee Mountain E½T45N,R27E	131	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Wendell, 1970, p. 95, 98, 109
Remarks: Steam and warm water emissions are reported from along a fault at the east edge of McGee Mountain. A core hole into this fault had a temperature of 131°F at 200 ft: cinnabar is reported from along this fault at the Painted Hills Mine.																				
[114] Fivemile Spring S22,T45N,R33E	83	224	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Zones, 1963
Remarks: Springs issue from a single pool in gravel down gradient from the contact of bedrock and alluvium; water is about 20°F warmer than that pumped from nearby wells.																				
2 springs S22,T45N,R33E	76-80	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 6
[115] springs about T45N,R41E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 7
Remarks: Several springs; at head of North Fork of Little Humboldt River. Location uncertain.																				
[116] springs CW½S12,T44N,R27E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Railroad Point 15-minute quad
[117] **Howard Hot Spring**																				
spring SE¼NE¼NE¼S4,T44N,R31E	136	50	7Oct60	84	–	2.4	0.5	91	2.0	52	39	64	14	7.9	0.1	.26	324	401	9.3	Sinclair, 1962a
spring NE¼S4,T44N,R31E	133	–	1973	85	–	3	<0.1	88	1.7	127	–	62	10	–	–	–	–	400	9.2	Mariner & others, 1974

HUMBOLDT COUNTY (continued)

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
spring T45N,R32E	118	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 4
	Remarks: 12 mi north of Mason's Crossing of Quinn River. Probably Howard Hot Spring.																			
spring NE¼S5,T44N,R31E	163	5	7Oct60	84	–	3.2	0	90	2.3	58	0.4	46	12	8.0	0.2	0.21	344	398	9.3	Sinclair, 1962a
spring T45N,R32E	130	150	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 5
	Remarks: 11 mi north of Quinn River (town). Location unknown, possibly Howard Hot Spring.																			
[118] Ninemile Springs SW¼NE¼SW¼ S10,T44N,R33E	79	450	22Jun59	54	0.14	25	5.8	33		117	–	20	22	0.1	.2	0.07	219	303	8.0	Zones, 1963
	Remarks: Springs at Ninemile Ranch are in alluvium near bedrock; the water temperature is about 15°F above that from wells in the valley.																			
[119] Dyke Hot Springs																				
spring SE¼S25,T43N,R30E	151	26	1973	85	–	1.8	<0.1	150	4.3	243	17	82	21	8.0	–	1.0	–	666	8.9	Mariner & others, 1974
	Remarks: Li = 0.09.																			
springs SE¼SE¼S25,T43N,R30E	158	–	8Oct60	83	–	3.2	0	146	3.7	218	16	76	6.0	8.9	0.3	0.41	470	636	8.7	Sinclair, 1962a
springs T43N,R31E	155	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 10
	Remarks: 7 mi west of Mason's Crossing of Quinn River.																			
[120] spring SW¼NE¼S12,T42N,R30E	104	1-2	8Oct60	125	3.2	–	1.5	210	6.2	358	7	67	54	14	1.2	2.9	660	883	8.3	Sinclair, 1962a
	Remarks: Flowing into stock tank.																			
[121] well NW¼S11,T42N,R31E	75	170	8Oct60	65	–	18	2.4	34	4.8	104	0	25	15	0.6	0.8	0.11	244	259	7.7	Sinclair, 1962a
	Remarks: Depth – 352 ft; flowing.																			
[122] spring SE¼S19,T42N,R32E	70	5	7Oct60	51	–	30	6.3	455	9.9	948	0	204	69	9.8	0.4	1.3	1290	1900	8.1	Sinclair, 1962a; Waring, 1965, No. 10A
[123] U.S.G.S. test well no. 21 SE¼NE¼S32,T42N,R33E	76	–	5Oct54	39	0.04	32	5.2	416	11	885	0	184	59	0.9	0.2	1.7	1180	1820	–	Malmberg & Worts, 1966
	Remarks: Depth – 88 ft.																			
[124] well NE¼S20,T41N,R35E	80	–	26Oct54	4.8	–	2.2	0.8	197	18	211	36	70	106	1.4	0.2	–	541	941	9.0	Sinclair, 1962b
	Remarks: Depth – 112 ft; water from other wells in Desert Valley averaged about 60°F, springs averaged about 58°F.																			
[125] E. W. Gondra well NE¼SE¼S22,T41N,R40E	71	–	18Jul68	83	–	23	6	–	–	173	7	31	29	0.7	2.0	0.20	337	–	8.4	Harrill & Moore, 1970
	Remarks: Depth – 435 ft, As = 0.01.																			
[126] The Hot Springs																				
spring NE¼S20,T41N,R41E	136	–	1973	55	–	10	8	296	36	881	–	36	26	–	–	–	–	1340	8.0	Mariner & others, 1974
	Remarks: Travertine present. Silica estimated reservoir temperature = 223°F.																			
spring NE¼NE¼S19,T41N,R41E	135	60	14Aug45	–	–	26	8.5	334	–	920	–	34	26	–	–	2.54	930	–	–	Loeltz, Phoenix & Robinson, 1949, p. 33
spring SW¼NE¼S19,T41N,R41E	135	–	14Aug45	–	–	26	8.5	334		920	–	34	26	–	–	–	–	–	–	Harrill, & Moore, 1970
spring T41N,R41E	130	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 11
[127] spring T41N,R43E	hot	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 11A
	Remarks: 25 mi east of Paradise Valley near North and South Forks of Humboldt River. Location uncertain.																			
[128] Soldier Meadows Hot Springs																				
spring S5,14,15,22,T40N,R24E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 8
spring S23,T40N,R24E	129	13	1973	63	–	3.1	<0.1	74	1.1	92	3	41	18	12	–	0.64	–	363	8.6	Mariner & others, 1974
	Remarks: Li = 0.17.																			
spring S23,T40N,R24E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
	Remarks: Al = 0.011, N = 0.10, P = 0.04, As = 0.06, Br = 0.06, I = 0.01, δD(‰) = –129.9, δO^{18}(‰) = –16.56, Gas (volume %), O_2 + Ar = 7, N_2 = 93, CH_4 <1, CO_2 <1.																			
springs S23,T40N,R24E	warm	–	6May61	65	–	2.4	1.5	76	0	96	0	39	21	12	0.5	0.82	272	357	7.6	Sinclair, 1963a
spring S23,T40N,R24E	118	–	–	65	–	2.6	1.4	76	1.3	96	0	39	21	10	–	1.0	272	360	7.6	Grose & Keller, 1975b; Mud Meadow 7½-minute sheet
	Remarks: Numerous hot springs in all parts of S23.																			
spring S23,T40N,R24E	129	–	–	63	–	3.5	1.1	74	1	90	3	35	18	12	–	0.6	275	360	8.6	Grose & Keller, 1975b
springs CSE¼SE¼S25,T40N,R24E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mud Meadows 7½-minute sheet
springs SW¼NW¼S18,T40N,R25E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Soldier Meadow 7½-minute sheet
spring NE¼NW¼S18,T40N,R25E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Soldier Meadow 7½-minute sheet
spring NW¼SW¼S19,T40N,R25E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mud Meadows 7½-minute sheet

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
HUMBOLDT COUNTY (continued)																				
[129] Pinto Hot Springs																				
East Pinto Hot Spring E½SE¼S17,T40N,R28E	199	132	1973	150	–	14	0.4	330	23	495	1	120	160	12	–	7.5	–	1560	7.1	Mariner & others, 1974
	Remarks: Li = 0.45; unsurveyed? (lat. 41°21'N, long. 118°47'W); 3 springs (Pinto Mountain 7½-minute quad).																			
West Pinto Hot Spring (well) CNE¼S19,T40N,R28E	198	26	1973	160	–	4.6	0.1	320	25	436	2	130	160	14	–	6.9	–	1520	7.7	Mariner & others, 1974
	Remarks: Li = 0.45; unsurveyed? (lat. 41°20'N, long. 118°48'W); one spring shown on Pinto Mountain 7½-minute quad.																			
West Pinto Hot Spring S19,T40N,R28E	200	–	–	162	–	5	0.1	325	26	440	2	130	160	15	–	7	–	1500	7.7	Grose & Keller, 1975b
	Remarks: Li = 0.5.																			
East Pinto Hot Spring S21,T40N,R28E	201	–	–	155	–	19	0.3	325	26	500	1	120	160	14	–	7	–	1560	7.2	Grose & Keller, 1975b
	Remarks: Li = 0.5.																			
spring S21 or 28,T40N,R28E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair, 1963a
	Remarks: Hot spring shown on map.																			
Pinto Mountain Hot Springs S29,T40N,R28E	boiling	50	–	–	–	–	–	–	–	420	0	126	159	–	–	–	1043	–	–	Sinclair, 1963a
[130] Cain Spring SE¼S30,T39N,R27E	74	5	6May61	34	–	6.4	0.2	55	0.6	120	0	15	11	0.3	0.3	0.32	186	264	8.2	Sinclair, 1963a
Cain Spring S30,T39N,R27E	74	–	Jun75	32	–	7	0.2	55	0.6	120	0	15	12	0.3	–	0.3	186	264	8.1	Grose & Keller, 1975b
[131] Double Hot Springs–Black Rock Hot Springs area																				
well SE¼S10,T37N,R25E	97	–	Aug75	80	–	10	3.0	77	11	165	0	45	32	1.5	–	0.2	321	446	7.8	Grose & Keller, 1975b
well SE¼S10,T37N,R25E	97	–	14Jun61	79	–	9.6	2.8	78	11	165	–	38	28	1.8	0	–	–	446	7.8	Sinclair, 1963a
well NW¼S11,T37N,R25E	103	–	Feb51	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair, 1963a
	Remarks: Depth – 303 ft.																			
well SW¼S26,T37N,R25E	78	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair, 1963a
	Remarks: Depth – 200 ft.																			
well NE¼S26,T37N,R25E	72	–	9Nov50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair, 1963a
spring T37N,R25E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 13, 14?
	Remarks: Several springs. Southeast side of the Black Rock Range. Location uncertain.																			
spring S10,T37N,R26E	130-150	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 12A
	Remarks: 3 springs, 1-2 miles apart. Near base of west flank of Black Rock Range.																			
Double Hot Springs S4,T36N,R26E	172	–	–	105	–	15	0.1	225	4.5	260	2	120	80	10	–	2.0	–	910	8.0	Grose & Keller, 1975b
	Remarks: Li = 0.05.																			
spring S4,T36N,R26E	176	46	1973	105	–	4.8	0.1	180	4.5	261	2	120	59	10	–	1.8	–	902	7.9	Mariner & others, 1974
	Remarks: Li = 0.06.																			
spring S4,T36N,R26E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
	Remarks: Al = 0.024, N = 0.30, P = 0.07, As = 0.06, Br = 0.2, I = 0.02, Sr = 0.09, Fe <0.02, Cu = 0.02, Hg = 0.0004, δD = –128.8, δO^{18} = –15.93. Gas (volume %): O_2 + Ar = 3, N_2 = 90, CH_4 = 3, CO_2 = 38.																			
Double Hot Springs NW¼S4,T36N,R26E	165-191	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 12
Double Hot Springs NW¼S4,T36N,R26E	–	250	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair, 1963a
spring S4(?),T36N,R26E	150	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Remarks: Spring is located ¾ mile southeast of Double Hot Springs.																			
spring DH-2 S16,T36N,R26E	155	–	–	130	–	17	0.1	230	4.5	280	0	120	110	10	–	2.1	–	–	7.6	Grose & Keller, 1975b
Van Riper? Springs T36N,R24E	145	50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 15
	Remarks: Location uncertain.																			
spring DH-3 S16,T36N,R26E	164	–	–	112	–	15	0.15	260	5.6	275	0	140	120	9.4	–	2.0	–	–	7.0	Grose & Keller, 1975b
spring DH-4 S21,T36N,R26E	155	–	–	86	–	18	0.19	265	10	280	0	135	120	10	–	1.8	–	–	7.1	Grose & Keller, 1975b
springs S22,T36N,R26E	165-194	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hose & Taylor, 1974
springs S16,21,24,34,T36N,R26E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 17
	Remarks: Several springs.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
HUMBOLDT COUNTY (continued)																				
spring S27,T36N,R26E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair, 1963a
	Remarks: Hot springs shown on map.																			
spring S34,T36N,R26E	194	–	1973	120	–	35	4	1500	20	932	–	290	787	–	–	–	–	6590	8.1	Mariner & others, 1974
	Remarks: Unsurveyed area, near Black Rock (lat. 40°57'N, long. 118°58'W).																			
Black Rock Hot Springs NW¼S34,T36N,R26E	136	50	3May61	62	–	18	1.9	486	13	902	0	130	155	8.9	0.2	2.8	1330	2050	7.9	Sinclair, 1963a
Black Rock Spring S34,T36N,R26E	131	–	–	70	–	24	0.19	370	12	902	0	130	180	9	–	2.8	1330	2050	7.5	Grose & Keller, 1975b
hot spring approx. S2,T35N,R26E	194	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Johnson, 1977, p. 106
	Remarks: In Pershing County.																			
spring DH-7 S10,T35N,R26E	202	–	–	120	–	36	4	1500	20	932	0	290	790	14	–	4	–	6650	8.1	Grose & Keller, 1975b
	Remarks: In Pershing County; Li = 0.25.																			
[132] Macfarlane's Bath House Spring NW¼S27,T37N,R29E	170	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair, 1963a
[133] spring SW¼SW¼S3,T37N,R39E	158	2	10Aug61	–	–	30	7.1	450	26	1240	0	52	14	–	–	–	1190	1900	7.4	Cohen, 1962c
well SW¼SE¼S3,T37N,R39E	156	2	28Apr62	–	–	26	11	–	–	1230	–	71	16	–	–	1.4	–	1900	7.7	Harrill & Moore, 1970
	Remarks: Depth – 61 ft.																			
well SE¼S3,T37N,R39E	158	2	25Oct47	–	–	29	10	467	–	1240	–	73	22	–	–	–	1250	–	–	Loeltz, Phoenix & Robinson, 1949
	Remarks: Depth – 61 ft; well reportedly drilled at the site of a small spring which ceased to flow after the well was drilled.																			
[134] spring S24,T37N,R43E	warm	>200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Anctil, 1960; Waring, 1965, No. 19E?
	Remarks: Hot Springs Ranch is in S26.																			
hot spring S35,T37N,R43E	hot	2000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965
[135] Cane Spring SW¼SE¼S8,T36N,R24E	71	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Alvin McLane, personal communication, 1971
Caine Spring S11,T36N,R24E	73	–	Jun75	74	–	23	8.5	75	10	107	0	24	32	0.1	–	0.1	250	325	7.9	Grose & Keller, 1975b
Caine (Cane) Spring NE¼S16,T36N,R24E	70	10	12Dec61	74	–	23	8.4	74	10	107	0	22	32	0.1	1.8	0	256	323	7.3	Sinclair, 1962c
spring T36N,R25E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 16
	Remarks: Several springs; 10 mi southeast of Division Peak. Possibly Caine Springs.																			
[136] spring SE¼NE¼SW¼ S13,T36N,R37E	93	–	20Jul61	25	0	179	58	74	2.0	211	0	390	191	0.3	20	0.4	1040	1540	7.7	Cohen, 1962c
spring 2 mi north of Winnemucca (T36N,R37E?)	hot	–	–	0	–	16	2	382		937	0	76	23	–	–	–	953	–	–	Adams, 1944; Waring, 1965, No. 18
	Remarks: Fe + Al = 1; this analysis may not be for this spring—it is listed as "Hot Spring, Paradise Valley".																			
[137] BLM well SW¼NE¼SE¼ S26,T36N,R38E	73	–	27Jul61	10	0.04	102	30	42	3.5	166	0	85	178	0.3	2.9	0.1	536	1020	8.0	Cohen, 1962c
	Remarks: Depth – 55 ft.																			
[138] Calif. Pacific Utilities Co. well NE¼SW¼SE¼ S30,T36N,R38E	73	–	24Jul61	51	0	56	19	60	6.5	260	0	72	58	0.3	0.3	0.4	452	728	7.9	Cohen, 1964c
	Remarks: Depth – 495 ft.																			
[139] Golconda area																				
spring SE¼S29,T36N,R40E	165	198	1973	66	–	33	6.8	130	22	429	<1	56	18	1.8	–	1.1	–	810	6.5	Mariner & others, 1974
	Remarks: Li = 0.36.																			
spring SE¼S29,T36N,R40E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
	Remarks: Al = 0.002, N = 0.30, P = 0.04, As = 0.02, Br = 0.02, I = 0.005, Rb = 0.09, Ce = 0.2, Sr = 0.73, Fe = 0.22, Mn = 0.10, Cu = 0.05, Hg = 0.0001, δD(‰) = −125.5, δO^{18} (‰) = −15.65. Gas (volume %): O_2 + Ar = 4, N_2 = 58, CH_4 = 1, CO_2 = 38.																			
well NE¼SE¼SW¼ S29,T36N,R40E	73	–	7Aug61	80	–	40	6.8	126	22	434	0	50	20	–	–	–	478	811	7.7	Cohen, 1962c
	Remarks: Depth – 18 ft.																			
Golconda Hot Springs NE¼SW¼SE¼ S29,T36N,R40E	148	50-200	24Aug45	–	–	33	8	180	–	444	0	108	21	–	–	–	–	–	–	Miller, Hardman & Mason, 1953

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
HUMBOLDT COUNTY (continued)																				
spring NE¼SW¼SE¼ S29,T36N,R40E	148	–	2Dec61	59	0	35	8.4	146	23	448	0	56	20	2.0	0.4	1.3	571	845	8.2	Cohen, 1962c; Waring, 1965, No. 19B
Golconda Hot Springs SE¼NE¼S32,T36N,R40E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Davis, 1954, p. 2
Remarks: This spring is moderately radioactive.																				
well CNE¼NE¼S32,T36N,R40E	177	–	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	D. I. Segerstrom, written communication, 1972
Remarks: Drilled in 1940 to 175 ft.																				
Golconda Hot Springs T36N,R40E	109	–	20Feb74	40	0.79	47	7.8	159	24	528	0	57	27	2.9	0.2	–	626	942	7.0	Sanders & Miles, 1974
Remarks: PO_4 <0.1, NH_4 = 0.8, Ag <0.02, As = 0.9μg/l, Ba = .46, Be <0.005, Bi <0.1, Cd <0.01, Cr <0.02, Cs = 1.12, Cu <0.01, Hg <0.5μg/l, Li = .527, Mn = .096, Ni = .06, Pb = .02, Rb = .198, Sb <0.1, Se <1.0μg/l, Sn <0.05, Sr = 0.227, Zn = 0.068.																				
springs T36N,R40E	120-150	250	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 19
Remarks: About 12 springs.																				
Golconda Hot Springs	149	50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1955, p. 136
Golconda tungsten mine drill hole 302 CSW¼S36,T36N,R40E	143	–	1972	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	D. I. Segerstrom, written communication, 1972
Remarks: Depth – 258 ft.																				
spring S36,T36N,R40E	69	1.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	D. I. Segerstrom, written communication, 1972; Waring, 1965, No. 19C
[140] spring SW¼NE¼NE¼ S2,T36N,R41E	70	25	8Aug61	34	0	2	0	620	3.5	1080	143	98	46	16	0	4.6	1500	2340	9.2	Cohen, 1962c; Waring, 1965, No. 19D
Remarks: 2 thermal springs.																				
[142] Northern East Range area																				
well no. 5 CNW¼S21,T35N,R36E	84	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Cohen, 1962c
well NW¼NW¼NW¼ S27,T35N,R36E	82	–	19Jul61	52	0.05	117	48	512	60	1610	0	59	225	4.8	1.0	7.8	1880	3030	7.8	Cohen, 1962c
Remarks: Depth – 99 ft.																				
spring SW¼SW¼SE¼ S28,T35N,R36E	83	–	18Jul61	73	0.08	61	12	550	51	1270	10	100	237	6	3.5	9.2	1740	2640	8.3	Cohen, 1964
spring NE¼NW¼NE¼ S28,T35N,R36E	82	–	18Jul61	50	0.01	17	40	920	94	1940	41	121	381	12	0.8	15	2650	4080	8.3	Cohen, 1964
[143] Sulfur Spring S34,T35N,R41E	hot	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Kerr, 1940, p. 1369
Remarks: Extensive tufa deposits.																				
[144] Hot Pot (Blossom Hot Springs)																				
spring SW¼S11,T35N,R43E	136	–	1973	80	–	29	5	288	33	823	–	60	28	–	–	–	–	1400	8.0	Mariner & others, 1974
Remarks: Li = 0.72; travertine present; estimated reservoir temperature = 257°F.																				
spring S11,T35N,R43E	95	400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bradberry & Associates, 1964
Blossom Hot Springs NW¼SW¼S11,T35N,R43E	107	70	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 19A
Remarks: Spring rises in broad deep pool.																				
[145] Brooks Hot Spring																				
spring NW¼NE¼S13,T34N,R41E	94	450	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bradberry & Associates, 1964
spring NW¼NE¼S13,T34N,R41E	94	2+	1959	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Olcott, 1959
spring NW¼NE¼S13,T34N,R41E	98	~20	1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 19F
Remarks: Flowing from alluvium in a man-made trench.																				
[146] Hot Springs (Tipton) Ranch																				
spring NW¼NW¼NW¼ S4,T33N,R40E	–	30-40	1959	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Oesterling, 1959
Remarks: Along fault zone.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
HUMBOLDT COUNTY (continued)																				
Magma Power Co. Tipton No. 1 well SW¼NW¼SW¼ S4,T33N,R40E	–	–	1974	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Remarks: Depth – 3071 ft; geothermal well (API No. 27-013-9000).																			
spring W½SE¼SE¼ S5,T33N,R40E	115	15	1959	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Oesterling, 1959
	Remarks: Along fault zone; 120 gpm total from several springs.																			
springs SE¼NE¼SE¼ S5,T33N,R40E	–	50 & 15	1959	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Oesterling, 1959; Waring, 1965, No. 19G
	Remarks: Two springs along fault zone.																			
spring SE¼S5,T33N,R40E	185	26	1973	125	–	16	0.9	200	18	385	–	140	41	–	–	2.6	–	1060	8.4	Mariner & others, 1974
	Remarks: Li = 1.2.																			
LANDER COUNTY																				
[147] Izzenhood Ranch Springs SW¼NE¼NW¼ S10,T35N,R45E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965
	Remarks: Water level lowered 4 ft by trenching, thus doubling original discharge; water used for irrigation.																			
springs SW¼NE¼NW¼ S10,T35N,R45E	83	1000	1917	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 76
[148] White Rock Springs S8,T33N,R47E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 77
	Remarks: 2 mi west of Rock Creek.																			
[149] spring NE¼SW¼S6,T32N,R46E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bradberry & Associates, 1964
	Remarks: Two springs.																			
[150] spring NW¼S11,T31N,R42E	75	–	8Oct60	65	–	18	2.4	34	4.8	104	0	25	15	0.6	0.8	0.11	244	259	7.7	Sinclair, 1963a
[94] Beowawe Geysers S17,T31N,R48E	See Eureka County.																			
[151] Buffalo Valley Hot Springs																				
spring S6,T29N,R41E	162	–	–	75	–	24	–	268	29	–	–	–	28	–	–	–	–	–	–	Wollenberg & others, 1977
	Remarks: U <0.08µg/l, Ba = 160µg/l, W = 28µg/l, Br = 62µg/l, Sb = 37µg/l, Mo = 4µg/l, Rb = 124µg/l, Cs = 150µg/l, As <10µg/l, Fe <100µg/l, Sc <0.02µg/l, Mn = 30µg/l ; Pershing County.																			
spring S6,T29N,R41E	162	–	–	64	–	25	–	269	27	–	–	–	28	–	–	–	–	–	–	Wollenberg & others, 1977
	Remarks: U <0.16µg/l, Ba = 160µg/l, W = 28µg/l, Br = 62µg/l, Sb = 37µg/l, Mo <1µg/l, Rb = 133µg/l, Cs = 155µg/l, As <10µg/l, Fe <100µg/l, Sc <0.02µg/l, Mn = 30µg/l ; Pershing County.																			
spring S6,T29N,R41E	154	–	–	84	–	20	–	280	36	–	–	–	25	–	–	–	–	–	–	Wollenberg & others, 1977
	Remarks: U <0.14µg/l, Ba = 135µg/l, W = 24µg/l, Br = 70µg/l, Sb = 22µg/l, Mo <1µg/l, Rb = 135µg/l, Cs = 160µg/l, As = 25µg/l, Fe <100µg/l, Sc <0.02µg/l, Mn = 10µg/l; Pershing County.																			
spring S6,T29N,R41E	149	–	–	81	–	28	–	277	27	–	–	–	26	–	–	–	–	–	–	Wollenberg & others, 1977
	Remarks: U <0.16µg/l, Ba = 140µg/l, W = 33µg/l, Br = 70µg/l, Sb = 35µg/l, Mo <1µg/l, Rb = 130µg/l, Cs = 160µg/l, As <10µg/l, Fe <250µg/l, Sc <0.02µg/l, Mn = 40µg/l ; Pershing County.																			
spring S6(?),T29N,R41E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Ransome, 1909b
	Remarks: West side of Buffalo Valley, Pershing County.																			
springs SE¼S23,T29N,R41E	130	5	–	117	tr	30	tr	327		761	0	109	34	–	0	–	1032	–	–	Waring, 1965, No. 78
spring SE¼S23,T29N,R41E	120	3	1973	80	–	45	4.9	250	34	813	<1	110	29	4.8	–	2.3	–	1530	6.5	Mariner & others, 1974
	Remarks: Li = 0.80.																			
spring SE¼S23,T29N,R41E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
	Remarks: Al = 0.01, N = 1.7, P = 0.02, As = 0.01, Br = 0.1, I = 0.02, Rb = 0.18, Ce = 0.2, Sr = 2.4, Fe = 0.05, Mn = 0.06, Cu = 0.08, Hg = 0.0001, δD(‰) = −131.6, δO^{18}(‰) = −15.85. Gas (volume %): O_2 + Ar = 4, N_2 = 35, CH_4 = 2, CO_2 = 60.																			
spring SE¼S23,T29N,R41E	174	–	5Aug74	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1460	–	Olmsted & others, 1975
spring T29N,R41E	162	–	–	–	–	–	–	263	–	–	–	–	27	–	–	–	–	–	–	Wollenberg & others, 1975
	Remarks: U <0.08 ppb; W = 27 ppb; Mo = 4 ppb; Sb = 41 ppb; Ba = 157 ppb.																			
spring T29N,R41E	154	–	–	–	–	–	–	275	–	–	–	–	24	–	–	–	–	–	–	Wollenberg & others, 1975
	Remarks: U <0.14 ppb; W = 34 ppb; Mo <1 ppb; Sb = 24 ppb; Ba = 127 ppb.																			

LANDER COUNTY (continued)

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
spring T29N,R41E	149	–	–	–	–	–	–	272	–	–	–	–	25	–	–	–	–	–	–	Wollenberg & others, 1975
	Remarks: U <0.18 ppb; W = 32 ppb; Mo <1 ppb; Sb = 40 ppb; Ba = 134 ppb.																			
spring T29N,R41E	162	–	–	–	–	–	–	264	–	–	–	–	27	–	–	–	–	–	–	Wollenberg & others, 1975
	Remarks: U <16 ppb; W = 29 ppb; Mo <1 ppb; Sb = 64 ppb; Ba = 148 ppb.																			
south spring west of main hot spring	77	–	–	–	–	–	–	76	–	–	–	–	19	–	–	–	–	–	–	Wollenberg & others, 1975
	Remarks: U = 1.1 ppb; W = 6.8 ppb; Mo = 14 ppb; Sb <0.6 ppb; Ba = 11 ppb.																			
[152] Mound Springs C S7,T28N,R44E	110	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 79
	Remarks: Calcareous sinter over 0.5 square mile area.																			
[153] Hot Springs Ranch area																				
spring NE¼S23,T27N,R43E	127	–	1973	40	–	20	9	118	21	333	–	64	21 –	–	–	–	–	700	8.0	Mariner & others, 1974
	Remarks: In Valley of the Moon.																			
spring C S½S23,T27N,R43E	124	450	–	41	tr	65	10	121		447	0	63	24	–	0	–	559	–	–	Waring, 1965, No. 80
spring SW¼NE¼S23,T27N,R43E	124	450	1950	39	0.02	52	7.3	116	20	428	–	62	21	3.9	0.8	0.6	519	825	7.9	Crosthwaite, 1963
	Remarks: Six springs shown.																			
spring S26,T27N,R43E	129	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hose & Taylor, 1974
spring NE¼S26,T27N,R43E	122	50	–	55	tr	64	tr	154		468	0	74	23	–	0	–	627	–	–	Waring, 1965, No. 81
spring	–	–	–	–	–	66	3.9	121	–	447	–	63	24	–	–	–	–	1043	–	Miller & others, 1953, p. 44-45
[154] Chillis Hot Springs S27,T27N,R46E	102	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Zones, 1961b, p. 22; Waring, 1965, No. 82
spring NW¼S28,T27N,R46E	72	–	12Jul65	–	–	141	61	292		540	0	315	332	–	–	–	–	2330	7.8	Everett & Rush, 1966
	Remarks: Probably at Carico Lake Ranch.																			
[155] spring NE¼S15,T26N,R45E	72	–	12Jul65	–	–	54	18	111		396	0	95	18	–	–	–	–	806	7.9	Everett & Rush, 1966
[156] James Lister well S27,T24N,R43E	102	–	1918?	41	tr	64	tr	280		793	0	74	34	–	0	–	905	–	–	Waring, 1919
	Remarks: This is a non-flowing artesian well. Depth – 15 ft. Water used for bathing.																			
[157] spring SW¼SW¼S15,T24N,R47E	hot	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 92
	Remarks: Several springs. Water supply for cattle. Near Hot Springs Point.																			
[158] Little Hot Springs NE¼S2,T23N,R47E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walti Hot Springs 15-minute sheet
	Remarks: 3.5 mi west of Walti Hot Springs, Eureka County.																			
[159] Northern Smith Creek Valley																				
Peterson's Mill Hot Spring NW¼NW¼S36,T20N,R40E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mount Airy 7½-minute quad
well NW¼S36,T20N,R40E	85	–	30Mar64	–	–	42	20	–	–	180	8	74	19	–	–	–	–	477	8.4	Everett & Rush, 1964
[160] Southern Smith Creek Valley																				
spring S27(?),T18N,R39E	warm	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 84
	Remarks: Six mi north of Smith Creek Valley Hot Springs.																			
spring S11,T17N,R39E	187	20	1973	110	–	4.8	0.06	170	8.4	246	5	102	22	8.9	–	0.66	–	737	7.7	Mariner & others, 1974
	Remarks: Li = 0.38.																			
springs E½S26 & NW¼ S25,T17N,R39E	~boiling	~123	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Everett & Rush, 1964
	Remarks: About 20 hot springs; discharge from each is small, but water is near boiling; the springs appear to be associated with recent faults which cut the younger alluvium.																			
spring S25,T17N,R40E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 85
	Remarks: No spring shown on Iron Mountain 7½-minute quad; possibly in S25,T17N,R39E.																			
[161] well SW¼S8,T18N,R47E	71	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush & Everett, 1964
Monitor well NE¼S20,T18N,R47E	71	–	14Apr64	–	–	62	12	36	–	160	0	88	43	–	–	–	–	579	7.8	Rush & Everett, 1964
[162] Spencer Hot Springs																				
Spencer (Spencer's) Hot Spring SE¼S13,T17N,R45E	144	6	16Sep13	34	0.2	57	18	197		646	12	52	28	–	0	–	802	–	–	Meinzer, 1917; Waring, 1965, No. 86

LANDER COUNTY (continued)

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
well SE¼SE¼SE¼ S13,T17N,R45E	144	flowing	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
well NE¼SE¼S11,T17N,R45E	164	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush & Schroer, 1970
Marie Streshly well SE¼S13,T17N,R45E	110	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush & Schroer, 1970
	Remarks: Depth – 60 ft; water at land surface.																			
spring SE¼S13,T17N,R45E	162	13	1973	77	–	43	9.4	200	36	672	<1	51	22	4.7	–	2.6	–	1180	6.5	Mariner & others, 1974
	Remarks: Li = 1.8.																			
spring SE¼S13,T17N,R45E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
	Remarks: P = 0.01, Br = 0.1, I = 0.02, Rb = 0.15, Ce = 0.1, Sr = 1.8, Fe = 0.06, Cu = 0.12, δD(‰) = –135.8, δO^{18} (‰) = –16.01. Gas (volume %): O_2 + Ar = 5, N_2 = 41, CH_4 = 1, CO_2 = 54.																			
Spencer Hot Spring SE¼SE¼SE¼ S13,T17N,R45E	boiling	–	17Sep73	79	0.13	51	10.2	198	34	684	0	47	26	5.2	<0.1	–	800	1161	7.4	Sanders & Miles, 1974
	Remarks: Li = 3.2, NH_4 = 2.8, As = 24µg/l, Ba = 0.1, Sr = 0.67, PO_4 <0.1, Be <0.005, Cu <0.004, Pb <0.02, Mn <0.01, Zn <0.01, Ni < 0.02, Cd <0.002, Cr <0.04, Ag <0.004, Ba <0.10, Bi <0.10, Cs = .90, Hg = .30µg/l, Nb <10.0, Rb .26, Sb <0.2, Se <1.0µg/l, Sn <0.2, Ta <5.0.																			
well SE¼S14,T17N,R45½E	117	flowing	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
	Remarks: Near North Spring at Spencer's Hot Springs; not presently flowing.																			
[163] well NW¼S24,T16N,R44E	84	6	1948	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
	Remarks: Depth – 120 ft.																			
[164] springs SE¼S14,T16N,R45E	hot	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 87
	Remarks: Seven springs; water used for bathing.																			

LINCOLN COUNTY

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
[165] Geyser Ranch Springs area																				
springs S1,12,13,23,T9N,R65E	65-70	4500	4Aug63	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush & Eakin, 1963
Geyser Spring T9N,R65E	68	–	1963	13	–	30	3.4	3.0	1.0	103	0	5.0	3.0	0	0.6	0	115	181	8.0	Rush & Eakin, 1963
springs	65-70	50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 142
[166] Hammond Ranch																				
spring S17,T5N,R69E	84	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Carpenter, 1951; Waring, 1965, No. 143
[167] Flatnose Ranch																				
spring SE¼S34,T1N,R69E	77	400	Dec1946	20	–	30	10	42		162	0	44	20	–	–	–	247	–	–	Phoenix, 1948
spring S34,T1N,R69E	70	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 144B
[168] Delmue's Springs																				
two springs NE¼NW¼SE¼ S13,T1S,R68E	70	200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hardman & Miller, 1948; Waring, 1965, No. 144A
[169] Bennett's (Bennett) Spring																				
spring SW¼S7,T2S,R66E	70	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hardman & Miller, 1948; Waring, 1965, No. 144
[170] Panaca (Owl) Warm Springs																				
Kenneth D. Lee south well SE¼S32,T1S,R68E	warm	–	1954	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1964
	Remarks: Depth – 75 ft.																			
C. Kenneth Lee south well SE¼S33,T1S,R68E	76	–	1952	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush, 1964
	Remarks: Depth – 106 ft.																			
spring CN½S4,T2S,R68E	85	4880	15Apr63	51	0	31	9.8	38	6.8	189	–	29	15	1.6	2.6	0.1	271	401	8.1	Rush, 1964
springs S4,T2S,R68E	85-88	2500	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 145
spring CN½S4,T2S,R68E	87	3600	–	40	–	54	15	21		149	34	31	25	–	–	–	273	–	–	Phoenix, 1948

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
LINCOLN COUNTY (continued)																				
spring CN½S4,T2S,R68E	–	–	–	30	–	48	15	18		183	0	41	20	–	–	–	278	–	–	Phoenix, 1948
spring CN½S4,T2S,R68E	85-89	1800	5Oct12	46	0.3	40	23	2.1		178	0	27	18	–	0	–	283	–	–	Carpenter, 1915
spring CN½S4,T2S,R68E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 1.83; Ca + Mg = 2.03; Cl + SO_4 = 1.91; tritium = <8 T.U.																			
Lester Mathews well SW¼S5,T2S,R68E	78	–	1949	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush, 1964
	Remarks: Depth – 158 ft. Tops–surface, sandy clay; 18 ft, clay; 35 ft, interbedded sand and clay; 125 ft, sand and gravel.																			
Panaca LDS Church well NE¼S7,T2S,R68E	74	–	Dec63	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush, 1964
	Remarks: Depth – 135 ft.																			
Delmue Bros. north well SW¼S8,T2S,R68E	75	–	4Dec63	–	–	61	31	–	–	308	–	–	63	–	–	–	–	–	7.8	Rush, 1964
	Remarks: Depth – 120 ft (casing perforated 74–90 ft). Clay, sandy clay, and gravel to bottom.																			
Pioche LDS Church well NW¼S8,T2S,R68E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush, 1964
[171] Sand Springs Valley																				
Sand Spring NE¼SE¼SE¼ S26,T2S,R55E	86	0.2	5Oct75	–	–	56	22	67		357	0	25	5	–	–	–	–	609	8.0	Van Denburgh & Rush, 1974
N. J. Gunderson well SE¼SE¼S19,T3S,R55E	83	–	1963	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Van Denburgh & Rush, 1974
	Remarks: Depth – 238 ft.																			
G. C. Englemann well NW¼SW¼S5,T4S,R55E	warm	–	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Van Denburgh & Rush, 1974
	Remarks: Depth – 250 ft; water stands at 185 ft; all in alluvium.																			
G. C. Englemann well NW¼NW¼S8,T4S,R55E	warm	–	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Van Denburgh & Rush, 1974
	Remarks: Depth – 250 ft.																			
[172] Hiko Spring																				
spring NE¼NW¼SE¼ S14,T4S,R60E	90	5380	15Nov12	35	0	52	24	22		272	0	36	11	–	0.8	–	315	–	–	Carpenter, 1915
spring NE¼NW¼SE¼ S14,T4S,R60E	80	2400	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
spring S22,T4S,R60E	90	4000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 147
spring T4S,R60E	80	2950	10Mar62	33	–	44	23	29	7.2	260	0	36	11	0.5	1.2	0.1	–	494	8.0	Eakin, 1963b
springs T4S,R60E	–	–	25Feb44	–	–	45	26	17	–	268	–	24	8.9	–	–	–	–	–	–	Eakin, 1963b
spring T4S,R60E	–	–	4Jun44	–	–	48	23.2	29.9	–	281	0	35.5	10.5	–	–	0.21	–	–	–	Eakin, 1963b
spring T4S,R60E	–	–	–	–	–	52.1	23.9	22.0	–	285	–	36.1	11.0	–	–	–	–	–	–	Eakin, 1966
[173] Caliente Hot Springs																				
springs SW¼S5,T4S,R67E	112	0	–	126	–	33	7	84		278	0	4.5	12	–	4	–	430	–	–	Phoenix, 1948a; Waring, 1965, No. 146
	Remarks: Al = trace.																			
Wallis Health well NW¼S8,T4S,R67E	145	–	4Feb74	88	.01	41	4.4	40	11	205	0	33	7	1.57	5.6	–	333	437	7.8	Sanders & Miles, 1974
	Remarks: Li = 0.169, NH_4 <0.2, PO_4 = 0.1, As = 0.001, Ba = 0.1, Be <0.005, Cu <0.02, Pb <0.02, Mn = 0.01, Sr = 0.25, Zn = 0.152, Ni = 0.02, Cd = 0.008, Cr <0.02, Ag <0.02, Au = .05µg/l, Bi <0.1, Cs = 0.40, Hg <0.5µg/l, Ni = 0.02, Rb = 0.061, Sb <0.1, Se <1.0µg/l, Sn = .05.																			
Caliente Public Utility No. 4 well SW¼S5,T4S,R67E	104	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush, 1964
	Remarks: Depth – 130 ft.																			
City of Caliente North well NE¼S7,T4S,R67E	107	–	–	84	–	29	10	70		232	7	26	20	–	–	–	352	–	–	Phoenix, 1948
	Remarks: Depth – 130 ft.																			
Caliente Mineral Spring NE¼S8,T4S,R67E	118	–	4Feb74	91	<0.01	43	6.2	46	15	239	0	42.1	12	1.63	4.8	–	380	518	8.2	Sanders & Miles, 1974
	Remarks: Li = 0.18, NH_4 <0.2, PO_4 = 0.2, Be <0.005, Cu <0.02, Pb <0.02, Mn = 0.02, Sr = 0.09, Zn = 1.42, Ni = 0.02, Cd = 0.009, Cr <0.02, Ag <.02, As = 0.1µg/l, Ba <0.04, Bi <0.1, Cs = .40, Hg <0.5µg/l, Pb <0.02, Rb = .054, Sb <0.1, Se <1.0µg/l, Sn <0.05.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
LINCOLN COUNTY (continued)																				
well NE¼S8,T4S,R67E	135	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Smith, 1958, p. 32
	Remarks: Near springs.																			
[174] Crystal Springs																				
spring CNE¼S10,T5S,R60E	81	–	15Apr63	31	–	45.0	23.6	23.0	5.1	262	0	26.9	8.2	0.6	1.2	0.7	277	–	8.0	Eakin, 1963b
spring S10,T5S,R60E	90	9000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 148
spring CNE¼S10,T5S,R60E	82	4480	10Mar62	31	–	46.2	22.2	23.9	5.5	242	0	34.0	9.9	2.9	0.6	0.04	–	–	7.2	Eakin, 1963b
spring S10,T5S,R60E	–	–	4Jun44	–	–	46	23.9	25.3	–	268	0	34	8.9	–	–	0.05	–	488	–	Eakin, 1963b
spring S10,T5S,R60E	–	–	25Apr44	–	–	44	24.3	16.4	–	256	0	22.1	8.9	–	–	–	–	491	–	Eakin, 1963b
spring S10,T5S,R60E	–	–	16Nov12	–	–	53.0	23.0	19.1	–	261	–	37	11	–	–	–	–	577	–	Eakin, 1963b
spring S10,T5S,R60E	–	–	11Mar35	–	–	55	23.0	37	–	26.4	–	13	7.0	–	–	–	–	671	–	Eakin, 1963b
spring CNE¼S10,T5S,R60E	82	5300	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
spring S10,T5S,R60E	81	–	15Apr63	28	0	45	23	23	5.2	272	–	27	8	0.5	1.1	0.2	295	484	8.4	Cohen, 1966
spring S10,T5S,R60E	90	2680	16Nov12	26	–	53	23	19	–	261	0	37	11	–	–	–	306	–	–	Hardman & Miller, 1934
[175] Ash (Alamo) Springs area																				
Little Ash Spring SE¼S36,T5S,R60E	97	9000	4Feb74	29	0.01	56	14	31	5.6	266	0	34.1	21	8.7	0.7	–	332	497	7.6	Sanders & Miles, 1974
	Remarks: Li = 0.061, NH_4 <0.2, As = 0.002µg/l, Ba = 0.32, Cu <0.02, Pb <0.02, Mn = 0.01, Sr = 0.32, Zn = 2.0, Ni = 0.02, Cd = 0.005, Cr <0.02, PO_4 <0.1, Ag <.02, As = 2.4µg/l, Be <.005, Bi <0.1, Cs = 0.40, Hg = 0.5µg/l, Sn <0.05, Rb = .030, Sb <0.1, Se <1.0µg/l.																			
spring S36,T5S,R60E	–	–	25Apr44	–	–	45.0	18.1	20.9	–	256	0	43.8	10.5	–	–	0.37	–	480	–	Eakin, 1963b
spring S36,T5S,R60E	–	–	11Mar35	–	–	53.6	10.0	47.2	–	264	–	40.7	13.6	–	–	–	–	–	6.4	Eakin, 1963b
spring T5S,R60E	90	–	16Nov12	34	–	49	13	59	–	259	0	46	11	–	–	–	303	–	–	Hardman & Miller, 1934
springs NW¼NW¼NW¼ S6,T6S,R61E	88	8690	9Mar62	31	–	39	18	32	6.8	231	0	34	9.7	0.5	1.3	0.1	286	443	8.1	Eakin, 1963b
spring NW¼NW¼NW¼ S6,T6S,R61E	90-97	9000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 149
springs NW¼NW¼S6,T6S,R61E	90	7630	23May66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 1.51, Ca + Mg = 3.08, Cl + SO_4 = 1.05.																			
spring S18,T6S,R61E	warm	–	26Oct12	24	0.2	66	24	13		278	0	0.48	10	–	0.4	–	263	–	–	Carpenter, 1915
	Remarks: Three miles south southeast of main Ash Springs.																			
[176] Ash Creek Spring NW¼NE¼S1,T12S,R58E	72	1.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	510	–	Hughes, 1966
LYON COUNTY																				
[177] Hazen area (Patua Hot Springs)																				
springs (4) S18,T20N,R26E	warm	–	21Feb30	–	–	55	0	550	–	67	–	41	865	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
Magma Power Co. Hazen No. 1 well SW¼S18(?),T20N,R26E	270	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Koenig, 1970
	Remarks: Geothermal well; depth – 750 ft.																			
spring SW¼S18,T20N,R26E	187	–	–	150	0.02	70	1.5	620	38	100	–	400	820	4.2	–	5.6	–	3530	7.1	Mariner & others, 1975
	Remarks: Li = 1.6, Al = 0.004, Rb = 0.23, Ce = 0.2, Mn = 0.06, Cu = 0.01, Hg = 0.0001, δD(‰) = –121.5, $δO^{18}$(‰) = –13.30. Gas (volume %): O_2 + Ar = 11, N_2 = 81, CH_4 = 2, CO_2 = 6.																			

LYON COUNTY (continued)

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
Magma Power Co. Hazen No. 1(?) well S18(?),T20N,R26E	275+	–	1962	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	B. C. McCabe, written communication
Remarks: Geothermal well.																				
[178] Sutro Tunnel NE¼NE¼SE¼ S2,T16N,R21E	81	–	16Apr59	34	3.3	267	53	67	4.6	312	0	732	8.2	0.6	0	0.03	1320	1650	7.6	Glancy & Katzer, 1975
Remarks: Mn = 1.2; PO_4 = 0.00.																				
Sutro Tunnel NE¼NE¼SE¼ S2,T16N,R21E	83	22-50	1Jun70	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Glancy & Katzer, 1975
Remarks: Water drains from the Comstock mining district, Storey County.																				
[179] well SE¼SW¼NE¼ S12,T16N,R21E	95	–	11Jul72	–	–	120	0	170		49	0	570	30	–	–	–	–	1280	7.8	Glancy & Katzer, 1975
Remarks: Depth – 265 ft.																				
well NW¼SE¼NW¼ S7,T16N,R22E	80	–	6Oct67	–	0.13	102	1	42		149	0	192	21	–	0	–	583	–	7.7	Glancy & Katzer, 1975
Remarks: Depth – 100 ft.																				
[181] Wabuska-Hot Springs																				
springs S11,14,15,16,23, T15N,R25E	138-162	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 62
Magma Power Co. Wabuska No. 1-C well	–	–	–	–	0.02	38	0	384		61	10	760	507?	9.3	–	–	1279	–	–	unpub. analysis, Nev. Div. of Health
Remarks: Geothermal well; As = 0.05, Cu = 0.06.																				
Magma Power Co. Wabuska No. 2 well	–	–	–	–	0.02	38	75	379		66	12	740	50	9.2	–	–	1231	–	8.8	unpub. analysis, Nev. Div. of Health
Remarks: Geothermal well; As = 0.045, Cu = 0.02.																				
Magma Power Co. Wabuska No. 3 well NW¼SE¼S15,T15N,R25E	222	25	15Oct59	100	0.01	37	8.7	276	12	80	–	566	43	7.6	0	1.0	1090	1490	8.0	Huxel, 1969
Remarks: Geothermal well; depth – 2223 ft; flowing.																				
Magma Power Co. Wabuska No. 3 well	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1330	–	–	Dennis Trexler, written communication, 1974
Remarks: Geothermal well																				
Magma Power Co. Wabuska No. 3 well NW¼SE¼SE¼ S16,T15N,R25E	227	–	–	–	0.02	370	–	–	–	73	6	760	52	9.3	–	–	1279	–	–	unpub. analysis, Nev. Div. of Health
Remarks: Geothermal well; depth – 2223 ft. As = 0.05, Cu = 0.03.																				
Magma Power Co. well NW¼SW¼S15,T15N,R25E	207	400	15Oct59	109	0.06	40	1.0	313	13	52	12	642	49	8.2	0	1.0	1210	1630	8.6	Huxel, 1969
Wabuska well NW¼SW¼S15,T15N,R25E	boiling	–	10Mar74	100	.41	46	.10	332	13.8	49	12	658	54	9.21	<0.1	–	1250	1656	8.6	Sanders & Miles, 1974
Remarks: PO_4 = 0.2, NH_4 = 0.5, Ag <0.02, As = 1.1μg/l, Ba = .14, Be = .007, Bi <0.1, Cd <0.01, Cr <0.02, Cs = 1.16, Cu <0.01, Hg <0.5μg/l, Li = 0.302, Mn = 0.044, Ni = .08, Pb = 0.07, Rb = 0.152, Sb <0.1, Se <1.0μg/l, Sn = 0.05, Sr = 0.250, Zn = 1.03.																				
Magma Power Co. well SE¼SE¼S16,T15N,R25E	207	400	15Oct59	99	0.02	39	0	291	12	68	2	596	46	7.7	0	1.0	1130	1580	8.3	Huxel, 1969
Magma Power Co. well SE¼S16,T15N,R25E	207	–	1973	115	–	38	0.2	277	15	70	–	580	46	–	–	–	–	1550	8.5	Mariner & others, 1974
spring SE¼S16,T15N,R25E	201	–	–	110	–	39	0.1	300	14	74	–	620	55	8.2	–	10	–	1610	8.1	Mariner & others, 1975
Remarks: Al = 0.017, Rb = 0.09.																				
well NW¼NE¼S14,T15N,R25E	86	25	17Feb66	–	–	39	1.6	273		72	–	552	45	–	–	–	–	1480	7.9	Huxel, 1969
Remarks: Depth – 145 ft, flowing.																				
well NE¼SW¼S21,T15N,R25E	84	200	16Feb66	–	–	4.6	0.6	124		187	8	80	24	–	–	–	–	560	8.6	Huxel, 1969
Remarks: Depth – 400 ft.																				
well SE¼NE¼S28,T15N,R25E	86	15	1966	–	–	7.2	1.7	129		159	–	128	29	–	–	–	–	652	8.2	Huxel, 1969
Remarks: Depth – 1000 ft, flowing; well drilled in 1890's.																				
[182] well NE¼NE¼NW¼ S1,T14N,R25E	70	–	2Aug66	–	0.05	5	1	91		84	–	110	23	–	–	–	333	–	7.9	CWRR, 1973
Remarks: Depth – 364 ft; 4 mi southeast of Wabuska.																				
[183] Artesia Lake area																				
Ambassador well NW¼SW¼S25,T13N,R23E	82	–	6Apr55	36	0.03	2.0	0.2	69	3.4	146	4	23	6.2	1.0	0.2	–	–	305	8.5	Scott & Barker, 1962
Remarks: Depth – 540 ft; Al = 0, Mn = 0, PO_4 = 0.6, H_2S = present, Ra = 2.5μg/l, U = 0.5μg/l, well may penetrate volcanic rocks at depth.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
LYON COUNTY (continued)																				
Ambassador well NW¼SW¼S25,T13N,R23E	82	400	13Jun50	86	–	–	–	71		162	0	22	7	1.0	0.2	0.16	–	307	–	Loeltz & Eakin, 1953
Remarks: Depth – 540 ft; flowing.																				
well SW¼SE¼S27,T13N,R23E	70	12	24May50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Loeltz & Eakin, 1953
Remarks: Depth – 230 ft, flowing.																				
well SE¼SE¼S27,T13N,R23E	73	10	24May50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Loeltz & Eakin, 1953
Remarks: Depth – 170 ft; flowing.																				
well SE¼SE¼S27,T13N,R23E	76	26	24May50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Loeltz & Eakin, 1953
Remarks: Depth – 155 ft, flowing.																				
spring NE¼S34,T13N,R23E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Moore, 1969
spring SW¼S34,T13N,R23E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Moore, 1969
well SW¼NW¼S10,T12N,R23E	70	0.8	21Oct48	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Loeltz & Eakin, 1953
Remarks: Depth – 59 ft.																				
[184] Hind's (Nevada) Hot Springs																				
springs SW¼S16 & NW¼ S21,T12N,R23E	144	550	–	61	–	–	–	103		0	28	145	18	2.7	0	0.04	–	495	–	Loeltz & Eakin, 1953
spring SE¼S16,T12N,R23E	142	53	1973	52	–	4.5	0.01	102	2.5	54	7	169	17	3.1	–	0.19	–	509	8.7	Mariner & others, 1974
Remarks: Li = 0.08.																				
springs	60-143	550	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 61
springs SW¼S16,T12N,R23E	–	–	16Apr32	–	–	–	–	125	–	56	–	192	18	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
springs SW¼S16,T12N,R23E	–	–	16Apr32	–	–	tr	–	96	–	105	–	90	21	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
springs SW¼S16,T12N,R23E	–	–	15Jun50	–	–	5	–	101	–	2	27	145	18	–	–	0.2	–	–	–	Miller, Hardman & Mason, 1953
spring	–	–	24Aug73	–	–	–	–	–	–	–	–	–	–	–	–	–	1286	–	–	Dennis Trexler, written communication, 1974
spring CN½S21,T12N,R23E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Moore, 1969
Remarks: Just south of Hind's Hot Springs.																				
spring NE¼SE¼S28,T12N,R23E	–	–	26Mar46	–	–	55	8	62	–	167	6	0	12	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
spring NE¼SW¼S28,T12N,R23E	–	–	26Mar46	–	–	79	21	76	–	227	15	0	32	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
[185] spring CW½S34,T12N,R25E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Yerington 15-minute quad
[186] Wilson Hot Springs																				
springs SE¼SW¼S34,T11N,R25E	warm	0	1969	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Alvin McLane, personal communication
[187] Wellington area																				
well NW¼SE¼S2,T10N,R23E	117	–	2Feb42	62	–	–	–	115		41	22	157	28	3.5	0.4	1.0	–	581	–	Loeltz & Eakin, 1953
Remarks: Depth – 200 ft; static temperature 117°F; 143°F? reportedly observed when pumping; water used for public swimming pool.																				
well NW¼SE¼S2,T10N,R23E	warm	–	19Mar37	55	–	108	28	38		293	0	175	32	–	–	–	579	–	–	Loeltz & Eakin, 1953
Remarks: Depth – 65 ft; Fe + Al = tr.																				
well SE¼SE¼S2,T10N,R23E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Loeltz & Eakin, 1953
Remarks: Depth – 217 ft.																				
well SE¼SE¼S2,T10N,R23E	warm	–	Dec47	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Loeltz & Eakin, 1953
Remarks: Depth – 40 ft.																				
well NE¼NE¼S11,T10N,R23E	warm	–	2Feb42	63	–	61	17	65		281	0	109	13	–	–	–	450	–	–	Loeltz & Eakin, 1953
Remarks: Depth – 163 ft. Al + Fe = tr.																				
well NE¼NW¼S12,T10N,R23E	warm	–	Jul35	49	–	33	10	36		–	0	41	29	–	–	–	350	–	–	Loeltz & Eakin, 1953
Remarks: Depth – 82 ft; Fe + Al = tr.																				
well NW¼NW¼S12,T10N,R23E	warm	–	27Dec49	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Loeltz & Eakin, 1953
Remarks: Depth – 65 ft.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
LYON COUNTY (continued)																				
[188] springs SW¼SE¼S4,T7N,R27E	110	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Davis, 1954; Waring, 1965, No. 109
Remarks: U = 2000 (radiometric analysis).																				
MINERAL COUNTY																				
[189] Double Spring																				
spring S25,T13N,R29E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 108
[190] Dead Horse Wells																				
well (dry) S21,T12N,R32E	hot	–	3Jul51	–	–	48	13	70	–	88	10	190	43	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
[191] Wedell Springs																				
spring (no. 1) SW¼S7,T12N,R34E	129-144	60	18Feb34	–	–	16	0	262	–	210	–	315	78	–	–	1.6	–	1290	–	Eakin, 1962c
Remarks: There are 2 main springs; water used locally.																				
spring (no. 2) SW¼S7,T12N,R34E	144	60	20Sep35	–	–	50	13	216	–	220	–	254	94	–	–	–	–	1370	–	Eakin, 1962c; Waring, 1965, No. 113
[192] Hawthorne area																				
Naval Ammunition Depot well No. 1 NE¼NE¼S18,T8N,R30E	124	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	unpublished data, U. S. Navy
Naval Ammunition Depot well No. 5 SW¼SE¼S18,T8N,R30E	114	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	unpublished data, U. S. Navy
Naval Ammunition Depot well No. 2 SE¼S26,T8N,R30E	75	–	15Feb66	–	–	78	14	205		129	0	436	98	–	–	–	–	1380	8.0	Everett & Rush, 1967
Remarks: 69°F according to U. S. Navy data.																				
Naval Ammunition Depot well No. 2 SE¼S26,T8N,R30E	–	–	11Dec52	59	0.07	88	11	214	8.8	134	0	455	98	1.5	0.3	2.1	1000	1430	7.7	Everett & Rush, 1967
Remarks: Depth – 423 ft.																				
City of Hawthorne well SW¼S27,T8N,R30E	80	–	1May57	25	0.01	82	14	148	6.4	82	0	403	79	0.7	0.2	–	810	1180	7.4	Scott & Barker, 1962
Remarks: Depth – 602 ft; Al = 0.1, Mn = 0, PO_4 = 0; Ra <0.1μμc/l, U = 1.8μg/l.																				
City of Hawthorne well SW¼S27,T8N,R30E	100	–	1976?	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	unpublished data, U. S. Navy
well S33,T8N,R30E	91	–	18Feb72	–	0.1	91	17	75		137	–	307	19	0.55	1.5	–	620	–	7.8	CWRR, 1973
Naval Ammunition Depot well No. 3 NW¼S32,T8N,R31E	100	–	15Feb66	–	–	33	10	224		100	0	372	101	–	–	–	–	1340	7.9	Everett & Rush, 1967
Remarks: Depth – 452 ft; 93°F according to U. S. Navy data.																				
Naval Ammunition Depot well No. 3 NW¼S32,T8N,R31E	–	–	11Dec52	25	0.01	82	14	148	6.4	82	0	403	79	0.7	0.2	–	810	1180	7.4	Everett & Rush, 1967
Remarks: Depth – 452 ft.																				
Naval Ammunition Depot well No. 4 NE¼SW¼S2,T7N,R30E	74	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	unpublished data, U. S. Navy
[193] Sodaville (Soda) Springs area																				
spring SE¼S29,T6N,R35E	95	26	1973	46	–	40	3.3	305	16	112	<1	597	87	7.4	–	2.3	–	1640	7.6	Mariner & others, 1974
Remarks: Li = 0.65, Rb = 0.08, Ce = 0.1, Fe = 0.07, Mn = 0.08, δD(‰) = 130.3, δO^{18}(‰) = –16.13.																				
springs (south group) SW¼SW¼SE¼ S29,T6N,R35E	86	50	25May68	–	–	44	3	–	303	119	0	561	70	–	–	–	–	1900	8.0	Van Denburgh & Glancy, 1970
springs S½S29,T6N,R35E	80-101	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 110
[194] U. S. Bureau of Land Management well NE¼S19,T5N,R31E	110	–	8Dec52	37	–	6.0	0.9	116		47	9	109	64	4.8	0.1	–	370	575	–	Everett & Rush, 1967
Remarks: Depth – 345 ft.																				
[195] U. S. Bureau of Land Management No. 2 well NE¼SW¼S7,T3N,R31E	78	–	20May68	–	–	26	8	27		144	0	23	11	–	–	–	–	360	7.7	Van Denburgh & Glancy, 1970
Remarks: Depth – 64 ft; used to water stock; water level 20.8 ft below casing top.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
MINERAL COUNTY (continued)																				
[196] well S32,T2N,R33E	113	–	7Jun60	–	0.02	46	16	67		150	–	81	59	–	42	–	316	–	8.0	CWRR, 1973
NYE COUNTY																				
[197] McLeod's Ranch Spring NE¼SW¼S34,T14N,R43E	hot	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968; Waring, 1965, No. 114
[198] Charnock (Big Blue) Springs S16,T13N,R44E	80	450	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 116
Charnock (Big Blue) Springs S16,T13N,R44E	–	450	1913	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Meinzer, 1917
[199] Big Blue ("A") Spring NW¼SE¼S29,T13N,R44E	79	250	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
[200] Diana's Punch Bowl–Pott's Ranch area																				
spring SW¼NW¼S1,T14N,R47E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 119
		Remarks: Several springs; water used locally.																		
Pott's Ranch Spring SE¼NE¼S2,T14N,R47E	–	450	15Apr64	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965
Pott's Ranch Hot Spring NE¼S2,T14N,R47E	113	33	1973	36	–	52	11	47	13	249	<1	57	10	2.0	–	0.17	–	561	6.6	Mariner & others, 1974
		Remarks: Li = 0.3.																		
spring NE¼S2,T14N,R47E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
		Remarks: N = 0.25, P = 0.01, As = 0.01, Br = 0.05, I = 0.006, Rb = 0.06, Sr = 0.90, Mn = 0.02, Cu = 0.01, Hg <0.0001, δD(‰) = –127.5, δO^{18}(‰) = –16.28. Gas (volume %): O_2 + Ar = 4, N_2 = 93, CH_4 <1, CO_2 = 5.																		
spring SE¼SE¼NE¼ S2,T14N,R47E	–	450	15Apr64	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
spring SE¼S22,T14N,R47E	138	–	1973	46	–	50	11	55	15	277	<1	59	8	2.8	–	0.21	–	605	7.1	Mariner & others, 1974
		Remarks: Li = 0.4. Sample probably from pool in Diana's Punch Bowl.																		
spring SE¼S22,T14N,R47E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
		Remarks: P = <0.01, As = 0.01, Br = 0.04, I = 0.02, Rb = 0.07, Sr = 1.0, Cu = 0.05, Hg = <0.0001, δD(‰) = –124.9, δO^{18}(‰) = –16.24.																		
spring SE¼S22,T14N,R47E	124	53	1973	46	–	47	11	57	15	270	<1	59	8	2.8	–	0.23	–	589	6.7	Mariner & others, 1974
		Remarks: Li = 0.4. Sample probably from spring just southwest of Diana's Punch Bowl.																		
Diana's (Devil's) Punch Bowl SW¼SE¼S22,T14N,R47E	hot	900	15Apr64	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965; Waring, 1965, No. 120
spring NW¼NE¼S22,T14N,R47E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Diana's Punch Bowl 15-minute quad
Diana's (Devil's) Punch Bowl SW¼SW¼S22,T14N,R47E	134	202	18Dec66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Diana's (Devil's) Punch Bowl SW¼SW¼SE¼ S22,T14N,R47E	–	900	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965
[201] Gabbs area																				
well NW¼S28,T13N,R36E	129	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1962b
		Remarks: Depth – 296 ft.																		
well NW¼S22,T12N,R36E	70	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1962b
		Remarks: Depth – 285 ft.																		
well NW¼S27,T12N,R36E	98	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1962b
		Remarks: Depth – 254 ft.																		
well NW¼S27,T12N,R36E	118	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1962b
		Remarks: Depth – 215 ft.																		
well NW¼S27,T12N,R36E	135	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1962b
		Remarks: Depth – 457 ft.																		
well SE¼S28,T12N,R36E	140	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1962b
		Remarks: Depth – 625 ft.																		

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
NYE COUNTY (continued)																				
well SE¼S28,T12N,R36E	155	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1962b
	Remarks: Depth – 325 ft.																			
well SE¼S28,T12N,R36E	145	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1962b
	Remarks: Depth – 250 ft.																			
well SE¼S33,T12N,R36E	125	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1962b
	Remarks: Depth – 200 ft.																			
[202] Duckwater																				
Big Warm Spring SW¼NE¼NW¼ S32,T13N,R56E	91	5828	16Apr63	–	–	62	22	28	6.5	321	0	47	7	0.6	0.0	–	358	587	–	Van Denburgh & Rush, 1974
Big Warm Spring SE¼NW¼S32,T13N,R56E	90	6300	1912	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 2.96; Ca + Mg = 3.54; Cl + SO_4 = 2.02; tritium ≤7 T. U.																			
Big Warm Spring NW¼SE¼NW¼ S32,T13N,R56E	90	7284	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin & others, 1951
Big Warm (Duckwater) Spring NE¼NW¼S32,T13N,R56E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 122
Big Warm (Duckwater) Springs NE¼NW¼S32,T13N,R56E	–	6290	1916	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fulton & Smith, 1919
spring NW¼SE¼NW¼ S32,T13N,R56E	93	–	21Jun67	25	0.06	62	22	28	6.5	321	0	47	8.6	0.6	<0.10	0.12	380	587	8.0	unpublished data, USGS
Little Warm Spring NW¼NE¼S5,T12N,R56E	90	300	12Nov66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 1.42; Ca + Mg = 4.80; Cl + SO_4 = 1.26; tritium ≤7 T. U.																			
Little Warm Spring CN½S5,T12N,R56E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin & others, 1951
Little Warm Spring NW¼NE¼S5,T12N,R56E	90	300	12Nov66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
spring NW¼NE¼S5,T12N,R56E	90	–	7Aug67	34	0.02	57	25	40	7.3	240	0	27	81	0.4	<0.10	0.11	380	535	8.2	unpublished data, USGS
[203] spring SE¼SE¼S24,T12N,R46E	hot	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
	Remarks: Tufa mound; infrared imagery indicates shallow thermal ground water.																			
[204] Darrough's Hot Springs area																				
spring S7,T11N,R43E	180-200	450	31Jan57	105	0.05	1.2	0	104	2.4	112	24	40	12	15	0	0.27	367	472	8.7	Scott & Barker, 1962
	Remarks: Al = 0.1; Mn = 0; PO_4 = 0.1; Ra = 0.2µµc/l; U = <0.1.																			
spring S7,T11N,R43E	198	150+	30Sep13	88	tr	13	3	80		102	31	60	15	–	0	–	382	–	–	Meinzer, 1917
spring SE¼S7,T11N,R43E	180-198	600	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
spring S7,T11N,R43E	207	200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Koenig, 1970; Waring, 1965, No. 117, 118?
Darrough Ranch well SE¼S7,T11N,R43E	boiling	1400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush & Schroer, 1970
	Remarks: Depth – 800+ ft; boiling water; flow controlled by valve.																			
spring S8,T11N,R43E	203	92	1973	98	–	1.3	0.1	110	2.6	146	3	53	12	14	–	0.22	–	479	8.3	Mariner & others, 1974
	Remarks: Li = 0.3.																			
spring S8,T11N,R43E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
	Remarks: N = 0.13, P = 0.02, As = 0.06, Br = 0.04, I = 0.009, Rb = 0.03, Sr = 0.06, Hg = 0.0004, δD(‰) = 118.8, δO^{18}(‰) = –15.30.																			
Darrough Ranch well SW¼S8,T11N,R43E	hot	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush & Schroer, 1970
	Remarks: Depth – 55 ft; flowing 50°F water. The hot water was cemented off at 55 ft.																			
steam well S8,T11N,R43E	201	79	17Sep73	105	–	1.4	0.1	110	2.9	165	3	55	12	15	–	0.24	–	499	8.3	Mariner & others, 1974
	Remarks: Li = 0.3.																			
well SW¼SW¼SW¼ S8,T11N,R43E	boiling?	20-30	17Sep73	105	0.06	9	.02	111	2.8	76.3	44	49	15	16	<0.1	–	390	488	9.3	Sanders & Miles, 1974
	Remarks: Li = 0.7, NH_4 <0.1, PO_4 = 0.9, As = 0.013µg/l, Ba <0.01, Be <0.005, Cu <0.004, Pb <0.02, Mn <0.01, Sr = 0.04, Zn = 0.03, Ni <0.02, Cd <0.002, Cr <0.04, Ag <.004, Bi <0.10, Cd <0.002, Cr <0.04, Cs = .32, Hg = .35µg/l, Nb <10.0, Rb = .06, Sb <.2, Se <1.0µg/l, Sn <0.02, Ta <5.0.																			

NYE COUNTY (continued)

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
Magma Power Co. (and associates) well SE¼SE¼SE¼ S7,T11N,R43E	265	–	1962	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Koenig, 1970
	Remarks: Depth – 812 ft; very large flow of hot water, minor steam.																			
Magma Power Co. (and associates) well SE¼SE¼SE¼ S7,T11N,R43E	214	1145	–	106	–	–	–	–	–	–	–	48	14	–	–	0.2	370	–	–	U. S. Bureau of Reclamation, 1972, table 3
[205] spring on south Mosquito Creek Ranch SE¼NE¼S6,T11N,R47E	95	15	17Mar67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
[206] Little Fish Lake Valley																				
Fish Springs NE¼NW¼NE¼ S7,T11N,R50E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 121
	Remarks: Several springs, water used locally.																			
Warm Spring SW¼SE¼SE¼ S14,T10N,R49E	108	–	14Oct67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Upper Warm Spring SE¼NE¼SE¼ S14,T10N,R49E	104	27	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
spring SE¼SE¼S14,T10N,R49E	105	–	3Aug67	21	0.007	40	12	12	4.2	166	0	38	3.7	0.4	0.10	0.065	267	342	8.1	unpublished data, USGS
	Remarks: CO_2 = 2.1; PO_4 <0.01; As = 0.04; Ba = 0.16; Mo = 0.006; Sr = 0.22; V = 0.012; Al = 0.008; Li = 0.01; Co, Be, Pb, Ti each <0.002; Cd <0.02; Se <0.01; Mn, Ni, Ag, Zr each <0.000; Cu <0.01 (samples taken 10 May & 22 Jun 67 gave similar results).																			
test hole UCE-10 NE¼NE¼SW¼ S22,T10N,R49E	118	–	3Aug67	31	0.15	45	11	17	5.9	158	0	64	5.8	0.4	<0.1	0.045	–	391	7.8	unpublished data, USGS
	Remarks: Depth – 2963 ft. CO_2 = 4.0; PO_4 = 0.01; Ba = 0.13; Mn = 0.025; Mo = 0.003; Sr = 0.38; Al = 0.12; Be, Bi, Ni, Ag each <0.000; Co, Pb, Ga, Ti each <0.002; Cd <0.02; V <0.004 (samples taken 10 May 67 gave similar results).																			
[207] Railroad Valley																				
well SE¼SE¼NE¼ S34,T9N,R57E	hot	–	1Apr74	–	–	680	0	11000		51	0	1800	17000	–	–	–	–	50100	7.2	Van Denburgh & Rush, 1974
	Remarks: Probably Texota Oil Co. Eagle Springs Unit No. 1-34 oil well; 8694 feet deep.																			
Lock's (Lockes) Stockyard (Hay Corral) Spring NW¼NW¼S14,T8N,R55E	93-99	2000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 126
Lockes Stockyard (Hay Corral) Spring NW¼NW¼S14,T8N,R55E	93	425	12Nov66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 2.55; Ca + Mg = 4.74; Cl + SO_4 = 1.57; tritium ≤7 T. U.																			
Lockes Stockyard (Hay Corral) Spring NW¼NW¼S14,T8N,R55E	93	600	7Feb34	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin & others, 1951
Lockes North Spring NW¼S14,T8N,R55E	95	–	2Nov65	–	–	63	25	60		380	0	60	12	–	–	–	–	694	7.6	Rush & Everett, 1966
Lockes North Spring NE¼NE¼NE¼ S15,T8N,R55E	95	–	2Nov65	–	–	–	–	–	–	–	–	–	12	–	–	–	–	694	–	Van Denburgh & Rush, 1974
Lockes Reynolds Spring SE¼NE¼S15,T8N,R55E	97-99	323	12Nov66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: Two pools approximately 40 ft apart at base of tufa bluff; (epm) Na + K = 2.45, Ca + Mg = 4.65; Cl + SO_4 = 1.58; tritium ≤8 T. U.																			
Lockes Reynolds Spring SE¼SE¼NE¼ S15,T8N,R55E	97	331	6Oct71	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Van Denburgh & Rush, 1974
Lockes Big Spring SE¼S15,T8N,R55E	95	–	2Nov65	–	–	59	23	68		376	0	63	12	–	–	–	–	684	8.1	Rush & Everett, 1966
Lockes Big Spring NW¼SW¼NE¼ S15,T8N,R55E	100	476	21Jun67	–	–	66	21	52	10	376	0	59	10	1.2	0.0	–	–	694	7.5	Van Denburgh & Rush, 1974
Lockes Big Spring SW¼NE¼S15,T8N,R55E	99	471-582	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Lockes Big Spring SW¼NE¼S15,T8N,R55E	99-101	520	12Nov66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 2.43; Ca + Mg = 4.70; Cl + SO_4 = 1.56; tritium ≤8 T. U.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
NYE COUNTY (continued)																				
Lockes Big Spring SW¼NE¼S15,T8N,R55E	100	–	13Sep68	27	0.03	63	21	53	12	367	0	5.6	6.3	1.1	0.2	–	470	676	7.9	unpublished data, USGS
Remarks: CO_2 = 7.4, PO_4 <0.04, Cu <0.01, Mn <0.01, Sr = 0.46, Zn = 0.04, Li = 0.25.																				
Lockes Big Spring SW¼NE¼S15,T8N,R55E	100	–	21Jun67	26	0.06	66	21	52	10	376	0	59	10	1.2	<0.1	0.4	457	694	7.9	unpublished data, USGS
Remarks: CO_2 = 7.6; PO_4 <0.01; As <0.01; Ba = 6.001; Co <0.007; Cu <0.01; Pb <0.005; Mn <0.01; Mo = 0.002; Ni <0.002; Sr = 0.46; V <0.004; Zn = 0.01; Sn <0.005; Al = 0.5; Li = 0.25; Se = 0.04; Ti <0.003 (sample taken 7 Aug 67 gave similar results).																				
Lockes Big Spring SW¼NE¼S15,T8N,R55E	99	900	7Feb34	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin & others, 1951
Locks (Locke's) Hot Spring SW¼S15,T8N,R55E	95	200	7Feb34	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin & others, 1951
Blue Eagle Spring NW¼SE¼SE¼ S11,T8N,R57E	82	1860	6Oct71	–	–	30	28	48		297	0	36	9	–	–	–	–	584	8.1	Van Denburgh & Rush, 1974
Blue Eagle (Jacks) Springs SE¼SE¼S11,T8N,R57E	82	1800	7Feb34	17	0.6	80	24	30		385	0	34	10	–	0	–	465	–	–	Eakin & others, 1951
Remarks: 2 main springs; water used for irrigation.																				
Blue Eagle (Jacks) Springs SE¼SE¼S11,T8N,R57E	82	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Remarks: Issues from toe of alluvial fan; (epm) Na + K = 1.71; Ca + Mg = 5.07; Cl + SO_4 = 1.03; tritium ≤8 T. U.																				
Kate? (Blue Eagle) Spring SE¼SE¼S11,T8N,R57E	83	–	7Aug67	30	0.003	25	21	39	5.9	–	4	–	–	0.003	2.7	0.26	254	439	8.4	unpublished data, USGS
Remarks: CO_3 = 4, PO_4 <0.01, As = 0.000, Cd <0.035, Co <0.004, Al = 0.5, Li = 0.12, Se <0.01, Ti <0.004, Cu = 0.000, Pb = 0.003, Mn <0.002, Ni <0.002, Ag = 0.000, Sr = 0.45, Zn = 0.02, Sn <0.007, Al = 0.5, Li = 0.12.																				
Blue Eagle Springs SE¼SE¼S11,T8N,R57E	82	1385	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 128
Remarks: 2 main springs; 3 springs and a well shown on topo sheet.																				
Tom Spring NW¼NW¼S12,T8N,R57E	72	250	13Nov66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Remarks: Issues from alluvium; (epm) Na + K = 1.77, Ca + Mg = 5.20, Cl + SO_4 = 0.99, tritium ≤8 T. U.																				
Kate Spring SW¼NE¼S14,T8N,R57E	73	14	24Jan35	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 129
Remarks: Water used for domestic purposes and irrigation; flowing wells nearby.																				
Carl Hanks well SW¼NE¼S14,T8N,R57E	72	600	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Remarks: Depth – 185 ft, flowing well.																				
Carl Hanks well SW¼NE¼S14,T8N,R57E	71	600	Aug51	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Van Denburgh & Rush, 1974
Remarks: Depth – 185 ft; used for irrigation; water level = flows.																				
Shell Oil Co. Eagle Springs Unit No. 2 well NW¼NE¼SE¼ S2,T7N,R56E	229	–	24Nov54	–	–	7	6	192		293	43	50	68	–	–	–	–	–	9.0	Van Denburgh & Rush, 1974
Remarks: 10,155 feet deep oil well. Analysis of formation water from drill stem tests.																				
Chimney Hot Spring NW¼SE¼S16,T7N,R55E	140	95	7Feb34	–	–	56	17	68	17	350	0	47	26	–	0.0	–	–	640	7.5	Van Denburgh & Rush, 1974
Chimney Springs NW¼SE¼S16,T7N,R55E	140	95	7Feb34	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Chimney Hot Springs SE¼NE¼S16,T7N,R55E	160	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Chimney Springs S16,T7N,R55E	130-160	100	7Feb34	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 127
Chimney Hot Spring CS16,T7N,R55E	151	100	2Nov65	–	–	72	22	70		433	0	51	11	–	–	–	–	763	7.4	Rush & Everett, 1966
Chimney Springs SW¼SE¼S16,T7N,R55E	140	–	7Aug67	51	0.04	56	17	68	17	350	0	47	26	2.0	<0.1	0.4	405	640	7.8	unpublished data, USGS
Remarks: CO_2 = 8.9; Ba = 0.002; Mn = 0.016; Mo = 0.003; Sr = 0.67; Zn = 0.025; Al = 0.015; Li = 0.24; Bi <0.008; Cd <0.04; Co <0.004; Pb <0.004; Ni <0.002; V <0.003; Sn <0.008.																				
Shell Oil Co. Coyote Unit No. 1 well CN½SW¼S28,T7N,R55E	140	15-480	1955	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	NBMG files
Remarks: Oil well; depth – 1711 ft.																				
Shell Oil Co. Coyote Unit No. 1 well NE¼SW¼S28,T7N,R55E	140	–	6Oct55	–	–	12	5	189		410	0	99	16	–	–	–	–	–	8.3	Van Denburgh & Rush, 1974
Storm Spring NE¼NE¼S11,T6N,R54E	98	5	10Jul71	–	–	–	–	–	–	–	–	–	17	–	–	–	–	1200	–	Van Denburgh & Rush, 1974
Storm Spring NE¼S11,T6N,R54E	95	–	2Nov65	–	–	63	25	60		–	–	60	12	–	–	–	–	–	–	CWRR, 1973

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
NYE COUNTY (continued)																				
Storm Spring NE¼S11,T6N,R54E	84	–	2Nov65	–	–	106	30	138		736	0	57	19	–	–	–	–	1170	7.6	Rush & Everett, 1966
	Remarks: Mixed water from a three spring complex sampled for analysis.																			
Stormy Spring NW¼NE¼S12,T6N,R54E	84	4	16Oct67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1100	–	Fiero, 1968
Coyote Hole SW¼SE¼S11,T6N,R54E	113	2	7Aug67	–	–	–	–	–	–	–	–	–	9.8	–	–	–	–	1070	–	Van Denburgh & Rush, 1974
Coyotes Holes W½S13,T6N,R54E	111	2	16Oct67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Coyote Hole Spring SW¼S11,T6N,R54E	113	–	7Aug67	37	0.1	91	31	123	25	698	0	59	9.8	2.4	<0.1	0.8	700	1070	8.0	unpublished data, USGS
	Remarks: CO_2 = 11; PO_4 <0.01; As = 0.000; Ba = 0.002; Bi <0.012; Cd <0.06; Cu = 0.000; Pb <0.006; Mn = 0.03; Sr = 0.85; Zn = 0.015; Al = 0.015; Li = 0.33.																			
Abel Spring SE¼NW¼S23,T6N,R54E	115	25	12Sep68	27	0.02	100	26	120	22	673	0	51	15	2.7	0.2	–	696	1100	7.5	Van Denburgh & Rush, 1974
	Remarks: Mn = 0.00. PO_4 = 0.00.																			
Abel Spring NE¼SW¼S24,T6N,R54E	115	–	12Sep68	27	0.002	100	26	120	22	673	0	51	15	2.7	0.2	0.62	732	1100	7.6	unpublished data, USGS
	Remarks: CO_2 = 27; Cd <0.05; Cu = 0.02; Fe = 0.02; Pb 0.01; Mn = 0.012; Mo = 0.006; Sr = 1; V <0.009; Zn = 0.08; Al = 0.03; Li = 0.3.																			
Abel Spring NE¼SW¼S24,T6N,R54E	113	26	16Oct67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1080	–	Fiero, 1968
[208] Morman (Moorman) Spring CN½SE¼S32,T9N,R61E	100	100	15Sep45	–	–	63	22	23		290	0	46	9	–	–	0.2	–	–	–	Miller, Hardman & Mason, 1953; Waring, 1965, No. 134
Morman (Moorman) Spring CN½SE¼S32,T9N,R61E	–	1900	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Mifflin, 1966
	Remarks: Water used for irrigation.																			
Morman (Moorman) Spring CN½SE¼S32,T9N,R61E	98-100	225	15Nov66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: Issues from alluvium; (epm) Na + K = 1.27; Ca + Mg = 4.30; Cl + SO_4 = 1.28; tritium ≤ 7 T. U.																			
[209] Emigrant (Riordon Ranch) Spring S19,T9N,R62E	70	200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 135
	Remarks: Several springs; water used for irrigation.																			
[210] Test Hole UCE-18 SW¼NW¼S1,T8N,R51E	92	–	7Jun67	54	0.3	4.2	1.0	325	5.7	656	8	47	67	17	0.7	1.1	852	1300	8.4	unpublished data, USGS
	Remarks: CO_2 = 4.3; PO_4 = 0.13; Mn = 0.001; Mo = 0.035; Sr = 0.05; V = 0.02; Li = 0.12; Se = 0.02; Ba = 0.015; Cu = 0.001; Al = 0.05; Ti = 0.002; B <0.013; Cd <0.07; Co <0.007; Pb <0.005; Ni <0.007; Sn <0.013 (sample taken 1 Apr 68 gave similar results).																			
Test Hole UCE-18	–	–	21Jul73	66	0.22	2.3	0.4	770	6.8	1790	0	110	60	30	–	–	1910	2780	8.7	unpublished data, USGS
SW¼NW¼S1,T8N,R51E	–	–	–	54	0.05	6.8	0.5	710	6.2	1250	263	59	35	23	–	–	1810	2590	8.2	
	Remarks: (Six samples were taken over a 12-hour period; values on first line above are maximum concentrations, values on second line are minimums) CO_2 = 5.7–18; Mn = 0–0.01; Sr = 0.05–0.09; Al = 0.13–0.02; Li = 0.26–0.28; U = 0.043–0.048.																			
[211] Hot Creek Canyon																				
Pat Spring SE¼NW¼SE¼ S21,T8N,R49E	72	50	19Mar67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Upper Warm Spring SE¼SW¼SW¼ S21,T8N,R49E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Upper Warm Spring SW¼SE¼SW¼ S21,T8N,R49E	95	–	31Jul67	46	0.01	4.7	0.1	38	0.8	80	0	19	7.0	0.4	1.3	100	148	192	7.6	USGS
	Remarks: CO_2 = 3.2; PO_4 <0.01; Mo = 0.006; Sr = 0.08; V = 0.005; Cu = 0.02; Al = 0.03; Ba = 0.007; Be, Bi, Co, Pb, Mn, Ni, Ag, Sn, Ti each <0.001 (sample taken 18 Sep 77 gave similar results).																			
spring SE¼S24,T8N,R49E	94	–	30Aug65	–	–	18	26	52		–	–	64	22	–	–	–	–	–	–	CWRR, 1973
	Remarks: Possibly Old Dugan Place Hot Spring.																			
Old Dugan Place Hot Spring NW¼NW¼NE¼ S25,T8N,R49E	97	–	11May77	32	0.007	70	22	49	6.8	358	0	55	19	1.0	<0.1	0.33	444	699	7.7	unpublished data, USGS
	Remarks: CO_2 = 11; PO_4 <0.01; Ba = 0.11; Sr = 0.56; Li = 0.23; Be, Mn, Mo, Ag, V each <0.001; Ni, Sn, Ti each <0.004; Al <0.1; Se <0.01 (sample taken 31 Jul 77 gave similar results).																			
Old Dugan Place Hot Spring NW¼NW¼NE¼ S25,T8N,R49E	102	–	11Aug68	–	–	68	21	–	–	318	0	–	–	–	–	–	398	637	7.8	unpublished data, USGS
	Remarks: CO_2 = 8.1 (sample taken 18 Sep 68 gave similar results).																			
Old Dugan Place Hot Spring NE¼NW¼S25,T8N,R49E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
springs NW¼NE¼S25,T8N,R49E	92	360	29Aug65	–	–	18	26	52		204	0	64	22	–	–	–	–	462	8.0	Rush & Everett, 1966
Hot Creek Ranch Spring NE¼SE¼SE¼ S29,T8N,R50E	145	763(1966)	21Sep73	135	0.04	51	15.1	197	13.4	545	0	86.4	42	8	<0.1	–	823	1101	8.0	Sanders & Miles, 1974
	Remarks: Li = 1.8, NH_4 <0.1, PO_4 <0.1, As = 0.013µg/l, Ba = 0.1, Be <0.005, Cu <0.004, Pb <0.02, Mn = 0.09, Sr = 0.26, Zn = 0.02, Ni <0.02, Cd <0.002, Cr <0.04, Ag <.004, Bi <.10, Cs = 0.62, Hg <0.2, Li = 1.82, Nb <10, Rb = 0.22, Sb <0.2, Se <1.0, Sn <.2, Ta <5.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
NYE COUNTY (continued)																				
Hot Creek Ranch Spring SE¼S29,T8N,R50E	94-180	675	30Aug	–	–	13	26	124		340	0	81	33	–	–	–	–	718	8.2	Rush & Everett, 1966
Remarks: Three springs; sample mixed from all three; lower spring (180°F) provides about half the flow.																				
Hot Creek Ranch Spring NE¼SE¼S29,T8N,R50E	160	763	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
spring SW¼NW¼S29,T8N,R50E	70	75	19Mar67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Remarks: On Mine Fault in canyon.																				
Upper Hot Creek Ranch Spring NW¼NE¼SE¼S29,T8N,R50E	94	–	30Aug65	–	–	13	26	124		–	–	81	33	–	–	–	–	–	–	CWRR, 1973
Upper Hot Creek Ranch Spring NE¼SW¼S29,T8N,R50E	169	280	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Remarks: Discharge along fault zone; contributes to irrigation and stock uses.																				
Upper Hot Creek Ranch Hot Spring NE¼SE¼S29,T8N,R50E	153	–	31Jul67	0.161	0.04	33	9.5	193	1.4	501	0	64	37	8.3	0.2	0.52	721	1010	8.1	USGS, 1973
Remarks: CO_2 = 6.4; PO_4 <0.01; Ba = 0.095; Be = 0.002; Cd <0.035; Cu <0.01; Mn = 0.12; Sr = 0.71; V <0.0011; Sn <0.011; Al = 0.05; Li = 0.86; Se = 0.01; Bi, Co, Pb, Mo, Ni, Ga, Ti each <0.004 (samples taken 31 Jul 68 and 11 May 67 gave similar results except temperature was recorded as 91°F on 11 May 67).																				
Upper Hot Creek Ranch Hot Spring NE¼SE¼S29,T8N,R50E	153	–	18Sep68	–	–	32	8.5	–	–	505	0	–	–	–	–	–	620	980	8.1	unpublished data, USGS
[212] Stanley A. Tanner well NW¼SW¼S28,T7N,R40E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush & Schroer, 1970
Remarks: Depth – 300 ft; warm water; first water at 105 ft.																				
[213] Indian Springs S34(?),T7N,R42E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 123
Remarks: 3 springs; water used locally.																				
[214] Hot Creek Valley Spring S30,T7N,R51E	142	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hose & Taylor, 1974; Waring, 1965, No. 124
Remarks: Travertine present.																				
[215] Butterfield Springs NE¼S28,T7N,R62E	65-75	2000	1944	46	–	40	23	2		178	–	27	18	–	–	–	283	–	–	Maxey & Eakin, 1949; Waring, 1965, No. 136; Adams, 1944
Remarks: Fe + Al = 0.3; Flag (Sunnyside) Springs in NW¼S32,T7N,R62E may also be thermal. Water is used for irrigation. Analysis from Adams, 1944.																				
[216] Warm Spring NE¼NW¼S36,T6N,R47E	79	5	30Nov66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
[217] Moon River Spring NW¼S25,T6N,R60E	92	900	1948	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Eakin, 1948; Waring, 1965, No. 134A
Moon River Spring NW¼S25,T6N,R60E	92	900	14Nov66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Remarks: Issues from alluvium; (epm) Na + K = 1.23; Ca + Mg = 4.26; Cl + SO_4 = 1.10; tritium ≤8 T. U.																				
[218] Hot Creek Ranch Springs S18,T6N,R61E	88	–	23Jun62	28	–	60	22	29	5.3	288	–	45	8.9	1.0	0.4	0	342	540	8.0	Eakin, 1966
Remarks: Several springs; water used for irrigation.																				
Hot Creek Ranch Springs S18,T6N,R61E	80	–	16Apr63	28	0.01	60	24	24	5.1	300	–	43	9.0	1.0	0.6	0.1	343	548	7.6	Eakin, 1966
Hot Creek Springs SE¼NE¼NE¼ S18,T6N,R61E	92	6885	6Apr35	32	–	58	22	32		294	–	45	12	–	0.3	0.04	–	–	–	Maxey & Eakin, 1949
Remarks: Issues from alluvium.																				
Hot Creek Ranch Springs S18,T6N,R61E	85-90	5000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 137
Remarks: Several springs; water used for irrigation.																				
[219] Salisbury Spring NW¼SE¼S8,T5N,R46E	76	12	28Dec66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Remarks: Probably in S28.																				
Salisbury(?) Spring SW¼SE¼S28,T5N,R46E	86	–	30Jul67	76	0.014	1.6	0.1	65	2.5	132	0	26	10	1.2	–	0.16	229	296	8.1	unpublished data, USGS
Remarks: Ba = 0.5.																				
warm spring S½S28,T5N,R46E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Saulsbury Basin 7½-minute quad
spring S½S28,T5N,R46E	–	–	25Aug44	–	–	9	tr	74	–	146	7	25	18	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
[220] Warm (Nanny Goat) Springs																				
Warm Spring NW¼SW¼S20,T4N,R50E	145	–	21Sep73	55	<.02	91.5	22.5	199	23.3	737	0	96.1	36	3.6	<0.1	–	890	1311	6.9	Sanders & Miles, 1974
Remarks: PO_4 <0.1, NH_4 <0.1, As = 13µg/l, Ba <0.10, Ta < 5, Be <.005, Cd <.002, Cr <.04, Cu <.004, Hg = .55µg/l, Li = 1.4, Mn <0.01, Ni <0.02, Pb <0.02, Se <1.0µg/l, Sn <0.2, Sr = 1.83, Zn <0.01, Ag <0.004, Bi <0.10, Cs = 0.64, Nb <10, Rb = .20, Sb <0.2.																				
spring SW¼S20,T4N,R50E	142	–	1973	60	–	43	24	175	24	714	–	120	32	–	–	–	–	1250	8.1	Mariner & others, 1974

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
NYE COUNTY (continued)																				
Nanny Goat Springs SW¼SW¼SW¼ S20,T4N,R50E	106	225	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Warm Spring SW¼S20,T4N,R50E	141	675	17Oct65	–	–	96	28	168	–	693	–	90	41	–	–	–	–	–	–	Rush & Everett, 1966
Warm Spring NW¼SW¼S20,T4N,R50E	140	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush & Everett, 1966
springs T4N,R50E	boiling	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 125
Warm Spring (Nanny Goat Spring) SW¼S20,T4N,R50E	–	small	–	–	–	55	36	206		712	0	98	32	–	–	–	–	1270	7.9	Eakin & others, 1951
	Remarks: 2 springs; water used in swimming pool.																			
spring SW¼SW¼SW¼ S20,T4N,R50E	140	–	11May67	50	0.012	73	17	194	23	708	0	96	32	3.0	0.10	0.44	876	1300	7.3	unpublished data, USGS
	Remarks: CO_2 = 57; PO_4 <0.02; Ba = 0.12; Sr = 2.2; Li = 0.64; Be <0.001; Co, Pb, Se, Ti each <0.007.																			
[221] Tonopah mining district																				
Mizpah Mine NE¼NW¼SW¼ S35,T3N,R42E	106	–	1904	227	0.7	68.8	6.3	149	3.4	157	10.6	327	35	–	tr	–	–	–	–	Bastin & Laney, 1918
	Remarks: In 2316-foot drill hole; Al = 0.7; Zn = trace.																			
Belmont Mine CW½S36,T3N,R42E	99	–	1915	68	3	22	4.4	80	5	51	36	106	35	–	–	–	367	–	–	Bastin & Laney, 1918
	Remarks: On 1500-ft level; Mn = 12.																			
[222] well SW¼S16,T3N,R44E	72	–	18May47	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1962c
	Remarks: Depth – 540 ft.																			
[223] spring SW¼NE¼S14,T2N,R47E	85	–	28Jul67	25	–	58	18	276	27	702	0	222	36	6.2	0.7	0.61	945	1560	7.8	unpublished data, USGS
	Remarks: Sr = 1.4, Li = 0.95.																			
[224] Pedro Spring SE¼NW¼S28,T2N,R50E	77	10	2Aug67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Alvin McLane, unpublished map
Pedro Spring NW¼SW¼NE¼ S28,T2N,R50E	77	10	8Feb67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Fiero, 1968
Reveille Mill Spring NW¼SW¼NE¼ S28,T2N,R50E	84	23	17Jul69	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Alvin McLane, unpublished map
[225] deep well NE¼SE¼NW¼ S28,T1S,R53E	70	–	29Mar72	–	–	14	1	65		138	0	46	14	–	–	–	–	385	8.1	Van Denburgh & Rush, 1974
	Remarks: Depth – 465 ft.																			
[226] Cedar Spring SE¼S21,T2S,R51E	77	2.5	1Aug67	38	0.03	62	5.9	47	2.5	240	0	48	23	0.8	0.1	0.18	346	533	7.7	Van Denburgh & Rush, 1974
	Remarks: Mn = 0.00, PO_4 = 0.00.																			
[227] Sarcobatus Flat–Beatty area																				
well NW¼SW¼S28,T7S,R44E	72	–	13Mar62	–	0	48	4.9	123		266	–	106	54	2.7	3.0	–	560	800	7.9	Malmberg & Eakin, 1962
	Remarks: Depth – 203 ft.																			
well T8S,R49E	90	–	26Aug65	–	–	0.6	–	–	–	107	–	30	15	2.7	1.3	–	231	–	8.1	CWRR, 1973
well NE¼S20,T9S,R46E	108	–	5Jun64	–	0.13	0.40	–	–	–	130	–	43	57	4.6	1.0	–	336	–	7.7	CWRR, 1973
well NE¼S20,T9S,R46E	72	–	21Mar62	–	0	18	2.0	149		212	–	67	87	3.2	11	–	568	810	8.2	Malmberg & Eakin, 1962
well NE¼S35,T9S,R46E	72	–	21Mar62	–	0	11	5.8	87		155	–	24	55	4.5	12	–	427	610	8.2	Malmberg & Eakin, 1962
spring NW¼S14,T10S,R47E	72	50	14Mar62	–	0	6.0	1.0	117		212	–	24	54	3.8	tr	–	384	550	8.5	Malmberg & Eakin, 1962
spring NE¼S33,T10S,R47E	75	15	14Mar62	–	0	24	0.1	127		275	–	14	65	1.9	4.0	–	532	760	8.0	Malmberg & Eakin, 1962
spring NW¼NE¼S10,T11S,R47E	72	50-75	14Mar62	–	0	19	1.0	90		188	–	24	48	2.9	tr	–	413	590	8.3	Malmberg & Eakin, 1962
Hick's Hot Spring SW¼SE¼S16,T11S,R47E	–	45	before 1907	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Ball, 1907

NYE COUNTY (continued)

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
Hick's Hot Spring SW¼SE¼S16,T11S,R47E	109	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 138
Hick's Hot Spring SW¼SE¼S16,T11S,R47E	100	5	22Feb56	65	0	18	0	167	–	256	–	121	45	5.0	0.3	–	–	821	7.9	Malmberg & Eakin, 1962
Hick's Hot Spring SW¼SE¼S16,T11S,R47E	–	–	14Mar62	–	0	18	0.5	144		266	–	72	48	4.2	0	–	–	750	7.9	Malmberg & Eakin, 1962
Amargosa Hot Springs SW¼SE¼S16,T11S,R47E	100	20	22Feb56	65	0	18	0	167	7.4	256	0	121	45	5.0	0.3	–	535	821	7.9	Scott & Barker, 1962
Remarks: Al = 0; Mn = 0; PO_4 = 0; Ra = 0.6µµc/l; U = 10µg/l.																				
Amargosa Hot Springs SW¼SE¼S16,T11S,R47E	90	–	8Sep27	76	–	50	16	195	–	422	0	133	93	–	–	–	781	–	–	Hardman & Miller, 1934
Amargosa Hot Springs SW¼SE¼S16,T11S,R47E	–	–	–	–	–	–	–	–	–	352	–	tr	64	–	–	–	–	740	–	Miller, Hardman & Mason, 1953
Burrell Hot Spring S21,T11S,R47E	102	–	5Feb74	62	0.06	28	0.4	151	6.0	246	0	121	44	6.0	0.4	–	539	814	7.9	Sanders & Miles, 1974
Remarks: Li = 0.25, NH_4 = 0.2, PO_4 = 0.1, As = 0.001µg/l, Ba = 0.06, Be <0.005, Cu <0.02, Pb <0.02, Mn = 0.02, Sr = 0.05, Zn = 0.22, Ni = 0.02, Cd <0.005, Cr <0.02, Ag <0.02, Bi <0.1, Cs = .60, Hg <0.5µg/l, Rb = .047, Sb <0.1, Se <0.1µg/l, Sn <0.05.																				
spring SW¼NE¼S21,T11S,R47E	97	100	14Mar62	–	0	27	3.9	181		393	–	48	75	4.5	0	–	784	1100	7.9	Malmberg & Eakin, 1962
spring NE¼NW¼S33,T11S,R47E	88	25	14Mar62	–	–	4.8	0.5	96		176	–	34	31	4.1	0	–	330	470	8.2	Malmberg & Eakin, 1962
Beatty Municipal spring NE¼SW¼S5,T12S,R47E	75	200-300	22Feb56	68	–	14	1.9	106	–	194	0	69	27	4	0.8	–	368	552	8.2	Malmberg & Eakin, 1962
Beatty Municipal spring NE¼SW¼S5,T12S,R47E	–	–	–	68	0.12	14	1.9	106	5.8	194	0	69	27	4.0	0.8	–	368	552	8.2	Scott & Barker, 1962
Remarks: Al = 0.4; Mn = 0; PO_4; Ra <0.1µµc/l; U = 4.5µg/l.																				
spring NE¼SE¼SW¼ S5,T12S,R47E	75	–	31Oct64	–	0.01	15	1.8	–	–	196	–	70	26	3.2	1.6	–	380	–	7.5	CWRR, 1973
spring S7,T12S,R47E	79	–	1Apr67	–	–	13	1	–	–	–	–	48	49	0.85	3.7	–	–	–	–	CWRR, 1973
[228] Yucca Flat																				
well 79-69a (test well C) 36°59'40"N, 116°01'30"	99	–	1Sep61	30	1.0	74	27	142	15	577	0	71	34	0.9	1.0	–	624	1080	7.0	Schoff & Moore, 1964
Remarks: Depth – 1701 ft; aquifer is Paleozoic carbonate rock; Al = 0.3; Mn = 0; PO_4 = 0.07.																				
well 84-69 (test well E) 37°03'20"N, 116°00'30"	108	–	31Jul60	61	–	1.6	0	81	2.6	187	0	16	6.0	0.6	2.5	–	287	358	9.0	Schoff & Moore, 1964
Remarks: Depth – 1875 ft; aquifer is Tertiary volcanic rock; PO_4 = 0.72.																				
[229] Amargosa Desert																				
well T13S,R50E	79	–	19Feb59	–	0.06	14	1.5	–	–	118	–	24	8	1.8	0.7	–	–	–	7.4	CWRR, 1973
well SE¼S30,T13S,R51E	91	105	18Sep57	67	0.26	85	14.0	157	16	102	0	484	20	0.9	7.4	–	893	1210	7.8	Walker & Eakin, 1963
Remarks: Depth – 1329 ft; Al = 0.1; PO_4 = 0; Sn = 0; perforated 1077–1097 ft & 1244–1300 ft.																				
well NE¼S35,T13S,R47E	84	100	12Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Remarks: Depth – 575 ft; perforated 453–493 ft.																				
well NE¼S6,T14S,R50E	79	200	25Apr58	26	0.52	9.6	1.9	46	5.2	121	0	24	7.0	1.8	0	–	169	266	8.2	Walker & Eakin, 1963
Remarks: Depth – 887 ft; Al = 0.2; PO_4 = 0.																				
well J-12 S6,T14S,R50E	80	–	Apr69	56	–	14	2.5	40	5.8	117	0	22	6.4	2.1	9.7	0.13	205	–	–	Dudley & Larson, 1976
Remarks: Li = 0.04.																				
well 73-61 (well J-11) 36°46'45"N, 116°16'50"	92	–	18Sep57	67	0.26	85	14	157	16	102	0	484	20	0.9	7.4	–	893	1210	7.8	Schoff & Moore, 1964
Remarks: Depth – 1327 ft; aquifer is Tertiary volcanic rock; Al = 0.1, Mn = 0, Sn = 0, PO_4 = 0.																				
test well F SE¼SE¼S3,T14S,R52E	149	–	21May75	37	–	46	17	60	8.3	264	–	89	10	3.4	–	–	390	666	–	USGS
Remarks: Depth – 3300 ft. Mn = 0.05; Sr = 0.52; Al <0.01; Li = 0.16.																				
well NE¼NE¼S14,T15S,R49E	82	–	24Apr58	52	0.09	25	2.4	41	5.2	145	0	33	8.0	1.4	3.5	–	233	336	8.0	Walker & Eakin, 1963
Remarks: Depth – 77.7 ft; Al = 0.1; PO_4 = 0.																				
well 69-57 NE¼NE¼S14,T15S,R49E	82	–	24Apr58	52	0.09	25	2.4	41	5.2	145	0	33	8.0	1.4	35	–	233	336	8.0	Schoff & Moore, 1964
Remarks: Depth – 570 ft; Al = 0.1; Mn = 0; PO_4 = 0.																				
well SW¼S18,T15S,R50E	75	–	26Jun59	45	0.67	21	2.9	103	6.0	162	0	122	18	1.4	6.9	–	408	863	7.9	Walker & Eakin, 1963
Remarks: Depth – 360 ft; Al = 0; PO_4 = 0.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
NYE COUNTY (continued)																				
well SE¼S2,T16S,R48E	73	–	2Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Remarks: Depth – 409 ft(?); perforated 212–422 ft(?).																				
well NE¼S3,T16S,R48E	72	650-900	2Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Remarks: Depth – 234 ft; perforated 120–250 ft(?).																				
well SW¼S11,T16S,R48E	72	–	4Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Remarks: Depth – 288 ft; perforated 130–302 ft.																				
well NE¼S17,T16S,R48E	75	1200-1500	18Aug62	75	0	60	7.8	157	12	302	0	179	69	1.2	1.2	0.57	800	1074	7.4	Walker & Eakin, 1963
Remarks: Depth – 280 ft; perforated 120–280 ft; Al = 0, Li = 0.2, PO_4 = 0, Sn = 0.6.																				
well NW¼NW¼NE¼ S17,T16S,R48E	75	–	18Aug62	75	–	60	7.8	157	12	302	0	179	69	1.2	1.2	–	800	1074	7.4	Schoff & Moore, 1964
Remarks: Depth – 280 ft; Li = 0.2, PO_4 = 0.																				
well NW¼S18,T16S,R48E	72	–	3Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Remarks: Depth – 361 ft; perforated 140–218 ft & 258–380 ft.																				
well SE¼S20,T16S,R48E	72	1500	4Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Remarks: Depth – 366 ft; perforated 119–225 ft.																				
well SE¼S23,T16S,R48E	73	–	7Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Remarks: Depth – 474 ft(?); perforated 270–503 ft(?).																				
well SW¼S23,T16S,R48E	73	–	7Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Remarks: Depth – 510 ft; perforated 170–485 ft.																				
well NW¼S23,T16S,R48E	75	–	19Aug62	74	1.1	9.4	1.0	66	6.8	156	0	27	8.8	2.0	3.1	0.15	294	346	7.3	Walker & Eakin, 1963
Remarks: Depth – 330 ft; perforated 100–300 ft; Al = 0.57, PO_4 = 0, Sn = 1.8.																				
well SW¼S24,T16S,R48E	73	–	9Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Remarks: Perforated 110–306 ft.																				
well NE¼S24,T16S,R48E	81	1600	24May56	–	–	–	–	–	–	–	–	–	–	–	–	–	–	345	–	Walker & Eakin, 1963
Remarks: Depth – 480 ft.																				
well SE¼S24,T16S,R48E	81	1100	24May56	–	–	–	–	–	–	–	–	–	–	–	–	–	–	325	–	Walker & Eakin, 1963
Remarks: Depth – 421 ft.																				
well SW¼S27,T16S,R48E	73	–	4Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Remarks: Depth – 236 ft; perforated 106–236 ft.																				
well NE¼S36,T16S,R48E	75	1000	21Feb56	82	0.14	70	3.9	62	9.0	142	0	107	61	–	–	–	489	700	7.9	Walker & Eakin, 1963
Remarks: Depth – 165 ft; Al = 0.2; Mn = 0; PO_4 = 0; Ra <0.1$\mu\mu$c/l; U = 4.7μg/l.																				
well SE¼S36,T16S,R48E	70	940	25Jun59	–	–	–	–	–	–	–	–	–	–	–	–	–	–	675	–	Walker & Eakin, 1963
Remarks: Depth – 407 ft.																				
well SW¼S9,T16S,R49E	75	274	15Jul58	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
well NE¼NE¼SW¼ S9,T16S,R49E	75	274	19Aug62	56	0	28	3.4	46	7.6	142	0	53	10	0.7	3.3	0.16	310	381	7.2	Walker & Eakin, 1963
Remarks: Depth – 300 ft; Al = 0.3, Li = 0.06, PO_4 = 0, Sn = 0.9.																				
well NW¼S14,T16S,R49E	73	–	29Jun62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Remarks: Depth – 390 ft; perforated 150–390 ft.																				
well NE¼S15,T16S,R49E	75	–	29Jun62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Remarks: Depth – 420 ft.																				
well NE¼S18,T16S,R49E	73	–	28Jun62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Remarks: Depth – 420 ft; perforated 140–420 ft.																				
Parent Springs NW¼S23,T17S,R50E	93	193	23Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	650	–	Walker & Eakin, 1963
well NW¼NW¼S23,T17S,R50E	94	–	Feb71	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Dudley & Larson, 1976
Remarks: Depth – 140 ft.																				
well SM7 NW¼SE¼SE¼ S23,T17S,R50E	91	–	3Oct70	22	0.04	45	19	72	8.1	281	0	80	20	1.7	0.1	<0.01	528	630	7.8	Naff, 1973
Remarks: Al <0.1, Mn <0.01, Sr = 0.79, Li = 0.08.																				
spring SW¼NE¼NW¼ S26,T17S,R50E	81	–	13Feb72	29	–	45	20	69	6.8	285	0	81	21	1.32	–	–	528	619	7.9	Naff, 1973
Scruggs Spring SE¼SW¼NE¼ S35,T17S,R50E	86	–	12Feb72	28	–	46	19	71	7.8	283	0	80	22	1.15	–	–	529	613	7.6	Naff, 1973

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
NYE COUNTY (continued)																				
spring NE¼S35,T17S,R50E	91	140	24Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	640	–	Walker & Eakin, 1963
spring NW¼NE¼S35,T17S,R50E	82	17	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	620	–	Hughes, 1966
Button Springs NE¼SE¼S35,T17S,R50E	93	6	24Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	620	–	Walker & Eakin, 1963
Button Springs NE¼SE¼S35,T17S,R50E	93	7.2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hughes, 1966
Devil's Hole SW¼SE¼S36,T17S,R50E	92	–	9Dec66	22	0	50	24	65	7.6	310	0	76	20	1.6	0.2	0.32	555	677	–	Naff, 1973
Remarks: Al = 0.01, Mn <0.01, Sr = 0.89, Li = 0.09, PO_4 = 0.																				
Devil's Hole SW¼SE¼S36,T17S,R50E	81	–	21Oct64	21	0	52	19	67	8.1	306	0	78	22	1.4	0.3	–	554	686	7.8	Naff, 1973
Remarks: Al = 0.01, Mn = 0, PO_4 = 0.																				
Devil's Hole SE¼S36,T17S,R50E	–	450	–	–	–	62	18	35	–	315	0	52	30	–	–	–	–	731	–	Miller, Hardman & Mason, 1953
Devil's Hole SE¼S36,T17S,R50E	90	450	22Jan53	23	0.04	51	21	66	7.2	311	0	79	22	1.6	–	0.38	425	686	7.4	Eakin, 1963a
Remarks: 4 springs.																				
Devil's Hole SW¼SE¼S36,T17S,R50E	91	0	23Jan53	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Remarks: Standing water in solution sink in upper Bonanza King Formation (Cambrian limestone); (epm) Na + K = 2.79; Ca + Mg = 4.27; Cl + SO_4 = 2.28.																				
Ash Meadow Springs SE¼S36,T17S,R50E	76-94	450	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 139
Remarks: 4 springs.																				
well SW¼SE¼S36,T17S,R50E	92	–	28Jun72	24	–	47	20	69	7.1	304	0	82	26	–	0.20	<0.04	555	677	7.4	Naff, 1973
DH well SE¼SE¼S36,T17S,R50E	92	–	10Mar67	24	0.23	46	20	69	8.6	301	0	77	20	1.8	0	0.29	545	669	7.9	Naff, 1973
Remarks: Al = 0, Mn = 0.02, Sr = 0.93, Li = 0.08, PO_4 = 0.																				
well NE¼S1,T17S,R51E	73	191	10Jan61	18	0	39	20	69	10	350	0	53	6.0	0.6	0	–	372	607	7.2	Walker & Eakin, 1963
Remarks: Depth – 135 ft; perforated 48–135 ft; Al = 0.2.																				
well SE¼SE¼S31,T17S,R51E	78	–	Feb72	22	–	30	12	120	6.2	313	0	90	19	1.5	<0.1	–	435	–	–	Dudley & Larson, 1976
Remarks: Li = 0.12.																				
spring NE¼NW¼S35,T17S,R51E	82	17	23Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	620	–	Walker & Eakin, 1963
well SW¼S8,T17S,R52E	82	–	27Apr58	18	34	34	–	61	7.2	274	0	63	21	1.1	0	–	342	595	8.0	Walker & Eakin, 1963
Remarks: Depth – 400 ft; perforated 39–139 ft; Al = 0.2.																				
well SW¼S8,T17S,R52E	82	–	27Apr58	18	0	34	22	61	7.2	274	0	63	21	1.1	0	–	483	595	8.0	Naff, 1973
Remarks: Al = 0.2, PO_4 = 0.																				
Embry well NE¼SE¼SW¼ S2,T18S,R49E	70	–	28Dec71	82	–	25	6.0	75	8.8	219	0	49	16	1.02	4.03	–	404	456	7.9	Naff, 1973
spring NW¼SE¼S1,T18S,R50E	79	9.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hughes, 1966
spring NW¼S1,T18S,R50E	84	3.8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hughes, 1966
Crystal Spring NE¼SE¼NW¼ S3,T18S,R50E	86	–	30Dec71	26	–	48	20	80	8.8	311	0	92	32	1.35	–	–	593	657	7.4	Naff, 1973
Crystal Pool (Crystal Spring) NW¼S3,T18S,R50E	91	2824	29Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	650	–	Eakin, 1963a
Crystal Pool SE¼NE¼S3,T18S,R50E	90-91	2834	24Feb29	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Remarks: In alluvium; (epm) Na + K = 3.53; Ca + Mg = 4.09; Cl + SO_4 = 2.51.																				
Crystal Pool NW¼SE¼NE¼ S3,T18S,R50E	91	–	Nov66	25	–	40	20	70	8.6	278	0	81	22	1.7	<0.1	0.31	432	–	–	Dudley & Larson, 1976
Remarks: Li = 0.09.																				
well NE¼NE¼S3,T18S,R50E	89	–	Mar66	–	–	–	–	70	–	284	–	77	21	1.9	–	–	416	–	–	Dudley & Larson, 1976
Remarks: Depth – 516 ft.																				
well NE¼NE¼S5,T18S,R50E	74	–	Mar67	22	–	–	–	237	–	106	130	170	42	1.9	–	–	792	–	–	Dudley & Larson, 1976
Remarks: Depth – 670 ft.																				
spring SE¼NW¼S7,T18S,R50E	90	–	26Oct64	–	0.17	15	19	–	–	306	–	78	21	1.2	0.2	–	412	–	8.2	CWRR, 1973

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
NYE COUNTY (continued)																				
Davis Ranch Spring NE¼NW¼S11,T18S,R50E	70	–	29Dec71	30	–	50	22	101	11	340	0	114	34	1.7	–	–	672	732	7.7	Naff, 1973
Davis Ranch (3) Spring SE¼S11,T18S,R50E	72	30	25Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	750	–	Walker & Eakin, 1963
Davis Ranch Spring NW¼SW¼S12 & NE¼SE¼ S11,T18S,R50E	77	397	25Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	750	–	Eakin, 1963a
Remarks: Several springs.																				
Davis Ranch Spring NW¼SW¼S12 & NE¼SE¼ S11,T18S,R50E	75-81	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	760	–	Hughes, 1966
Remarks: Several springs.																				
Davis Ranch well SE¼S11,T18S,R50E	73	174	2Feb53	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
Davis Ranch well SE¼S11,T18S,R50E	–	5	25Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
well SE¼S11,T18S,R50E	87	–	Feb67	–	–	–	–	55	–	304	0	64	21	1.9	–	–	412	–	–	Dudley & Larson, 1976
well NE¼NE¼S6,T18S,R51E	75	–	13Feb72	18	–	36	19	68	7.8	272	0	69	20	0.98	–	–	492	572	7.7	Naff, 1973
well NW¼NW¼NW¼ S7,T18S,R51E	87	–	Mar71	23	–	44	19	69	8.2	214	0	79	20	1.5	0.3	–	335	–	–	Dudley & Larson, 1976
Remarks: Depth – 500 ft; Li = 0.08.																				
Indian Seep NW¼NW¼SE¼ S7,T18S,R51E	89	–	26Oct64	23	0.17	52	19	66	7.9	309	0	78	21	1.2	0.2	–	555	671	7.3	Naff, 1973
Remarks: Al = 0.09, Mn = 0, PO_4 = 0.																				
Indian Rock Spring NE¼NW¼SE¼ S7,T18S,R51E	92	–	Nov70	22	–	46	21	68	7.4	304	0	78	21	1.5	0.2	0.35	412	–	–	Dudley & Larson, 1976
Remarks: Li = 0.09.																				
Indian Rock Spring (1) SW¼S7,T18S,R51E	91	22	25Jul62	62	–	–	–	–	–	–	–	–	–	–	–	–	–	640	–	Walker & Eakin, 1963
Indian Rock Spring (2) SE¼S7,T18S,R51E	91	379	26Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	645	–	Walker & Eakin, 1963
Point-of-Rock Spring NW¼SE¼S7,T18S,R51E	90	1162	28Feb49	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Remarks: In alluvium; (epm) Na + K = 3.20; Ca + Mg = 4.17; Cl + SO_4 = 2.26.																				
Point-of-Rock Spring NW¼SE¼S7,T18S,R51E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	675	–	Hughes, 1966
King Spring NW¼SE¼S7,T18S,R51E	91	–	26Oct64	21	0	52	19	68	7.9	301	0	78	22	1.6	0.3	0.45	550	685	7.3	Naff, 1973
Remarks: Al = 0.02, Mn = 0, PO_4 = 0.																				
King Spring NW¼NW¼SE¼ S7,T18S,R51E	90	–	4Oct70	22	0.09	45	19	70	8.0	278	0	79	20	1.5	0.3	–	521	625	7.9	Naff, 1973
Remarks: Al = 0.10, Mn <0.01, Sr = 0.78, Li = 0.08, PO_4 <0.01.																				
King Pool NW¼NW¼SE¼ S7,T18S,R51E	90	–	Nov66	22	–	48	21	67	7	304	0	76	21	2.1	0.2	0.30	408	–	–	Dudley & Larson, 1976
Remarks: Li = 0.09.																				
spring SW¼S7,T18S,R51E	93	19	26Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	650	–	Walker & Eakin, 1963
spring SE¼S7,T18S,R51E	93	2	26Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	650	–	Walker & Eakin, 1963
well SM1 NE¼NE¼SE¼ S7,T18S,R51E	82	–	4Oct70	23	0.04	60	36	170	11	263	0	330	95	1.5	7.1	–	975	1300	7.9	Naff, 1973
Remarks: Al = 0.10, Mn <0.01, Sr = 1.4, Li = 0.12, PO_4 <0.01.																				
well SM2 SW¼NE¼SE¼ S7,T18S,R51E	80	–	4Oct70	23	0.26	140	82	400	19	242	0	920	300	1.4	27	–	2136	2750	7.4	Naff, 1973
Remarks: Al = 0.50, Mn = 0.01, Sr = 3.8, Li = 0.19, PO_4 <0.01.																				
well SM3 SE¼NE¼S7,T18S,R51E	85	–	20Oct70	24	0.05	59	30	130	9.1	183	0	230	76	1.7	5.6	–	726	1000	8.3	Naff, 1973
Remarks: Al <0.1, Mn <0.01, Sr = 1.5, Li = 0.12, PO_4 <0.01.																				
well SM4 NW¼NE¼SW¼ S7,T18S,R51E	87	–	20Oct70	23	0.03	51	21	78	8.4	293	0	83	25	1.7	2.6	–	565	700	7.8	Naff, 1973
Remarks: Al <0.1, Mn <0.01, Sr = 0.93, Li = 0.09, PO_4 <0.01.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
NYE COUNTY (continued)																				
well SM5 NW¼NW¼NW¼ S7,T18S,R51E	87	–	4Oct70	23	0.12	44	19	70	8.2	214	0	79	20	1.5	0.3	–	457	540	8.2	Naff, 1973
	Remarks: Al = 0.2, Mn <0.01, Sr = 0.78, Li = 0.08, PO_4 <0.01.																			
well SM17 NE¼NW¼SW¼ S8,T18S,R51E	70	–	27Mar72	31	–	67	89	810	26	246	0	1635	288	–	–	–	3161	3067	7.9	Naff, 1973
Jack Rabbit Spring NW¼SE¼NW¼ S18,T18S,R51E	79	–	20Oct70	24	0.04	160	95	420	21	168	0	980	310	1.7	29	–	2189	3000	8.0	Naff, 1973
	Remarks: Al = 0.20, Mn <0.01, Sr = 4.2, Li = 0.21, PO_4 <0.01.																			
Jack Rabbit Spring SE¼NW¼SE¼ S18,T18S,R51E	82	–	Nov66	22	–	45	21	68	7.8	300	–	78	20	1.52	0.1	0.38	541	–	–	Naff, 1973
	Remarks: Li = 0.09.																			
Jackrabbit (Rogers) Spring SE¼NW¼S18,T18S,R51E	82	587	27Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	675	–	Walker & Eakin, 1963
Jack Rabbit Spring SE¼NW¼SE¼ S18,T18S,R51E	82	–	Nov66	22	–	45	21	68	7.8	300	0	78	20	1.5	0.1	0.38	412	–	–	Dudley & Larson, 1976
	Remarks: Li = 0.08.																			
Jack Rabbit Spring SE¼NW¼SE¼ S18,T18S,R51E	78	–	Oct70	24	–	158	95	420	21	168	0	980	310	1.7	29	–	2140	–	–	Dudley & Larson, 1976
	Remarks: Li = 0.21.																			
Big (Ash Meadows; Deep) Spring SW¼NE¼S19,T18S,R51E	81	–	14Feb66	–	–	58	12	–	–	290	–	82	28	1.75	–	–	–	–	7.7	CWRR, 1973
	Remarks: Data is probably from several springs.																			
Big (Ash Meadows; Deep) Spring SW¼NE¼S19,T18S,R51E	82	1773	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	700	–	Hughes, 1966
Big (Ash Meadows; Deep) Spring SW¼NE¼S19,T18S,R51E	82	1078-1247	27Jan59	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: In alluvium; (epm) Na + K = 4.55, Ca + Mg = 4.72, Cl + SO_4 = 3.00.																			
Big (Ash Meadows; Deep) Spring SW¼NE¼S19,T18S,R51E	81	–	27Oct64	–	–	48	14	–	–	314	–	105	26	1.4	–	–	482	–	7.2	CWRR, 1973
Ash Meadows (Deep; Big) Spring NE¼S19,T18S,R51E	75-93	1000	26Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965
	Remarks: Larger spring is 24°C, smaller is 34°C.																			
Ash Meadows (Deep; Big) Spring NE¼S19,T18S,R51E	82	1036	27Jan59	32	0.11	45	18	98	–	314	0	110	25	1.4	0.3	0.51	468	780	7.7	Walker & Eakin, 1963
	Remarks: Al = 0; PO_4 = 0.51; Sr = 1.8.																			
Big Spring NW¼SW¼NE¼ S19,T18S,R51E	83	–	Nov66	28	–	44	19	97	8.6	318	0	105	25	1.3	0.2	0.44	480	–	–	Dudley & Larson, 1976
	Remarks: Li = 0.12.																			
Big Spring SW¼NE¼S19,T18S,R51E	81	–	27Oct76	75	0.03	48	14	95	9.0	311	0	105	26	1.4	0	–	610	773	7.4	Naff, 1973
	Remarks: Al = 0.08, Mn = 0, PO_4 = 0.																			
Big Spring SE¼NW¼S19,T18S,R51E	82	–	29Apr71	–	–	51	14	106	8.6	301	0	130	32	1.5	–	0.25	644	770	7.5	Naff, 1973
well SW¼S19,T16S,R49E	73	1200	9Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
	Remarks: Depth – 300 ft; perforated 100–300 ft.																			
well NE¼S28,T16S,R49E	75	–	15Mar59	–	–	–	–	–	–	–	–	–	–	–	–	–	–	440	–	Walker & Eakin, 1963
	Remarks: Depth – 300 ft; perforated 120–300 ft.																			
well SE¼S32,T16S,R49E	70	–	26Jun62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
	Remarks: Depth – 233 ft; perforated 94–248 ft(?).																			
well NE¼NE¼NW¼ S35,T16S,R49E	75	–	18Aug62	34	0.03	50	17	106	12	286	0	145	29	4.4	0.5	0.42	545	796	7.3	Walker & Eakin, 1963
	Remarks: Depth – 325 ft; Al = 0.6, Li = 0.18, PO_4 = 0, Sr = 1.0.																			
USGS well NE¼NW¼S27,T16S,R51E	87	–	Feb68	22	–	45	18	62	7.8	284	–	64	21	2.1	<0.1	–	504	–	–	Naff, 1973
	Remarks: Li = 0.07.																			
tracer well 2 NE¼NE¼NW¼ S27,T16S,R51E	87	–	Feb68	22	–	45	18	62	7.8	284	0	64	21	2.1	<0.1	0.27	400	–	–	Dudley & Larson, 1976
	Remarks: Li = 0.08.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
NYE COUNTY (continued)																				
well NW¼S4,T16S,R53E	91	438	10Jul62	21	0.03	47	21	37	5.2	256	0	53	16	0.9	0.9	–	330	544	7.1	Walker & Eakin, 1963
	Remarks: Depth – 1953 ft; perforated 800–1050 ft; Al = 0.03, Li = 0, PO_4 = 0.16, Sr = 0.4.																			
army well 1 NW¼S5,T16S,R53E	87	–	Apr69	20	–	44	22	36	5.9	258	0	51	13	1.1	1.1	0.20	308	–	–	Dudley & Larson, 1976
	Remarks: Li = 0.04.																			
well S5,T16S,R53E	90	–	15Jul62	–	–	46	21	–	–	254	–	58	17	0.9	1.4	–	332	–	7.5	CWRR, 1973
	Remarks: Depth – 918 ft.																			
well SE¼S1,T17S,R48E	70	–	5Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
	Remarks: Depth – 188 ft; perforated 30–197 ft.																			
well NE¼NE¼NW¼ S12,T17S,R48E	77	–	13Dec72	60	–	81	24	160	15	370	0	231	86	3.2	28	–	997	1250	7.8	Naff, 1973
well NE¼S4,T17S,R44E	82	650	30Oct62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
	Remarks: Depth – 630 ft.																			
well NE¼S7,T17S,R49E	73	–	25Jun62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
	Remarks: Depth – 209 ft(?); perforated 55–210 ft(?).																			
well SE¼S7,T17S,R49E	73	–	25Jun62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
	Remarks: Depth – 400 ft; perforated 54–360 ft.																			
well NW¼S11,T17S,R49E	70	–	20Jun62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
	Remarks: Depth – 274 ft(?); perforated 80–300 ft(?).																			
Mecca well NE¼NW¼S11,T17S,R49E	71	–	23Feb71	–	–	46	13	113	15	220	–	158	36	2.3	–	0.6	602	740	8.4	Naff, 1973
Ash Tree Spring SE¼SE¼SE¼ S35,T17S,R49E	72	–	1Jul70	76	<0.5	15	4.2	55	8.8	156	0	35	6.6	2.6	6.7	0.28	291	360	8.0	Naff, 1973; Dudley & Larson, 1976
	Remarks: Al <0.1, Mn <0.1, Sr 0.25, Li 0.07, PO_4 <0.01.																			
Ash Tree Spring SE¼SE¼S35,T17S,R49E	75	10	8May52	80	0.08	16	4.8	55	7.9	160	0	37	7.2	2.8	3.9	.29	293	370	7.9	Walker & Eakin, 1963
Fairbanks Spring SE¼NE¼S9,T17S,R50E	81	–	27Oct64	20	0	51	18	71	8.0	300	0	80	22	2.2	0	0.51	552	686	7.3	Naff, 1973
	Remarks: Al = 0.06, Mn = 0, PO_4 = 0.																			
Fairbanks Spring SE¼NE¼S9,T17S,R50E	81	1715	23Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	650	–	Walker & Eakin, 1963
Fairbanks Spring SE¼NE¼S9,T17S,R50E	81	1715	–	–	–	55	18	93	–	367	–	74	262	–	–	–	–	911	–	Mifflin, 1968
	Remarks: In alluvium; (epm) Na + K = 2.82; Ca + Mg = 4.23; Cl + SO_4 = 2.28.																			
Soda Spring SE¼SW¼NW¼ S10,T17S,R50E	71	–	3Oct70	23	0.17	38	18	78	8.7	288	0	82	21	1.9	<0.10	–	537	695	7.9	Naff, 1973
	Remarks: Al = 0.10, Mn <0.01, Sr = 0.62, Li = 0.09, PO_4 <0.01.																			
Bell (Soda) Spring SW¼S10,T17S,R50E	73	79	31Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	725	–	Walker & Eakin, 1963
Soda Spring SE¼SW¼NW¼ S10,T17S,R50E	73	–	Nov66	35	–	36	17	106	10	330	0	93	27	2.1	<0.1	0.99	488	–	–	Dudley & Larson, 1976
	Remarks: Li = 0.10.																			
well NE¼SE¼SW¼ S10,T17S,R50E	72	–	Jun68	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Remarks: Depth – 157 ft.																			
well SE¼SE¼SW¼ S10,T17S,R50E	70	–	Feb71	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Dudley & Larson, 1976
well SM13 SW¼SW¼SE¼ S10,T17S,R50E	70	–	3Oct70	31	0.04	22	11	110	15	296	0	74	22	2	0.5	–	554	640	8.0	Naff, 1973
	Remarks: Al = 0.2, Mn = 0.01, Sr = 1.1, Li = 0.14, PO_4 <0.01.																			
"Purgatory Spring" well SW¼NE¼SW¼ S14,T17S,R50E	93	–	1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Dudley & Larson, 1976
	Remarks: Depth – 92 ft.																			
Rogers Spring NW¼NE¼S15,T17S,R50E	82	–	Nov66	23	–	47	21	69	7.8	302	–	78	21	1.52	<0.1	0.31	547	–	–	Naff, 1973
	Remarks: Li = 0.09.																			
Rogers Spring SW¼NE¼S15,T17S,R50E	84	–	7Oct71	–	–	55	15	78	9	290	–	96	27	1.8	–	–	571	693	8.0	Naff, 1973

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
NYE COUNTY (continued)																				
Rogers Springs NW¼NE¼S15,T17S,R50E	66	725	1966?	23	0.16	50	20	76		305	0	79	23	1.2	0.9	0.28	–	–	–	Maxey & Mifflin, 1966
Rogers Spring NW¼NE¼S15,T17S,R50E	84	717-736	14Jan65	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Remarks: In alluvium; (epm) Na + K = 4.00; Ca + Mg = 4.14; Cl + SO_4 = 3.52.																				
Rogers Springs NW¼NE¼S15,T17S,R50E	82	82	29Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	650	–	Walker & Eakin, 1963
well NW¼NW¼S21,T17S,R50E	76	–	Jun68	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Dudley & Larson, 1976
Remarks: Depth – 202 ft.																				
Longstreet Spring NE¼NW¼NE¼ S22,T17S,R50E	81	–	28Oct64	22	0	51	17	68	7.9	303	0	78	22	1.6	0.3	0.45	549	681	7.4	Naff, 1973
Remarks: Al = 0.05, Mn = 0, PO_4 = 0.																				
Longstreet Spring NW¼NE¼S22,T17S,R50E	82	1042	29Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	640	–	Walker & Eakin, 1963
Longstreet Spring NW¼NE¼S22,T17S,R50E	82	1042-1239	14Jan65	–	–	–	–	–	–	312	0	–	28	–	–	0.35	–	685	–	Mifflin, 1968
Remarks: In alluvium; (epm) Na + K = 3.78, Ca + Mg = 4.10, Cl + SO_4 = 2.91.																				
Longstreet Spring NE¼NW¼NE¼ S22,T17S,R50E	82	–	Nov66	22	–	48	19	69	7.8	300	0	73	17	1.7	0.4	0.26	419	–	–	Dudley & Larson, 1976
Remarks: Li = 0.09.																				
Parent Springs NW¼S23,T17S,R50E	93	177	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hughes, 1966
Remarks: Three springs.																				
Main Spring NE¼SW¼NW¼ S23,T17S,R50E	92	–	3Oct70	22	0.02	45	19	72	8.4	269	0	82	20	1.7	0.3	–	518	620	8.1	Naff, 1973
Remarks: Al = 0.10, Mn <0.01, Sr = 0.78, Li = 0.08, PO_4 <0.01.																				
spring NW¼S29,T18S,R51E	72	1	28Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	790	–	Walker & Eakin, 1963
Bole Spring NW¼NE¼S30,T18S,R51E	72	12	27Jul62	33	0.03	38	0.6	106	9.2	306	0	113	27	1.0	1.0	–	500	776	7.1	Walker & Eakin, 1963
Remarks: Al = 0.11, Li = 0.17, PO_4 = 0, Sr = 0.6.																				
spring NE¼S30,T18S,R51E	72	12	27Jul62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Walker & Eakin, 1963
[230] Pahrump Valley																				
well NW¼S9,T19S,R53E	73	–	–	21	0.10	46	26	28	4.0	280	0	36	12	0.3	2.4	0.14	302	524	7.8	Hunt & others, 1966
Remarks: Al = 0.1, Mn = 0.00, As = 0.00, Sr = 0.76, PO_4 = 0.00, Ra = 0.1 ± 0.1μμc/l, U = 2.1 ± 0.2.																				
Wilcox well SW¼NE¼S34,T19S,R53E	78	–	26Oct64	16	0	56	22	5.5	1.6	258	0	18	4.3	0.1	1.5	0.16	367	437	7.5	Naff, 1973
Remarks: Al = 0.04, Mn = 0, PO_4 = 0.																				
Ray Thomas well SW¼SW¼SE¼ S14,T20S,R53E	79	–	10Oct16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Remarks: Depth – 495 ft.																				
J. M. Raycraft well S14,T20S,R53E	79	flowing	1916	8	–	51	25	42	–	242	0	32	63	–	–	–	383	–	–	Waring, 1919
Remarks: Depth – 322 ft.																				
Pahrump (Bennetts) Springs SE¼SE¼S14,T20S,R53E	–	0	1963	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965
Pahrump Springs SE¼SE¼S14,T20S,R53E	77	486	5Aug27	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hardman & Miller, 1934; Waring, 1965, No. 140
Remarks: 2 springs; water used for irrigation.																				
Bennetts Spring SW¼SE¼S14,T20S,R53E	75	0	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Bennetts Springs SW¼SE¼S14,T20S,R53E	77	2520	5Aug27	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
Remarks: In alluvium; spring has been destroyed by drilling of nearby flowing well.																				
Raycraft well SW¼NW¼SW¼ S14,T20S,R53E	81	–	9Sep46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Remarks: Depth – 360 ft.																				
Ray Thomas well SW¼SW¼SE¼ S14,T20S,R53E	79	–	6Mar45	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Remarks: Depth – 254 ft.																				
George P. Brooks well SE¼SE¼NE¼ S15,T20S,R53E	82	–	10Oct46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
Remarks: Depth – 316 ft.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
NYE COUNTY (continued)																				
A. F. Cayton well SW¼SE¼NW¼ S15,T20S,R53E	73	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
	Remarks: Depth – 212 ft.																			
J. P. Cayton well SE¼SE¼NW¼ S15,T20S,R53E	81	–	10Sep46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
J. M. Raycraft well NW¼SE¼S15,T20S,R53E	81	flowing	9Sep46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
J. M. Raycraft well NW¼SE¼S15,T20S,R53E	79	flowing	1916	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1919
	Remarks: Depth – 175 ft; flow struck at 156 ft.																			
Ray Thomas well NE¼NW¼NE¼ S23,T20S,R53E	79	–	9Sep46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Jameson, 1948
	Remarks: Depth – 516 ft.																			
Manse Ranch Springs SE¼NE¼S3,T21S,R54E	75	1500	–	–	–	52.2	10.9	30.2	–	239	0	42.3	0.7	–	–	–	375	–	–	Hardman & Miller, 1934; Waring, 1965, No. 141
Manse Ranch Springs SE¼NE¼S3,T21S,R54E	75	800-1160	5Aug27	18	–	55	29	tr	–	239	0	42	4.9	–	–	–	268	–	–	Hardman & Miller, 1934
	Remarks: 2 springs; water used for irrigation; Clark County.																			
Manse Ranch Springs SE¼NE¼S3,T21S,R54E	–	605-1500	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: In alluvium; flow has diminished because of nearby flowing well, (epm) Na + K = 1.30; Ca + Mg = 3.50; Cl + SO_4 = 1.02; Clark County.																			
well NE¼S16,T21S,R54E	73	–	1955	16	0	53	22	7.1	0.8	224	0	47	3.0	0.5	0.6	–	259	–	7.9	Scott & Barker, 1962
	Remarks: Depth – 795 ft; Al = 0, Mn = 0, PO_4 = 0, Ra = 0.1µµc/l, U = 1.6µg/l; Clark County.																			
well NE¼S16,T21S,R54E	74	–	–	0.16	–	53	22	7.1	0.8	224	0	47	3.0	0.5	0.6	–	259	428	7.8	Hunt & others, 1966
	Remarks: Al = 0.0, Mn = 0.00, PO_4 = 0.0, Ra = 0.1µµc/l, U = 1.6; Clark County.																			
PERSHING COUNTY																				
[131] Double Hot Springs–Black Rock Hot Springs																				
springs S3,10,T35N,R26E	Remarks: See the section "Double Hot Springs–Black Rock Hot Springs" in Humboldt County.																			
[151] Buffalo Valley Hot Springs																				
spring S6,T29N,R41E	hot																			Wollenberg & others, 1977
	Remarks: See Buffalo Valley Hot Springs, Lander County.																			
[231] Bailey well SW¼SW¼S6,T35N,R24E	78	–	16Jul67	–	–	1.8	0.9	124		166	–	77	44	–	–	–	–	480	8.1	Harrill, 1969
	Remarks: Depth – 310 ft.																			
[232] spring SE¼S28,T35N,R28E	72	–	22May57	–	–	62	27	–	–	1280	–	102	235	5.5	–	–	–	–	6.4	CWRR, 1973
	Remarks: PO_4 = 0.8; location uncertain.																			
[233] Trego area																				
Butte Spring S31?,T34N,R26E	187	–	1973	85	–	25	0.2	463	9.3	154	–	86	520	–	–	–	–	2300	8.4	Mariner & others, 1973
	Remarks: Unsurveyed area, near Trego (lat. 40°46′N, long. 119°7′W) 1.8 mi east of Trego, south of railroad.																			
Butte Spring S31?,T34N,R26E	182	20	1885?	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 63
spring NW¼S31,T34N,R25E	hot	–	1963	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair, 1963a
	Remarks: Probably Butte Spring in R26E, east of Trego.																			
spring? T33N,R25E	187	–	–	85	–	25	0.2	545	10	188	0	86	280	5.0	–	9	–	2300	8.2	Grose & Keller, 1975b
	Remarks: H_2S = 5.0, probably Butte Spring.																			
Coyote Spring S3?,T33N,R25E	72	–	Jun75	58	–	12	20	1175	17	1210	0	5.8	1170	1.5	–	4.5	3060	5150	7.6	Grose & Keller, 1975b
Garrett Ranch well NW¼S10,T33N,R25E	92	–	12Jun61	94	–	13	0.6	272	8.4	93	–	156	278	2.8	0.2	–	–	1410	7.4	Sinclair, 1963a
	Remarks: Depth – 125 ft. Approximately 2 miles southwest of Trego.																			
Garrett Ranch well NW¼S10,T33N,R25E	125	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair, 1963a
Garrett Ranch well NW¼S10,T33N,R25E	104	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair, 1963a
	Remarks: Depth – 90 ft.																			
Garrett Ranch well NE¼S10,T33N,R25E	108	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair, 1963a
well? T33N,R25E	92	–	–	94	–	14	0.4	310	12	93	15	156	275	2.8	–	–	1410	1980	8.4	Grose & Keller, 1975b

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
PERSHING COUNTY (continued)																				
well? T33N,R25E	97	–	–	86	–	21	0.2	315	21	102	14	141	290	2.7	–	–	–	2150	8.6	Grose & Keller, 1975b
[234] springs approx. SW¼T33N,R35E	warm	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 63A
	Remarks: Several springs; near Humboldt River 2 miles north of Mill City.																			
[235] Leach (Pleasant Valley, Nelson's, Guthrie) Hot Springs																				
spring SE¼S36,T32N,R38E	198	53	1973	135	–	8.8	0.5	160	13	366	1	53	29	7.8	–	1.2	–	811	7.4	Mariner & others, 1974
	Remarks: Li = 1.7.																			
spring SE¼S36,T32N,R38E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
	Remarks: Al = 0.009, N = 0.40, P = 0.07, Br = 0.06, I = 0.003, Rb = 0.12, Ce = 0.2, Sr = 0.29, Mn = 0.02, Cu = 0.01, Hg = 0.0006, δD(‰) = −128.6, δO^{18}(‰) = −15.76.																			
Leach's Hot Springs NW¼S36,T32N,R38E	204	200	20Feb74	155	0.12	97	20	518	80	544	0	47.8	775	6.32	<0.1	–	1968	3312	7.0	Sanders & Miles, 1974
	Remarks: PO_4 <0.1, NH_4 = 1.3, Ag <0.02, As <.05μg/l, Ba = 0.46, Be <.005, Bi <0.1, Cd <0.01, Cr <0.02, Cs = 2.82, Cu 0.01, Hg <0.5μg/l, Li = 5.34, Mn = .034, Ni <0.02, Pb = 0.05, Rb = 1.60, Sb <0.1, Se <1.0μg/l, Sn <0.05, Sr = .160, Zn = .050.																			
Nelson (Guthrie) Hot Spring S35,T32N,R38E	139-204	250	19Mar43	–	–	60	18	93	–	366	–	50	35	–	–	–	–	–	–	Miller, Hardman & Mason, 1953; Waring, 1965, No. 65
	Remarks: 8 pools in 1 acre area, plus several other springs; water is sulfurous, and used for irrigation; deposits of siliceous sinter and "tufa".																			
springs S36,T32N,R38E	140-207	90-135	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Cohen, 1964
spring SE¼S36,T32N,R38E	139-204	–	before 1940	–	–	1.5	tr	193		233	74	52	33	–	–	tr	790	–	–	Dreyer, 1940
spring S36,T32N,R38E	–	–	–	–	–	–	–	193		233	–	–	33	–	–	–	790	–	–	U. S. Bureau of Reclamation, 1972, table 3
springs S36,T32N,R38E	158-202	200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 64, 83
pool S36,T32N,R38E	93	–	–	175	–	3	–	181	11	–	–	–	30	–	–	–	–	–	–	Wollenberg & others, 1977
	Remarks: U <0.08μg/l, Ba = 70μg/l, W = 132μg/l, Br = 70μg/l, Sb = 14μg/l, Mo = 3μg/l, Rb = 125μg/l, Cs = 122μg/l, As = 16μg/l, Fe <52μg/l, Sc <0.02μg/l, Mn = 60μg/l.																			
pool S36,T32N,R38E	167	–	–	89	–	10	–	154	8	–	–	–	26	–	–	–	–	–	–	Wollenberg & others, 1977
	Remarks: U <0.02μg/l, Ba = 190μg/l, W = 85μg/l, Br = 75μg/l, Sb = 9μg/l, Mo = 1μg/l, Rb = 98μg/l, Cs = 102μg/l, As = 3μg/l, Fe <75μg/l, Sc <0.02μg/l, Mn = 55μg/l.																			
pool S36,T32N,R38E	174	–	–	99	–	7	–	164	9	–	–	–	27	–	–	–	–	–	–	Wollenberg & others, 1977
	Remarks: U <0.1μg/l, Ba = 170μg/l, W = 125μg/l, Br = 60μg/l, Sb = 10μg/l, Mo =1.5μg/l, Rb = 105μg/l, Cs = 110μg/l, As <4μg/l, Fe <55μg/l, Sc <0.02μg/l, Mn = 60μg/l.																			
pool S36,T32N,R38E	201	'–	–	–	–	8	–	80	4	–	–	–	12	–	–	–	–	–	–	Wollenberg & others, 1977
	Remarks: U <0.3μg/l, Ba = 190μg/l, W = 80μg/l, Br = 35μg/l, Sb = 180μg/l, Mo = 13μg/l, Rb = 120μg/l, Cs = 115μg/l, As <5μg/l, Fe = 950μg/l, Sc = 0.16μg/l, Mn = 12μg/l.																			
pool S36,T32N,R38E	203	–	–	183	–	7	–	89	7	–	–	–	14	–	–	–	–	–	–	Wollenberg & others, 1977
	Remarks: U <0.2μg/l, W = 25μg/l, Br = 30μg/l, Sb = 140μg/l, Mo = 13μg/l, Rb = 120μg/l, Cs = 115μg/l, As = 12μg/l, Fe <25μg/l, Sc <0.03μg/l, Mn = 55μg/l.																			
spring NE¼NW¼SE¼ S36,T32N,R38E	167	–	–	–	–	–	–	149	–	–	–	–	25	–	–	–	–	–	–	Wollenberg & others, 1975
	Remarks: U = 0.10 ppb; W = 84 ppb; Mo = 0.8 ppb; Sb = 9.3 ppb; Ba = 186 ppb.																			
spring NE¼NW¼SE¼ S36,T32N,R38E	167	–	–	–	–	–	–	167	–	–	–	–	27	–	–	–	–	–	–	Wollenberg & others, 1975
	Remarks: U = 0.40 ppb; W = 94 ppb; Mo = 0.9 ppb; Sb = 13 ppb; Ba = 286 ppb.																			
spring NE¼NW¼SE¼ S36,T32N,R38E	203	–	–	–	–	–	–	87	–	–	–	–	12	–	–	–	–	–	–	Wollenberg & others, 1975
	Remarks: U <0.28 ppb; W = 24 ppb; Mo = 13 ppb; Sb = 134 ppb; Ba = 126 ppb.																			
spring NE¼NW¼SE¼ S36,T32N,R38E	203	–	–	–	–	–	–	89	–	–	–	–	13	–	–	–	–	–	–	Wollenberg & others, 1975
	Remarks: U = 0.35 ppb; W = 44 ppb; Mo = 14 ppb; Sb = 156 ppb; Ba = 214 ppb.																			
spring NE¼NW¼SE¼ S36,T32N,R38E	201	–	–	–	–	–	–	77	–	–	–	–	12	–	–	–	–	–	–	Wollenberg & others, 1975
	Remarks: U <0.25 ppb; W = 75 ppb; Mo = 13 ppb; Sb = 177 ppb; Ba = 182 ppb.																			
spring NE¼NW¼SE¼ S36,T32N,R38E	174	–	–	–	–	–	–	159	–	–	–	–	26	–	–	–	–	–	–	Wollenberg & others, 1975
	Remarks: U = 0.08 ppb; W = 120 ppb; Mo = 1.5 ppb; Sb = 10 ppb; Ba = 166 ppb.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
PERSHING COUNTY (continued)																				
[236] Humboldt (Rye Patch) area																				
Phillips Petroleum Co. Campbell E No. 1 well SE¼S21,T31N,R33E	325	–	1977	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	unpublished data, Nevada Bureau of Mines & Geol.
	Remarks: Depth – 1853 ft. Geothermal exploratory well.																			
spring S20,T30N,R33E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Crofutt, 1872
[237] Southwest Dredging Co. well SE¼S34,T29N,R34E	75	2	15May52	20	0.05	50	9.3	33	1.3	210	–	23	29	0.1	2.0	0.18	271	463	7.4	Loeltz & Phoenix, 1955
	Remarks: Depth – 136 ft.																			
[238] Kyle Hot Springs																				
spring SW¼S1,T29N,R36E	171	5	1973	150	–	95	25.5	540	80	544	<1	51	770	5.7	–	3.8	–	3220	6.5	Mariner & others, 1974
	Remarks: Li = 3.1.																			
spring SW¼S1,T29N,R36E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
	Remarks: Al = 0.013, N = 0.80, P = 0.02, Rb = 0.12, Ce = 0.2, Sr = 0.29, Mn = 0.02, Cu = 0.01, Hg = 0.0006, δD(‰) = –130.0, δO^{18}(‰) = –15.50. Gas (volume %): O_2 + Ar = 1, N_2 = 7, CH_4 = 2, CO_2 = 90.																			
spring NW¼NW¼S12,T29N,R36E	204	–	20Feb74	155	0.02	97	20	518	80	544	0	47.8	775	6.32	<0.1	–	1968	3312	7.0	Sanders & Miles, 1974
	Remarks: PO_4 <0.1, NH_4 = 1.3, Ag <0.02, As = 1.5µg/l, Ba = .38, Be <0.005, Bi <0.1, Cd = 0.007, Cr <0.02, Cs = 1.60, Cu <.02, Hg = 0.5µg/l, Li = 0.667, Mn <0.01, Ni = 0.02, Pb = 0.07, Rb = 0.138, Sb <0.1, Se <1.0µg/l, Sn <0.05, Sr = 4.93, Zn = 0.021.																			
spring S2,T29N,R36E	100-160	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 66
	Remarks: Several springs; sinter deposits; former resort.																			
spring NW¼NW¼S12,T29N,R36E	159	0	25Mar46	53	tr	96	20	574		512	–	59	770	–	–	–	1970	–	–	Loeltz & Phoenix, 1955
spring S12(?),T29N,R36E	138	–	–	155	–	87	–	535	77	–	–	–	730	–	–	–	–	–	–	Wollenberg & others, 1977
	Remarks: (From spring house) U <0.7µg/l, Ba = 565µg/l, W = 82µg/l, Br = 720µg/l, Sb = 8µg/l, Mo <2µg/l, Rb = 760µg/l, Cs = 340µg/l, As <20µg/l, Fe = 290µg/l, Sc <0.04µg/l, Mn <50µg/l.																			
spring	–	–	–	–	–	–	–	569	–	–	–	–	721	–	–	–	–	–	–	Wollenberg & others, 1975
	Remarks: U <0.7 ppb; W = 80 ppb; Mo <2 ppb; Sb = 8 ppb; Ba = 550 ppb.																			
[239] Colado																				
Mineral Materials well SE¼S33,T28N,R32E	150	–	8Oct64	76	0.4	115	19	1700	120	186	0	282	2580	4.1	42	5.4	5040	10200	7.9	Everett & Rush, 1965
drill hole NE¼SE¼SE¼ S27,T28N,R32E	155	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Pruss, Bonham & Spruck, 1961
	Remarks: Hot water reported at 80 ft in a drill hole and in a 30-ft deep shaft about 350 ft to the southwest.																			
[240] well NW¼S2,T27N,R38E	70	–	1May52	36	0.05	–	–	98	6.5	204	0	71	126	0.3	1.1	0.2	505	842	7.6	Cohen & Everett, 1963
Paris well NW¼S2,T27N,R38E	72	10	24Jul63	39	0.04	46	19	101	6.4	205	0	69	124	0.5	1.3	0.3	503	853	7.9	Cohen & Everett, 1963
	Remarks: Depth – 382 ft.																			
[241] well NW¼S28,T27N,R38E	71	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Cohen & Everett, 1963
	Remarks: Depth – 500 ft; artesian flow of 10 gpm reportedly from the gravel–clay contact at 90 feet.																			
[242] Jersey Valley																				
spring SW¼S28,T27N,R40E	84	5	1973	110	–	36	4.4	180	20	374	<1	150	40	7.8	–	1.9	–	1040	7.1	Mariner & others, 1974
	Remarks: Li = 1.2.																			
spring SW¼SW¼S28,T27N,R40E	hot	1	29Jul59	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Cohen & Everett, 1963
Home Station Ranch Hot Spring SE¼S29,T27N,R40E	135	50	8Jun50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Cohen & Everett, 1963; Johnson, 1977, p. 106
[243] Sou (Seven Devils, Gilbert's) Hot Springs																				
spring SE¼S29,T26N,R38E	158	–	20Feb74	64	0.30	106	19.8	167	26	324	0	352	77	5.5	0.2	–	978	1411	7.3	Sanders & Miles, 1974
	Remarks: PO_4 = 0.1, NH_4 = 1.0, Ag <0.02, As <0.05µg/l, Ba = .10, Be <0.005, Bi <0.1, Cd <0.01, Cr <0.02, Cs = 1.30, Cu <0.01, Hg <0.5µg/l, Li = .704, Mn = .042, Ni <0.02, Pb <0.02, Rb = .202, Sb = 0.1, Se <1.0µg/l, Sn <.05, Sr = 8.37, Zn = .085.																			
spring SE¼S29,T26N,R38E	163	–	1973	65	–	110	22	165	26	312	–	370	75	–	–	–	–	1407	8.1	Mariner & others, 1974
springs SE¼S29,T26N,R38E	160-185	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hague & Emmons, 1877; Waring, 1965, No. 68
Devil's Ranch Springs S29,T26N,R38E	–	–	–	–	–	142	–	165	–	308	–	327	85	–	–	–	–	–	–	Miller, Hardman & Mason, 1953

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
PERSHING COUNTY (continued)																				
spring T24N,R36E?	–	–	9Mar31	–	–	tr	0	169	–	122	–	88	124	–	–	0.66	–	–	–	Miller, Hardman & Mason, 1953
Remarks: Probably Sou Hot Springs, S29,T26N,R35E.																				
spring S1,T25N,R36E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 67
Remarks: Near north end of Dixie (Salt Marsh or Osobb) Valley. Section, Township and Range as given in Waring (1965) are probably incorrect.																				
[244] McCoy (J. Saval) springs NW¼S33,T26N,R39E	120	–	28Jul59	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Cohen & Everett, 1963
J. S. Ranch spring SW¼S33,T26N,R39E	119	670	7Jun50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Cohen & Everett, 1963
[245] New York Canyon kaolin deposit																				
drill hole SW¼S1,T25N,R35E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	K. Papke, personal communication, 1977
Remarks: Depth < 140 ft. Steam reported in a drill hole at the deposit.																				
[246] Hyder (Cone) Hot Spring SW¼S28,T25N,R38E	83	–	6Jul50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Cohen & Everett, 1963
Hyder Hot Spring SW¼S28,T25N,R38E	175	–	7Jun50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Cohen & Everett, 1963
Remarks: An area of travertine is reported.																				
Hyder (Cone) Hot Spring SW¼S28,T25N,R38E	125	small	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 69
[247] Lower Ranch Hot Spring S½NW¼S16,T25N,R39E	104	–	1973	42	–	31	15	143	12	456	–	63	29	–	–	–	–	850	8.1	Mariner & others, 1974
[248] spring NW¼S19,T25N,R39E	83	50	7Jun50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Cohen & Everett, 1963
STOREY COUNTY																				
[250] hot spring T19N,R23E	73	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 58
Remarks: Possibly same as Biddleman Springs.																				
[252] Comstock mining district																				
Ophir shaft SE¼NW¼NE¼ S29,T17N,R21E	–	–	–	38	tr	78	98	19	11	–	76	198	6	–	–	–	–	–	–	Peale, 1886, p. 330
C & C shaft SW¼SE¼NE¼ S29,T17N,R21E	–	–	–	133	6.3	100	5.8	130	53	–	20	475	19	–	–	–	–	–	–	Reid, 1905
Remarks: Al = 0.13. From 2250-ft level.																				
Savage Mine NE¼SE¼SW¼ S29,T17N,R21E	–	–	–	30	–	155	24	7.4	74	–	100	390	1.34	–	–	–	–	–	–	Church, 1878
Remarks: Al + Fe = 0.5 ppm. From 600-ft level.																				
Gould & Curry Mine CS29,T17N,R21E	–	–	–	69	tr	83	–	7.8	225	–	193	203	12	–	–	–	–	–	–	Church, 1878
Remarks: From 1800-ft level.																				
Gould & Curry Mine CS29,T17N,R21E	–	–	–	38	tr	71	–	0.27	63	–	47	173	0.43	–	–	–	–	–	–	Church, 1878
Remarks: From 1700-ft level.																				
Hale & Norcross shaft NW¼S32,T17N,R21E	–	–	–	60	–	112	–	146	82	–	242	273	14	–	–	–	–	–	–	Church, 1878
New Yellow Jacket shaft SW¼SE¼S32,T17N,R21E	170	–	Nov1880	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Becker, 1882, p. 230
Remarks: Maximum water temperature recorded; other temperatures mentioned in text. From 3000-ft level.																				
WASHOE COUNTY																				
[253] spring NW¼S12,T44N,R19E	73	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair & Malchow, 1963
springs SE¼S12,T44N,R19E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Alkali Lake 7½-minute quad
Remarks: Six springs shown.																				
Hill's Warm Spring SW¼S18,T44N,R20E	80	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair & Malchow, 1963
Hill's Warm Spring S18,T44N,R20E	83	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 35A
[254] Twin (Vya) Spring NW¼S4,T42N,R19E	71	50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair & Malchow, 1963

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
WASHOE COUNTY (continued)																				
Twin (Vya) Spring S4,T42N,R19E	70	200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 35C
[255] spring T38N,R18E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 36
	Remarks: At the south end of Suprise Valley, possibly along the Suprise Valley fault (Slossen, 1974; Woods, 1974), which has extensive associated geothermal activity to the northwest in California.																			
[256] Leadville Springs T37N,R23E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Smith, 1956
[257] "New Spring" S18,T34N,R22E	84	–	–	86	–	32	–	25	?	–	0	–	28	–	–	–	–	–	7.8	Grose & Keller, 1975b
spring SE¼S18,T34N,R22E	84	500	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.0	Grose & Keller, 1975a
	Remarks: Five springs aligned roughly north-northeast for a distance of 700 feet along a Quaternary? fault zone. Flows into Squaw Creek.																			
[258] Ward's (Fly Ranch, Hualapai Flat) Hot Springs																				
well SE¼NE¼S23,T35N,R23E	75	–	25Jul67	–	–	34	13	61		174	–	61	48	–	–	–	–	440	8.2	Harrill, 1969
well NW¼SE¼S24,T35N,R23E	77	–	28Sep67	–	–	31	13	59		172	4	56	38	–	–	–	–	420	8.3	Harrill, 1969
well SW¼NE¼S25,T35N,R23E	70	–	21May67	60	0.02	44	14	35	8.9	178	–	42	46	0.1	1.2	0	339	509	7.3	Harrill, 1969
	Remarks: Depth – 158 ft.																			
Richard Bailey well SW¼SW¼S6,T35N,R24E	78	–	–	–	–	1.8	0.9	124		166	–	77	44	–	–	–	–	480	8.1	Harrill, 1969
	Remarks: Depth – 310 ft; possibly in Pershing County.																			
Cordero Fly No. 1 temperature test hole NW¼SE¼NE¼ S1,T34N,R23E	108	–	14Jun72	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	George Berry, written communication, 1972
	Remarks: Depth – 660 ft; predominantly in sand.																			
pool H-82 SE¼SW¼NW¼ S1,T34N,R23E	90	–	–	82	–	20	0.2	400	18	440	0	368	245	–	–	–	–	–	8.0	Grose & Keller, 1975b
"The Geyser" well (Fly Geyser) SW¼S1,T34N,R23E	>220	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Koenig, 1970
	Remarks: Depth – shallow.																			
"The Geyser" well (Fly Geyser) SW¼S1,T34N,R23E	boiling	–	3May61	76	–	18	4.6	386	16	336	40	205	250	7.9	0.2	2.1	1170	1840	9.0	Sinclair, 1962b
	Remarks: Depth – shallow; has 15 ft high tower of travertine around well bore.																			
spring H-63 NW¼SW¼SW¼ S1,T34N,R23E	180	–	–	86	–	24	0.2	405	15	456	0	390	255	–	–	–	–	–	7.2	Grose & Keller, 1975b
	Remarks: Travertine terrace.																			
Ward's Hot Spring (Ward's Ranch, Fly Ranch) SW¼S1,T34N,R23E	boiling	–	–	113	–	36	3	355	19	–	tr	390	239	–	–	–	–	–	–	Russell, 1885; Waring, 1965, No. 37
	Remarks: Li = tr.																			
Ward's Hot Spring (Ward's Ranch, Fly Ranch) SW¼S1,T34N,R23E	–	500	1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sinclair, 1962b
	Remarks: Both calcareous and siliceous spring deposits.																			
well H-18 SE¼SE¼NE¼ S2,T34N,R23E	196	–	–	88	–	28	0.2	400	18	452	0	–	245	–	–	–	–	–	7.2	Grose & Keller, 1975b
	Remarks: Travertine cone.																			
Cottonwood Springs SW¼SW¼S2,T34N,R23E	73-79	12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Alvin McLane, written communication
Western Geothermal Inc. Fly Ranch No. 1 well SW¼S2,T34N,R23E	207	440	Jun70	76	–	33	4.3	347	17	436	–	187	244	–	–	–	1667	–	–	Alvin McLane, written communication, 1972
	Remarks: Depth – 1000+ ft.																			
Western Geothermal Inc. Fly Ranch No. 1 well SW¼S2,T34N,R23E	207	440	–	–	–	33	4.1	335	13.8	431	–	186	229	–	–	–	1768	–	–	Alvin McLane, written communication, 1972
	Remarks: Depth – 1000+ ft; geothermal exploratory well.																			
John Casey steam well NE¼SE¼S2,T34N,R23E	–	–	3May61	76	–	18	4.6	386	16	336	–	205	250	7.9	0.2	2.1	1170	1840	9.0	Harrill, 1969
pool H-50 SE¼NE¼SE¼ S2,T34N,R23E	90	–	–	82	–	17	0.2	430	15	452	0	380	250	–	–	–	–	–	8.0	Grose & Keller, 1975b

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
WASHOE COUNTY (continued)																				
pool(?) H-41 SE¼NE¼SE¼ S2,T34N,R23E	92	–	–	90	–	18	0.2	440	16	448	0	380	260	–	–	–	–	–	7.9	Grose & Keller, 1975b
well H-16 SE¼NW¼SE¼ S2,T34N,R23E	201	–	–	90	–	22	0.19	405	18	486	0	245	250	–	–	–	–	–	7.2	Grose & Keller, 1975b
	Remarks: Travertine cone.																			
Western Geothermal Inc. Fly Ranch No. 1 well SW¼NE¼SE¼ S2,T34N,R23E	205	–	–	90	–	22	0.2	386	17	458	0	46	275	7	–	2	–	1800	8.4	Grose & Keller, 1975b
	Remarks: pH may be 7.2.																			
pool H-8 NW¼NE¼SE¼ S2,T34N,R23E	109	–	–	84	–	18	0.2	405	16	456	0	250	245	–	–	–	–	–	7.5	Grose & Keller, 1975b
pool H-5 NE¼NW¼SE¼ S2,T34N,R23E	88	–	–	88	–	22	0.15	424	17	450	0	–	240	–	–	–	–	–	8.2	Grose & Keller, 1975b
pool H-3 NE¼NW¼SE¼ S2,T34N,R23E	95	–	–	89	–	24	0.2	380	17	458	0	–	240	–	–	–	–	–	8.4	Grose & Keller, 1975b
pool(?) H-1 CW¼S2,T34N,R23E	90	–	–	88	–	28	0.2	380	17	446	0	–	250	–	–	–	–	–	8.4	Grose & Keller, 1975b
"Geyser" well CW¼S2,T34N,R23E	183	–	–	90	–	32	0.18	456	17	484	0	260	260	–	–	–	–	–	8.4	Grose & Keller, 1975b
flowing well S2,T34N,R23E	176	132	1973	82	–	31	4.2	340	17	458	4	46	240	7.0	–	1.9	–	1800	7.9	Mariner & others, 1974
	Remarks: Li = 0.46.																			
spring NE¼S10,T34N,R23E	72	–	13Dec61	89	–	72	21	54	10	223	–	67	93	0.1	0.3	0.1	516	755	7.2	Harrill, 1969
spring NE¼S10,T34N,R23E	72	2-3	13Dec61	89	–	72	21	54	10	223	0	67	93	0.1	0.3	0.1	549	755	7.2	Sinclair, 1962b
[259] **Granite Ranch**																				
Cordero Fly No. 3 temperature test hole NW¼SE¼SE¼ S35,T34N,R23E	hot	–	4Aug72	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	George Berry, written communication, 1972; Olmsted & others, 1975, p. 128
	Remarks: Depth – 462 ft. Near hot abandoned water well.																			
USGS test hole BR AH-9 NE¼S2,T33N,R23E	hot	–	1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Olmsted & others, 1975
	Remarks: Depth – 102 ft.																			
[260] Wall Spring S3,T32N,R21E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 41
[261] **Gerlach area**																				
Cordero Gerlach No. 3 temperature test hole SE¼SE¼SE¼ S9,T32N,R23E	boiling	–	29Jun72	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	George Berry, written communication, 1972
	Remarks: Depth – 365 ft; hole in granodiorite; top boiling water at 90 ft.																			
spring NE¼S10,T32N,R23E	207	–	–	184	–	73	2.2	1440	121	84	0	386	2150	–	–	–	–	–	7.7	Grose & Keller, 1975b
spring G-3 SW¼SW¼SW¼ S10,T32N,R23E	147	–	–	186	–	80	2.3	1800	130	83	0	–	2430	5.0	–	10	–	–	7.7	Grose & Keller, 1975b
spring G-9 SE¼SW¼SW¼ S10,T32N,R23E	167	–	–	178	–	73	2.0	1560	110	90	0	–	2100	–	–	–	–	–	7.6	Grose & Keller, 1975b
spring G-18 SE¼SW¼SW¼ S10,T32N,R23E	136	–	–	186	–	73	2.5	1560	135	84	0	–	2230	–	–	–	–	7600	8.3	Grose & Keller, 1975b
spring G-19 SE¼SW¼SW¼ S10,T32N,R23E	208	–	–	174	–	95	1.0	1610	140	–	0	–	2100	–	–	–	–	–	7.4	Grose & Keller, 1975b

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
WASHOE COUNTY (continued)																				
spring G-22 SE¼SW¼SW¼ S10,T32N,R23E	132	–	–	180	–	75	2.5	1800	128	88	0	–	2400	–	–	–	–	–	8.2	Grose & Keller, 1975b
"spring" G-23 SE¼SW¼SW¼ S10,T32N,R23E	95	–	–	174	–	150	12	1900	270	10	0	1350	4950	–	–	–	–	27600	4.5	Grose & Keller, 1975b
	Remarks: H_2S = 0.5; from mud vent.																			
spring G-24 SE¼SW¼SW¼ S10,T32N,R23E	200	–	–	172	–	73	2.0	1590	135	66	0	360	2880	–	–	–	–	7800	7.6	Grose & Keller, 1975b
spring G-27 SE¼SW¼SW¼ S10,T32N,R23E	145	–	–	176	–	75	2.2	1590	148	82	0	–	2180	–	–	–	–	–	7.8	Grose & Keller, 1975b
spring G-28 SE¼SW¼SW¼ S10,T32N,R23E	204	–	–	172	–	68	2.4	1560	134	156	0	410	2180	–	–	–	–	7620	7.1	Grose & Keller, 1975b
spring NE¼S15,T32N,R23E	145	–	–	182	–	74	1.0	1380	130	74	0	356	1915	–	–	–	–	–	7.6	Grose & Keller, 1975b
Gerlach Hot Springs (Great Boiling Spring) NW¼NW¼S15,T32N,R23E	–	–	–	135	–	102	26	1476	–	227	0	353	2016	–	–	–	4135	–	–	Sinclair, 1963b
Gerlach Hot Springs NW¼NW¼S15,T32N,R23E	188-194	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 38
Gerlach Hot Springs NW¼NW¼S15,T32N,R23E	boiling	200	7May40	199	–	67	5	1576		97	0	363	2146	–	–	–	4486	–	–	Adams, 1944
	Remarks: Fe + Al = tr.																			
Great Boiling Spring NW¼S15,T32N,R23E	187	–	1973	165	–	68	1.2	1400	130	83	<1	400	2200	4.5	–	9.9	–	7610	7.2	Mariner & others, 1974
	Remarks: Li = 1.6.																			
spring NW¼S15,T32N,R23E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
	Remarks: Al = 0.011, N = 0.80, P = 0.10, As = 0.05, Br = 6, I = 0.01, Rb = 0.94, Ce = 0.3, Sr = 2.6, Fe = 0.02, Mn = 0.03, Cu = 0.08, Hg <0.0001, δD(‰) = −100.5, $δO^{18}$(‰) = −10.83.																			
Gerlach Hot Springs NE¼NW¼NW¼ S15,T32N,R23E	183	–	19Feb74	170	0.09	89	0.98	1548	113	91	0	385	2238	5.5	0.7	–	4596	7830	8.1	Sanders & Miles, 1974
	Remarks: PO_4 = 0.2, NH_4 = 0.6, Ag <0.02, As = 3.3µg/l, Ba <0.04, Be <0.005, Bi <0.1, Cd = .01, Cr <0.02, Cs = 4.76, Cu <0.01, Hg = 0.7µg/l, Li = 3.52, Mn = .018, Ni = .05, Pb = .06, Rb = 1.73, Sb = 0.3, Se <1.0µg/l, Sn <0.05, Sr = 0.408, Zn = 0.135. Springs are 1 mile NW of Gerlach. Many springs. Water used for bathing.																			
Gerlach Hot Springs NW¼NW¼S15,T32N,R23E	203	50	6Aug47	–	–	–	–	–	–	–	–	–	2136	–	–	–	–	6850	7.1	White, 1955b
spring G-37 NE¼NW¼NW¼ S15,T32N,R23E	149	–	–	192	–	70	2.2	1420	133	–	0	–	2340	–	–	–	–	–	7.8	Grose & Keller, 1975b
spring G-43 NE¼NW¼NW¼ S15,T32N,R23E	114	–	–	172	–	69	2.3	1760	130	–	0	356	2230	–	–	–	–	–	6.8	Grose & Keller, 1975b
spring G-46 NE¼NW¼NW¼ S15,T32N,R23E	183	–	–	172	–	96	2.3	1360	136	83	0	400	2350	4.8	–	10	–	7600	7.7	Grose & Keller, 1975b
spring G-55 NE¼NW¼NW¼ S15,T32N,R23E	172	–	–	180	–	73	2.3	1600	140	–	0	360	2130	–	–	–	–	–	7.0	Grose & Keller, 1975b
Hughes well SE¼S15,T32N,R23E	142	15	6Aug47	–	–	–	–	–	–	–	–	–	1996	–	–	–	–	6600	7.3	White, 1955b
	Remarks: Flowing (1947).																			
well S15(?),T32N,R23E	70	–	6Aug47	–	–	–	–	–	–	–	–	–	2004	–	–	–	–	6600	7.2	White, 1955b
	Remarks: ¾ mi east of Gerlach Hot Springs.																			
spring MS-13 NE¼SW¼S16,T32N,R23E	108	–	–	172	–	50	2.3	1600	131	–	0	–	2400	–	–	–	–	–	7.2	Grose & Keller, 1975b
spring MS-2 NE¼(?)SE¼ S16,T32N,R23E	149	–	–	172	–	75	2.8	1530	135	–	0	–	2100	–	–	–	–	–	8.2	Grose & Keller, 1975b
spring MS-1 NE¼SE¼S16,T32N,R23E	165	–	–	172	–	174	2.5	1540	134	–	0	–	2075	–	–	–	–	–	7.2	Grose & Keller, 1975b
spring MS-9 NW¼SE¼S16,T32N,R23E	184	–	–	165	–	73	2.4	1470	143	–	0	290	2130	–	–	–	–	–	7.0	Grose & Keller, 1975b

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
WASHOE COUNTY (continued)																				
spring SE¼S16,T32N,R23E	153	–	14Oct66	–	–	66	8.1	1510		126	0	400	2100	–	–	–	–	6800	7.9	Glancy & Rush, 1968; Waring, 1965, No. 39
spring SE¼S16,T32N,R23E	153	–	14Oct66	–	–	66	8.1	510		–	–	400	100	–	–	–	–	–	–	CWRR, 1973
"pool" S16,T32N,R23E	80	0	6Aug47	–	–	–	–	–	–	–	–	–	4500	–	–	–	–	15740	6.3	White, 1955b
Remarks: Sample from an inactive mud volcano 500 ft northeast of the geyser pool.																				
[262] Buffalo Spring S6(?),T31N,R20E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Russell, 1885; Waring, 1965, No. 42
[263] Rotten Egg Spring S2(?),T29N,R19E	92	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 44
Remarks: Water smells strongly of H_2S.																				
[264] Round Hole Spring S26(?),T29N,R19E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 45; Russell, 1885
Remarks: Also several flowing wells. Reference gives location as S31.																				
Buckbrush Spring T29N,R19E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 43
Remarks: There is also a spring with this name in S12,T28N,R21E, but it is not known if it is the spring referred to in the reference.																				
[265] San Emidio Desert (Mud Flat)																				
wells S9,T29N,R23E	boiling	–	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	T. A. Alberg, written communication, Aug 75
Remarks: Steam and hot water encountered at 25–87 ft in several wells.																				
[266] Jack Bonham Ranch well NE¼S12,T28N,R19E	74	–	13Sep66	–	–	37	2.3	815		155	0	528	849	–	–	–	–	3490	8.0	Glancy & Rush, 1968
Remarks: Ranch now owned by David Beyers (July 1978).																				
Ross Spring S7(?),T28N,R20E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 46; Russell, 1885
Remarks: Possibly near the Bonham Ranch.																				
[267] spring S26,T28N,R23E	187	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hose & Taylor, 1974
Remarks: Boiling spring of Waring.																				
Boiling Spring SW¼NE¼NE¼ S34,T28N,R23E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 50; Kumiva Peak 15-minute quad
[268] Fish Spring SE¼SE¼S19,T26N,R19E	73	–	27Jul66	–	–	3.0	3.0	78		179	–	–	18	–	–	–	–	328	8.0	Rush & Glancy, 1967; Waring, 1965, No. 48
[269] The Needle Rocks																				
spring? S12,T26N,R20E	141	–	Aug75	110	–	198	0.3	1040	120	110	0	350	1760	–	–	–	3770	5800	7.8	Grose & Keller, 1975b
Remarks: H_2S = 2.																				
well? S12,T26N,R20E	180	–	Aug75	117	–	163	0.1	1040	120	50	0	335	1950	–	–	–	4615	7100	7.4	Grose & Keller, 1975b
Remarks: H_2S = 0.																				
Western Geothermal Inc. Needles No. 2(?) well CW½NE¼S12,T26N,R20E	191	–	Dec71	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	L. Garside, unpublished data
Remarks: Geothermal exploration well. Depth – ±4000 ft. Temperature of water escaping from capped well.																				
spring NE¼NW¼S12,T26N,R20E	208	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 49
Western Geothermal Needles No. 1 well NW¼SW¼SW¼ S6,T26N,R21E	133	–	1973	110	–	260	0.1	1100	160	24	0	340	1900	3.0	–	6.1	–	6200	8.4	Mariner & others, 1974; The Needle Rocks 7½-minute quad
Remarks: Unsurveyed (projected from west). Li = 0.61.																				
Western Geothermal Needles No. 1 well NW¼SW¼SW¼ S6,T26N,R21E	∿240	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Koenig, 1970
Remarks: Depth – 5888 ft; steam and hot water encountered, but further tests were disappointing; water at well head was 140°F (Dec 71).																				
The Needles Spring NW¼SW¼SW¼ S6,T26N,R21E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	The Needle Rocks 7½-minute quad
Western Geothermal Needles No. 1 well NW¼SW¼SW¼ S6,T26N,R21E		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
Remarks: Al = 0.018, N = 0.20, P = 0.04, As = 0.02, Br = 10, I = 0.3, Rb = 0.19, Ce = 0.2, Sr = 0.06, Cu = 0.01, Hg <0.0001, δD(‰) = –106.5, δO^{18}(‰) = –6.33. Unsurveyed, projected from west.																				
Western Geothermal Needles No. 1 well SE¼SE¼S6,T26N,R21E	153	50	12Oct73	95	0.02	282	0.1	1080	31	11.5	0	338	1841	3	<0.1	–	3676	6072	8.1	Sanders & Miles, 1974
Remarks: Li = 0.76, NH_4 <0.1, PO_4 <0.1, As = 1.1µg/l, Ba = 0.5, Be <0.005, Cu <0.01, Pb <0.02, Mn <0.01, Sr = 4.2, Zn = 0.02, Ni <0.02, Cd = 0.006, Cr <0.02, Mg = .12, Ag <0.01, Bi <0.10, Cs = 4.17, Hg <0.1µg/l, Li = .76, Rb = .80, Sb = <0.1, Se = <1.0µg/l, Sn = <0.02. North end of Pyramid Lake; north–south fault in lake sediments; associated tufa deposits; continuous geyser.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
WASHOE COUNTY (continued)																				
Western Geothermal Needles No. 1 (steam geyser) well S6,T26N,R21E	151	–	Aug75	110	–	260	0.1	1100	160	22	0	340	1880	3.0	–	6.1	4225	6500	8.4	Grose & Keller, 1975b
Remarks: H_2S = 0.																				
spring(?) S7,T26N,R21E	150	–	Aug75	82	–	315	0.4	1150	280	100	0	330	1850	–	–	–	4680	7200	7.6	Grose & Keller, 1975b
Remarks: H_2S = 2.																				
spring T28N(?),R21E	hot	–	–	147	–	272	5	1661		78	0	255	2693	–	–	–	5170	–	–	Adams, 1944; Waring, 1965, No. 47
Remarks: Fe + Al = tr; several springs. Probably in T26N.																				
Pyramid Island Hot Spring SW¼NW¼S3,T24N,R22E	–	–	Mar72	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	L. Garside, unpublished data
Remarks: Steam issues from a small crack in the rock about 60 ft above the level of Pyramid Lake on the west face of Pyramid Island; a small amount of water flows from the crack.																				
Anaho Island Spring S16(?),T24N,R22E	120	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 52
Remarks: On Anaho Island.																				
[*] Spring SE¼S10,T26N,R23E	63	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 51; unpublished data
Remarks: Along west shore of Winnemucca Lake. Exact location unknown. *Not shown on Plate 1.																				
[270] spring E½S22,T23N,R20E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Sutcliff 15-minute quad; Reno 1 x 2 degree sheet
[271] Cottonwood Spring S26,T23N,R21E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 53
Remarks: Location uncertain.																				
[272] McCulloch Corp. well SE¼NW¼S7,T22N,R21E	110	–	31Mar67	–	–	16	1	154		56	8	168	114	3	2	–	788	–	8.9	CWRR, 1973
[273] spring S21(?),T21N,R24E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 54
Remarks: Location uncertain; in Dead Ox Canyon 12 mi south of Nixon.																				
[*] Well SW¼S23,T20N,R19E	140	–	5Feb58	–	–	50	25	–	–	160	–	126	7.5	–	–	–	–	–	–	Bateman & Scheibach, 1975
Remarks: Temperature probably incorrect (probably 60°F). *Not shown on Plate 1.																				
[*] Well SW¼S27,T20N,R20E	113	–	28Aug60	–	–	54	12.7	77	–	205	–	110	27	–	–	–	486	–	7.7	Bateman & Scheibach, 1975
Remarks: Temperature probably incorrect (probably 45°F). *Not shown on Plate 1.																				
[274] Wedekind Mine																				
Wedekind shaft SW¼S28,T20N,R20E	hot	–	1903	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Morris, 1903
Remarks: Hot, acid water encountered at 213 ft.																				
[275] Lawton Hot Springs																				
spring S13,T19N,R18E	120	250	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 55
spring SW¼NE¼S13,T19N,R18E	120	–	11Feb58	46	0	6.2	0.1	117	5.4	12	20	144	57	2.5	0	1.3	361	625	9.0	Cohen & Loeltz, 1964
Remarks: Al = 0.1, Mn = 0, Li = 0.5, U = 0.1 ppb.																				
spring S13,T19N,R18E	120	–	–	46	–	8	0.9	121		16	18	137	68	–	–	–	429	–	–	Adams, 1944
Remarks: Fe + Al = 2.																				
artesian well S13,T19N,R18E	140	–	5May70	–	0.15	8	–	130		61	16	165	57	2.9	0.4	–	400	–	9.1	R. B. Scheibach, written communication, 1975
Remarks: As = 0.10.																				
[276] well S17,T19N,R18E	78	–	9Aug71	–	–	–	–	–	–	–	–	–	5	–	1	–	–	–	7.0	CWRR, 1973
Remarks: Depth – 32 ft; PO_4 = 0.11.																				
[277] Moana Hot Springs area																				
well SW¼SW¼SE¼ S4,T19N,R19E	72	–	9Aug60	32	–	26	6.2	55	–	110	12	84	8	0.2	–	–	333	–	8.6	Bateman & Scheibach, 1975
Remarks: Depth – 582 ft.																				
Sierra Pacific well SW¼NW¼S13,T19N,R19E	86	–	26Jun31	55	tr	39	12	148		193	0	258	30	–	–	–	648	–	–	Cohen & Loeltz, 1964; White, 1964a
Remarks: Depth – 785 ft; Al = tr.																				
Washoe Oil & Development Co. No. 1 well SE¼S21,T19N,R19E	>90	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Anderson, 1909
Remarks: Depth – 1890 ft; an artesian flow of hot water was reported at 1200 ft; the water rose to within 200 ft of the surface; the well was almost entirely in the lacustrine and fluvatile sediments of the Pliocene Coal Valley Formation. Mud from the bottom of the well (an oil test) was brought up through cold water in a bailer and still had a temperature of over 90°F.																				
well SW¼NE¼S22,T19N,R19E	74	–	13Feb58	41	0.04	51	7.1	23	2.6	156	0	48	22	0.4	8.5	–	307	436	8.1	Cohen & Loeltz, 1964
Remarks: Depth – 184 ft; Al = 0, Mn = 0, Li = 0.4, U = 2.9 ppb.																				
Al Koenig well SW¼SW¼S22,T19N,R19E	94	–	31Oct58	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Nevada Division of Water Resources, unpublished well drilling report
Remarks: Depth – 460 ft; chief aquifer 325–350 ft.																				

WASHOE COUNTY (continued)

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
Al Koenig well SW¼SW¼S22,T19N,R19E	87	–	20Jan59	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Nevada Division of Water Resources, unpublished well drilling report
Remarks: Depth 500 ft; chief aquifer 335–363 ft.																				
well SE¼SW¼S22,T19N,R19E	87	–	8Aug46	41	–	336	112	500		378	0	1959	26	–	–	–	3306	–	–	Cohen & Loeltz, 1964
Remarks: Depth – 270 ft.																				
Jack Horgan well SW¼SE¼S22,T19N,R19E	72	–	6May55	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Nevada Division of Water Resources, unpublished well drilling report
Remarks: Depth – 150 ft.																				
Crano well NE¼SE¼S23,T19N,R19E	99	–	20May58	79	0.77	21	4.1	199	3.7	211	0	325	32	1.5	2.0	0.74	856	1210	7.9	Cohen & Loeltz, 1964
Remarks: Depth – 103 ft; Al = 0, Mn = 0, Li = 0.8, U = 3.5 ppb; formerly used for domestic hot water.																				
Country Club well SW¼SE¼S23,T19N,R19E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
Remarks: Depth – 140 ft.																				
Mark Twain Motel well NE¼NW¼NW¼ S24,T19N,R19E	108	–	–	57.8	–	15.8	1.5	175	6.0	131	–	258	31	0.75	–	0.75	679	942	8.0	Bateman & Scheibach, 1975
Remarks: Depth – 900 ft; As = 1.3, Li = 1.2. Used for motel and pool heating; artesian when drilled in 1953.																				
Pepper Mill Motel well NE¼NW¼NE¼NW¼ S24,T19N,R19E	117	–	–	85.4	–	5.2	0.3	139	7.4	136	–	171	20	0.81	–	0.76	567	724	8.1	Bateman & Scheibach, 1975
Remarks: As = 0.10, Li = 0.17. Used for motel heating.																				
Nevada Lakeshore Co., Inc. well NW¼SE¼SW¼NW¼ S24,T19N,R19E	hot	–	26Jun70	–	0.06	11	3	153		154	12	206	23	0.68	–	–	568	–	8.3	R. B. Scheibach, written communication, 1975
Remarks: Depth – 1125 ft; As = 0.05.																				
Nevada Lakeshore Co., Inc. well NW¼SE¼SW¼NW¼ S24,T19N,R19E	138	–	–	85.8	–	5.7	0.4	155	6.5	144	–	227	26	0.5	–	0.6	650	886	7.8	Bateman & Scheibach, 1975
Remarks: Depth – 1006 ft; As = 0.01, Li = 0.18; used for domestic hot water.																				
well SW¼SE¼SE¼ S24,T19N,R19E	118	–	18Jan58	–	–	19.2	0.97	182	–	119	–	294	31	–	–	–	646	–	7.4	Bateman & Scheibach, 1975
Moffat well NW¼NE¼S25,T19N,R19E	107	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
Remarks: Depth – 662 ft.																				
Moffat well NW¼NE¼S25,T19N,R19E	105	–	–	–	–	–	–	–	–	–	–	–	26	–	–	–	–	836	7.9	White, 1968
Remarks: Depth – 500 ft.																				
Moana Springs well NE¼NW¼S25,T19N,R19E	127	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
Remarks: Depth – 571 ft.																				
Moana Springs well NE¼NW¼S25,T19N,R19E	124+	–	–	–	–	–	–	–	–	–	–	–	28	–	–	–	–	832	8.1	White, 1968
well SE¼NW¼S25,T19N,R19E	112	–	9Jul47	27	tr	38	10	128		139	17	225	32	–	–	–	528	–	–	Cohen & Loeltz, 1964
Remarks: Depth – 95 ft; Al = tr.																				
well NE¼NW¼S25,T19N,R19E	96	–	11Feb58	97	0.03	16	0.7	130	2.6	165	0	153	16	4.5	0.5	–	532	697	8.0	Cohen & Loeltz, 1964
Remarks: Depth – 67 ft; Al = 0, Mn = 0.01, Li = 0.8, U = 0.6 ppb.																				
well NE¼NW¼S25,T19N,R19E	114	–	11Feb58	86	–	15	0.1	150	8.2	134	–	221	24	2.1	–	–	641	792	7.9	Bateman & Scheibach, 1975
Remarks: Depth – 700 ft; Li = 0.7; formerly used to heat Moana swimming pool.																				
old Van Slyck well SE¼NW¼S25,T19N,R19E	92	–	Apr74	50	–	121	1.0	127	5.5	159	–	156	17	2.9	–	0.9	532	725	8.1	Bateman & Scheibach, 1975
Remarks: Depth – 77 ft; As = 0.04, Li = 0.07.																				
Van Slyck well SE¼NW¼S25,T19N,R19E	92	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
Remarks: Depth – 77 ft.																				
Smith well NW¼NW¼S25,T19N,R19E	90	–	–	–	–	–	–	–	–	–	–	–	29	–	–	–	–	944	7.3	White, 1968
Remarks: Depth – 60 ft.																				
Randall well SE¼NW¼S25,T19N,R19E	114	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
Remarks: Depth – 260 ft.																				
Randall well SE¼NW¼S25,T19N,R19E	114	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
Remarks: Depth – 111 ft.																				
Johnson well SE¼NW¼S25,T19N,R19E	112	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
Remarks: Depth – 95 ft.																				
well CN½S25,T19N,R19E	75	–	11Jan63	–	0.03	14.4	0.98	97		181	0	72	20	3.8	tr	–	505	–	7.9	R. B. Scheibach, written communication, 1975
Remarks: Depth – 86 ft.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
WASHOE COUNTY (continued)																				
Clark well NW¼NW¼NW¼SW¼ S25,T19N,R19E	146	–	–	93	–	16	0.41	189	5.5	131	–	305	33	4.2	–	1.4	780	1035	8.1	Bateman & Scheibach, 1975
	Remarks: Depth – 225 ft; As = 0.11, Li = 0.14; used for apartment and pool heating.																			
Pecknam well NE¼SE¼S25,T19N,R19E	76	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 700 ft.																			
University Farm well SW¼SE¼S25,T19N,R19E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 500 ft.																			
Moana Hot Springs S25,T19N,R19E	100-200	–	–	97	–	21	2	167		126	0	264	34	–	–	–	661	–	–	Adams, 1944; Waring, 1965, No. 55A
	Remarks: Fe + Al = 2, hot waters utilized locally for bathing.																			
Frey well SE¼NE¼S26,T19N,R19E	180+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 464 ft.																			
Yates well SE¼NE¼S26,T19N,R19E	168	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 197.5 ft.																			
Yates well SE¼NE¼S26,T19N,R19E	160	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 168 ft.																			
Yates well SE¼NE¼S26,T19N,R19E	160	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 184 ft.																			
Moana well SE¼NE¼S26,T19N,R19E	196+	–	–	–	–	–	–	–	–	–	–	–	52	–	–	–	–	1320	7.9	White, 1968
Moana well SE¼NE¼S26,T19N,R19E	191	–	–	–	–	–	–	–	–	–	–	–	55	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 179 ft.																			
Erskine well SW¼NE¼S26,T19N,R19E	78	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 155 ft.																			
Martie well NE¼NE¼S26,T19N,R19E	170	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 600 ft.																			
Kimberly well NE¼NE¼S26,T19N,R19E	106	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 155 ft.																			
Parragari well SE¼SW¼NE¼ S26,T19N,R19E	180	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
	Remarks: Depth – 635 ft; used for home heating.																			
Brown well NE¼SW¼SE¼NE¼ S26,T19N,R19E	187	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
	Remarks: Depth – 200 ft; well is artesian and used for home heating.																			
Hobson well NE¼SE¼NE¼ S26,T19N,R19E	185	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	R. B. Scheibach, written communication, 1975
	Remarks: Used for home heating.																			
King well SW¼SW¼SE¼NE¼ S26,T19N,R19E	176	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
	Remarks: Depth – 225 ft; used for home heating.																			
well NE¼SE¼SE¼NE¼ S26,T19N,R19E	176	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
	Remarks: Depth – approx. 200 ft; used for home heating.																			
King well SW¼SW¼SE¼NE¼ S26,T19N,R19E	185	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
	Remarks: Depth – 210 ft; used for home heating.																			
Sigi well SE¼SW¼NE¼ S26,T19N,R19E	140	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
	Remarks: Depth – 250 ft; used for home and swimming pool heating.																			
Etnyre(?) well SE¼NW¼SE¼NE¼ S26,T19N,R19E	185	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
	Remarks: Depth – approx. 200 ft; formerly used for pool heating.																			
McCulloch well NW¼SW¼SE¼NE¼ S26,T19N,R19E	185	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
	Remarks: Depth – 360 ft; used for home and pool heating.																			
Edmiston well SW¼NW¼SE¼NE¼ S26,T19N,R19E	185	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
	Remarks: Depth – 300 ft; used for pool heating.																			

WASHOE COUNTY (continued)

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
Helms well NE¼SE¼SW¼NE¼ S26,T19N,R19E Remarks: Warm water well used for pool heating.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
DeGiovanni well NE¼NW¼SE¼NE¼ S26,T19N,R19E Remarks: Depth – 265 ft; used for home heating.	176	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	R. B. Scheibach, written communication, 1975
Clark well NE¼SW¼SE¼NE¼ S26,T19N,R19E Remarks: Depth – 204 ft; used for home heating.	185	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
Berrum well SW¼SE¼SE¼NE¼ S26,T19N,R19E Remarks: Depth – 170 ft; was used to heat Moana swimming pool, now used for home heating.	185	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
Glatly well NE¼NW¼SE¼NE¼ S26,T19N,R19E Remarks: Depth – 201 ft; used for home heating.	180	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
Hill well NW¼SE¼SE¼NE¼ S26,T19N,R19E Remarks: Depth – 197 ft; used for home heating.	185	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
Drendel well SW¼SE¼NE¼ S26,T19N,R19E Remarks: Depth – 180 ft; used for home heating.	171	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
Arbico well SW¼SE¼NE¼ S26,T19N,R19E Remarks: Depth – 318 ft; used for home heating.	185	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
Matley well SE¼NE¼S26,T19N,R19E Remarks: Depth – 250 ft.	hot	–	16Jul73	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Nevada Division of Water Resources, unpublished well drilling report
Gibbons well NE¼SE¼SE¼NE¼ S26,T19N,R19E Remarks: Depth – 310 ft; As = 0.2; used for home heating.	172	–	–	103	–	25	0.26	293	8.1	101	–	465	53	6.3	–	1.2	1057	1320	8.2	Bateman & Scheibach, 1975
Etcheberry well NE¼SE¼NE¼ S26,T19N,R19E Remarks: Depth – 464 ft; As = 0.11, Li = 0.18; artesian well, used for home heating.	185	–	–	92	–	22	0.8	259	7.2	99	–	478	53	4.8	–	2.1	1012	1430	7.8	Bateman & Scheibach, 1975
DeGiovanni well NE¼SE¼NE¼ S26,T19N,R19E Remarks: Depth – 245 ft; As = 0.01, Li = 0.19.	185	–	–	111	–	14	0.2	243	7.7	97	–	448	54	5.1	–	1.9	984	1423	8.4	Bateman & Scheibach, 1975
Upton well NE¼NE¼SE¼NE¼ S26,T19N,R19E Remarks: Depth – 247 ft; As = 0.06, Li = 0.19.	184	–	–	114	–	13	0.2	266	7.6	108	–	463	54	5.1	–	2.1	1033	1454	8.3	Bateman & Scheibach, 1975
old Yates well SE¼SE¼SE¼NE¼ S26,T19N,R19E Remarks: Depth – 150 ft; As = 0.1, Li = 0.19; used for apartment and pool heating.	194	–	–	102	–	23.4	0.21	243	7.4	86	–	457	50	4.8	–	2.0	975	1367	8.3	Bateman & Scheibach, 1975
Terrill well SW¼SW¼SE¼NE¼ S26,T19N,R19E Remarks: Depth – 230 ft; As = 0.04, Li = 0.16; used for home heating.	194	–	–	135	–	29	0.79	203	7.4	146	–	348	42	4.8	–	1.8	918	1185	7.7	Bateman & Scheibach, 1975
McKenzie well SE¼SW¼SE¼NW¼ S26,T19N,R19E Remarks: Depth – 750 ft; used for home and pool heating.	185	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
Isbell well SW¼NE¼NE¼SW¼ S26,T19N,R19E Remarks: Depth – 360 ft; used for home and pool heating.	199	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
Morrey well NE¼SW¼SW¼ S26,T19N,R19E Remarks: Depth – 660 ft; used for home heating.	180	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
well SW¼SE¼S26,T19N,R19E Remarks: Depth – 750 ft; Al = tr.	180	–	25Oct39	95	tr	33	9.0	241		88	tr	478	52	–	–	–	980	1327	7.9	Cohen & Loeltz, 1964
well NW¼NW¼SE¼ S26,T19N,R19E Remarks: Depth – approx. 100 ft; used for home heating.	149	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975

WASHOE COUNTY (continued)

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
Quadrio well SE¼NE¼NW¼SE¼ S26,T19N,R19E	198	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
	Remarks: Depth – 98 ft; well is artesian and is used for home heating.																			
Miles well NW¼NW¼NE¼SE¼ S26,T19N,R19E	140	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	R. B. Scheibach, written communication, 1975
	Remarks: Depth – 75 ft, used for home heating.																			
Moore well NE¼NW¼NE¼SE¼ S26,T19N,R19E	176	–	18Feb74	104	–	20	0.3	248	7.1	95	–	419	53	4.9	–	1.7	959	1070	7.5	Bateman & Scheibach, 1975
	Remarks: Depth – 198 ft; As = 0.09, Li = 0.22; used for home heating.																			
Campbell well SW¼SE¼S26,T19N,R19E	180+	–	–	–	–	–	–	–	–	–	–	–	48	–	–	–	–	1327	7.9	White, 1968
	Remarks: Depth – 750 ft.																			
Kelty well NW¼SE¼S26,T19N,R19E	204	–	–	–	–	–	–	–	–	–	–	–	48	–	–	–	–	1384	8.3	White, 1968
	Remarks: Depth – 104 ft.																			
Kelty well NE¼SE¼S26,T19N,R19E	196	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 200 ft.																			
Biglin well NW¼SW¼NE¼SE¼ S26,T19N,R19E	185	–	–	106	–	23	0.08	236	8.0	86	–	455	48	5.1	–	1.9	969	1345	8.0	Bateman & Scheibach, 1975
	Remarks: Depth – 150 ft; As = 0.11, Li = 0.19. Artesian well, used for home heating.																			
Guisti well SW¼SW¼NE¼NE¼ S27,T19N,R19E	167	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bateman & Scheibach, 1975
	Remarks: Depth – 850 ft; used for home heating.																			
well NE¼NE¼NW¼ S36,T19N,R19E	82	–	4Jun62	–	–	21	5.8	58	–	185	–	29	11	–	–	–	309	–	7.3	Bateman & Scheibach, 1975
Willis well S25,36,T19N,R19E	82	–	14May62	–	–	21	5.9	58		185	0	29	11	–	5	–	365	–	7.3	R. B. Scheibach, written communication, 1975
	Remarks: Depth – 110 ft. 700-block, Hash Lane.																			
J. R. Martie well T19N,R19E	hot	–	20Jan38	–	–	36	6	128	–	112	–	553	52	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
	Remarks: Located at Frey Lane, Reno.																			
well SE¼SW¼SE¼ S6,T19N,R20E	72	–	12Oct68	56	–	38	12	35	–	128	–	98	4	0.6	–	–	379	410	7.9	Bateman & Scheibach, 1975
	Remarks: Depth – 550 ft.																			
well SE¼NW¼S8,T19N,R20E	74	–	24Jul59	39	tr	22	3.9	43		116	0	57	7.0	–	–	–	313	325	8.0	Cohen & Loeltz, 1964
	Remarks: Depth – 752 ft; Al = tr.																			
well NW¼SE¼SE¼ S8,T19N,R10E	72	–	21Nov66	41	–	8	2	126	–	165	–	149	8	0.8	–	–	500	616	7.6	Bateman & Scheibach, 1975
	Remarks: Depth – 621 ft.																			
well NW¼NW¼S17,T19N,R20E	75	–	4Aug59	–	0.3	15	6.3	157		200	0	204	21	–	–	–	551	796	8.1	Cohen & Loeltz, 1964
	Remarks: Depth – 1025 ft (sample collected with screen set at 753–763 ft below surface; packer at 745 feet below land surface).																			
well NW¼NW¼S18,T19N,R20E	70	–	22May59	10	0.2	4.8	0.7	69		104	0	70	5.0	–	–	–	85	321	8.3	Cohen & Loeltz, 1964
	Remarks: Depth – 660 ft.																			
well NW¼SE¼S18,T19N,R20E	70	–	27Aug60	18	–	4.2	1.2	80	–	122	0	78	5	0.3	–	–	309	375	8.1	Bateman & Scheibach, 1975
	Remarks: Depth – 685 ft.																			
well SW¼NE¼S27,T19N,R20E	72	–	13Jan58	88	–	107	41	160	21	241	–	225	264	0.2	–	–	1148	1600	7.4	Bateman & Scheibach, 1975
	Remarks: Depth – 650 ft; Li = 0.2.																			
well SW¼NW¼S30,T19N,R20E	76	–	13Jan58	94	0.35	18	0.3	170	9.5	116	0	280	30	2.5	0.5	49	665	917	7.8	Cohen & Loeltz, 1964
	Remarks: Depth – 600 ft; Al = 0.1, Mn = 0.03, Li = 0.4, U = 0.2 ppb.																			
Fife well SW¼SW¼S30,T19N,R20E	80	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1964a
	Remarks: Depth – 400 ft.																			
Newton well SW¼NW¼S30,T19N,R20E	84+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1964a
	Remarks: Depth – 360 ft.																			
[278] Steamboat Hot Springs area																				
Huffaker Springs S3,T18N,R20E	79-81	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 55B
	Remarks: Several springs on bank of creek, 5 miles southeast of Moana bathing resort.																			
Huffaker Spring SW¼NE¼S3,T18N,R20E	81	5	–	–	–	–	–	–	–	–	–	–	420	–	–	–	–	–	7.1	White, 1964a
well NW¼NE¼S6,T18N,R20E	71	–	20Aug68	62	–	14	4	45	–	154	–	18	2	0.2	–	–	299	213	7.9	Bateman & Scheibach, 1975
	Remarks: Depth – 504 ft.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
WASHOE COUNTY (continued)																				
Double Diamond Spring SE¼NW¼S9,T18N,R20E	84	20	–	–	–	–	–	–	–	–	–	–	250	–	–	–	–	1500	7.2	White, 1964a
Christman well NW¼SE¼S12,T18N,R19E	70	–	–	–	–	–	–	–	–	–	–	–	8.0	–	–	–	–	256	7.8	White, 1964a
Remarks: Depth – 376.5 ft.																				
well SE¼NW¼S9,T18N,R20E	86	–	8May56	115	–	19	12	262	7.4	227	–	50	313	0.3	–	12.3	1032	1508	7.9	Bateman & Scheibach, 1975
Remarks: Depth – 112 ft.																				
Double Diamond(?) well SE¼NW¼S9,T18N,R20E	84	–	–	–	–	–	–	–	–	–	–	–	310	–	–	–	–	1500	7.2	White, 1964a
Remarks: Depth – 29.3 ft.																				
well NE¼SW¼S9,T18N,R20E	72	–	8May56	111	–	3.0	2.2	147	13	151	9.0	30	128	0.4	0.2	8.2	524	752	8.5	Cohen & Loeltz, 1964
Remarks: Depth – 45 ft.																				
well SW¼SW¼S9,T18N,R20E	80	–	19May58	102	0.04	10	4.6	160	14	224	0	17	160	0.3	2.0	0.61	709	969	7.5	Cohen & Loeltz, 1964
Remarks: Depth – 84 ft, Al = 0, Mn = 0.1, Li = 3.1, U = 1.7 ppb.																				
well NW¼NW¼S14,T18N,R20E	75	–	14May58	113	0.04	63	46	313	31	264	0	151	511	0.3	0.8	0.44	1540	2320	7.5	Cohen & Loeltz, 1964
Remarks: Al = 0.1, Mn = 0, Li = 4.4, U = 2.0 ppb.																				
LeCroix well NW¼NW¼S14,T18N,R20E	87	–	–	–	–	–	–	–	–	–	–	–	680	–	–	–	–	2680	6.6	White, 1964a
Remarks: Depth – 163 ft.																				
Davidson well SW¼NW¼S14,T18N,R20E	85	–	–	–	–	–	–	–	–	–	–	–	509	–	–	–	–	2325	7.4	White, 1964a
Remarks: Depth – 60 ft.																				
well NW¼S14,T18N,R20E	72	–	24Jul73	–	–	73	23	330	28	268	–	143	490	0.21	–	–	1359	–	7.1	Bateman & Scheibach, 1975
Remarks: Depth – 103 ft.																				
well SW¼NW¼S14,T18N,R20E	71	–	14May58	79	0.36	68	43	202	24	258	0	125	360	0.2	1.0	0.66	1230	1810	7.2	Cohen & Loeltz, 1964
Remarks: Depth – 48 ft, Al = 0.1, Mn = 0.02, Li = 3.1, U = 3.3 ppb.																				
well SE¼SW¼SW¼ S14,T18N,R20E	90	–	Mar73	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Dennis Bryan, oral communication, 1973
Remarks: Depth – approx. 90 ft.																				
Dimonte Spring SW¼SE¼S16,T18N,R20E	127	70	–	–	–	–	–	–	–	–	–	–	560	–	–	–	–	2400	6.8	White, 1964a
Da Monte Springs S16,T18N,R20E	130	40	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 55D
Remarks: On bank of creek, 1.5 mile east of Zoleggi Spring.																				
well SE¼NE¼S17,T18N,R20E	72	–	8May56	96	0	3.8	0.4	79	5.9	176	9.6	6.2	6.0	1.0	15	0.88	306	369	8.4	Cohen & Loeltz, 1964
Remarks: Depth – 73 ft.																				
well SE¼NE¼S17,T18N,R20E	84	–	8May56	109	0.01	3.0	2.7	94	9.4	228	6.6	7.6	12	0.4	.15	2.1	382	457	8.3	Cohen & Loeltz, 1964
Remarks: Depth – 100 ft.																				
Zoleggi Springs S17,T18N,R20E	103	125	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 55C
Remarks: Three miles southwest of Huffaker Springs.																				
Zolezzi Spring SW¼SE¼S17,T18N,R20E	102	125	–	–	–	–	–	–	–	–	–	–	130	–	–	–	–	789	7.4	White, 1968
spring SW¼SE¼S17,T18N,R20E	94	–	14Jan58	134	0.53	9.3	2.1	130	15	224	0	17	94	0.5	3.0	–	562	729	7.6	Cohen & Loeltz, 1964
Remarks: Al = 0.1, Mn = 0, Li = 0.4, U = 2.0 ppb.																				
Zolezzi Springs well SW¼SE¼S17,T18N,R20E	114	–	–	–	–	–	–	–	–	–	–	–	86	–	–	–	–	623	7.6	White, 1968
Remarks: Depth – 99 ft.																				
well SW¼SE¼S17,T18N,R20E	114	–	22Oct48	23	tr	72	18	115		461	tr	10	82	–	–	5.0	505	–	–	Cohen & Loeltz, 1964
Remarks: Depth – 99 ft; Al = tr.																				
Hall well NW¼NE¼S20,T18N,R20E	70+	–	–	–	–	–	–	–	–	–	–	–	11.6	–	–	–	–	308	8.0	White, 1968
Remarks: Depth – 73.3 ft.																				
well SE¼SE¼S20,T18N,R20E	74	–	11Feb46	25	tr	27	8.0	4.0		102	0	21	14	–	–	–	153	–	–	Cohen & Loeltz, 1964
Remarks: Depth – 66 ft.																				
Herz well SE¼SE¼S20,T18N,R20E	74	–	–	–	–	–	–	–	–	–	–	–	6.0	–	–	–	–	282	7.8	White, 1968
Remarks: Depth – 66 ft.																				
well NE¼SW¼S21,T18N,R20E	73	–	19May58	79	0.05	19	4.6	22	5.7	126	0	5.8	6.0	0.1	9.5	0.05	221	255	7.1	Cohen & Loeltz, 1964
Remarks: Depth – 44 ft, Al = 0, Mn = 0, Li = 0.6, U >0.1 ppb.																				
McComas well NE¼SW¼S21,T18N,R20E	70	–	–	–	–	–	–	–	–	–	–	–	10.0	–	–	–	–	214	7.0	White, 1968
Remarks: Depth – 44 ft.																				
Sutherland well NE¼SW¼S21,T18N,R20E	118	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
Remarks: Depth – 55 ft.																				
Sutherland well NE¼SW¼S21,T18N,R20E	71	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
Remarks: Depth – 93 ft.																				

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
WASHOE COUNTY (continued)																				
Sutherland well NE¼SW¼S21,T18N,R20E	78	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 50 ft.																			
Sutherland well NE¼SW¼S21,T18N,R20E	86	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 55 ft.																			
well S21,T18N,R20E	hot	–	–	–	0.01	0	0	900		268	62	126	1050	2.2	–	–	2676	–	8.5	Nevada Division of Health, unpublished analysis
	Remarks: As = 3.0, Cu = 0.03.																			
C. B. Concrete well SW¼NW¼NW¼ S23,T18N,R20E	105	–	8Apr73	–	–	–	–	–	–	–	–	–	–	–	–	–	≈2000	–	–	L. Garside, unpublished data
	Remarks: Depth – 101 ft; perforated 76–96 ft.																			
well SW¼NW¼S23,T18N,R20E	106	–	–	152	–	44	12.4	318	27	306	–	147	337	–	–	22.1	1367	1837	7.1	Bateman & Scheibach, 1975
	Remarks: As = 0.28.																			
well NW¼S27,T18N,R20E	120	–	2Nov72	–	–	30	3	762	–	388	12	75	950	–	–	–	2230	–	8.3	Bateman & Scheibach, 1975
	Remarks: Depth – 115 ft; As = 0.64.																			
McKnight well NE¼SW¼S27,T18N,R20E	83	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 192.2 ft.																			
Isbell well SW¼SW¼S27,T18N,R20E	82	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 134.7 ft.																			
well SW¼SE¼S27,T18N,R20E	85	–	29Mar59	38	0.74	114	36	100	5.8	148	0	508	6.2	0.1	0	0.06	929	1200	7.6	Cohen & Loeltz, 1964
	Remarks: Depth – 195 ft; Al = 0.6, Mn = 0, U = 0.2 ppb.																			
well SE¼SE¼SE¼ S27,T18N,R20E	104	–	25Aug59	–	–	98	43	112	–	158	–	504	7	–	–	–	927	–	7.3	Bateman & Scheibach, 1975
well SW¼SE¼S33,T18N,R20E	167	–	–	4.7	–	2.0	0.4	69	6.8	146	19	2.3	8.4	–	–	0.1	182	348	9.0	Bateman & Scheibach, 1975
	Remarks: Depth – 258 ft.																			
well NW¼SE¼S33,T18N,R20E	198	–	–	222	–	3.9	0.5	605	56	191	104	105	747	1.8	–	24	2066	–	8.6	Bateman & Scheibach, 1975
	Remarks: As = 0.4, Li = 6.0.																			
Knox well NE¼SE¼S33,T18N,R20E	86	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 56 ft.																			
Carver well NW¼SE¼S33,T18N,R20E	203	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 28.3 ft.																			
Steamboat 4 well NW¼SE¼S33,T18N,R20E	311	–	–	–	–	–	–	–	–	–	–	–	702	–	–	–	–	2700	–	White, 1968
	Remarks: Depth – 184 ft.																			
East Reno well SE¼NW¼S28,T18N,R20E	280	–	–	–	–	–	–	–	–	–	–	–	868	–	–	–	–	–	7.0	White, 1968
	Remarks: Depth – 156.5 ft.																			
West Reno well SE¼NW¼S28,T18N,R20E	280	–	–	–	–	–	–	–	–	–	–	–	898	–	–	–	–	–	7.5	White, 1968
	Remarks: Depth – 186 ft.																			
Reno well SE¼NW¼S28,T18N,R20E	201	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 34.3 ft.																			
well NW¼SW¼S28,T18N,R20E	293	–	1May50	299	0.01	11	1.0	640	64	337	–	94	836	2.1	–	46	2226	3150	7.6	Cohen & Loeltz, 1964
	Remarks: Depth – 200 ft; Li = 7.6.																			
Senges well NW¼SW¼S28,T18N,R20E	294	–	–	–	–	–	–	–	–	–	–	–	826	–	–	–	–	3440	6.4	White, 1968
	Remarks: Depth – 177 ft.																			
well NW¼NE¼S28,T18N,R20E	72	–	14May58	61	0.08	34	9.2	83	6.6	241	0	22	73	0.2	5.1	0.03	439	671	7.6	Cohen & Loeltz, 1964
	Remarks: Depth – 80 ft; Al = 0, Mn = 0, Li = 1.1, U = 1.6 ppb.																			
Warren well NW¼NE¼S28,T18N,R20E	99	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 63.1 ft.																			
Mount Rose 1 well NE¼NW¼S28,T18N,R20E	250	–	–	–	–	–	–	–	–	–	–	–	824	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 110 ft.																			
well SW¼SE¼NW¼ S28,T18N,R20E	167	–	2Aug60	–	–	27	11	630	–	256	–	130	805	1.55	–	–	1862	–	7.1	Bateman & Scheibach, 1975
well NE¼NW¼S28,T18N,R20E	271	–	6Mar58	121	0.01	1.4	0	660	68	172	65	130	863	2.5	2.0	17	2230	3360	8.7	Cohen & Loeltz, 1964
	Remarks: Depth – 151 ft; Al = 0, Mn = 0, Li = 10, U = 0.7 ppb.																			
Mount Rose 1 well NE¼NW¼S28,T18N,R20E	271	–	–	–	–	–	–	–	–	–	–	–	844	–	–	–	–	3400	7.4	White, 1968
	Remarks: Depth – 159.6 ft.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
									WASHOE COUNTY (continued)											
Mount Rose 1 well NE¼NW¼S28,T18N,R20E	246	–	–	–	–	–	–	–	–	–	–	–	844	–	–	–	–	3400	7.4	White, 1968
	Remarks: Depth – 133.2 ft.																			
Harold Herz 1 well NW¼NW¼S28,T18N,R20E	199	–	–	–	–	–	–	–	–	–	–	–	416	–	–	–	–	1820	7.1	White, 1968
	Remarks: Depth – 154.5 ft.																			
Harold Herz 2 well NW¼NW¼S28,T18N,R20E	193	–	–	–	–	–	–	–	–	–	–	–	400	–	–	–	–	1745	7.0	White, 1968
	Remarks: Depth – 153 ft.																			
Harold Herz 3 well NW¼NW¼S28,T18N,R20E	79	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 23.3 ft.																			
spring NE¼SW¼S33,T18N,R20E	135	–	Jul45	205	–	23	2.0	602	54	419	–	106	752	1.6	–	25	2196	–	7.7	Bateman & Scheibach, 1975
	Remarks: As = 4, Li = 6.																			
Nevada Thermal Power Co. No. 2 well SE¼SW¼S28,T18N,R20E	–	–	–	–	–	–	–	–	–	–	–	–	955	–	–	–	–	3770	8.5	White, 1968
	Remarks: Depth – 964 ft.																			
spring S28,T18N,R20E	hot	–	1888?	311	0.14	6.9	0.28	680	101	–	240	125	952	–	–	68	–	–	–	Becker, 1888
	Remarks: Al = 0; Li = 7.1; Cs, Rb = tr.																			
Mackay well NE¼S29,T18N,R20E	boiling	–	Jan75	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bruce Mackay, oral communication, 1975
	Remarks: Depth – 309 ft; boiling water stands at 100 ft.																			
well NE¼S29,T18N,R20E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bruce Mackay, oral communication, 1975
Peigh well NE¼NE¼S29,T18N,R20E	79	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 57 ft.																			
Peigh well NE¼NW¼S29,T18N,R20E	81	–	–	–	–	–	–	–	–	–	–	–	6	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 73.7 ft.																			
Peigh well SW¼NW¼S29,T18N,R20E	93	–	–	–	–	–	–	–	–	–	–	–	2.6	–	–	–	–	194	7.7	White, 1968
	Remarks: Depth – 82.2 ft.																			
well NW¼S29,T18N,R20E	74	–	30Jul71	–	–	51	10	18	–	212	–	13	6	–	–	–	310	–	8.0	Bateman & Scheibach, 1975
	Remarks: Depth – 160 ft.																			
well SW¼NW¼S29,T18N,R20E	93	–	Jun49	36	–	15	2.8	12	5.0	78	0	11	2.6	2.1	–	46	2226	3150	7.7	Cohen & Loeltz, 1964
	Remarks: Depth – 82 ft.																			
U. S. Geological Survey GS-2 well NE¼SE¼S29,T18N,R20E	309	–	–	–	–	–	–	–	–	–	–	–	564	–	–	–	–	2730	6.0	White, 1968
	Remarks: Depth – 398 ft.																			
U. S. Geological Survey GS-6 well SE¼SE¼S29,T18N,R20E	216	–	–	–	–	–	–	–	–	–	–	–	12	–	–	–	–	372	6.7	White, 1968
	Remarks: Depth – 212 ft.																			
H. Herz well NW¼NW¼S28,T18N,R20E	125	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	R. B. Scheibach, written communication, 1975
	Remarks: Depth – 120 to 170 ft; used for home heating in the past.																			
R. Hertz well S29(?),T18N,R20E	boiling(?)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	R. B. Scheibach, written communication, 1975
	Remarks: Depth – 150 ft; once used in a greenhouse.																			
Nevada Power Co. No. 3 well NW¼NE¼S32,T18N,R20E	hot	–	–	–	–	–	–	–	–	–	–	–	1080	–	–	–	–	4250	8.4	White, 1968
	Remarks: Depth – 1263 ft.																			
U. S. Geological Survey GS-7 well NW¼NE¼S32,T18N,R20E	322	–	22May52	14	–	6.0	0	9.3	4.5	–	–	24	0.5	0	tr	1.3	–	85	6.5	White, Hem & Waring, 1963
	Remarks: Depth – 402 ft; Li – 0, H_2S – 2.4; drill hole penetrated acid leached granodiorite for 112 ft, where acid water was found; high temperature steam, CO_2 and other gases found near bottom of hole.																			
Mercury well NW¼NE¼S32,T18N,R20E	217	–	–	–	–	–	–	–	–	–	–	–	600	–	–	–	–	–	7.8	White, 1968
	Remarks: Depth – 129 ft.																			
Cox well NW¼NE¼S32,T18N,R20E	203	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 93 ft.																			
Nevada Thermal Power Co. Steamboat No. 5 well NW¼NW¼S32,T18N,R20E	347	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Thompson & White, 1964
Nevada Power Co. No. 6 well NE¼NW¼S32,T18N,R20E	354	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 716 ft.																			
Nevada Power Co. No. 4 well NE¼NW¼S32,T18N,R20E	325	–	–	–	–	–	–	–	–	–	–	–	45	–	–	–	–	1950	7.2	White, 1968
	Remarks: Depth – 520 ft.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
WASHOE COUNTY (continued)																				
Reno Press Brick well NW¼NW¼S32,T18N,R20E	158	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
		Remarks: Depth – 58 ft.																		
Nevada Thermal Power Co. No. 5 well NW¼NW¼S32,T18N,R20E	325	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
		Remarks: Depth – 826 ft.																		
U. S. Geological Survey GS-7 well NW¼SE¼S32,T18N,R20E	322	–	–	–	–	–	–	–	–	–	–	–	0.5	–	–	–	–	158	6.7	White, 1968
		Remarks: Depth – 407.8 ft.																		
Cox well NW¼SE¼S32,T18N,R20E	136	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
		Remarks: Depth – 14.5 ft.																		
spring SW¼NE¼S33,T18N,R20E	hot	–	25May56	125	0	7.8	1.2	665	69	212	62	118	889	2.0	1.0	36.9	2360	3555	8.3	Cohen & Loeltz, 1964
		Remarks: Li = 8.3.																		
U. S. Geological Survey GS-8 well NW¼NE¼S33,T18N,R20E	262	–	–	–	–	–	–	–	–	–	–	–	896	–	–	–	–	3300	6.6	White, 1968
		Remarks: Depth – 121.8 ft.																		
well NW¼NE¼S33,T18N,R20E	–	–	28Sep68	235	–	2.3	0.4	770	60	300	46	121	999	2.6	–	–	2536	3661	8.7	Bateman & Scheibach, 1975
spring NW¼NE¼S33,T18N,R20E	192	–	Aug49	293	–	5	0.8	653	71	305	–	100	865	1.8	–	49	2354	–	7.9	Bateman & Scheibach, 1975
		Remarks: As = 2.7, Li = 7.6.																		
spring NE¼S33,T18N,R20E	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mariner & others, 1975
		Remarks: Al = 0.009, Rb = 0.70, Ce = 1.5, Sr = 1.9, Mn = 0.02, Cu = 0.01, Hg = 0.0005, δD(‰) = −116.7, δO^{18}(‰) = −12.16. Gas (volume %): O_2 + Ar = 2, N_2 = 6, CH_4 <1, CO_2 = 93.																		
spring NE¼S33,T18N,R20E	201	13	1973	270	–	16	0.7	680	66	364	2	73	837	2.1	–	47	–	3340	7.2	Mariner & others, 1974
		Remarks: Li = 7.5.																		
spring SE¼NW¼S33,T18N,R20E	136	–	5Feb57	205	0.08	14	1.9	644	59	328	0	142	790	2.2	0.4	2.2	2130	3240	6.7	Cohen & Loeltz, 1964
		Remarks: Al = 0, Mn = 0.05, U <0.1 ppb.																		
spring NE¼SE¼NW¼ S33,T18N,R20E	129	–	27Aug68	245	–	25	0.6	635	65	336	–	141	767	2.2	–	58	2275	2933	7.1	Bateman & Scheibach, 1975
spring NE¼NW¼S33,T18N,R20E	203	–	Jul45	317	–	12	0.5	707	75	292	20	129	949	2.2	–	30	2542	–	8.2	Bateman & Scheibach, 1975
		Remarks: As = 1.3, Li = 7.																		
spring NE¼NW¼S33,T18N,R20E	–	–	24Aug73	–	–	–	–	–	–	–	–	–	–	–	–	–	2700	–	–	D. Trexler, written communication, 1973
		Remarks: From spring on upper terrace.																		
spring 50 SW¼NW¼S33,T18N,R20E	136	5	5Feb57	79	0.08	14	1.9	644	59	328	0	142	790	2.2	0.4	2.2	2130	3240	–	Scott & Backer, 1962
		Remarks: Al = 0; Mn = 0.05; PO_4 = 2.7; Ra = 0.3μμc/l; U = <0.1 pppb.																		
Rodeo well NE¼NW¼S33,T18N,R20E	336	–	–	–	–	–	–	–	–	–	–	–	836	–	–	–	–	3440	7.0	White, 1968
		Remarks: Depth – 276.9 ft.																		
U. S. Geological Survey GS-3 well NE¼NW¼S33,T18N,R20E	327	–	–	–	–	–	–	–	–	–	–	–	791	–	–	–	–	3280	6.6	White, 1968
		Remarks: Depth 683.6 ft.																		
U. S. Geological Survey GS-4 well NE¼NW¼S33,T18N,R20E	340	–	–	–	–	–	–	–	–	–	–	–	816	–	–	–	–	3180	6.6	White, 1968
		Remarks: Depth – 503 ft.																		
U. S. Geological Survey GS-5 well NE¼NW¼S33,T18N,R20E	337	–	–	–	–	–	–	–	–	–	–	–	826	–	–	–	–	3270	6.0	White, 1968
		Remarks: Depth – 572 ft.																		
U. S. Geological Survey GS-1 well NW¼SE¼S33,T18N,R20E	314	–	–	–	–	–	–	–	–	–	–	–	817	–	–	–	–	3250	6.1	White, 1968
		Remarks: Depth – 398 ft.																		
No. 32 Geyser well NW¼SE¼S33,T18N,R20E	238	–	–	–	–	–	–	–	–	–	–	–	885	–	–	–	–	3335	7.4	White, 1968
		Remarks: Depth – 43.2 ft.																		
South Steamboat well SW¼SE¼S33,T18N,R20E	168	–	–	–	–	–	–	–	–	–	–	–	10	–	–	–	–	348	7.4	White, 1968
		Remarks: Depth – 258 ft.																		
Steamboat Hot Springs S33,T18N,R20E	–	300	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965
Steamboat Hot Springs S33,T18N,R20E	167-203	825	9Aug49	293	0.05	5.0	0.8	653	71	305	0	100	865	1.8	–	49	–	3210	7.9	White, Hem & Waring, 1963; Waring, 1965, No. 56
		Remarks: Al = 0.5, Mn = 0.05, Sr = 0.5, Li = 7.6, As = 2.7, Sb = 0.4, I = 0.1, Br = 0.2, H_2S = 4.7.																		

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
WASHOE COUNTY (continued)																				
spring S33,T18N,R20E	–	–	–	–	–	–	–	–	–	–	–	–	–	2.1	–	47	–	–	–	Dunn & Hanson, 1967
	Remarks: Spring near highway.																			
Steamboat Hot Springs S33,T18N,R20E	–	–	–	332	–	30	9	790		293	0	237	950	–	–	–	2557	–	–	Adams, 1944
	Remarks: Fe + Al = tr.																			
Steamboat Springs S28,33,T18N,R20E	–	590	–	–	–	–	–	–	–	–	–	–	900	–	–	–	–	–	–	White, 1964a
well S33,T18N,R20E	284	–	13Sep65	–	2.2	36	5	313		339	–	82	308	–	–	–	–	–	–	CWRR, 1973
well S33,T18N,R20E	194	–	22Feb61	–	3.5	53	3	390		337	–	26	490	–	–	–	–	–	–	CWRR, 1973
Reno Hot Springs S33,T18N,R20E	hot	–	–	252	–	28	8	832		373	0	125	1044	–	–	–	2350	–	–	Adams, 1944; Waring, 1965, No. 55F
	Remarks: Fe + Al = tr; drilled wells, former resort.																			
Johnson well SW¼NE¼S34,T18N,R20E	72	–	–	–	–	–	–	–	–	–	–	–	12	–	–	–	–	1947	7.2	White, 1964a
	Remarks: Depth – 136.5 ft.																			
well NW¼NW¼S34,T18N,R20E	82	–	11Jun73	–	–	64	16	230	19	200	–	543	43	–	–	–	1117	–	7.2	Bateman & Scheibach, 1975
Frazier well SE¼SW¼S34,T18N,R20E	72	–	–	–	–	–	–	–	–	–	–	–	8.4	–	–	–	–	367	8.0	White, 1964a
	Remarks: Depth – 160 ft.																			
well NE¼NE¼SW¼ S34,T18N,R20E	151	–	7Jan63	–	–	66	8.8	5.8	–	158	–	72	5	–	–	–	316	–	7.8	Bateman & Scheibach, 1975
well SW¼S34,T18N,R20E	158	–	22Feb63	–	–	67	18	18	–	242	–	72	6	–	–	–	423	–	7.2	Bateman & Scheibach, 1975
well NE¼SE¼S34,T18N,R20E	122	–	–	–	–	78	40	101	–	95	–	480	6	0.5	–	–	806	–	7.8	Bateman & Scheibach, 1975
well S34,T18N,R20E	85	–	17Apr	–	–	32	8	679	–	361	–	234	750	1.2	–	–	2056	–	7.7	Bateman & Scheibach, 1975
	Remarks: Depth – 120 ft.																			
Geyser well T18N,R20E	198	–	–	245	–	15	1.0	667	63	340	0	122	885	–	–	52	2322	–	7.4	White, 1964a
	Remarks: Well non-erupting when sampled.																			
Geyser well T18N,R20E	203+	–	–	245	–	11	1.4	728	66	143	100	128	986	–	–	58	2505	–	8.7	White, 1964a
	Remarks: Well erupting when sampled.																			
Forest Eccks well T18N,R20E(?)	hot	–	22Oct48	–	–	72	18	115	–	461	–	10	82	–	–	–	–	–	–	Miller, Hardman & Mason, 1953
	Remarks: Eight miles south of Reno.																			
Mount Rose Spring(?) T18N,R20E	hot	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 55E
	Remarks: Erupting wells; resort; 10 mi south of Reno.																			
Tachino well SW¼SE¼S4,T17N,R20E	99	–	–	–	–	–	–	–	–	–	–	–	3.9	–	–	–	–	256	7.6	White, 1968
	Remarks: Depth – 52.3 ft.																			
Tachino well SW¼SE¼S4,T17N,R20E	97	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 24.7 ft.																			
Tachino well SW¼SE¼S4,T17N,R20E	81	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	White, 1968
	Remarks: Depth – 21.6 ft.																			
Tachino well SW¼SE¼S4,T17N,R20E	72	–	–	–	–	–	–	–	–	–	–	–	5.6	–	–	–	–	256	7.3	White, 1968
	Remarks: Depth – 14.8 ft.																			
[279] Pleasant Valley																				
well SE¼S7,T17N,R20E	75	–	–	–	–	24	9	19	–	151	–	3	5	–	–	–	211	–	8.0	Bateman & Scheibach, 1975
	Remarks: Depth – 107 ft.																			
well NW¼SW¼S7,T17N,R20E	100	–	1958	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	R. L. Bateman, written communication, 1977
	Remarks: Depth – 168 ft.																			
well S7,T17N,R20E	71	–	17Nov70	–	0.26	24	9	19		151	0	3	5	0.13	5.9	–	–	–	–	CWRR, 1973
well NW¼NW¼S8,T17N,R20E	81	–	1968	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	R. L. Bateman, written communication, 1977
	Remarks: Depth – 194 ft.																			
well NW¼NW¼S8,T17N,R20E	86	–	1972	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	R. L. Bateman, written communication, 1977
	Remarks: Depth – 140 ft.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
WASHOE COUNTY (continued)																				
[280] Bowers Mansion (Franktown) Hot Spring																				
Bowers Mansion, main spring NW¼S3,T16N,R19E	117	–	8Mar54	44	–	2.8	1.0	49	0.4	34	26	35	5.4	–	–	0.2	–	242	9.3	White, Hem & Waring, 1963
	Remarks: Li = 0.08.																			
main spring NW¼S3,T16N,R19E	–	–	–	39	tr	7	0.7	54		29	27	37	8	–	–	–	194	–	–	Adams, 1944
	Remarks: Fe + Al = tr.																			
well SW¼NW¼S3,T16N,R19E	75	–	12Oct65	–	–	19	3.3	16		103	0	6.0	3.8	–	–	–	–	171	7.8	Rush, 1967
spring NE¼NW¼S3,T16N,R19E	128	76	12Apr66	–	–	2.7	0.4	49		78	4	33	6.6	–	–	–	–	236	8.7	Rush, 1967; Waring, 1965, No. 57
	Remarks: Hot waters utilized locally.																			
Bowers Mansion Hot Springs NE¼NW¼S3,T16N,R19E	115-118	75	–	45	–	3.2	10	45	0.6	70	6.0	36	4.0	3.4	0	0.21	180	–	9.2	Feth, Roberson & Polzer, 1964
	Remarks: Li = 0.11, OH = 0.3, PO_4 = 0.06.																			
spring NW¼S3,T16N,R19E	115	–	–	47	–	2.9	0.2	50	0.6	76	–	38	6.3	2.8	–	0.20	–	243	9.4	Mariner & others, 1975
	Remarks: Li = 0.09, Al = 0.02, Hg = 0.0002, δD(‰) = −102.3, δO^{18}(‰) = −14.79.																			
spring NE¼NW¼S3,T16N,R19E	117	50-75	–	–	–	–	–	–	–	–	–	–	6	–	–	–	–	240	9.4	White, 1968
well S3,T16N,R19E	117	–	–	–	0.02	3	0	58		15	34	32	15	3.48	0.5	–	212	–	9.2	unpublished data, Washoe County Park System
	Remarks: As = 0.005.																			
main pool S3,T16N,R19E	80	–	18Jul72	–	0	8	1	96		110	0	32	74	1.98	7.2	–	297	–	7.9	unpublished data, Washoe County Park System
spring S3,T16N,R19E	–	–	3Feb77	42	–	2.2	0.01	53	0.5	11.9	37	34	4.7	3.3	–	–	187	250	9.6	unpublished data, CWRR
spring SE¼NW¼NW¼ S3,T16N,R19E	104	–	7Mar66	–	0.18	29	8.7	32		151	–	24	5	–	27	–	212	–	7.4	CWRR, 1973
[281] well S6,T16N,R20E	78	–	16Dec71	–	0.27	13	–	62		120	6	–	7	7	–	–	253	–	8.4	CWRR, 1973
	Remarks: Depth – 80 ft.																			
WHITE PINE COUNTY																				
[282] Collar and Elbow Spring																				
spring S27,T26N,R65E	92	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 94
spring S33,T26N,R65E	92	18	12Aug18	–	–	–	–	18		236	0	26	5.3	–	–	–	248	–	–	Clark, Riddell & Meinzer, 1920
	Remarks: A flow rate of 34 gpm reported on Aug. 12, 1918.																			
[283] Shell Oil Co. Steptoe Unit No. 1 well NE¼NE¼S19,T24N,R64E	304	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	unpublished data, Nevada Bureau of Mines & Geology
	Remarks: Depth – 8406 ft; exploratory oil well.																			
[284] spring NE¼S31,T24N,R65E	83	450	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Synder, 1963
[285] Cherry Creek (Young's) Hot Springs																				
springs S2(?),T23N,R63E	118-136	3.6	29Aug18	100	0.12	13	1.1	162		375	7.7	17	17	–	0.75	–	518	–	–	Clark, Riddell & Meinzer, 1920; Waring, 1965, No. 95
Shellbourne Hot Springs NW¼NW¼S7,T23N,R63E	124, 135	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 96
	Remarks: About 100 feet from Cherry Creek Hot Springs.																			
spring S6,T23N,R63E	142	–	–	105	–	12	0.3	150	4.8	380	–	1	16	1.2	–	0.35	–	692	7.8	Mariner & others, 1975
	Remarks: Li = 0.65, Rb = 0.08, Ce = 0.1, Mn = 0.06, δD(‰) = −127.8, δO^{18} = −16.20.																			
John Salvi's Hot Spring S7,T23N,R63E	149	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Hose & Taylor, 1974
	Remarks: Travertine reported.																			
spring S8,T23N,R63E	"thermal"	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Snyder, 1963
[286] Northern Spring Valley																				
Lawrence Henroid water well NE¼S31,T23N,R66E	89	50	22Jun50	–	–	24	7.4	34		141	0	22	16	–	–	–	–	309	–	Rush & Kazmi, 1965
	Remarks: Depth – 600 ft.																			

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (µmhos/cm)	pH	Reference
WHITE PINE COUNTY (continued)																				
Hans L. Anderson water well NW¼S31,T23N,R66E	79	5-30	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Rush & Kazmi, 1965
	Remarks: Depth – 1040 ft.																			
[287] Giocoechea Warm Springs (Simonsen Warm Springs, Warm Springs Ranch) area																				
springs NE¼NE¼S1,T22N,R56E	74-76	1120	25Oct66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 0.96, Ca + Mg = 4.60, Cl + SO_4 = 0.91.																			
springs NE¼NE¼S1,T22N,R56E	74	900-1350	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Eakin, 1960
	Remarks: Discharge probably varies seasonally and annually; flow rate of 2700 reported.																			
Moore's Ranch Springs T23N,R56E	65-70	200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 102A
[288] Schellbourne Springs																				
Lower Schellbourne Warm Springs S12,T22N,R64E	77	450	11Sep66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 0.36, Ca + Mg = 4.22, Cl + SO_4 = 0.37, tritium ≤ 8 T. U.																			
Upper Schellbourne Spring SE¼NW¼S8,T22N,R65E	74	450	11Sep66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 0.17, Ca + Mg = 4.43, Cl + SO_4 = 0.54, tritium ≤ 8 T. U.																			
[289] Monte Neva (Melvin, Goodrich) Hot Springs																				
spring S24,T21N,R63E	174	–	–	52	0.02	63	21	16	5.6	303	–	26	5.0	1.0	–	0.04	–	522	6.4	Mariner & others, 1975
	Remarks: Li = 0.07, Rb = 0.03, Cu = 0.01, δD(‰) = −127.8, δO^{18}(‰) = −16.68. Gas (volume %): O_2 + Ar = 4, N_2 = 71, CH_4 = <1, CO_2 = 26.																			
springs SW¼S24,T21N,R63E	173-193	625	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 98
large spring SW¼S24,T21N,R63E	174	625	21Aug17	54	0.19	67	21	26		324	tr	25	6.6	–	0.09	–	349	–	–	Clark, Riddell & Meinzer, 1920
spring	–	–	–	67	–	76	22	10		346	0	34	10	–	–	–	361	–	–	Adams, 1944
	Remarks: Fe + Al = tr (analysed by Dept. of Food & Drugs, Univ. Nev. Reno).																			
spring NE¼NW¼S25,T21N,R63E	174	620	27Oct66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 0.72, Ca + Mg = 4.76, Cl + SO_4 = 0.86.																			
springs	–	–	–	–	–	–	–	–	–	239	–	–	–	–	–	–	231	–	–	U. S. Bureau of Reclamation, 1972, table 3
Magma Power Co. Monte Neva No. 1 well S24(?),T21N,R63E	190	–	1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Koenig, 1970
	Remarks: Depth – 402 ft. Geothermal exploratory well, hot water, no steam.																			
[290] Kern Mountains																				
spring T21N,R70E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 99
[291] Campbell Ranch (North Group) Springs																				
springs SW¼S5,T19N,R63E	76	1350	6Sep17	–	0.2	–	–	60		257	62	21	6.2	–	–	–	320	–	–	Clark, Riddell & Meinzer, 1920; Waring, 1965, No. 100
	Remarks: In Oct. 1918, individual springs flowed at rates varying from 112 to 224 gpm.																			
northern spring SW¼S5,T19N,R63E	–	–	9Apr18	32	0.05	52	21	15		268	0	20	4.5	–	–	–	268	–	–	Clark, Riddell & Meinzer, 1920
[292] McGill–Schoolhouse zone																				
Schoolhouse Spring NW¼SE¼S3,T18N,R64E	–	450	21May66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 0.58, Ca + Mg = 3.51, Cl + SO_4 = 0.74.																			
Schoolhouse Spring	76	–	5Jul18	–	–	–	–	24	–	147	6.7	27	9.4	–	–	–	71	–	–	Hardman & Miller, 1934
McGill Warm Springs SE¼NW¼S21,T18N,R64E	76-84	4490	10Apr13	32	0.10	54	21	12		267	0	21	4.3	–	1.2	–	266	–	–	Clark, Riddell & Meinzer, 1920, Waring, 1965, No. 101
	Remarks: Flowed 4500 gpm and had temperature of 84°F on 6 Oct 18.																			
McGill Warm Springs SE¼NW¼S21,T18N,R64E	–	4578	29Sep65	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 1.01, Ca + Mg = 5.11, Cl + SO_4 = 3.34.																			
[293] Ely–Lackawanna zone																				
Lackawanna Hot Springs NE¼S3,T16N,R63E	70	135		–	–	94		29.4	–	155		138	20	–	–	–	420	600	8.7	Holmes, 1966, p. 21
Lackawanna Hot Springs NE¼S3,T16N,R63E	90-95	–	21Sep65	–	–	32	25	19		148	0	83	10	–	–	–	–	–	8.0	Eakin, Hughes & Moore, 1967

Identification number, name, location	Temp. (°F)	Discharge (gpm)	Date	SiO_2 (ppm)	Fe (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4 (ppm)	Cl (ppm)	F (ppm)	NO_3 (ppm)	B (ppm)	TDS (ppm)	SC (μmhos/cm)	pH	Reference
WHITE PINE COUNTY (continued)																				
Ely Warm Springs S10,T16N,R63E	85	22	10Apr18	37	0.22	51	23	19		222	0	68	7.5	0.67	–	–	314	–	–	Clark, Riddle & Meinzer, 1920; Waring, 1965, No. 102
[294] Big Blue Spring																				
spring S23,T14N,R56E	warm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 103
[295] Williams Hot Springs																				
springs NE¼S33,T13N,R60E	124, 128	50-185	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Eakin, 1949; Waring, 1965, No. 103A
[296] Preston Springs																				
Preston Big Spring SW¼NE¼S2,T12N,R61E	70	3900	13Oct66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 0.64, Ca + Mg = 1.18, tritium = ≤8 T. U.																			
Preston Big Springs SW¼NE¼S2,T12N,R61E	72	5700	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965; Waring, 1965, No. 104
Cold Spring SW¼NW¼S12,T12N,R61E	70	780	13Nov66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 0.65, Ca + Mg = 3.47, Cl + SO_4 = 1.15, tritium = ≤8 T. U.																			
Cold Spring SW¼NW¼S12,T12N,R61E	–	630	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965
Nicholas Spring SW¼SE¼S12,T12N,R61E	71	1125	13Nov66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 0.64, Ca + Mg = 3.47, Cl + SO_4 = 1.31, tritium = ≤8 T. U.																			
Arnoldson Spring SW¼SE¼S12,T12N,R61E	72	1380	13Nov66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Mifflin, 1968
	Remarks: (epm) Na + K = 0.66, Ca + Mg = 2.98, Cl + SO_4 = 1.28, tritium = ≤9 T. U.																			
Nicholas Spring	–	1200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Lamke & Moore, 1965
[297] Southern Spring Valley																				
Bureau of Land Management water well SE¼S35,T13N,R67E	73	7	14Jul64	–	–	18	1.0	16		88	0	5.8	3.5	–	–	–	–	158	–	Rush & Kazmi, 1965
	Remarks: Depth – 396 ft.																			
Bureau of Land Management water well NE¼S2,T12N,R67E	75	50	16Jul64	–	–	23	0.9	13		92	0	6.4	5.2	–	–	–	–	161	7.7	Rush & Kazmi, 1965
	Remarks: Depth – 407 ft.																			
[*] Warm Sulphur Springs																				
springs T11N,R65E	warm	972	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Waring, 1965, No. 106
	Remarks: At head of Warm Creek. Exact location uncertain. *Not shown on Plate 1.																			
[298] Big Spring																				
spring S33,T10N,R70E	61	4571	1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Maxey & Mifflin, 1966; Waring, 1965, No. 107A
	Remarks: May be several warm springs in this area.																			

APPENDIX 2. Exploratory geothermal drilling in Nevada (Major, large-diameter wells only. Additional information on these wells may be found elsewhere in this report using the identification numbers [in brackets]).

Operator	Name	API No.	Location	Depth, ft	Completion Date	Maximum Temperature (°F)
CHURCHILL COUNTY						
Brady's Hot Springs [10]						
Magma Power Co.	Brady No. 1	27-001-90000	NE¼ NE¼ SW¼ S12,T22N,R26E	700?	1959?	
Magma Power Co.	Brady No. 2	27-001-90001	NE¼ NE¼ SW¼ S12,T22N,R26E	241	1959?	330
Magma Power Co.	Brady No. 3	27-001-90002	SE¼ SE¼ NW¼ S12,T22N,R26E	610	1961?	335
Magma Power Co.	Brady No. 4	27-001-90003	SE¼ SE¼ NW¼ S12,T22N,R26E	723	1961?	
Magma Power Co.	Brady No. 5	27-001-90004	NW¼ SW¼ NE¼ S12,T22N,R26E	1800	1961?	340
Magma Power Co.	Brady No. 6	27-001-90005	NW¼ SW¼ NE¼ S12,T22N,R26E	770	?	
Magma Power Co.	Brady No. 7	27-001-90006	NW¼ SW¼ NE¼ S12,T22N,R26E	250	?	
Earth Energy Inc.	R Brady EE No. 1	27-001-90007	S12?,T22N,R26E	5062?	1964	414
Earth Energy Inc.	Brady Pros. No. 1	27-001-90008	S12?T22N,R26E	1758?	1965?	355
Union Oil Co. of Calif.	SP-Brady No. 1	27-001-90010	NE¼ SW¼ SE¼ S1,T22N,R26E	7275	1974	371
Magma Energy Inc.	SP-Brady No. 2	27-001-90013	NE¼ NW¼ SE¼ S1,T22N,R26E	4446	1975	
Magma Energy Inc.	SP-Brady No. 8	27-001-90014	NE¼ SE¼ NW¼ S12,T22N,R26E	3469	1975	
Desert Peak Area [12]						
Phillips Petroleum Co.	Desert Peak No. 29-1	27-001-90011	SE¼ SE¼ S29,T22N,R27E	7662	1974	
Phillips Petroleum Co.	Desert Peak B No. 21-1	27-001-90015	S½ SE¼ S21,T22N,R27E	4150	1976	406
Phillips Petroleum Co.	Desert Peak B No. 21-2	27-001-90016	NE¼ NE¼ S21,T22N,R27E	3192	1976	390
Soda Lake [13]						
Chevron-Phillips	Soda Lake No. 1-29	27-001-90012	C SE¼ SE¼ S29,T20N,R28E	4306	1974	342
Chevron Resources Co.	Soda Lake No. 44-5	27-001-90020	S5,T19N,R28E	5070	1978	244
Stillwater [14]						
O'Neill Geothermal Inc.	J. I. O'Neill, Jr.-Reynolds No. 1	27-001-90009	NE¼ SW¼ SW¼ S6,T19N,R31E	4237	1964	265
Union Oil Co.	Weishaupt No. 1	27-001-90017	Lot 2, S6,T19N,R31E	4000±	1976	
Union Oil Co.	Weishaupt No. 2	27-001-90018	Lot 4, S5,T19N,R31E	4000±	1977	
Union Oil Co.	De Braga No. 1	27-001-90019	Lot 1, S1,T19N,R30E	4000±	1977	
Lee Hot Springs [21]						
Oxy Geothermal Inc.	Federal No. 72-33(K)	27-001-90021	NW¼ NW¼ S34,T16N,R29E	3015	1978	
Dixie Valley [4]						
Sunoco Energy Devel. Co.	S.W. Lamb No. 1	27-001-90022	NW¼ NW¼ S18,T24N,R37E	7255	1978	425
DOUGLAS COUNTY						
Wally's Hot Springs [45]						
U.S. Steel Corp.	Wally's No. 1	27-005-90000	SE¼ NW¼ NW¼ S22,T13N,R19E	1268	1962	181
U.S. Steel Corp.	Wally's No. 2	27-005-90001	SW¼ SW¼ NW¼ S22,T13N,R19E	499	1962	
EUREKA COUNTY						
Beowawe Geysers [94]						
Magma Power Co.	Beowawe No. 1	27-011-90000	NE¼ SE¼? NW¼ S17,T31N,R48E	1918	1959?	
Magma Power Co.	Beowawe No. 2	27-011-90001	NW¼? NW¼ S17,T31N,R48E	715	1959?	
Vulcan Thermal Power Co.	Vulcan No. 1	27-011-90002	NW¼ SE¼ SW¼ NW¼ S17,T31N,R48E	638	1961	414
Vulcan Thermal Power Co.	Vulcan No. 2	27-011-90003	NE¼ SE¼ SW¼ NW¼ S17,T31N,R48E	655	1961	407
Vulcan Thermal Power Co.	Vulcan No. 3	27-011-90004	NW¼ SW¼ SE¼ NW¼ S17,T31N,R48E	796	1961	407
Vulcan Thermal Power Co.	Vulcan No. 4	27-011-90005	NE¼ SW¼ SE¼ NW¼ S17,T31N,R48E	767	1961	410

Operator	Name	API No.	Location	Depth, ft	Completion Date	Maximum Temperature (°F)
Beowawe Geysers [94]—*Continued*						
Vulcan Thermal Power Co.	Vulcan No. 5	27–011–90006	S17,T31N,R48E	237	1963?	
Vulcan Thermal Power Co.	Vulcan No. 6	27–011–90007	NW¼ SW¼ NE¼ S17,T31N,R48E	478	1963	282
Sierra Pacific Power Co.	Sierra No. 1	27–011–90008	C NW¼ SE¼ SW¼ S17,T31N,R48E	927	1964?	
Sierra Pacific Power Co.	Sierra No. 2	27–011–90009	C NE¼ SW¼ S17,T31N,R48E	418	1964	
Sierra Pacific Power Co.	Sierra No. 3	27–011–90010	NW¼ SE¼ SW¼ NW¼ S17,T31N,R48E	2052	1965	
Sierra Pacific Power Co.	Sierra No. 4	27–011–90011	NW¼ NE¼ NW¼ S17,T31N,R48E	1005	1964?	240
Magma Energy Inc.	Batz No. 1	27–011–90013	SW¼ NW¼ NE¼ S17,T31N,R48E	6002	1975	
Hot Springs Point (Crescent Valley) [96]						
Magma Power Co.	Hot Springs Point No. 1(?)	27–011–90012	S1, 2 or 11,T29N,R48E	410	1965	166
Chevron Oil Co.	Hot Springs Point No. 1	27–011–90014	NW¼ SW¼ NW¼ S1,T29N,R48E	2335	1975	
HUMBOLDT COUNTY						
Hot Springs Ranch [146]						
Magma Power Co.	Tipton No. 1	27–013–90000	SW¼ NW¼ SW¼ S4,T33N,R40E	3071	1974	
LANDER COUNTY						
Beowawe Geysers [94]						
Chevron–American Thermal Resources	Ginn No. 1-13	27–015–90000	C SE¼ SE¼ S13,T31N,R47E	9563	1974	
Chevron U.S.A., Inc.	Rossi No. 21-19 (Beowawe No. 1)	27–015–90001	SW¼ NW¼ NW¼ S19,T31N,R48E	5680	1976	
LYON COUNTY						
Hazen (Fernley) [177]						
Magma Power Co.	Hazen No. 1(?)	27–019–90003	SW¼ S18?,T20N,R26E	750	1962	275+
Magma Power Co.	Hazen No. 2(?)	27–019–90004	S18?,T20N,R26E	300?	1962	
Magma Power Co.	Hazen No. 3(?)	27–019–90005	S18?,T20N,R26E	300?	1962	
Magma Energy Inc.	Fernley No. 1	27–019–90009	SW¼ SW¼ SE¼ S24,T20N,R25E	3668	1974	
Wabuska Hot Springs [181]						
Magma Power Co.	Wabuska No. 1	27–019–90000	S16?,T15N,R25E	488	1959	
Magma Power Co.	Wabuska No. 2	27–019–90001	SE¼ NE¼ SW¼ S16,T15N,R25E	532?	1959	
Magma Power Co.	Wabuska No. 3	27–019–90002	NW¼ SE¼ SE¼ S16,T15N,R25E	2223	1959	227
Hind's Hot Springs [184]						
U.S. Steel Corp.	Hind's No. 1(?)	27–019–90006	SW¼ SE¼ S16,T12N,R23E	?	1962?	150
U.S. Steel Corp.	Hind's No. 2(?)	27–019–90007	SW¼ SE¼ S16,T12N,R23E	?	1962?	
U.S. Steel Corp.	Hind's No. 3(?)	27–019–90008	SW¼ SE¼ S16,T12N,R23E	?	1962?	
NYE COUNTY						
Darrough Hot Springs [204]						
Magma Power Co.	Darrough No. 1(?)	27–023–90000	SE¼ SE¼ SE¼ S7,T11N,R43E	812	1962	265
PERSHING COUNTY						
Humboldt (Rye Patch) [236]						
Phillips Petroleum Co.	Campbell E No. 1	27–027–90000	SE¼ S21,T31N,R33E	1853	1977	325
Union Oil Co.	Campbell No. 1	27–027–90001	NE¼ S3,T31N,R33E	~6600	1978	
Phillips Petroleum Co.	Campbell E No. 2	27–027–90002	NW/4 NW/4 SE/4 S15,T31N,R33E	drilling	1979	

Operator	Name	API No.	Location	Depth, ft	Completion Date	Maximum Temperature (°F)
			WASHOE COUNTY			
Ward's Hot Springs (Fly Ranch) [258]						
Western Geothermal Inc.	Fly Ranch No. 1(?)	27–031–90009	SW¼ NE¼ SE¼ S2,T34N,R23E	1000+	1964	
Granite Ranch [259]						
Western Geothermal Inc.	(?)Granite Creek Ranch 1	27–031–90010	S35?,T34N,R23E	800	1965?	
Gerlach [261]						
Sunoco Energy Development Co.	Holland Ranch No. 1-15-G	27–031–90013	SW/4 SW/4 SW/4 S15,T32N,R23E	drilling	1979	
San Emidio Desert [265]						
Chevron Oil Co.	Cosmos No. 1-8	27–031–90011	SE¼ S8,T29N,R23E	4013	1975	
Chevron Oil Co.	Cosmos No. 1-9	27–031–90012	SW¼ S9,T29N,R23E	5367	1978	
The Needles (Pyramid Lake) [269]						
Western Geothermal Inc.	Needles No. 1	27–031–90006	NW¼ SW¼ SW¼ S6,T26N,R21E	5888	1964	~240
Western Geothermal Inc.	Needles No. 2(?)	27–031–90007	C W½ NE¼ S12,T26N,R20E	4000±	1962	
Western Geothermal Inc.	Needles No. 3(?)	27–031–90008	NW¼ SW¼ SW¼ S6,T26N,R21E	?	1964	
Steamboat Hot Springs [278]						
Nevada Thermal Power Co.	Steamboat No. 1	27–031–90000	NW¼ NE¼ S28,T18N,R20E	1830	1954	
Nevada Thermal Power Co.	Steamboat No. 2	27–031–90001	SE¼ SW¼ S28,T18N,R20E	964	1959	
Nevada Thermal Power Co.	Steamboat No. 3	27–031–90002	NW¼ NE¼ S32,T18N,R20E	1263	1960?	
Nevada Thermal Power Co.	Steamboat No. 4	27–031–90003	NE¼ NW¼ S32,T18N,R20E	520?	1960	367
Nevada Thermal Power Co.	Steamboat No. 5	27–031–90004	NW¼ NW¼ S32,T18N,R20E	826	1961	347
Nevada Thermal Power Co.	Steamboat No. 6	27–031–90005	NW¼ NW¼ S32,T18N,R20E	716	1961	354
			WHITE PINE COUNTY			
Monte Neva Hot Springs [289]						
Magma Power Co.	Monte Neva No. 1(?)	27–033–90000	S24?,T21N,R63E	402	1965	190

APPENDIX 3. Temperature Conversion Table.

To Convert			To Convert			To Convert			To Convert		
To °F	←°C or °F→	To °C	To °F	←°C or °F→	To °C	To °F	←°C or °F→	To °C	To °F	←°C or °F→	To °C
+33.8	+1	-17.22	+141.8	+61	+16.11	+249.8	+121	+49.44	+357.8	+181	+82.78
+35.6	+2	-16.67	+143.6	+62	+16.67	+251.6	+122	+50.00	+359.6	+182	+83.33
+37.4	+3	-16.11	+145.4	+63	+17.22	+253.4	+123	+50.56	+361.4	+183	+83.89
+39.2	+4	-15.56	+147.2	+64	+17.78	+255.2	+124	+51.11	+363.2	+184	+84.44
+41.0	+5	-15.00	+149.0	+65	+18.33	+257.0	+125	+51.67	+365.0	+185	+85.00
+42.8	+6	-14.44	+150.8	+66	+18.89	+258.8	+126	+52.22	+366.8	+186	+85.56
+44.6	+7	-13.89	+152.6	+67	+19.44	+260.6	+127	+52.78	+368.6	+187	+86.11
+46.4	+8	-13.33	+154.4	+68	+20.00	+262.4	+128	+53.33	+370.4	+188	+86.67
+48.2	+9	-12.78	+156.2	+69	+20.56	+264.2	+129	+53.89	+372.2	+189	+87.22
+50.0	+10	-12.22	+158.0	+70	+21.11	+266.0	+130	+54.44	+374.0	+190	+87.78
+51.8	+11	-11.67	+159.8	+71	+21.67	+267.8	+131	+55.00	+375.8	+191	+88.33
+53.6	+12	-11.11	+161.6	+72	+22.22	+269.6	+132	+55.56	+377.6	+192	+88.89
+55.4	+13	-10.56	+163.4	+73	+22.78	+271.4	+133	+56.11	+379.4	+193	+89.44
+57.2	+14	-10.00	+165.2	+74	+23.33	+273.2	+134	+56.67	+381.2	+194	+90.00
+59.0	+15	-9.44	+167.0	+75	+23.89	+275.0	+135	+57.22	+383.0	+195	+90.56
+60.8	+16	-8.89	+168.8	+76	+24.44	+276.8	+136	+57.78	+384.8	+196	+91.11
+62.6	+17	-8.33	+170.6	+77	+25.00	+278.6	+137	+58.33	+386.6	+197	+91.67
+64.4	+18	-7.78	+172.4	+78	+25.56	+280.4	+138	+58.89	+388.4	+198	+92.22
+66.2	+19	-7.22	+174.2	+79	+26.11	+282.2	+139	+59.44	+390.2	+199	+92.78
+68.0	+20	-6.67	+176.0	+80	+26.67	+284.0	+140	+60.00	+392.0	+200	+93.33
+69.8	+21	-6.11	+177.8	+81	+27.22	+285.8	+141	+60.56	+393.8	+201	+93.89
+71.6	+22	-5.56	+179.6	+82	+27.78	+287.6	+142	+61.11	+395.6	+202	+94.44
+73.4	+23	-5.00	+181.4	+83	+28.33	+289.4	+143	+61.67	+397.4	+203	+95.00
+75.2	+24	-4.44	+183.2	+84	+28.89	+291.2	+144	+62.22	+399.2	+204	+95.56
+77.0	+25	-3.89	+185.0	+85	+29.44	+293.0	+145	+62.78	+401.0	+205	+96.11
+78.8	+26	-3.33	+186.8	+86	+30.00	+294.8	+146	+63.33	+402.8	+206	+96.67
+80.6	+27	-2.78	+188.6	+87	+30.56	+296.6	+147	+63.89	+404.6	+207	+97.22
+82.4	+28	-2.22	+190.4	+88	+31.11	+298.4	+148	+64.44	+406.4	+208	+97.78
+84.2	+29	-1.67	+192.2	+89	+31.67	+300.2	+149	+65.00	+408.2	+209	+98.33
+86.0	+30	-1.11	+194.0	+90	+32.22	+302.0	+150	+65.56	+410.0	+210	+98.89
+87.8	+31	-0.56	+195.8	+91	+32.78	+303.8	+151	+66.11	+411.8	+211	+99.44
+89.6	+32	±0.00	+197.6	+92	+33.33	+305.6	+152	+66.67	+413.6	+212	+100.00
+91.4	+33	+0.56	+199.4	+93	+33.89	+307.4	+153	+67.22	+415.4	+213	+100.56
+93.2	+34	+1.11	+201.2	+94	+34.44	+309.2	+154	+67.78	+417.2	+214	+101.11
+95.0	+35	+1.67	+203.0	+95	+35.00	+311.0	+155	+68.33	+419.0	+215	+101.67
+96.8	+36	+2.22	+204.8	+96	+35.56	+312.8	+156	+68.89	+420.8	+216	+102.22
+98.6	+37	+2.78	+206.6	+97	+36.11	+314.6	+157	+69.44	+422.6	+217	+102.78
+100.4	+38	+3.33	+208.4	+98	+36.67	+316.4	+158	+70.00	+424.4	+218	+103.33
+102.2	+39	+3.89	+210.2	+99	+37.22	+318.2	+159	+70.56	+426.2	+219	+103.89
+104.0	+40	+4.44	+212.0	+100	+37.78	+320.0	+160	+71.11	+428.0	+220	+104.44
+105.8	+41	+5.00	+213.8	+101	+38.33	+321.8	+161	+71.67	+431.6	+222	+105.56
+107.6	+42	+5.56	+215.6	+102	+38.89	+323.6	+162	+72.22	+435.2	+224	+106.67
+109.4	+43	+6.11	+217.4	+103	+39.44	+325.4	+163	+72.78	+438.8	+226	+107.78
+111.2	+44	+6.67	+219.2	+104	+40.00	+327.2	+164	+73.33	+442.4	+228	+108.89
+113.0	+45	+7.22	+221.0	+105	+40.56	+329.0	+165	+73.89	+446.0	+230	+110.00
+114.8	+46	+7.78	+222.8	+106	+41.11	+330.8	+166	+74.44	+449.6	+232	+111.11
+116.6	+47	+8.33	+224.6	+107	+41.67	+332.6	+167	+75.00	+453.2	+234	+112.22
+118.4	+48	+8.89	+226.4	+108	+42.22	+334.4	+168	+75.56	+456.8	+236	+113.33
+120.2	+49	+9.44	+228.2	+109	+42.78	+336.2	+169	+76.11	+460.4	+238	+114.44
+122.0	+50	+10.00	+230.0	+110	+43.33	+338.0	+170	+76.67	+464.0	+240	+115.56
+123.8	+51	+10.56	+231.8	+111	+43.89	+339.8	+171	+77.22	+467.6	+242	+116.67
+125.6	+52	+11.11	+233.6	+112	+44.44	+341.6	+172	+77.78	+471.2	+244	+117.78
+127.4	+53	+11.67	+235.4	+113	+45.00	+343.4	+173	+78.33	+474.8	+246	+118.89
+129.2	+54	+12.22	+237.2	+114	+45.56	+345.2	+174	+78.89	+478.4	+248	+120.00
+131.0	+55	+12.78	+239.0	+115	+46.11	+347.0	+175	+79.44	+482.0	+250	+121.11
+132.8	+56	+13.33	+240.8	+116	+46.67	+348.8	+176	+80.00	+485.6	+252	+122.22
+134.6	+57	+13.89	+242.6	+117	+47.22	+350.6	+177	+80.56	+489.2	+254	+123.33
+136.4	+58	+14.44	+244.4	+118	+47.78	+352.4	+178	+81.11	+492.8	+256	+124.44
+138.2	+59	+15.00	+246.2	+119	+48.33	+354.2	+179	+81.67	+496.4	+258	+125.56
+140.0	+60	+15.56	+248.0	+120	+48.89	+356.0	+180	+82.22	+500.0	+260	+126.67

BIBLIOGRAPHY

Adams, W. B. (1944) Chemical analysis of municipal water supplies, bottled mineral waters and hot springs, Nevada: Nevada Univ., Reno, Dept. of Food and Drugs, Pub. Serv. Div.

Adams and Bishop (1884) The Pacific tourist: New York.

Albers, J. P., and Stewart, J. H. (1972) Geology and mineral deposits of Esmeralda County, Nevada: Nevada Bur. Mines and Geology Bull. 78.

Allen, E. T., and Day, A. L. (1935) Hot springs of the Yellowstone National Park. Microscopic examinations by H. E. Merwin: Carnegie Inst. Washington Pub. 466.

Allen, W. W. (1962) Field data from geothermal steam well tests on Beowawe, Nevada, geothermal steam wells for Magma–Vulcan thermal power project: Magma Power Co., unpubl. report.

Anctil, R. J. (1960) Areal economic geology of T37N,R43E and 44E, M.D.M.: Southern Pacific Co., unpubl. map.

Anctil, R. J., and others (1960) Geology of Brady Hot Springs and vicinity, Churchill County, Nevada: Southern Pacific Co., unpubl. map.

Anderson, Robert (1908) Oil prospects in Lyon County, Nevada, *in* Contributions to economic geology, pt. II, Mineral fuels: U. S. Geol. Survey Bull. 281, p. 490–493.

_______ (1909) Geology and oil prospects of the Reno region, Nevada: U. S. Geol. Survey Bull. 381, pp. 475–489.

Archbold, N. L. (1969) Industrial mineral deposits, *in* Moore, J. G., 1969, Geology and mineral deposits of Lyon, Douglas, and Ormsby Counties, Nevada: Nevada Bur. Mines Bull. 75.

Austin, C. F., Austin, W. H., Jr., and Leonard, G. W. (1971) Geothermal science and technology, a national program: Naval Weapons Center, China Lake, CA, Tech. Ser. 45–029–72.

Bailey, E. H., and Phoenix, D. A. (1944) Quicksilver deposits in Nevada: Nevada Univ. Bull., v. 38, no. 5 [41].

Baker, A., III, Archbold, N. L., and Stoll, W. J. (1972) Forecasts for the future—minerals: Nevada Bur. Mines and Geology Bull. 82.

Ball, S. H. (1907) A geological reconnaissance in southwestern Nevada and eastern California: U. S. Geol. Survey Bull. 308.

Bastin, E. S., and Laney, F. B. (1918) Genesis of ores at Tonopah, Nevada: U. S. Geol. Survey Prof. Paper 104.

Bateman, R. L., and Scheibach, R. B. (1975) Evaluation of geothermal activity in the Truckee Meadows, Washoe County, Nevada: Nevada Bur. Mines and Geology Rept. 25.

Batzle, M. L. Hammond, S. E., and Farkash, V. N. (1976a) Telluric traverse location map and profiles for Pinto Hot Springs Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 76–701A.

_______ (1976b) Telluric traverse location map and profiles for Ruby Valley Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 76–701B.

Becker, G. F. (1882) Geology of the Comstock Lode and the Washoe district: U. S. Geol. Survey Mon. 3.

_______ (1888) Geology of the quicksilver deposits of the Pacific slope: U. S. Geol. Survey Mon. 13.

_______ (1889) Summary of the geology of the quicksilver deposits of the Pacific slope: U. S. Geol. Survey 8th Ann. Rept., pt. 2, p. 965–985.

Berger, B. R., Silberman, M. L., and Koski, R. A. (1975) Discussion on K-Ar relations of granodiorite emplacement and tungsten and gold mineralization near the Getchell Mine, Humboldt County, Nevada—a reply: Econ. Geology, v. 70, p. 1487–1491.

Beyer, J. H. (1977) Telluric and D. C. resistivity techniques applied to the geophysical investigation of Basin and Range geothermal systems, Part I, The E-field ratio telluric method: Calif. Univ., Lawrence Berkeley Laboratory Rept. 6325.

_______ (1977) Telluric and D. C. resistivity techniques applied to the geophysical investigation of Basin and Range geothermal systems, Part II, A numerical model study of the dipole–dipole and Schlumberger resistivity methods: Calif. Univ., Lawrence Berkeley Laboratory Rept. 6325.

_______ (1977) Telluric and D. C. resistivity techniques applied to the geophysical investigation of Basin and Range geothermal systems, Part III, The analysis of data from Grass Valley, Nevada: Calif. Univ., Lawrence Berkeley Laboratory Rept. 6325.

Beyer, H., Dey, A., Liaw, A., Majer, E., McEvilly, T. V., Morrison, H. F., and Wollenberg, H. (1976) Geological and geophysical studies in Grass Valley, Nevada: Natl. Tech. Inf. Service, preliminary open-file report LBL–5262.

Beyer, H., Morrison, H. F., and Dey, A. (1975) Electrical exploration of geothermal systems in the Basin and Range valleys of Nevada: 2nd United Nations Symposium on Devel. and Use of Geothermal Resources, San Francisco, 1975, Proc., v. 2, p. 889–894.

Bidwell, J. (1842) A journey to California (pamphlet).

Bingler, E. C. (1975) Guidebook to the Quaternary geology along the western flank of the Truckee Meadows, Washoe County, Nevada: Nevada Bur. Mines and Geology Rept. 22.

Bingler, E. C., and Bonham, H. F., Jr. (1976) Geologic map [Reno 7 ½-minute quadrangle]: Nevada Bur. Mines and Geology Environmental Series, Reno Folio, p. 24–31.

Blackwelder, Eliot (1948) The Great Basin, with emphasis on glacial and postglacial times; l. The geological background: Utah Univ. Bull., v. 38, no. 20, p. 3–16.

Blake, W. P. (1873) Diatoms in a hot spring in [Pueblo Valley, Humboldt County] Nevada: California Acad. Sci. Mtg., Aug. 21, 1871, Proc., v. 4, pt. 4, p. 183.

Bonham, H. F., Jr. (1960) Areal geology map T22N,R25 and 26E: Southern Pacific Co.

_______ (1969) Geology and mineral deposits of Washoe and Storey Counties, Nevada: Nevada Bur. Mines Bull. 70.

Bonham, H. F., Jr., and Bingler, E. C. (1973) Geologic map, Reno Folio: Nevada Bur. Mines and Geol.

Bowman, H., Hebert, A. J., Wollenberg, H. A., and Asaro, F. (1974) A detailed chemical and radiometric study of geothermal waters and associated rock formations, with environmental implications: Calif. Univ., Lawrence Berkeley Laboratory, U. S. Atomic Energy Comm. contract W–7405–ENG–48.

_______ (1975) Trace, minor, and major elements in geothermal waters and associated rock formations (north-central Nevada): 2nd United Nations Symposium on Devel. and Use of Geothermal Resources, San Francisco, 1975, Proc., v. 1, p. 699–702.

Bradberry, C. E. and Associates (1964) Mineral inventory of lands bordering the Western Pacific Railroad Company: Western Pacific Railroad Co., Los Altos, CA.

Brannock, W. W., Fix, P. F., Gianella, V. P., and White, D. E. (1948) Preliminary geochemical results at Steamboat Springs, Nevada: Am. Geophys. Union Trans., v. 29, no. 2, p. 211–226.

Breese, C. R., Jr. (1968) A general limnological study of Big Soda Lake: M.S. thesis, Univ. of Nevada, Reno.

Broderick, A. T. (1949) Geology of the southern part of the San Antonio Mountains: Ph.D. thesis, Yale Univ.

Brues, C. T. (1928) Studies on the fauna of hot springs in the western United States and the biology of thermophilous animals: Am. Acad. Arts and Sci. Proc., v. 63, no. 4, p. 139–228; 1929, abs., Internat. Cong. Enbiology, 1928, Report, p. 237–240.

_______ (1932) Further studies on the fauna of North American hot springs: Am. Acad. Arts and Sci. Proc., v. 67, no. 7, p. 185–303.

Bushnell, Kent (1967) Geology of the Rowland quadrangle, Elko County, Nevada: Nevada Bur. Mines Bull. 67.

California Geothermal Resources Board (1971) Economic potential of geothermal resources in California: California Geothermal Resources Board.

Camozzi, R. O. (1942) How a tough water problem was handled at Jarbidge (Nevada): Eng. and Mining Jour., v. 143, no. 7, p. 45–48.

Carlson, H. S. (1974) Nevada place names: Univ. Nevada Press, Reno.

Carpenter, E. B. (1915) Ground water in southeastern Nevada: U. S. Geol. Survey Water-Supply Paper 365.

Cartwright, K., Swinderman, J. N., and Gimlett, J. I. (1964) Extension of the East Range fault by gravity exploration: Nevada Univ., Reno, Desert Res. Inst. Tech. Report 2, pt. III.

Cathrall, J. B., and others (1977) Listing of analytical, stream-sediment, water, and algae samples.... Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake County, Oregon: U. S. Geol. Survey open-file report 77–403.

Christopherson, K. R., Hoover, D. B., and Cesario, D. J. (1977) Telluric traverse location map and profile for Gerlach Northwest Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 77–66E.

Christopherson, K. R., Hoover, D. B., and Senterfit, M. (1977) Telluric traverse location map and profiles for Fly Ranch Northeast Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 77–66D.

Church, J. A. (1878) Heat of the Comstock mines: Am. Inst. Mining Metall. Petroleum Engineers Trans., v. 7, p. 45–76.

_______ (1879) Underground temperatures on the Comstock Lode: Am. Jour. Sci., v. 17, p. 289–300.

Clark, W. O., Riddell, C. W., and Meinzer, O. E (1920) Exploratory drilling for water and use of ground water for irrigation in Steptoe Valley, Nevada: U. S. Geol. Survey Water-Supply Paper 467.

Clebsch, A., Jr. (1961) Ground water in the Oak Springs formation and hydrologic effects of underground nuclear explosions at the Nevada Test Site: U. S. Geol. Survey Trace Element Inv. Rept. TEI–759.

Cohen, Philip (1962a) Uranium in the waters of the Truckee Meadows, *in* Contributions to the hydrology of northern Nevada: Nevada Dept. Conserv. and Nat. Resources, Inf. Ser. Rept. 3, p. 1–11.

_______ (1962b) Hydrogeologic evidence of the extension of the East Range fault, Humboldt and Pershing Counties, Nevada: U. S. Geol. Survey Prof. Paper 450–B, art. 4, p. B9–B10.

_______ (1962c) Preliminary results of hydrogeochemical studies in the Humboldt River valley near Winnemucca, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 19.

_______ (1964) An evaluation of the water resources of the Humboldt River valley near Winnemucca, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 24.

_______ (1966) Water in the Humboldt River valley near Winnemucca, Nevada: U. S. Geol. Survey Water-Supply Paper 1816.

Cohen, Philip, and Everett, D. E. (1963) A brief appraisal of the ground-water hydrology of the Dixie–Fairview Valley area, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 23.

Cohen, Philip, and Loeltz, O. J. (1964) Evaluation of hydrogeology and hydrogeochemistry of Truckee Meadows area, Washoe County, Nevada: U. S. Geol. Survey Water-Supply Paper 1779–S. Also Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 28.

Cornwall, H. R. (1972) Geology and mineral deposits of southern Nye County, Nevada: Nevada Bur. Mines and Geology Bull. 78.

Cornwall, H. R., and Kleinhampl, F. J. (1961) Geology of the Bare Mountain quadrangle, Nevada: U. S. Geol. Survey Geol. Quad Map GQ–157.

Craig, Harmon (1953) Isotopic geochemistry of hot springs [abs.]: Geol. Soc. America Bull., v. 64, no. 12, pt. 2, p. 1410; also (1954) Am. Mineralogist, v. 39, nos. 3–4, p. 322.

Crofutt, G. A. (1872) Crofutt's transcontinental tourist's guide: New York, Geo. A. Crofutt.

Crook, J. K. (1899) Mineral waters of the United States and their therapeutic uses: New York and Philadephia, Lea Bros. & Co.

Crosthwaite, E. G. (1963) Ground-water appraisal of Antelope and Middle Reese River Valleys, Lander County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 19.

CWRR (1973) (Center for Water Resources Research); Nevada Univ., Reno, Desert Res. Inst., Center for Water Resources Research: computer data bank.

Dangberg, Grace (1972) Historical sketches of Nevada's first settlement: Carson Valley Historical Society.

Darlington, P. J., Jr. (1928) New *Coleoptera* from western hot springs: Psyche, v. 35, no. 1, p. 1–6.

Darton, N. H. (1920) Geothermal data of the United States: U. S. Geol. Survey Bull. 701.

Davis, H. C. (1954) Summary report of reconnaissance and exploration for uranium deposits in northern Nevada (rev.): U. S. Atomic Energy Comm. RME–2013, pt. 1.

Davis, L. E., and Ashizawa, R. Y. (1960) The mineral industry of Nevada: U. S. Bur. Mines, Minerals Yearbook, 1959, v. III, p. 623–648.

_______ (1964) The mineral industry of Nevada: U. S. Bur. Mines, Minerals Yearbook, 1963, v. III, p. 623–648.

Davis, L. E., Ashizawa, R. Y., and Giorgetti, L. (1961) The mineral industry of Nevada: U. S. Bur. Mines, Minerals Yearbook, 1960, v. III, p. 635–661.

_______ (1962) The mineral industry of Nevada: U. S. Bur. Mines, Minerals Yearbook, 1961, v. III, p. 659–685.

Day, T. J. (1975) A geothermal temperature study in and around Beowawe (Nevada): M.S. report, Stanford Univ.

de Braga, Marcia (1964) Dig no graves, a history of Churchill County, Nevada: Western Printing and Publishing Co., Sparks, NV.

Decius, L. C. (1964) Geological environment of hyperthermal areas in continental United States and suggested methods of prospecting them for geothermal power: United Nations Conf. on New Sources of Energy, Rome, Aug. 1961, Proc., v. 2, p. 166–178.

Dole, R. B. (1913) Exploration for salines in Silver Peak Marsh, Nevada: U. S. Geol. Survey Bull. 530.

Dreyer, R. M. (1940) Goldbanks mining district, Pershing County, Nevada: Nevada Univ. Bull., v. 34, no. 1 [33].

Dudley, W. W., Jr., and Larson, J. D. (1976) Effect of irrigation pumping on desert pupfish habitats in Ash Meadows, Nye County, Nevada: U. S. Geol. Survey Prof. Paper 927, 52 p.

Dunn, L. E., and Hanson, R. A. (1967) Chemical composition and quality of Nevada waters: Nevada Univ., Reno, Agr. Expt. Sta., Rept. R32.

Eakin, T. E. (1960) Ground-water appraisal of Newark Valley, White Pine County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 1.

_______ (1961) Ground-water appraisal of Pine Valley, Eureka and Elko Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 2.

_______ (1962a) Ground-water appraisal of Diamond Valley, Eureka and Elko Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 6.

_______ (1962b) Ground-water appraisal of Gabbs Valley, Mineral and Nye Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 9.

_______ (1962c) Ground-water appraisal of Ralston and Stonecabin Valleys, Nye County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 25.

_______ (1963a) Ground-water appraisal of Garden and Coal Valleys, Lincoln and Nye Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 18.

_______ (1963b) Ground-water appraisals of Pahranagat and Pahroc Valleys, Lincoln and Nye Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 21.

_______ (1964) Ground-water appraisal of Coyote Springs and Kane Springs Valleys and Muddy River Springs area, Lincoln and Clark Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 25.

_______ (1966) Regional interbasin ground-water system in the White River area, southeastern Nevada: Water Resources Research, v. 2, no. 2, pp. 251–271; also Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 33.

Eakin, T. E., Hughes, J. L., and Moore, D. O. (1967) Ground-water appraisal of Steptoe Valley, White Pine County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 42.

Eakin, T. E., Maxey, G. B., Robinson, T. W., Fredericks, J. C., and Loeltz, O. J. (1951) Contributions to the hydrology of eastern Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 12.

Eakin, T. E., and Moore, D. O. (1964) Uniformity of discharge of Muddy River Springs, southeastern Nevada, and relation to interbasin movement of ground water *in* Geologic Survey Research: U. S. Geol. Survey Prof. Paper 501, chap. D., p. 171–176.

Eakin, T. E., and Robinson, T. W. (1950) Ground-water conditions in Whisky Flat, Mineral County, Nevada: U. S. Geol. Survey open-file report.

Eakin, T. E., Schoff, S. L., and Cohen, Philip (1963) Regional hydrology of a part of southern Nevada; a reconnaissance: U. S. Geol. Survey Trace Element Inv. Rept. TEI–833.

Ehrlich, G. G., and Schoen, Robert (1967) Possible role of sulfur-oxidizing bacteria in surficial acid alteration near hot springs: U. S. Geol. Survey Prof. Paper 575–C, p. C110.

Eng. Mining Jour.-Press (1923) No dividend no mill for Divide: Eng. Mining Jour.-Press, v. 115, no. 12, p. 556.

Evans, A. S. (1869) In Whirlwind Valley: Overland Monthly [San Francisco, CA], v. 2, no. 2, p. 111–115.

Everett, D. E. (1964a) Ground-water appraisal of Edwards Creek Valley, Churchill County, Nevada: Nevada Dept. Conserv. and

Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 26.
_______ (1964b) Map showing saline ground-water areas of Nevada: U. S. Geol. Survey open-file report.

Everett, D. E., and Rush, F. E. (1964) Ground-water appraisal of Smith Creek and Ione Valleys, Lander and Nye Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 28.

_______ (1965) Water resources appraisal of Lovelock Valley, Pershing County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 32.

_______ (1966) Brief appraisal of the water resources of Grass and Carico Lake Valleys, Lander and Eureka Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 37.

_______ (1967) Brief appraisal of water resources of Walker Lake area, Mineral, Lyon, and Churchill Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 40.

Facca, G., and Tonani, F. (1962) Natural steam exploration in USA: Boll. Geofisica Teor. ed Appl., v. 4, no. 14, p. 155–170.

Fall, H. C. (1928) A new coelambus from a thermal spring in [Ruby Valley] Nevada: Psyche, v. 35, no. 1, p. 64–65.

Ferguson, H. G., Muller, S. W., and Roberts, R. J. (1951a) Geology of the Winnemucca quadrangle, Nevada: U. S. Geol. Survey Geol. Quad. Map GQ–11.

_______ (1951b) Geology of the Mount Moses quadrangle, Nevada: U. S. Geol. Survey Geol. Quad. Map GQ–12.

Ferguson, H. G., Roberts, R. J., and Muller, S. W. (1952) Geology of the Golconda quadrangle, Nevada: U. S. Geol. Survey Geol. Quad. Map GQ–15.

Feth, J. H., Roberson, C. E., and Polzer, W. L. (1964) Sources of mineral constituents in water from granitic rocks Sierra Nevada, California and Nevada: U. S. Geol. Survey Water-Supply Paper 1535–I.

Fiero, G. W., Jr. (1968) Regional ground-water flow systems of central Nevada: Nevada Univ., Reno, Desert Res. Inst., Center for Water Resources Research Misc. rept. 5.

Fitch, W E. (1927) Mineral waters of the United States and American spas: Philadelphia and New York, Lea & Febiger.

Frémont, J. C. (1845) Report of the exploring expedition to Oregon and north California in the years 1843–44: Illinois Univ. Press [1970], Expeditions of John Charles Frémont, v. 1, pt. 137.

Fulton, J. A., and Smith, A. M. (1932) Nonmetallic minerals in Nevada: Nevada Univ. Bull., v. 26, no. 7 [17]; reprinted from Pit and Quarry, v. 24, no. 11, Aug. 24, 1932.

Garside, L. J. (1973) Radioactive mineral occurrences in Nevada: Nevada Bur. Mines and Geology Bull. 81.

_______ (1974) Geothermal exploration and development in Nevada through 1973: Nevada Bur. Mines and Geology Rept. 21.

Garside, L. J., and Schilling, J. H. (1972) Geothermal exploration and development in Nevada, *in* Geothermal overviews of the western United States: Geothermal Resource Council Conf., El Centro, 1972, Proc., paper H; also (1972) *in* Geothermal World Directory, Meadows, K. F., ed.

Geothermal Resources Council (1974) A brief outline of geothermal regulatory agencies in the western United States: Geothermal Resources Council, Davis, CA.

Gianella, V. P. (1933) Middle California and western Nevada: 16th Internat. Geol. Congress, United States, 1933, Guidebook 16, Excursion C–1. (Itinerary Reno to Walley Hot Springs and return), p. 108.

Gianella, V. P., and White, D. E. (1946) Minerals of Steamboat Springs, Nevada [abs.]: Geol. Soc. America Bull., v. 57, no. 12, pt. 2, p. 1196; also (1947) Am. Mineralogist, v. 32, nos. 3–4, p. 200–201.

Gilbert, G. K. (1875) Report on the geology of portions of California, Nevada, Utah, Colorado, New Mexico, and Arizona, examined in the years 1871, 1872, and 1873: U. S. Geol. Geog. Survey West 100th Meridian, v. 3, no. 1, p. 19–187.

Gillis, W. R. (1868) Nevada directory for 1868–1869: San Francisco, M. D. Carr and Co.

Glancy, P. A., and Katzer, T. L. (1975) Water-resources appraisal of the Carson River Basin, western Nevada: Nevada Dept. Conserv. Nat. Resources–Reconn. Ser. Rept. 59.

Glancy, P. A., and Rush, F. E. (1968) Ground-water appraisal Smoke Creek–San Emidio Desert area: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 44.

Glancy, P. A., and Van Denburgh, A. S. (1969) Water-resources appraisal of the lower Virgin River Valley area, Nevada, Arizona, and Utah: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 51.

Godwin, L. H., Haigler, L. B., Rioux, R. L., White, D. E., Muffler, L. P. J., and Weyland, R. G. (1971) Classification of public lands valuable for geothermal steam and associated geothermal resources: U. S. Geol. Survey Circ. 647.

Godwin, L. H., and Johnson, E. (1967; Rev. July 1976) State of Nevada geothermal land classification map: U. S. Geol. Survey Conservation Division unpublished map, Pacific area, scale 1:500,000.

Goldstein, N. E., and Paulsson, B. (1977) Interpretation of gravity surveys in Grass and Buena Vista Valleys, Nevada: Calif. Univ., Lawrence Berkeley Laboratory Rept. LBL–7013.

Goldstein, N. E., Beyer, H., Corwin, R., di Somma, D. E., Majer, E., McEvilly, T. V., Morrison, H. F., Wollenberg, H. A., and Grannell, R. (1976) Geoscience studies in Buena Vista Valley, Nevada: Natl. Tech. Inf. Service open-file report LBL–5913.

Grose, L. T. (1971) Geothermal energy: geology, exploration, and developments, Part 1: Colorado School of Mines Mineral Industries Bull. v. 14, no. 6.

Grose, L. T., and Keller, G. V. (1974a) Colorado School of Mines Nevada Geothermal Study—Report of Progress for the Period May 1, 1974 to July 31, 1974: Colorado School of Mines report, Natl. Sci. Found. grant GI 43866.

_______ (1974b) Colorado School of Mines Nevada Geothermal Study—Report of Progress for Period August 1, 1974 to October 30, 1974: Colorado School of Mines report, Natl. Sci. Found. grant GI 43866.

_______ (1975a) Colorado School of Mines Nevada Geothermal Study—Progress Report No. 3—for Period November 1, 1974 to January 31, 1975: Colorado School of Mines report, Natl. Sci. Found. grant GI 43866.

_______ (1975b) Colorado School of Mines Nevada Geothermal Study Progress Report No. 4—for Period February 1, 1975 to October 31, 1975: Colorado School of Mines report, Natl. Sci. Found. grant GI 43866.

_______ (1976) Research on the physical properties of geothermal reservoir rocks. Summary report on collection of samples of volcanic rocks for petrophysical studies. Progress Report I: Natl. Tech. Inf. Service Rept. COO–2908–1.

Hague, Arnold, and Emmons, S. F. (1877) U. S. Geol. Explor. 40th Parallel, v. 2.

Hardman, G., and Miller, M. (1934) Quality of water of southeastern Nevada, drainage basins and water resources: Nevada Univ., Reno, Agr. Expt. Sta. Bull. 136.

Harrill, J. R. (1968) Ground water in Diamond Valley, Eureka County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 35.

_______ (1969) Hydrologic response to irrigation ground-water pumping in Hualapai Flat, Washoe, Humboldt, and Pershing Counties, Nevada, 1960–67: Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 37.

_______ (1970) Water-resources appraisal of the Granite Springs Valley area, Pershing, Churchill, and Lyon Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 55.

Harrill, J. R., and Moore, D. O. (1970) Effects of ground-water regimen of Paradise Valley, Humboldt County, Nevada, 1948–68, and hydrologic reconnaissance of the tributary areas: Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 39.

Hawley, J. W., and Wilson, W. E. (1965) Quaternary geology of the Winnemucca area: Nevada Univ., Reno, Desert Res. Inst. Tech. Rept. 6.

Henyey, T. L., and Lee, T. C. (1976) Heat flow in Lake Tahoe, California–Nevada, and the Sierra Nevada—Basin and Range transition: Geol. Soc. America Bull., v. 87, p. 1179–1187.

Hollander, J. M., Laird, A. D. K., Mirk, K. F., and Wollenberg, H. A. (1974) Utilization of intermediate-temperature geothermal brines in the production of electric power, *in* Geothermal Resources—Parts I and II: Committee on Interior and Insular Affaris, Washington, D. C., p. 126–140.

Holmes, G. H., Jr. (1966) Water requirements and uses in Nevada mineral industries: U. S. Bur. Mines Inf. Circ. 8288.

Hoover, D. B., and Batzle, M. (1977) Audio-magnetotelluric data log and station location map for Pinto Hot Springs Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 77–65A.

Hoover, D. B., Batzle, M., and Rodriquez, R. (1975) Self-potential map–Steamboat Hills, Nevada: U. S. Geol. Survey open-file report 75–446.

Hoover, D. B., Brougham, G., and Clark, J. (1976) Audio-magnetotelluric data log, station location map, and telluric profile data for the Elko Hot Springs Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 76–152.

Hoover, D. B., Manydeeds, S., and Martinez, R. (1975) Audiomagnetotelluric data log, station location map, and telluric profile for San Emidio Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 75–670.

Hoover, D. B., O'Donnell, J., Batzle, M., and Rodriquez, R. (1975) Map of telluric profiles, Steamboat Hills, Nevada: U. S. Geol. Survey open-file report 75–445.

Hoover, D. B., Peterson, D. L., and Farkash, V. (1977) Telluric profile location map and telluric data for the Baltazor Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 77–66C.

Hoover, D. B., Senterfit, R. M., Fisher, D., and Radtke, B. (1977) Telluric profile location map and telluric data for the Salt Wells Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 77–66F.

Horton, R. C. (1964a) Geothermal power *in* Mineral and water resources of Nevada: Nevada Bur. Mines Bull. 65, p. 267–269.

_______ (1964b) Hot springs, sinter deposits and volcanic cinder cones in Nevada: Nevada Bur. Mines Map 25.

Hubbs, C. L., Miller, R. R., and Hubbs, L. C. (1974) Hydrographic history and relict fishes of the north-central Great Basin: California Acad. Sci. Mem., v. 7.

Hose, R. K., and Taylor, B. E. (1974) Geothermal systems of northern Nevada: U. S. Geol. Survey open-file report 74–271.

Hughes, J. L. (1966) Some aspects of the hydrogeology of the Spring Mountains and Pahrump Valley, Nevada, and environs, as determined by spring evaluation: M.S. thesis, Univ. of Nevada, Reno.

Hummel, N. A. (1888) General history and resources of Washoe County, Nevada: Nevada Educ. Assoc. (printed by the Reno Evening Gazette).

Hunt, C. B., Robinson, T. W., Bowles, W. A., and Washburn, A. L. (1966) Hydrologic basin, Death Valley, California: U. S. Geol. Survey Prof. Paper 494–B.

Huxel, C. J. (1969) Ground water in Mason Valley, Lyon County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 38.

Johnson, E. A., Renner, J. L., and Telleen, K. E. (1976) Hydrothermal convection systems in Nevada, *in* Renner, J. L., and others, Selected geothermal resources data: Hydrothermal convection systems in the states of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming: Natl. Tech. Inf. Service PB–250 377.

Johnson, M. G. (1977) Geology and mineral deposits of Pershing County, Nevada: Nevada Bur. Mines and Geol. Bull. 89.

Jones, J. C. (1914) Occurrence of stibnite and metastibnite at Steamboat Springs, Nevada [abs.]: Geol. Soc. America Bull., v. 25, no. 1, p. 126.

Kaufmann, H. (1976) Telluric profiles across the Darrough Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 76–286.

Keller, G. V., Grose, T., and Crewdson, R. A. (1974) Colorado School of Mines Nevada geothermal study: Conf. on Research for Devel. of Geothermal Energy Resources, Pasadena, CA, 1974, Proc., p. 73–84; also Natl. Sci. Found RANN Rept. 74–159.

Kerr, P. F. (1940) Tungsten-bearing manganese deposit at Golconda, Nevada: Geol. Soc. America Bull., v. 51, p. 1359–1389.

_______ (1946) Tungsten mineralization in the United States: Geol. Soc. America Mem. 15.

Kiersch, G. A. (1964) Geothermal steam, origin, occurrence, characteristics and exploitation: Cornell Univ., Ithaca, NY (Prepared under contract for U. S. Air Force Cambridge Research Labs.).

Kingman, D. S. (1958) Camp Desert Rock, Nevada—water supply investigation: report to U. S. Corps of Engineers, San Francisco District, CA.

_______ (1959) Water supply investigation: Naval Auxiliary Air Station, Fallon, Nevada, for District Public Works Office, U. S. Navy, Twelfth Naval District, San Bruno, CA.

Koenig, J. B. (1970) Geothermal exploration in the western United States: Geothermics, Spec. Issue 2, v. 2, pt. 1, p. 1–13.

_______ (1973) Worldwide status of geothermal resources, *in* Kruger, Paul and Otte, Carel (eds.), Geothermal energy-resources, production, stimulation: Stanford Univ. Press, Stanford, CA.

Koenig, J. B., Anderson, D. N., and Huttrer, G. W. (1975) Exploration and development of geothermal resources in the United States, 1968–1975: 2nd United Nations Symposium on Devel. and Use of Geothermal Resources, San Francisco, 1975, Proc., v. 1, p. 139–142.

Lamke, R. D., and Moore, D. O. (1965) Interim inventory of surface-water resources of Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 30.

Lawrence, E. F. (1971) Mercury mineralization at the Senator Fumaroles, Dixie Valley, Nevada [abs.]: Geol. Soc. America Abstr. with Programs, v. 3, no. 2, p. 147 (Cordilleran Section).

Lawson, A. C. (1912) The recent fault scarps at Genoa, Nevada: Seismol. Soc. America Bull., v. 2, no. 3, p. 193–200.

LeConte, Joseph (1883) On mineral vein formation now in progress at Steamboat Springs [Nevada] compared with the same at Sulphur Bank [California]: Am. Jour. Sci., 3d ser., v. 25, p. 424–428.

Liaw, A. L. C. (1977) Microseisms in geothermal exploration—studies in Grass Valley, Nevada: Calif. Univ., Lawrence Berkeley Laboratory Rept. LBL–7002.

Liggett, M. A. (1974) Reconnaissance space sensing investigation of crustal structure for a strip from the eastern Sierra Nevada to the Colorado Plateau—Final report: Natl. Aeronautics and Space Admin. CR Rept. 139434, Natl. Tech. Info. Service.

Lindgren, Waldemar (1905) Occurrence of stibnite at Steamboat Springs, Nevada: Soc. Mining Engineers Trans., v. 36.

_______ (1911) Tertiary gravels of the Sierra Nevada of California: U. S. Geol. Survey Prof. Paper 73.

Lintz, Joseph, Jr. (1957) Nevada oil and gas drilling data, 1906–1953: Nevada Bur. Mines Bull. 52.

Livingston, Penn (1940) Underground leakage from artesian wells in the Las Vegas area, Nevada: U. S. Geol. Survey Water-Supply Paper 849–C.

Locke, A. (1912) The abnormal temperatures on the Comstock Lode: Econ. Geology, v. 7, p. 583–587.

Loeltz, O. J. (1953) Hydrologic characteristics of aquifers penetrated by irrigation wells in the vicinity of Orovada, Humboldt County, Nevada: U. S. Geol. Survey open-file report.

_______ (1953) Results of pumping test of an artesian well near Battle Mountain, Lander County, Nevada: U. S. Geol. Survey open-file report.

Loeltz, O. J., and Eakin, T. E. (1953) Geology and water resources of Smith Valley, Lyon and Douglas Counties, Nevada: U. S. Geol. Survey Water-Supply Paper 1228.

Loeltz, O. J., and Phoenix, D. A. (1955) Geology and ground-water resources of Buena Vista Valley, Pershing County, Nevada: State of Nevada, Office of the State Engineer Water Resources Bull. 13.

Loeltz, O. J., Phoenix, D. A., Robinson, T. W. (1949) Ground water in Paradise Valley, Humboldt County, Nevada: State of Nevada, Office of the State Engineer Water Resources Bull. 10.

Long, C. L., and Batzle, M. L. (1976a) Station location map and audio-magnetotelluric data log for Monte Neva Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 76–700A.

_______ (1976b) Station location map and audio-magnetotelluric data log for Ruby Valley Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 76–700B.

_______ (1976c) Station location map and audio-magnetotelluric data log for Rye Patch Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 76–700C.

Long, C. L., and Brigham, R. H. (1975a) Audio-magnetotelluric data log for Wabuska, Nevada: U. S. Geol. Survey open-file report 75–444.

_______ (1975b) Audio-magnetotelluric data log for Steamboat Hills, Nevada: U. S. Geol. Survey open-file report 75–447.

Long, C. L., and Senterfit, M. (1977a) Audio-magnetotelluric data log and station location map for Baltazor Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 77–65B.

_______ (1977b) Audio-magnetotelluric data log and station location map for Fly Ranch Northeast Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 77–65C.
_______ (1977c) Audio-magnetotelluric data log and station location map for Gerlach Northwest Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 77–65D.
Long, C. L., Senterfit, M., and Kaufmann, H. (1975) Audio-magnetotelluric data log and station location map for Gerlach Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 75–669.
_______ (1976) Audio-magnetotelluric data log, apparent resistivity maps and station location map for the Darrough Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 76–285.
Lord, E. (1883) Comstock mining and miners: U. S. Geol. Survey Mon. 4.
Lutsey, I. A., and Nichols, S. L. (1972) Land status map of Nevada (2nd edition): Nevada Bur. Mines and Geology Map 40.
Lyle, D. A. (1878) The springs of southern Nevada: Amer. Naturalist, v. 12, p. 18–27.
Majer, E., Liaw, A., and McEvilly, T. V. (1976) Seismological investigations near Leach Hot Springs, Nevada [abs.]: EΘS, Am. Geophys. Union Trans., v. 57, no. 3, p. 153.
Malmberg, G. T. (1965) Available water supply of the Las Vegas ground-water basin, Nevada: U. S. Geol. Survey Water-Supply Paper 1780.
_______ (1967) Hydrology of the valley-fill and carbonate-rock reservoirs, Pahrump Valley, Nevada–California: U. S. Geol. Survey Water-Supply Paper 1832.
Malmberg, G. T., and Eakin, T. E. (1962) Ground-water appraisal of Sarcobatus Flat and Oasis Valley, Nye and Esmeralda Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 10.
Malmberg, G. T., and Worts, F. G., Jr. (1966) Effects of pumping on the hydrology of Kings River Valley, Humboldt County, Nevada, 1957–64: Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 31.
Mariner, R. H., Presser, T. S., Rapp, J. B., and Willey, L. M. (1975) Minor and trace elements, gas, and isotope compositions of the principal hot springs of Nevada and Oregon: U. S. Geol. Survey open-file report.
Mariner, R. H., Rapp, J. B., Willey, L. M., and Presser, T. S. (1974) Chemical composition and estimated minimum thermal reservoir temperatures of the principal hot springs of northern and central Nevada: U. S. Geol. Survey open-file report.
Marshall, Ruth (1928) A new species of water mite from thermal springs: Psyche, v. 35, no. 2, p. 92–96.
Maxey, G. B., and Eakin, T. E. (1949) Ground water in White River Valley, White Pine, Nye, and Lincoln Counties, Nevada: State of Nevada, Office of the State Engineer Water Resources Bull. 8.
Maxey, G. B., and Jameson, C. H. (1946) Well data in Las Vegas and Indian Spring Valleys, Nevada: State of Nevada, Office of the State Engineer Water Resources Bull. 4.
_______ (1948) Geology and water resources of Las Vegas, Pahrump, and Indian Spring Valleys, Clark and Nye Counties, Nevada: State of Nevada, Office of the State Engineer Water Resources Bull. 5.
Maxey, G. B., and Mifflin, M. D. (1966) Occurrence and movement of ground water in carbonate rocks of Nevada: Natl. Speleol. Soc. Bull., v. 28, no. 3.
McKee, E. H. (1968) Geologic map of the Spencer Hot Springs quadrangle, Lander County, Nevada: U. S. Geol. Survey Geol. Quad. Map GQ–770.
Meinzer, O. E. (1917) Geology and water resources of Big Smokey, Clayton, and Alkali Spring Valleys, Nevada: U. S. Geol. Survey Water-Supply Paper 423.
Mendenhal, W. C. (1909) Some desert watering places in southwestern Nevada and eastern California: U. S. Geol. Survey Water-Supply Paper 224.
Middleton, W. M. (1961) Report on Beowawe, Nevada, geothermal steam wells for Magma–Vulcan thermal power project: Vulcan Thermal Power Co. unpubl. report.
_______ (undated) Data and comments on geothermal steam wells at Brady Hot Springs, Nevada: Magma Power Co. unpubl. report.
Mifflin, M. D. (1963) Preliminary report on ground-water possibilities in Valley of Fire State Park, Nevada: Nevada Univ., Reno, Desert Res. Inst. report to Dir. Nevada Div. of State Parks.
_______ (1968) Delineation of ground-water flow systems in Nevada: Nevada Univ., Reno, Desert Res. Inst., Center for Water Resources Research Tech. Rept. H–W, no. 4.
Mifflin, M. D., and Domenico, P. A. (1964) Hydrogeology *in* Seismology, hydrogeology, and meteorology of the proposed nuclear power plant site in Mason Valley, Nevada: Nevada Univ., Reno, Desert Res. Inst. report to Sierra Pacific Power Co.
Mifflin, M. D., and Maxey, G. B. (1963) Preliminary report of the geology and hydrology of the Settlemeyer site, Carson Valley, Nevada: Nevada Univ., Reno, Desert Res. Inst. report to Div. of Fisheries and Wildlife, U. S. Fish and Wildlife Service.
Miller, M. R., Hardman, George, and Mason, H. G. (1953) Irrigation waters in Nevada: Nevada Univ., Reno, Agr. Expt. Sta. Bull. 187.
Mirk, K. F., and Wollenberg, H. A. (1974) Lawrence Berkeley Laboratory geothermal program in northern Nevada: Calif. Univ., Lawrence Berkeley Laboratory Rept. 3224, U. S. Energy Research and Devel. Admin. contract no. W–7405–ENG–48.
_______ (1975) Lawrence Berkeley Laboratory geothermal program in northern Nevada: Conf. on Research for Devel. of Geothermal Energy Resources, Pasadena, CA, 1974, Proc., p. 167–185.
Mitzger, D. G., Carstens, G. H., and Somers, W. P. (1953) Preliminary report on water resources in the vicinity of the Naval Ammunition Depot, Hawthorne, Nevada: U. S. Geol. Survey admin. report.
Moore, D. O., and Eakin, T. E. (1968) Ground-water appraisal Snake River tributaries, Elko and Humboldt Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 48.
Moore, J. G. (1969) Geology and mineral deposits of Lyon, Douglas, and Ormsby Counties, Nevada: Nevada Bur. Mines Bull. 75.
Morris, D. (1975) Quadripole mapping near the Fly Ranch geothermal prospect, northwest Nevada: Natl. Tech. Inf. Service Rept. PB–262779.
Morris, H. G. (1903) Hydrothermal activity in the veins at Wedekind, Nevada: Eng. Mining Jour., v. 76, p. 275–276.
Morrison, R. B. (1964) Lake Lahontan: geology of southern Carson Desert, Nevada: U. S. Geol. Survey Prof. Paper 401.
Muffler, L. J. P. (1975a) Present status of resources development: 2nd United Nations Symposium on Devel. and Use of Geothermal Resources, San Francisco, 1975, Proc., v. 1, p. iv.
_______ (1975b) Tectonic and hydrologic control of the nature and distribution of geothermal resources: 2nd United Nations Symposium on Devel. and Use of Geothermal Resources, San Francisco, 1975, Proc., v. 1, p. 499–507.
Muller, S. W., Ferguson, H. G., and Roberts, R. J. (1951) Geology of the Mount Tobin quadrangle, Nevada: U. S. Geol. Survey Geol. Quad Map GQ–7.
Munroe, R. J., and Moses, T. H., Jr. (1969) Temperature data from exploratory boreholes at the supplemental test site, central Nevada: U. S. Geol. Survey interim report, contract no. AT–(29–2)–474.
Murbarger, Nell (1956) Geysers of Whirlwind Valley (Nevada): Desert Mag., v. 19, no. 1, p. 17–20.
Myerson, B. L. (1956) Uranium occurrence near Panaca, Lincoln County, Nevada: U. S. Atomic Energy Comm. RME–2052.
Myrick, D. F. (1962) Railroads of Nevada and eastern California, the northern roads, v. 1: Berkeley, CA, Howell–North.
Naff, R. L. (1973) Hydrogeology of the southern part of Amargosa Desert in Nevada: M.S. thesis, Univ. of Nevada, Reno.
Nevada Mining Association (1964) Geothermal power: Nevada Mining Assoc. Newsletter no. 140, Nov. 15, 1964, p. 9, 10.
Noble, D. C., Wollenberg, H. A., Silberman, M. L., and Archibald, Douglas (1975) Late Cenozoic structural, volcanic, and hydrothermal evolution of the Leach Hot Springs geothermal area, Pershing County, Nevada: Geol. Soc. America Abstr. with Programs, 1975, p. 357.
Nolan, T. B., and Anderson, G. H. (1934) Geyser area near Beowawe, Eureka County, Nevada: Am. Jour. Sci., 5th ser., v. 27, no. 159, p. 215–229.
O'Donnell, J. E. (1976) Magnetotelluric soundings in the Darrough Hot Springs area, Nevada: U. S. Geol. Survey open-file report 76–288.
O'Donnell, J. E., Brougham, G. W., Martinez, R., and Christopherson, K. R. (1977) Telluric survey data for Pinto Hot Springs Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 77–66A (Supplement to 76–701A).

Oesterling, W. A. (1959) Areal economic geology of T33N,R39 and 40E, M.D.M.: Land Dept., Southern Pacific Co., San Francisco, unpubl. maps.
_______ (1960) Areal economic geology of T37N,R61 and 62E, M.D.M.: Land Dept., Southern Pacific Co., San Francisco, unpubl. map.
_______ (1961) Areal economic geology of T38N,R61 and 62E, M.D.M.: Land Dept., Southern Pacific Co., San Francisco, unpubl. map.
_______ (1962) Geothermal power potential of northern Nevada: Pacific Southwest Mineral Industry Conf., Am. Inst. Mining, Metallurgical, Petroleum Engrs., San Francisco, unpubl. report.
Oesterling, W. A., and Anctil, R. J. (1962) Geological and economic appraisal of geothermal steam resources at Brady Hot Springs, Nevada: Southern Pacific Co., unpubl. report.
Oesterling, W. A., and others (1960) Geological appraisal of geothermal steam resources at The Geysers near Beowawe, Nevada: Southern Pacific Co., unpubl. report.
Olcott, G. W. (1959) Areal economic geology of T34N,R41 and 42E, M.D.M.: Southern Pacific Co., unpubl. maps.
Olcott, G. W., and Spruck, W. H. (1961) Areal economic geology of T32N,R33 and 34E, M.D.M: Land Dept., Southern Pacific Co., unpubl. map.
Olmsted, F. H. (1974a) Hydrologic reconnaissance of geothermal areas in Black Rock Desert and Cason Desert, Nevada [abs.]: Geol. Soc. America Abstr. with Programs, v. 6, no. 3, p. 232.
_______ (1974b) Leach Hot Springs geothermal area, Nevada [abs.]: Geol. Soc. America Abstr. with Programs, v. 6, no. 7, p. 899.
Olmsted, F. H., Glancy, P. A., Harrill, J. R., Rush, F. E., and Van Denburgh, A. S. (1973) Sources of data for evaluation of selected geothermal areas in northern and central Nevada—Water resources investigations: U. S. Energy Research and Devel. Admin. Rept. 222948; also, U. S. Geol. Survey Water Resources Inv. 44–73.
_______ (1975) Preliminary hydrogeologic appraisal of selected hydrothermal systems in northern and central Nevada: U. S. Geol. Survey open-file report 75–56.
Olmsted, F. H. and Rush, F. E. (1977) Data released on potential geothermal area, Beowawe, Nevada: U. S. Geological Survey Water Resources open-file report.
Olson, R. H. (1964) Sulfur, *in* Mineral and water resources of Nevada: Nevada Bur. Mines Bull. 65, p. 254–256.
Overton, T. D. (1947) Mineral resources of Douglas, Ormsby, and Washoe Counties (Nevada): Nevada Univ. Bull., v. 41, no. 9 [46].
Paden, I. D. (1949) Prairie schooner detours: New York, The Macmillan Co.
Papke, K. G. (1969) Industrial rock and mineral deposits *in* Bonham, H. F., Jr., Geology and mineral deposits of Washoe and Storey Counties, Nevada: Nevada Bur. Mines Bull. 70.
_______ (1976) Evaporites and brines in Nevada playas: Nevada Bur. Mines and Geol. Bull. 87.
Patterson, E. B., Ulph, L. A., and Goodwin, V. (1969) Nevada's northeast frontier: Sparks, NV, Western Printing and Publishing Co.
Peale, A. C. (1886) Lists and analyses of the mineral springs of the United States (a preliminary study): U. S. Geol. Survey Bull. 32.
Penrose, R. A. F., Jr. (1893) Pleistocene manganese deposit near Golconda, Nevada: Jour. Geology, v. 1, no. 3, p. 275–282.
Peterson, D. L. (1975) Principal facts for gravity stations in Steamboat Hills and Wabuska, Nevada: U. S. Geol. Survey open-file report 75–443.
Peterson, D. L., and Dansereau, D. A. (1975) Principal facts for gravity stations in Gerlach and San Emidio Known Geothermal Resource Areas, Nevada: U. S. Geol. Survey open-file report 75–668.
_______ (1976a) Principal facts for gravity stations in the Darrough Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 76–289.
_______ (1976b) Principal facts for gravity stations in the Elko Hot Springs Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 76–151.
Peterson, D. L., and Hassemer, J. H. (1977) Principal facts for a gravity survey of Pinto Hot Springs Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 77–67B.
Peterson, D. L., and Hoover, D. B. (1977) Principal facts for a gravity survey of Baltazor Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 77–67C.
Peterson, D. L., and Kaufmann, H. E. (1977) Principal facts for a gravity survey of Salt Wells Basin, Churchill County, Nevada: U. S. Geol. Survey open-file report 77–67D.
Peterson, R. E. (1976) Nonelectric geothermal—a versatile resource: Geothermal Energy, v. 4, no. 11, p. 8–18.
Phillips, J. A. (1871) On the connexion of certain phenomena with the origin of mineral veins: London, Edinburgh, and Dublin Philos. Mag. and Jour. Sci., 4th ser., v. 42, no. 282, p. 401–413.
_______ (1879) A contribution to the history of mineral veins: Geol. Soc. London Quart. Jour., v. 35, p. 390–396.
Phoenix, D. A. (1948a) Geology and ground water in the Meadow Valley Wash drainage area, Nevada, above the vicinity of Caliente, with statements on classification of irrigable lands in the Panaca area of Meadow Valley, by George Hardman and H. G. Fox, and Quality of spring and well waters of the Meadow Valley Wash drainage area above the vicinity of Caliente, by George Hardman and M. R. Miller: Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 7.
_______ (1948b) Ground-water conditions in the vicinity of Tonopah, Nye County, Nevada: U. S. Geol. Survey open-file report.
_______ (1949a) Ground water in the Austin area, Lander County, Nevada: U. S. Geol. Survey open-file report.
_______ (1949b) Results and description of test drilling in Argenta swamp near Battle Mountain, Lander County, Nevada: U. S. Geol. Survey open-file report.
Pioneer Nevada (1951): Reno, Harolds Club.
Piper, A. M. (1923) Geology and water resources of the Goose Creek Basin, Cassia County, Idaho: Idaho Bur. Mines and Geology Bull. 6.
Prehn, W. L. (1973) Future role of desalting in Nevada: Washington, U. S. Govt. Printing Office, PB Rept. 226760.
Pruss, D. E., Bonham, H. F., Jr., and Spruck, W. H. (1961) Areal economic geology of T28N,R31 and 32E, M.D.M.: Southern Pacific Co., unpubl. map.
Ransome, F. L. (1909a) Geology and ore deposits of Goldfield, Nevada: U. S. Geol. Survey Prof. Paper 66.
_______ (1909b) Notes on some mining districts in Humboldt County, Nevada: U. S. Geol. Survey Bull. 414.
Reid, J. A. (1905) Structure and genesis of the Comstock Lode: California Univ., Dept. Geology Bull., v. 4, no. 10, pp. 177–199.
Renner, J. L. (1976) Selected geothermal resources data: Hydrothermal convection systems in the States of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming: Natl. Tech. Inf. Service Rept. USGS–CD–76–001.
Renner, J. L., White, D. E., and Williams, D. L. (1975) Hydrothermal convection systems, *in* White, D. E., and Williams, D. L., eds., Assessment of geothermal resources of the United States—1975: U. S. Geol. Survey Circ. 726, p. 5–57.
Rinehart, J. S. (1968) Geyser activity near Beowawe, Eureka County, Nevada: Jour. Geophys. Research, v. 73, no. 24, p. 7703-7706.
Roberts, R. J., Montgomery, K. M., and Lehner, R. E. (1967) Geology and mineral resources of Eureka County, Nevada: Nevada Bur. Mines Bull. 64.
Robinson, T. W. (1950) Ground water for Indian Service hospital at Schurz, Nevada: U. S. Geol. Survey open-file report.
_______ (1950) Ground water in Nevada: Colorado School Mines Quart., v. 45, no. 4B, p. 33–38.
Robinson, T. W., and Fredericks, J. C. (1946) Ground water in Lovelock Valley, Nevada: State of Nevada, Office of the State Engineer Water Resources Bull. 2.
Robinson, T. W., Loeltz, J. O., and Poole, J. L. (1951) Ground water in the vicinity of Verdi, Washoe County, Nevada: U. S. Geol. Survey open-file report.
Robinson, T. W., and Phoenix, D. A. (1948) Ground water in Spanish Springs and Sun Valley, Washoe County, Nevada: U. S. Geol. Survey open-file report.
Rosevear, M. D. (1976) Growing up in Tonopah *in* Nevada official bicentennial book: Las Vegas, Nevada Publications.
Rush, F. E. (1964) Ground-water appraisal of the Meadow Valley area, Lincoln and Clark Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser.

Rept. 24.

_____ (1967) Water resources appraisal of Washoe Valley, Washoe County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 41.

_____ (1968a) Ground-water appraisal of Clayton Valley–Stonewall Flat area, Nye County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 45.

_____ (1968b) Ground-water appraisal of Thousand Springs Creek Valley, Elko County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 47.

_____ (1968c) Water resources appraisal of the lower Moapa–Lake Mead area, Clark Co., Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 50.

_____ (1970) Regional ground-water systems in the Nevada Test Site area, Nye, Lincoln, and Clark Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 54.

Rush, F. E., and Eakin, T. E. (1963) Ground-water appraisal of Lake Valley in Lincoln and White Pine Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 24.

Rush, F. E., and Everett, D. E. (1964) Ground-water appraisal of Monitor, Antelope, and Kobeh Valleys, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 30.

_____ (1966) Water resources appraisal of Little Fish Lake, Hot Creek, and Little Smoky Valleys, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 30.

Rush, F. E., and Glancy, P. A. (1967) Ground-water appraisal of the Warm Springs–Lemmon Valley area, Washoe County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 43.

Rush, F. E., and Huxel, C. J., Jr. (1966) Ground-water appraisal of the Eldorado–Piute Valley area, Nevada and California: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 36.

Rush, F. E., and Katzer, T. L. (1973) Water resources appraisal of Fish Lake Valley, Nevada and California: Nevada Dept. of Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 58.

Rush, F. E., and Kazmi, S. A. T. (1965) Water resources appraisal of Spring Valley, White Pine and Lincoln Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 33.

Rush, F. E., and Schroer, C. V. (1970) Water resources of Big Smokey Valley, Lander, Nye, and Esmeralda Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 41.

Russell, I. C. (1885) Geological history of Lake Lahontan: U. S. Geol. Survey Mon. 11.

Sanders, J. W., and Miles, M. J. (1974) Mineral content of selected geothermal waters: Nevada Univ., Reno, Desert Res. Inst., Center for Water Resources Research Proj. Rept. 26.

Sass, J. H., Lachenbruch, A. H., Munroe, R. J., Greene, G. W., and Moses, T. H., Jr. (1971) Heat flow in the western United States: Jour. Geophys. Research, v. 76, no. 26, p. 6376–6413.

Sass, J. H., Olmsted, F. H., Sorey, M. L., Wollenberg, H. A., Lachenbruch, A. H., Munroe, R. J., and Galanis, S. P., Jr. (1976) Geothermal data from test wells drilled in Grass Valley and Buffalo Valley, Nevada: U. S. Geol. Survey open-file report 76–85.

Sass, J. H., Wollenberg, H. A., di Somma, D. E., and Ziagos, J. P. (1976) Heat flow near Kyle Hot Springs, Buena Vista Valley, Nevada: U. S. Geol. Survey open-file report 76–862.

Sass, J. H., Ziagos, J. P., Wollenberg, H. A., Munroe, R. J., di Somma, D. E., and Lachenbruch, A. H. (1977) Application of heat-flow techniques to geothermal energy exploration, Leach Hot Springs area, Grass Valley, Nevada: U. S. Geol. Survey open-file report 77–762.

Schilling, J. H., ed. (1965a) A.I.M.E. Pacific Southwest mineral industry conference, fieldtrip guidebook.

_____ (1965b) Isotopic age determinations of Nevada rocks: Nevada Bur. Mines Rept. 10.

_____ (1968) Nevada's geothermal resources: Nevada Univ., Reno, Bur. Business and Econ. Research, Nevada Business Review, p. 2, 4.

Schilling, J. H., and Garside, L. J. (1968) Oil and gas developments in Nevada, 1953–1967: Nevada Bur. Mines Rept. 18.

Schoen, Robert, and White, D. E. (1965) Hydrothermal alteration in GS–3 and GS-4 drill holes, Main Terrace, Steamboat Springs, Nevada: Econ. Geology, v. 60, p. 1411–1421.

_____ (1967) Hydrothermal alteration of basaltic andesite and other rocks in drill hole GS–6, Steamboat Springs, Nevada: U. S. Geol. Survey Prof. Paper 575–B, p. B110.

Schoff, S. L., and Moore, J. E. (1964) Chemistry and movement of ground water, Nevada Test Site: U. S. Geol. Survey Trace Element Inv. Rept. TEI–838.

Schrader, F. C. (1947) Carson Sink area, Nevada: U. S. Geol. Survey open-file report.

Scott, R. C., and Barker, F. B. (1962) Data on uranium and radium in ground water in the United States: U. S. Geol. Survey Prof. Paper 426.

Senterfit, R. M., and Hoover, D. B. (1978) Audio-magnetotelluric station location map and data log for Double Hot Springs Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 78–105A.

Senterfit, R. M., Hoover, D. B., and Christopherson, K. (1978) Telluric traverse location map and profiles for Double Hot Springs Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 78–106A.

Senterfit, R. M., Hoover, D., and Tippens, C. (1976) Audio-magnetotelluric data log and station location map for the Dixie Valley Known Geothermal Resource Area, Nevada: U. S. Geol. Survey open-file report 76–292.

Sigvaldason, G. E., and White, D. E. (1962) Hydrothermal alteration in drill holes GS–5 and GS–7, Steamboat Springs, Nevada: U. S. Geol. Survey Prof. Paper 450–D, p. D113.

Silberman, M. L., and White, D. E. (1975) Limits on the duration of hydrothermal activity at Steamboat Springs, Nevada, by K-Ar ages of spatially associated altered and unaltered volcanic rocks [abs.]: Geol. Soc. America Abstr. with Programs, v. 7, no. 7, p. 1272–1273.

Sinclair, W. C. (1962a) Ground-water resources of Desert Valley, Humboldt and Pershing Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 7.

_____ (1962b) Ground-water resources of Haulapai Flat, Washoe, Pershing, and Humboldt Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 11.

_____ (1963a) Ground-water appraisal of the Black Rock Desert area, northwestern Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 20.

_____ (1963c) Ground-water appraisal of the Pueblo Valley–Continental Lake region, Humboldt County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources-Reconn. Ser. Rept. 22.

Sinclair, W. C., and Loeltz, O. J. (1963) Ground-water conditions in the Fernley–Wadsworth area, Churchill, Lyon, Storey, and Washoe Counties, Nevada: U. S. Geol. Survey Water-Supply Paper 1619–AA; also, Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 17.

Sinclair, W. C., and Malchow, R. L. (1963) Ground-water appraisal of the Long Valley–Massacre Lake region: Nev. Dept. Conserv. and Nat Resources, Ground-water Res.–Reconn. Ser. Rept. 15.

Slemmons, D. B. (1964) Part 1, Seismology, *in* Seismology, hydrogeology and meterology of the proposed nuclear power plant in Mason Valley, Nevada: Nevada Univ., Reno, Desert Res. Inst. report.

Slossen, J. E. (1974) Suprise Valley fault: Calif. Geol., Dec. 1974, p. 267–270.

Smith, A. M. (1956a) Resources report, Washoe County, Nevada: Report for the office of George W. Malone, U. S. Senate Nevada.

_____ (1956b) The nonmetallic mineral resources of Nevada: unpubl. report, Mackay School of Mines Library.

_____ (1957) Resources report, Elko County, Nevada: Report for the office of George W. Malone, U. S. Senate, Nevada.

_____ (1958) Resources report, Lincoln County, Nevada: Report for the office of George W. Malone, U. S. Senate, Nevada.

Smith, G. H. (1943) The history of the Comstock Lode, 1850–1920: Nevada Bur. Mines Bull. 37.

Snyder, C. A. (1963) Hydrology of stock-water development in the Ely grazing district, Nevada: U. S. Geol. Survey Water-Supply Paper 1475–L.

Sperandio, R. J., and Grose, L. T. (1976) Tectonic controls on the Fly Ranch hot-spring system, Hualapai Flat, northwest Nevada [abs.]: Geol. Soc. America Abstr. with Programs, v. 8, no. 6, p. 1116.

Spurr, J. E. (1903) Descriptive geology of Nevada south of the 40th parallel and adjacent parts of California: U. S. Geol. Survey Bull. 108.

_______ (1905) Geology of the Tonopah mining district, Nevada: U. S. Geol. Survey Prof. Paper 42.

_______ (1906) Ore deposits of the Silver Peak quadrangle, Nevada: U. S. Geol. Survey Prof. Paper 55.

Staatz, M. H., and Bauer, H. L., Jr. (1953) Uranium in the East Walker River area, Lyon County, Nevada: U. S. Geol. Survey Bull. 988–C, p. 29–43.

Stanley, W. D., Wahl, R. R., and Rosenbaum, J. G. (1976) A magnetotelluric study of the Stillwater–Soda Lakes, Nevada, geothermal area: U. S. Geol. Survey open-file report 76–80.

Stearns, N. D., Stearns, H. T., and Waring, G. A. (1937) Thermal springs in the United States: U. S. Geol. Survey Water-Supply Paper 679–B.

Stewart, J. H., and Carlson, J. E. (1974) Preliminary geologic map of Nevada: U. S. Geol. Survey Mineral Inv. Field Studies Map MF 609.

_______ (1976a) Cenozioc rocks of Nevada: Nevada Bur. Mines and Geol. Map 52.

_______ (1976b) Geologic map of north-central Nevada: Nevada Bur. Mines and Geol. Map 50.

St. John, Orestes (1883) Report on the geology of the Wind River district, *in* Hayden, F. V., U. S. Geol. and Geog. Survey Terr. 12th Ann. Rept., 1878, pt. 1, p. 173–269.

Tabor, R. W., and Ellen, S. (1975) Geologic map, Washoe City Folio: Nevada Bur. Mines and Geol.

Thompson, G. A. (1956) Geology of the Virginia City quadrangle, Nevada: U. S. Geol. Survey Bull. 1042–C.

Thompson, G. A., and White, D. E. (1964) Regional geology of the Steamboat Springs area, Washoe County, Nevada: U. S. Geol. Survey Prof. Paper 458–A, p. A1–A52.

Thompson, T. H., and West, A. A. (1881) History of Nevada (reprint., 1958): Berkeley, CA, Howell–North.

Tischler, M. S., Beers, A., and Bonham, H. F., Jr. (1960) Areal economic geology of T20N,R25 and 26E, M.D.M.: Southern Pacific Co., unpubl. map.

Truesdell, A. H. (1975) Geochemical techniques in exploration: 2nd United Nations Symposium on Devel. and Use of Geothermal Resources, San Francisco, 1975, Proc., v. 1, table 1.

TRW Systems Group (1976) Study of geothermal prospects in the western United States: TRW Systems Group contract 954243.

Trexler, D. T. (1977) Progress report for evaluation of lineament analysis as an exploration technique for geothermal energy: Nevada Bur. Mines and Geol. unpubl. report to U. S. Energy Research and Devel. Admin., contract no. EY–76–S–08–0671.

Tschanz, C. M., and Pampeyan, E. H. (1970) Geology and mineral deposits of Lincoln County, Nevada: Nevada Bur. Mines Bull. 73.

U. S. Bureau of Reclamation (1972) An appraisal of geothermal resources in the Mid-Pacific region: U. S. Dept. of Interior, Bureau of Reclamation Rept.

U. S. Energy Resources and Development Adiminstration (July 1976) A bibliography of geothermal resources—exploration and exploitation: U. S. Dept. Commerce, U. S. Energy Res. and Devel. Admin., Tech. Inf. Center Abstracts 1–5476.

_ (September 1976) Geothermal energy update: U. S. Dept. Commerce, U. S. Energy Res. and Devel. Admin., Tech. Inf. Center Abstracts 1–300.

U. S. Geological Survey (1977) WATSTORE water quality file (computer data bank).

Van Denburgh, A. S., and Glancy, P. A. (1970) Water resources appraisal of the Columbus Salt Marsh–Soda Spring Valley area, Mineral and Esmeralda Counties, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 52.

Van Denburgh, A. S., and Rush, F. E. (1974) Water resources appraisal of Railroad and Penoyer Valleys, east-central Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 60.

Vanderburg, W. O. (1936) Reconnaissance of mining districts in Pershing County, Nevada: U. S. Bur. Mines Inf. Circ. 6902.

_______ (1940) Reconnaissance of mining districts in Churchill County, Nevada: U. S. Bur. Mines Inf. Circ. 7093.

Visher, F. N. (1957) Geology and ground-water resources of Quinn River Valley, Humboldt County, Nevada: State of Nevada, Office of the State Engineer Water Resources Bull. 14.

Waldron, H. H. (1969) Potential applications of nuclear explosives to the recovery of geothermal energy—Progress report for the fiscal year 1966: U. S. Geol. Survey Rept. 289–2, contract no. AT(04–3)–289, U. S. Dept. Commerce, U. S. Energy Res. and Devel. Admin., Natl. Tech Inf. Service.

Walker, G. E., and Eakin, T. E. (1963) Geology and ground-water of Amargosa Desert, Nevada and California: Nevada Dept. Conserv. and Nat. Resources, Ground-water Resources–Reconn. Ser. Rept. 14.

Waring, G. A. (1919) Ground water in Reese River basin and adjacent parts of the Humboldt River basin, Nevada: U. S. Geol. Survey Water-Supply Paper 425.

_______ (1920) Ground water in Pahrump, Mesquite, and Ivanpah Valleys, Nevada and California: U. S. Geol. Survey Water-Supply Paper 450–C, p. 51–86.

_______ (1965) Thermal springs of the United States and other countries of the world: U. S. Geol. Survey Prof. Paper 492.

Warner, L. A., Holser, W. T., Wilmarth, V. R., and Cameron, E. N. (1959) Occurrence of nonpegmatite beryllium in the United States: U. S. Geol. Survey Prof. Paper 318.

Warner, M. M. (1975) Special aspects of Cenozoic history of southern Idaho and their geothermal implications: 2nd United Nations Symposium on Devel. and Use of Geothermal Resources, San Francisco, 1975, Proc., v. 1, p. 653–663.

Washington Univ., Seattle, Inst. for Environmental Studies (1974) Seismicity report on Black Rock Desert project—northwest Nevada: Natl. Tech. Inf. Service Rept. PB–262674.

Wehlage, E. F. (1973) Beowawe still roars, *in* Meadows, K. F., ed., Geothermal world directory: Glendora, CA, K. F. Meadows, p. 182–192.

Wendell, W. G. (1970) The structure and stratigraphy of the Virgin Valley–McGee Mountain area, Humboldt County, Nevada: M.S. thesis, Oregon State Univ.

White, D. E. (1947) Rock alteration associated with thermal springs [abs.]: Geol. Soc. America Bull., v. 58, no. 12, pt. 2, p. 1239; also [abs.] (1948) Am. Mineralogist, v. 33, nos. 3–4, p. 210–211.

_____ (1952) Some recent results of investigations at Steamboat Springs, Nevada [abs.]: Geol. Soc. America Bull., v. 63, pt. 2, no. 12, p. 1374.

_____ (1953) Three-dimensional picture of Steamboat Springs, Nevada [abs.]: Geol. Soc. America Bull., v. 63, no. 12, pt. 2, p. 1311–1312, Dec. 1952; also, Am. Mineralogist, v. 38, nos. 3–4, p. 364.

_ (1954) Hydrothermal alteration and other characteristics of five explored hot-spring systems [abs.]: Geol. Soc. America Bull., v. 65, no. 12, pt. 2, p. 1325–1326.

__ (1955a) Thermal springs and epithermal ore deposits: Econ. Geology, Fiftieth Anniv. Vol., p. 100–154.

_____ (1955b) Violent mud-volcano eruption of Lake City hot springs, northeastern California: Geol. Soc. America Bull., v. 66, no. 9, p. 1109–1130.

_____ (1957) Thermal waters of volcanic origin: Geol. Soc. America Bull., v. 65, no. 12, p. 1637–58.

_____ (1964) Preliminary evaluation of geothermal areas by geochemistry, geology, and shallow drilling: U. N. Conf. on New Sources of Energy, Rome, 1961, Proc., v. 2, p. 402–409.

_____ (1965) Geothermal energy: U. S. Geol. Survey Circ. 519.

_____ (1968) Hydrology, activity, and heat flow of the Steamboat Springs thermal system, Washoe County, Nevada, geology and geochemistry of the Steamboat Springs area, Nevada: U. S. Geol. Survey Prof. Paper 458–C.

_____ (1973) Characteristics of geothermal resources, *in* Kruger, Paul and Otte, Carel (eds.), Geothermal energy-resources, production, stimulation: Stanford Univ. Press, Stanford, CA.

_____ (1974) Diverse origins of hydrothermal fluids: Econ. Geology, v. 69, p. 954–973.

White, D. E., and Brannock, W. W. (1950a) Sources of heat, water supply, and mineral content of Steamboat Springs, Nevada: Internat. Geol. Geophys. Union, Assoc. Sci. Hydrology Gen. Assembly, Oslo, 1948, v. 3, p. 168–176. Slightly revised, Am. Geophys. Union Trans., v. 31, no. 4, p. 566–574.

_______ (1950b) Sources of heat and water supply of thermal

springs, with particular reference to Steamboat Springs, Nevada [abs.]: Geol. Soc. America Bull., v. 61, no. 12, pt. 2, p. 1534.
White, D. E., and Craig, Harmon (1959) Isotope geology of the Steamboat Springs area, Nevada [abs.]: Geol. Soc. America Bull., v. 70, no. 12, pt. 2, p. 1696.
White, D. E., Craig, H., and Begemann, F. (1957) Isotope geology of water of the Steamboat Springs area, Nevada [abs.]: California Univ., Scripps Inst. Oceanog., Conf. on New Research Methods in Hydrology, La Jolla, 1957, Craig, H. B., ed., Proc., p. 28–30.
White, D. E., Fix., P. F., Gianella, V. P., and Brannock, W. W. (1946) Preliminary results at Steamboat Springs, Washoe County, Nevada [abs.]: Geol. Soc. America Bull., v. 57, no. 12, pt. 2, p. 1258–1259.
White, D. E., Hem, J. D., and Waring, G. A. (1963) Data of geochemistry, Sixth Ed.: U. S. Geol. Survey Prof. Paper 440–F.
White, D. E., Sandberg, C. H., and Brannock, W. W. (1953) Geochemical and geophysical approaches to the problems of utilization of hot-spring water and heat: 7th Pacific Science Assoc. Cong., New Zealand, 1949, Proc., v. 2, p. 490–499.
White. D. E., Thompson, G. A., and Brannock, W. W. (1949) Thermal springs and their possible significance in the future discovery of ore deposits [abs.]: Econ. Geology, v. 44, no. 1, p. 83.
White, D. E. Thompson, G. A., and Sandberg, C. H. (1964) Rocks, structure, and geologic history of Steamboat Springs thermal area, Washoe County, Nevada: U. S. Geol. Survey Prof. Paper 458–B.
Willden, Ronald (1964) Geology and mineral deposits of Humboldt County, Nevada: Nevada Bur. Mines Bull. 59.
Willden, Ronald, and Speed, R. C. (1974) Geology and mineral deposits of Churchill County, Nevada: Nevada Bur. Mines and Geol. Bull. 83.
Wilson, C. W., and Peterson, D. L. (1977) Principal facts for gravity stations in Clayton Valley, Nevada: U. S. Geol. Survey open-file report 77–256.
Wilson, R. E. (1960a) Areal economic geology T28N,R49E, M.D.M.: Southern Pacific Co., unpubl. map.
_______ (1960b) Areal geology map T29N,R49 and 50E, M.D.M.: Southern Pacific Co., unpubl. map.
_______ (1960c) Areal economic geology T35N,R63 and 64E, M.D.M.: Southern Pacific Co., unpubl. map.
Winograd, I. J. (1963) Summary of ground-water hydrology of area between Las Vegas Valley and Amargosa Desert, Nevada, with special reference to effects of possible new withdrawals of ground water: U. S. Geol. Survey Trace Element Inv. Rept. TEI–840, p. 197–227.
Wollenberg, H. A. (1974a) Geothermal studies in north-central Nevada [abs.]: Geol. Soc. America Abstr. with Programs, v. 6, no. 7, p. 1009.
_______ (1974b) Radioactivity of Nevada hot-spring systems: Calif. Univ., Lawrence Berkeley Laboratory Rept. LBL–2482.
_______ (1974c) Radioactivity of Nevada hot-spring systems: Geophys. Res. Lett., v. 1, no. 8, p. 358–362.
_______ (1975a) Radioactivity of geothermal systems: Calif. Univ., Lawrence Berkeley Laboratory Rept. 3232, U. S. Energy Res. and Devel. Admin. contract no. W–7405–ENG–43.
_______ (1975b) Radioactivity of geothermal systems: 2nd United Nations Symposium on Devel. and Use of Geothermal Resources, San Francisco, 1975, Proc., v. 2, p. 1283–1292.
_______ (1976) Geothermal studies in northern Nevada: Calif., Univ., Lawrence Berkeley Laboratory Rept. LBL–4451, U. S. Energy Res. and Devel. Admin. contract no. W–7405–ENG–48.
Wollenberg, H. A., Asaro, F., Bowman, H., McEvilly, T., Morrison, F., and Witherspoon, P. (1975) Geothermal energy resource assessment: Calif. Univ., Lawrence Berkeley Laboratory Rept. UCID–3762, U. S. Energy Res. and Devel. Admin. contract no. W–7405–ENG–48.
Wollenberg, H., Bowman, H., and Asaro, F. (1977) Geochemical studies at four northern Nevada hot-spring areas: Calif. Univ., Lawrence Berkeley Laboratory Rept. 6808.
Woods, M. C. (1974) Geothermal activity in Suprise Valley (California): California Geol., Dec. 1974, p. 271–273.
Work Projects Administration (1940) Nevada, a guide to the Silver State: Portland, OR, Binfords and Mort.
Worts, F. G., Jr., and Malmberg, G. T. (1966) Hydrologic appraisal of Eagle Valley, Ormsby County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources–Reconn. Ser. Rept. 39.
Zones, C. P. (1961a) Ground-water reconnaissance of Winnemucca Lake Valley, Pershing and Washoe Counties, Nevada: U. S. Geol. Survey Water-Supply Paper 1539–C; also Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 15.
_______ (1961b) Ground-water potentialities in Crescent Valley, Eureka and Lander Counties, Nevada: U. S. Geol. Survey Water-Supply Paper 1581; also Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 15.
_______ (1963) Ground water in the alluvium of Kings River Valley, Humboldt County, Nevada: Nevada Dept. Conserv. and Nat. Resources, Water Resources Bull. 16; also U. S. Geol. Survey Water-Supply Paper 1619–L.

INDEX