

# **NEVADA BUREAU OF MINES AND GEOLOGY**

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## **THERMAL WATERS OF NEVADA**

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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.



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## 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their exploration, development, and utilization—to bring together under one cover all the scattered data, published and unpublished, on Nevada's thermal waters, both hot water and steam.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 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