

A Regulatory Guide to Geothermal Direct Use Development

NEVADA

Introduction

Geothermal resource temperatures range from low temperatures of 50 to 80 degrees F (10 to 27 °C), to temperatures exceeding 650 degrees F (343°C). Although power can be generated economically from resources as low as 218 degrees F (103° C), power generation projects typically favor resource temperatures above 300 degrees F (149° C). High temperature resources (>300 degrees F, 149°C) can also be used for direct-use applications. However, lower temperature resources (< 212° F, 100° C) are often better suited for these projects.

Low temperature, direct-use projects cover a variety of applications. Projects may include traditional space heating applications, as well as greenhouse heating, spas and swimming pools, aquaculture, crop drying, industrial processing and other activities requiring lower temperatures. Because these projects are primarily water use applications, they often fall under a different regulatory process than high temperature, power generation projects. Typically this process is shaped by water and wastewater laws and regulations, and administered by their respective state, and in some cases, federal water and wastewater resource agencies.

The intent of this document is to help guide developers of direct use geothermal projects through the regulatory process of drilling, using and disposing of low temperature geothermal fluids in the state of Nevada. This guide will provide background on the state regulatory process and identify contact information necessary for completing the various applications and permits. This guide; however, cannot substitute for direct communication with the regulatory agencies. These agencies need to be contacted early in the process so that any regulatory hurdles are identified upfront and in time.

Projects that are located on federal lands are regulated according to the national Geothermal Steam Act and related federal regulations.

Regulatory Process for Direct Use Applications

High quality geothermal resources are abundant in Nevada. Currently, Nevada has 236 megawatts of generating capacity from 14 geothermal power plants, at ten different physical locations. Geothermal energy is also used to heat homes and businesses in numerous Nevada locations. The cities of Elko and Caliente have small municipal heating districts, while a private heating district provides heat to homes in southwest Reno and in Elko.

The *Nevada Revised Statutes (NRS) Chapter 534A Geothermal Resources* describes Nevada state laws pertaining to geothermal resources. *The Nevada Administrative Code (NAC) 534A Geothermal Resources* provides the rules and regulations governing the administration of the state geothermal laws. Both NRS 534A and NAC 534A can be downloaded by clicking [here](#).

The State of Nevada defines “*geothermal resource*” as “*the natural heat of the earth and the energy associated with that natural heat, pressure and all dissolved or entrained minerals that may be obtained from the medium used to transfer that heat, but excluding hydrocarbons and helium (NRS 534A.010)*.” Geothermal resources in Nevada belong to the owner of the surface property. In addition, geothermal resources are divided into three distinct classes as follows:

Domestic well: Geothermal resource projects developed for dwellings with common ownership on a single parcel of land which use not more than an annual average of 1,800 gallons of water a day.

Commercial well: A commercial well is primarily used to provide geothermal resources on a commercial basis for purposes other than the generation of power. A commercial well that does not produce geothermal heat for sale or the generation of power may be classified as a domestic well.

Industrial well: An industrial well is primarily used to generate power.

Most direct use, geothermal resource projects, including but not limited to greenhouse heating, warm water aquaculture, space heating, irrigation swimming pools and spas, will fall under the definition of a commercial well. The regulations governing commercial geothermal wells are spelled out in [NAC 534A.180](#). The lead regulatory agency is the Nevada Commission on Mineral Resources-Division of Minerals.

Direct use geothermal projects that have minimal consumptive water use, and return or reinject the geothermal water into the same aquifer or reservoir are not subject to the State of Nevada’s water appropriation process (NRS 534A.040). Direct use geothermal projects which consume water as part of their operation must obtain a water right permit and follow the appropriation procedure as described in the section entitled Water Rights.

Project developers will also need to consider how the geothermal water will be disposed of once it has been used for its design application. Disposal is typically accomplished through direct injection of the geothermal water via an injection well, or through surface disposal to the ground or to surface waters if injection is not an option. State regulations prescribe the reinjection of geothermal waters back to their source as described under NRS 534A Geothermal Resources.

The Nevada Commission on Mineral Resources-Division of Minerals (NDOM), is the lead agency in charge of administering and enforcing the various rules and regulations governing direct use, geothermal projects. The Nevada Department of Conservation and

Natural Resources-Division of Water Resources (DWR) is responsible for issuing water rights. The Nevada Department of Conservation and Natural Resources-Bureau of Water Pollution Control (BWPC) oversees the administration of underground fluid injection wells, and is also responsible for administering surface disposal of wastewater, including geothermal fluids. In addition to state and federal agencies, local and county agencies may also play a role in issuing local zoning and construction permits, and should be contacted early on in the development of a direct use, geothermal project.

The regulatory process for developing a low temperature, direct use geothermal project consists of the following steps:

- Gain access to lands either through lease or direct ownership.
- Contact local and/or county agencies to ensure compliance with local land use laws including building permits and zoning restrictions.
- Secure drilling and operations permit for geothermal resource well (**NDOM**).
- Secure water right, where necessary (**DWR**).
- Determine fluid disposal plan and obtain permits for either underground injection or surface disposal (**BWPC**).
- Contact state fish and wildlife agency if developing an aquaculture project.

Geothermal Resource Well Regulations

The State of Nevada is somewhat unique among western states in that they have developed a regulatory path for direct use geothermal applications. The Nevada Commission on Mineral Resources-Division of Minerals (NDOM) administers this program, and the administrative rules and regulations are presented in NAC 534A.

The provisions for drilling a geothermal well for commercial use are outlined in [NAC 534A.180](#). While most of these rules are administered through the NDOM, there is interplay with other state agencies that have oversight. A summary of the provisions for commercial wells is presented below.

- **Application for permit for individual geothermal well.** An application for a permit to drill or operate an individual geothermal well must be submitted to NDOM. The application includes information on the location, use, depth and construction of the well. The application must also be accompanied by a bond of no less than \$10,000. The forms are provided by NDOM and include Form 1- Organization report; Form 2- Application for permit to drill and Oil, Gas and Geothermal Well; and, Form 3-Drilling bond. The applicant also must include a permit fee of \$200. The forms are available from NDOM (see Appendix A) or can be downloaded by clicking [here](#).
- **Application for permit for geothermal wells in a project area.** An application for a permit to drill or operate geothermal wells in a project area must be submitted to the division. Same Forms as above, but for projects with multiple wells. The drilling bond is for \$10,000 per well, or a blanket bond of \$50,000 can

- be used to cover all project production wells. The applicant must also pay a permitting fee of \$500, plus \$300 for each additional production well.
- **Location of well: Survey required; filing of certified plat of location.** The location of an individual geothermal well or the geothermal wells in a project area must be surveyed by a state water right surveyor and a certified plat of the location must be filed with the NDOM within 30 days after the completion of the construction of the well.
 - **Annual fee for geothermal production well or geothermal injection well.** The owner or operator of a geothermal production well or geothermal injection well must pay an annual fee of \$475 to NDOM for each production or injection well.
 - **Payment of fee based on depth of well.** Within 30 days after the completion of the construction of a geothermal well, the owner or operator of the geothermal wells is required to pay a fee to NDOM of \$200 per each commercial well.
 - **Well casing requirements** are presented in NAC 534A.260.
 - **Measurements of temperature and cuttings.** During drilling, temperatures must be recorded in a well log for each joint of pipe when the mud temperature reaches 200°F. The operator is also responsible for taking of cuttings at least every 30 feet and submit them to NDOM within 30 days.
 - **Well Drilling Records.** Operator must keep on-going drilling records as described in NAC 534A.340 . Records need to be filed with NDOM.
 - **Monthly and annual reports of production and temperature.** The owner or operator must file a monthly and annual report of production and temperature. Forms are available from NDOM.
 - **Reinjection of fluids.** Unless NDOM approves an alternative method of disposal, all fluids derived from geothermal resources must be reinjected into the same reservoir from which the fluids were produced. An owner or operator must notify NDOM prior to injecting fluids and must submit a monthly injection report with NDOM.
 - **Abandonment of well.** NDOM has set up provisions for abandonment of a well as described under NAC 534A.490.

A developer interested in low temperature geothermal resources may want to review data from other wells in the area. The Geo-Heat Center, located in Klamath Falls, Oregon maintains an extensive database covering wells and springs greater than 50 °C (122° F) for 16 western states, including Nevada. Information on the database can be found at <http://geoheat.oit.edu/databse.htm>

Water Rights

Background

The constitution and statutes of the State of Nevada guarantee the right to appropriate the public waters of the State. *NRS 533- Adjudication of Vested Water Rights; Appropriation of Public Waters* codifies the states water right appropriation laws which can be accessed by clicking [here](#). The Department of Conservation and Natural Resources-Division of

Water Resources (DWR) is the lead state agency that regulates the appropriation and distribution of water in the State of Nevada. When a private right to the use of public waters is established by appropriation, a water right is established that is a real property right, much like property rights in land.

Water rights are granted through the principal known as the Doctrine of Prior Appropriation. This means that those who first made beneficial use of water are entitled to continued use in preference to those who came later. The date the water right was established is called a priority date and determines who gets water when there is a shortage. If there is not enough water available to satisfy all of the water rights, then the individuals with the oldest (or senior) water rights get their water rights satisfied first and so on, in order, until there is no water left. It is the individuals with the new (or junior) water rights who do not get water when there is not enough to satisfy all claims.

Water rights must also meet the definition of beneficial use. In Nevada, beneficial uses include domestic use, irrigation, lawn and garden, stock-watering, manufacturing, mining, hydropower, municipal use, agricultural spraying, recreation, fish and wildlife, among others.

Water Rights Permit Process

In Nevada, any person planning a new or additional development for a beneficial use of water must obtain a Permit to appropriate the Public Water of the State of Nevada. A permit is not needed if the water is to be used for domestic purposes and the appropriation does not exceed 1800 gallons per day. The application is made to DWR and covers basic information regarding the applicant, the source of water supply, the amount to be used, how it is to be used and other related information. A copy of the application form can be downloaded by clicking [here](#), or by contacting DWR regional offices which are listed in Appendix A.

Upon receipt of an application, DWR records the date for priority of filing and reviews the application for completeness. If upon examination, the application is found to be defective, DWR returns the application to the permittee to make the necessary corrections and or additions. An application does not lose its priority of filing on account of defects if the application, properly corrected and accompanied by such maps and drawings as may be required, is returned to DWR within 60 days. Any application not returned in proper form within the 60 days, is canceled.

Once an application is deemed complete, DWR will publish a notice of the application once a week for 4 consecutive weeks in a local newspaper in the county where the water is to be appropriated. Any person interested may, within 30 days from the date of last publication of the notice of application, file with the DWR a written protest against the granting of the application. On receipt of a protest, DWR will inform the applicant of the protest by certified mail. DWR will review the protest for reason, and may hold public hearings as part of its review.

Before either approving or rejecting the application, DWR may require additional information including maps or hydrogeological studies if warranted. When approving permits, DWR also sets a time by which the project must be done and the water put to beneficial use. The permit is recorded in the office of the county recorder in which the water is used and or diverted. If approved the applicant begins developing water as per the conditions of the permit. When fully developed the applicant files proof with DWR stating the details of development. If satisfied that the terms and conditions of the permit are met, DWR issues a Certificate of Appropriation to the applicant.

The time it takes to complete the water right permitting process will vary and depends, in part, on the status of current permits. Recently, the Division had a back log of 3,000 applications, but is in the process of clearing these up. The fees associated with obtaining a water right permit include \$250 for processing the application to appropriate water and \$150, plus a flat fee of \$2 per acre-ft, for issuing and recording the water right permit.

Disposal of Geothermal Fluids

The regulations governing the disposal of low temperature geothermal fluids will depend on the type of application. Non contact geothermal projects, where the geothermal fluids are kept in a closed system and do not come in contact with outside contaminants, will typically have an easier compliance path than projects where contact with potential contaminants is made. When contact is made and water quality is potentially degraded, regulatory requirements may become more stringent to ensure that water quality is maintained.

There are basically three disposal options available to a developer of a direct use geothermal project: underground injection; disposal to surface waters; and/or, disposal to the ground or land application. In some cases, the regulatory agency(s) will specify the preferred disposal method. For example, in critical groundwater areas, reinjection may be required to ensure that the aquifer is maintained. However, in most cases, it will be up to the project developer to determine the best disposal method based on regulatory requirements and the cost of compliance.

Underground Injection

The Underground Injection Control (UIC) Program was established in 1982 when Congress passed the Safe Drinking Water Act. This program regulates, to one degree or the other, every "injection" of "fluid" into the subsurface. An "injection" is the emplacement of "fluids" regardless of whether the injection requires the application of pressure or not, and a fluid is defined as any liquid, gas or semisolid which can be made to flow. The intent of the program is to preserve and protect underground water from becoming polluted.

The mission of the Nevada Underground Injection Control (UIC) Program is to prevent degradation of underground sources of drinking water within the State due to

underground injection practices. Nevada has divided injection wells into five classes pursuant to federal regulations. Geothermal wells used to inject water for heating or cooling by a heat pump; and/or geothermal wells used in heating, the production of energy and aquaculture are considered Class V wells.

Unless a project receives a waiver from NDOM allowing an alternative method of disposal, the State of Nevada requires that geothermal fluids are injected back into the supply aquifer. The Nevada Division of Environmental Protection (DEP) is the lead agency in administering the rules and regulations governing injection wells. However, geothermal injection wells are permitted and regulated by the Division of Minerals (DOM), and/or the Bureau of Land Management (BLM) through a Memorandum of Understanding between DEP and these agencies. This includes injection wells that are used to enhance production or to dispose of produced water. The statutes governing underground injection can be found at [NRS 445A.265-470](#). The rules and regulations covering program administration are at [NAC 445A.810-925](#)

One of the major differences between the federal and State of Nevada UIC regulations is that a permit is required in Nevada for all injection activities, regardless of well class. The function of the permit is to satisfy DEP or NDOM that underground injection will not endanger groundwater supplies. The application form can be downloaded by clicking [here](#), and requires information on ownership; location and mapping; and, well construction and operation details. A \$50,000 bond may also be required at the discretion of DEP or NDOM; however, bonding requirements for Class 5 wells associated with direct use geothermal projects may be waived or reduced.

A non-refundable fee must accompany the permit application. The application fee for geothermal wells associated with space heating is \$700 for wells discharging less than 250,000 gallons per day, and \$1500 for wells discharging above this amount. The State of Nevada also collects an annual maintenance fee of \$250 fee for wells discharging less than 250,000 gallons per day, and \$500 for wells discharging in excess of this amount. Upon receiving a complete application, DEP or NDOM will prepare a draft permit and issue a public notice 30 days prior to the issuance of a final permit. Challenges to the permit may come up at this time and the permit can be modified or rejected based on public comment. Once the public process is satisfied, a final permit will be issued for no more than 5 years. Certain direct use geothermal projects may, alternatively, apply for a general UIC permit, which was developed for like projects. This process, when available, offers a quicker path for obtaining a UIC permit than getting an individual permit. DEP or NDOM staff will advise a project developer whether a general permit is acceptable.

Surface Disposal of Geothermal Fluids

The Nevada Revised Statutes Chapter 445A.300-730 Water Pollution Control establishes the laws governing the disposal and treatment of water resources in the State of Nevada. The accompanying rules and regulations for administering these laws are set forth in NAC 445A.226-348. Both NRS445A and NAC 445A can be accessed by clicking [here](#). Discharges to waters of the State (surface and groundwater) and discharges to municipal

wastewater treatment plants are covered under these laws and regulations. The Nevada Department of Conservation and Natural Resources-Bureau of Water Pollution Control (BWPC) is responsible for administering surface disposal of wastewater, including geothermal fluids.

In Nevada, the prescribed approach to disposing of geothermal waters is to reinject the fluid back to the source aquifer. Alternative disposal methods, including discharging to surface ground or surface waters, are only an option if the NDOM, in consultation with the BWPC, allow it. As a result of the State's position with regards to disposal of geothermal waters, only a brief discussion of alternative disposal options was included in this report.

In general, surface disposal of geothermal fluids to the ground is preferable to discharging into surface waters. Discharging to ground minimizes the chance of degrading existing water quality. Disposal to the ground surface or land application also keeps the water within the same geographic resource area. The BWPC issues National Pollutant Discharge Elimination System (NPDES) Permits for discharge to surface waters and ground water permits for discharges that may impact subsurface waters. Depending upon the type of discharge, the duration and the waters that may be potentially impacted, the BWPC may also issue temporary or general permits.

An individual Ground Water Discharge permit is required for projects that discharge to the ground and impact subsurface waters. The rules and regulations are contained in NAC 445A.228-263. An application for a permit must be submitted 180 days prior to discharge. Permitting takes between 3 to 6 months and involves a public notice period and the permit is in effect for 5 years.

A surface water discharge permit of NPDES permit is required for projects that discharge in to surface waters. The rules and regulations are contained in NAC 445A.070-302. The application process typically takes 6 months and requires a public notice period. The permit is issued for a 5 year period. A fee schedule for both groundwater and NPDES permits is presented in NAC 445A.232. Application forms can be accessed by clicking [here](#). An overview of state water pollution control permitting and regulatory requirements can be downloaded by clicking [here](#).

Aquaculture

The Nevada Division of Wildlife regulates and permits aquaculture projects in the state through the Fisheries Bureau. Contact information is presented in Appendix A.

Appendix A

State Contact Information

Geothermal

Geothermal Forms

Commission on Mineral Resources
Division of Minerals
400 W. King St., Suite 106
Carson City, NV 89703
775/884-7040

Geothermal Information/Assistance

Oil, Gas and Geothermal Program Manger
John Snow
Phone: 755/684-7040
Email: jsnow@govmail.state.nv.us

Water Rights

Division of Water Resources
123 W. Nye Lane, Room 246
Carson City, NV 89706-0818
Phone: 775/687-4380
FAX: 775/687-6972
Email: snbolv@water.nv.gov

Underground Injection Control (UIC) Program

[UIC Program Office](#)

333 W. Nye Lane, Room 129
Carson City, 89706-0851
Phone (775) 687-4670
Fax (775) 687-4684

UIC Program Staff

Evan Chambers, Environmental Scientist III ext. 3055
Russ Land, Environmental Scientist III ext. 3150

NPDES and Groundwater Discharge Contacts

The Nevada Department of Conservation and Natural Resources

Washington State University Extension Energy Program—2003

Bureau of Water Pollution Control

Website: <http://ndep.nv.gov/bwpc/bwpc01.htm>

Main Office:

333 W. Nye Lane, Room 129
Carson City, 89706-0851
Phone (775) 687-4670
Fax (775) 687-4684

Branch Office:

1771 E. Flamingo Ste. 121-A
Las Vegas, Nevada 89119
Phone (702) 486-2850
Fax (702) 486-2863

Aquaculture

Nevada Division of Wildlife

1100 Valley Road
Reno, NV 89512
(775) 688-1500
Fax (775) 688-1595
Website: <http://www.ndow.org/>

Appendix B

Geothermal References and Contacts

References

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Bloomquist, R. Gordon., Nimmons, John. T., Rafferty, Kevin, 1988, District Heating Development Guide, Legal, Institutional and Marketing Issues, Volume 1: for the Washington State Energy Office, funded by the US Department of Energy, pp. 1-268.

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Boyd, Tanya, Rafferty, Kevin, **date**, Aquaculture Information Package: Geo-Heat Center, Oregon Institute of Technology, Contract No. DE-FG07-90ID 13040, pp. 1-60.

Rafferty, Kevin, Boyd, Tonya, **date**, Geothermal Greenhouse Information Package: Geo-Heat Center, Oregon Institute of Technology, Contract No. DE-FG07-90ID 13040, pp.1-80.

Contacts

Geo-Heat Center

Website: www.oit.edu/-geoheat

Geothermal Education Office

Website: www.geothermal.marin.org

Geothermal Resources Council

Website: www.geothermal.org

Geothermal Heat Pump Consortium

Website: www.geoexchange.org

International Ground-Source Heat Pump Association

Website: www.igshpa.okstate.edu

U.S. Department of Energy

Website: www.eren.doe.gov/geothermal

Washington State University Energy Program

Website: <http://www.energy.wsu.edu/projects/renewables/geothermal.cfm>