

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION

FACT SHEET

(Pursuant to NAC 445A.874)

Permittee Name: City of Caliente	Type of Project: Geothermal Fluids Injection
Project Name: Caliente Geothermal Well No. 1	Address: Northern city limit, west of US-93, South of Antelope Canyon Caliente, Nevada 89008
Permit Action: UIC Draft Permit Renewal	Injection Wells (#): one (1)
Permit Number: UNEV94214	

A. Description of Injection

Location: Caliente Geothermal Well No. 1 (CGI-1) located in the NE1/4 SW1/4 section of Section 5, T.4S., R.67E. in Caliente, Lincoln County, Nevada. Latitude: 37° 37' 33" N; Longitude: 114° 30' 41" W.

Characteristics: The injectate is geothermal fluid (effluent temperature estimated to be approximately 170 degree F) which has passed through a closed-loop heat-exchanger system for a geothermal power generation plant. The average injection rate will be 300 gallons per minute (gpm) or less. The discharge fluid will have a TDS of approximately 300 mg/l. The major constituent is alkalinity (156 mg/l) with minor sodium (38 mg/l) and chloride (4 mg/l) and various trace constituents of fluoride (1 mg/l), boron (0.1 mg/l), silica (52 mg/l), arsenic (0.018 mg/l), nitrate (0.9 mg/l), potassium (15 mg/l), gross alpha (0.5 ± 1 pCi/l) and gross beta (19 ± 4 pCi/l). With the exception of arsenic, all measured water quality parameters are below primary and secondary drinking water standards.

B. Synopsis

Caliente Public Utilities, owned by the City of Caliente (Permittee), has constructed one injection well (CGI-1) and originally intended to use one existing well (CD-3) for production to supply heat to a perlite-drying plant in Caliente. Another existing well (CD-1) in close proximity to CD-3, will be a backup production well. Excess heat from the processing plant, if any, may be made available to other users.

- On August 21, 1995, permit UNEV94214 was issued to the Permittee to authorize injection of geothermal fluids, from Caliente geothermal production well (CD-3). The average injection rate was estimated at 540 gpm with a maximum rate of 1,100 gpm.
- The injection well, Caliente Geothermal Injection Well No. 1 (CGI-1), was constructed and testing was completed in August 1996. The well was rated to accept average injection rate of 300 gpm under gravity flow condition.
- Between August 1996 and March of 2009, no injection had occurred due to lack of funding for further development of the well.
- With this renewal, the Permittee intends to inject geothermal fluids, from production well CD-3 that would be used in a geothermal power generation plant, into well CGI-1.

The City of Caliente hopes that funding will be obtained to completely characterize the geothermal resources in the Caliente area for the potential development of a geothermal power generation project and place the injection well in operation.

Geologic reports of the area indicate the geothermal fluids upwell along normal/thrust faults in Antelope Canyon which lies north of Caliente in a northwesterly direction. The bedrock in the area of the canyon consists of Tertiary volcanic rocks, Paleozoic carbonate and Pre-Cambrian quartzite. The fluids discharge into overlying alluvial deposits, a heterogeneous mixture of clay, sand, and gravel, with maximum thickness of 200 feet. These alluvial deposits make up the known geothermal aquifer/reservoir. The maximum groundwater temperature found in the area of Antelope Canyon was 203 deg F.

After discharging to the alluvial sediments in Antelope Canyon, the thermal waters of a mixed-anion bicarbonate type high in manganese, migrate to the south toward Caliente and mix with cooler groundwater, a non-thermal water of a calcium-bicarbonate type, originating from Clover Canyon, which lies due east of Caliente. The aquifer in the vicinity of Antelope Canyon appears to be unconfined, while clay beds from driller's reports indicate the aquifer beneath the city to be semi-confined to confined.

At this time, due to the experimental nature of the drying process, the exact amount of production required has not been determined. However, based on previous pump and injection tests at well CGI-1, estimated average injection rate is 300 gpm. To prevent effluent from discharging at the surface due to a shallow piezometric surface and lack of confining zone, the effluent will be injected under gravity-flow conditions. The receiving aquifer is the same aquifer used for municipal wells.

C. Receiving Water Characteristics

The injection zone will be located within the alluvial material in groundwater aquifers beneath Caliente. The total drilled depth of the well is 252 feet. The injectate has a better overall water quality than the receiving waters. TDS of the injection zone is approximately 500 mg/l. The major constituent is alkalinity (232 mg/l) with sodium (100 mg/l) and chloride (66 mg/l) and various trace constituents of fluoride (1.2 mg/l), boron (1.4 mg/l), silica (43 mg/l), arsenic (0.036 mg/l), nitrate (0.4 mg/l), potassium (7.9 mg/l), gross alpha (15 ± 3 pCi/l) and gross beta (10 ± 4 pCi/l). With the exception of potassium, nitrate, silica, and gross beta the quality of geothermal fluid from well CD-3 is better than ambient ground water quality in the vicinity of the injection well CGI-1.

D. Procedures for Public Comment

The Notice of the Division's intent to issue a permit authorizing the facility to discharge to groundwater of the State of Nevada was sent to the *Las Vegas Review Journal* and the *Lincoln County Record* on **June 02, 2009** for publication. The notice was mailed to interested persons on our mailing list. Anyone wishing to comment on the proposed permit may do so for a period of 30 days following the date of the public notice.

A public hearing on the proposed determination can be requested by the applicant, any affected state, any affected interstate agency, the regional administrator of EPA Region IX or any interested agency, person or group of persons.

Any public hearing determined by the Administrator to be held must be conducted in the geographical area of the proposed discharge or any other area the Administrator determines to be appropriate. All public hearings will be conducted in accordance with NAC 445A.238.

The final determination of the Administrator may be appealed to the State Environmental Commission pursuant to NRS 445.274.

E. Proposed Determination

The Division has made the tentative determination to issue (renew) the proposed permit.

F. Proposed Effluent Limitations and Special Conditions

The daily injection rate shall not exceed limit and conditions shown in Table 1 below. The following items (Table 1) will be monitored by the Permittee and be reported as specified in Part I.A.12 of the permit.

Table 1

PARAMETER	FREQUENCY	LOCATION	LIMITATIONS
Production Rate, gpm	Daily readings of totalizing flow meter(s)	Continuous Recording Gauge for Production Well	Monitor and Report
Injection Rate, gpm	Daily readings of totalizing flow meter(s)	Continuous Recording Gauge for Injection Well	300; daily average
Injection pressure, psig	Daily	Injection wellhead	0
Injection water level, ft			5; bgs ¹
Injection Temperature, degrees Fahrenheit (F)	Daily, 1 st month; weekly thereafter.	Injection wellhead gauge(s)	Monitor and Report
Electrical conductivity of injected and produced fluids	Monthly	Injection/Production Wellhead	Monitor and Report
Water Chemistry parameters in Attachment B – Sampling Report Form	Quarterly, 1 st year; annually thereafter	Production Well	Monitor and Report
	1 sample, start of injection; annually thereafter	Injection Wellhead	

Groundwater Elevation (amsl) & Depth to Groundwater (ft)	1 month prior to startup; quarterly thereafter	Injection Well head	Monitor and Report
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¹bgs: below ground surface

G. Rationale for Permit Requirements

The permit conditions will help to ensure that the injectate does not adversely affect the existing water quality or hydrologic regime.

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Date: **June 02, 2009**