

Resource Exploitation at Steamboat, Nevada: What it takes to Document and Understand the Reservoir/Groundwater/Community Interaction

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ABSTRACT

Under operating permit regulations, groundwater wells near the Steamboat geothermal field have been monitored since the early 1980s to detect changes that may be caused by injection of spent geothermal fluids back into the reservoir. The phreatic aquifer to the NW, N, and NE of the geothermal field is underlain by a native plume of variably cooled and chemically re-equilibrated outflow from the geothermal system. There is evidence that these two aquifers are separated by an aquitard, and the hydraulic head decreases downwards, yielding downflow from the phreatic zone into the geothermal zone except when the phreatic zone suffers extreme drawdown (decreased recharge or increased groundwater production) and the head reverses. Chemical changes that include increasing (and decreasing) Cl have occurred at groundwater monitor wells, but in all cases these appear to be the result of changes in the hydraulic head of the groundwater aquifer. Subsurface discharge from the Steamboat reservoir occurs principally in the N and NW, there is some evidence that this discharge occurs across relatively broad low permeability barriers (not within a few confined pathways), and there is evidence that the rate of discharge from the geothermal reservoir has decreased since the onset of commercial production. Monitor wells just N of the geothermal field appear to be more closely connected to deep upflow and to Upper Steamboat than to waters of Lower Steamboat. Ormat is now making improvements and additions to Steamboat which are intended to take the electricity generated from ~47 MW to 76 MW. This is enough to supply the households of the greater Reno area, and all but ~10 MW are essentially emissions-free. To ensure the comfort of the community with this expansion, it is important to continue to study and monitor the interaction of reservoir and groundwater. Better understanding of the interaction is being sought through a planned tracer test, re-design of the monitoring program, and drilling a new monitor well (or wells).

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