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AN ANALYSIS OF GROUND WATER
MONITORING DATA IN THE STEAMBOAT
SPRINGS GEOTHERMAL AREA

Prepared for the
Washoe County Department of
Water Resources

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CHAPTER ONE - INTRODUCTION

Background

During the past twenty years Washoe County has developed and continues to develop the ground water resources in the south Truckee Meadows. The ground water has become an important source of municipal water for the residential and commercial growth in the area. The continued use of this water source depends on protecting the water quality in the aquifers supplying the county wells. Of particular importance is the shallow water table aquifer in the Mt. Rose alluvial fan west of Steamboat Creek. Ground water studies in respect to geothermal energy development have been undertaken since 1981.

Starting in January of 1987 geothermal fluids from the Steamboat Springs geothermal system have been used for the generation of electricity. Ormat Energy Systems, Inc. (ORMAT) in 1987 and SBGeo in 1993 constructed what were then separate geothermal power projects, the former on what is known as the High Terrace and the latter on the Main Terrace. For this report the ORMAT operation is identified by its present name SBI/IA and the SBGeo project is identified as SBII/III. Caithness Power, Inc. began operation of a single flash steam driven power plant in February of 1988 (Figure 1). The generators employ either the two phase flash flow of steam and water from a geothermal well (Caithness) or the single phase pumping of the geothermal fluids (SBI/IA and SBII/III).

The SBI/IA and SBII/III spent geothermal fluids are injected into the subsurface. Caithness fluids also are injected but a portion (>15%) are evaporated. Under operating permits issued by the Nevada Department of Environmental Protection the spent fluids are to be injected into zones that are equal to or lesser than the water quality of the injected fluids. This invariably means that the spent fluids are injected into the geothermal system. Generally the injection zones are no deeper than the production zones for an individual project and may be shallower than the production zones. Geothermal energy production and injection has continued and expanded in the last 20 years.

Purpose and Scope

With increasing demand for municipal water supplies the Washoe County Department of Water Resources has requested a review of the monitoring data to see if there have been changes in the cold, low total dissolved solids (TDS) water in the aquifer that is a source for the County's municipal wells and the target for future ground water development. This work focuses on ground water quality north of the geothermal production and injection areas. This is an area where there is natural subsurface geothermal discharge from faults in the bedrock into the shallow fresh water alluvial aquifer. With 20+ years of injection of spent geothermal fluids the question has arisen as to what effects, if any, has the injection had on the alluvial fresh water aquifer. This report has been prepared for the Washoe County Department of Water Resources for discussion with the Nevada Division of Environmental Protection and the geothermal operators.

The area of investigation in this report is north and northeast of the old U.S. Highway 395/Mt. Rose Highway intersection and on the east and west sides of U.S. Highway 395 (Figure 1). This area contains monitoring sites where there have been previous analyses of monitoring data. Comparison of these prior analyses with the subsequent monitoring data is helpful in drawing