7th Quarterly Technical Progress Report

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The contract was initiated on January 20, 1997. During the third quarter of the second year of the contract our activity has continued to focus on the task of implementing the exploration well data base. In addition we have continued to work on the tasks of the maintenance of the WWW site with the heat flow and gradient data base, and development of a modeling capability for analysis of the geothermal system exploration data. We are implementing the data base template (see Table 1 in Quarterly Report #5) for geothermal system temperature-depth/gradient/heat flow data to be used in conjunction with the regional temperature-depth/gradient/heat flow data base that we had already developed.

Some results of the implementation are included with this report in the form of graphic summaries of the data prepared from the assembled data base. These examples show how easy it will be to use the tabulated data to investigate the various areas. Examples are shown from the geothermal sites of McCoy, Nevada, an AMAX project in the Augusta Mountains immediately east of Dixie Valley; The Black Rock Desert, Nevada (including the geothermal areas of Gerlach and Fly Ranch), and Leach hot springs in Grass Valley, Nevada (the last two were explored by multiple companies). Included for each site are color contour maps of the geothermal gradient based on the wells in the data base. These maps were all produced with a commercial program, SURFER by Golden Software, directly from the data bases for each area. Contour maps are shown for various gradient intervals to show the vertical changes in gradient in the exploration wells for example. Also included are shaded relief maps for each area from the USGS 1:250,000 map set and scanned copies of the county scale (generally 1:250,000) geologic maps (were available). These will be included with the data compilation.

The advantage of the ancillary information is that programs that are oriented toward a GIS approach can be used to overlay the various sets of information to enhance the accuracy and speed of the interpretation process. Examples using the SURFER program of the geothermal gradients from McCoy overlaid on the topography and the
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geologic map are included. Examples of the Leach and Black Rock Desert thermal gradients overlaid on the topographic map are also included.

These example figures are shown on our Internet home page at the present time. Also included on the home page are the data sheets for these example areas listing all of the data types tabulated (an example copy was sent with the 6th quarterly report), the references for the data, and information as available on the actual temperature-depth curves.

We have continued to entering data into the geothermal data base. The implementation this quarter has continued to focus on the state of Nevada as the most number of wells are there and few of the wells have been previously available in a data base. We have 2274 total points in the data base as of this time, 1270 in the state of Nevada. We have entered about 90% of the data in Nevada that we have access to at the present time so we are on target with respect to inputting the data. We do anticipate that significant numbers of additional data will become available in the future, as discussed below.

Garside (1997) listed 2594 thermal gradient well sites on the CD-ROM prepared for Nevada. We now have 1270 points from Nevada with reasonably complete data. There are a number of duplications and permit-only sites in the CD-ROM data so that the true number of sites is not clear. We are attempting to "find" additional data sets. For example we are in the process of obtaining a data set of 115 thermal gradient wells and three deep wells (6,600 to 8,200 ft) developed by Hunt Oil Company in Dixie Valley, Nevada. These sites are listed in the CD-ROM but the thermal data are not in the public domain at the present time. Some additional AMAX data will be obtained soon and a large Phillips data set was just obtained by DOE for the USGS from California Energy that we hope to put into the data base in the future as well. We made a number of contacts at GRC pursuing additional data sets. We anticipate completing the initial data base development by the end of the next quarter. Additional data sets will probably be obtained for some time so the data entering process will continue into the third year of the project, but at a lower level.

During this quarter we have maintained the Internet home page illustrating and having available for distribution the regional data base and maps. The address of the page is http://www.smu.edu/~geothermal/. The page is listed with the Internet page search engines and linked to other geothermal pages, including the GRC, DOE, IGA and OIT pages, so that those interested in the resource information can find it more readily. We
have added the figures, and their associated data bases, included in this report to the home page as examples of the full implementation expected in the near future.

We are continuing to develop initial exploration models for Basin and Range type of systems. We will use this code in the development of the generalized exploration models using the geothermal database information. As part of the results of this aspect of the activity and the data base development we have submitted an abstract and are preparing a paper for the 1999 Stanford workshop on the use of the geothermal system specific gradient data base to categorize geothermal systems, and for system exploration and evaluation.
MCCOY GEOTHERMAL AREA, NEVADA

Geology map with combined well depth gradients

Topography map and combined well depth gradients
BLACK ROCK DESERT, GERLACH AND FLY RANCH
GEOThERMAL AREA, NEVADA

Combined well gradient depths

Topography, 1:250,000

Shallow well gradients (<150 m)
Labels are well depths (m)

Deep well gradients (150 - 613 m)
Labels are well depths (m)
BLACK ROCK DESERT, GERLACH, AND FLY RANCH
GEOTHERMAL AREA, NEVADA
GRADIENT CONTOURS AND WELL LOCATIONS