AMAX EXPLORATION, INC.
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GEOTHERMAL BRANCH

INTER-OFFICE MEMORANDUM

SUBJECT: Livermore Downward Continuation DATE: March 27, 1980

TO: William M. Dolan

FROM: Arthur L. Lange

The downward continuation of temperature isotherms performed by D. Blackwell has been replotted onto our 1:24000 Calistoga base. As presented the results were very confusing and contained numerous errors. In replotting, I have separated the various interpretations onto individual plots and overlays, so that they can be better understood.

Plot I: Heatflow contours and well locations are shown on the base map. The values are corrected for topography.

Overlay 1: Heatflow profiles are drawn for section BB' drawn through AMAX #1. The dotted curve is an alternate profile, incorporating higher values to the northeast. Below, the solid isotherms are drawn for a 240°C source at about 3km depth based on two-dimensional structure. The effect of alternate heatflow has been omitted throughout the presentation in order to keep the plots readable. Their effect is simply a slight pull-up in isotherms to the northeast.

Overlay 2: Here, dashed isotherms represent the pattern due to a 150°C source at a depth of about 2km (2-dimensional).

Plot II: Overlay 1: The geology profile along AA', through the thermal anomaly is here generalized (from KOENIG).

Overlay 2: Heatflow curves A and B are based on the assumption that the high thermal conductivity near-surface continues to depth; the dotted curve again represents the alternate higher values. The corresponding isotherms are depicted for a 240° source at about 3km in a two-dimensional environment.

Overlay 3: For the same heatflow profiles, the isotherms resulting from a 150° source at about 2km are plotted dashed (2D model).

Plot III; Overlay 1: Again, the geologic section, along AA'.

Overlay 2: Heatflow curves C and D are based on the assumption that a near-surface horizontal lenticular zone of higher conductivity occupies

the thermal anomaly, and that below this zone, condutivities decrease. Correspondingly, thermal gradients increase to pull up the isotherms. This plot is based on two-dimensional structure.

Overlay 3: Curves C and D are here interpreted in terms of a three-dimensional model; i.e., finite strike-length is assumed, for a near-surface horizontal zone of higher conductivity.

Determination of the thermal conductivity section seems to be the crux of the problem and holds the answer to the question of whether or not a deep test in James Creek Canyon will reach production temperature. Interpretations of gravity, EM, and MT results hopefully will reveal a lithologic contrast that might relate to thermal conductivty. Ultimately a temperature hole drilled to 600m or more should penetrate this zone and detect the conjectured increase in temperature gradient corresponding to decreasing thermal conductivity.

Arthur L. Lange

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