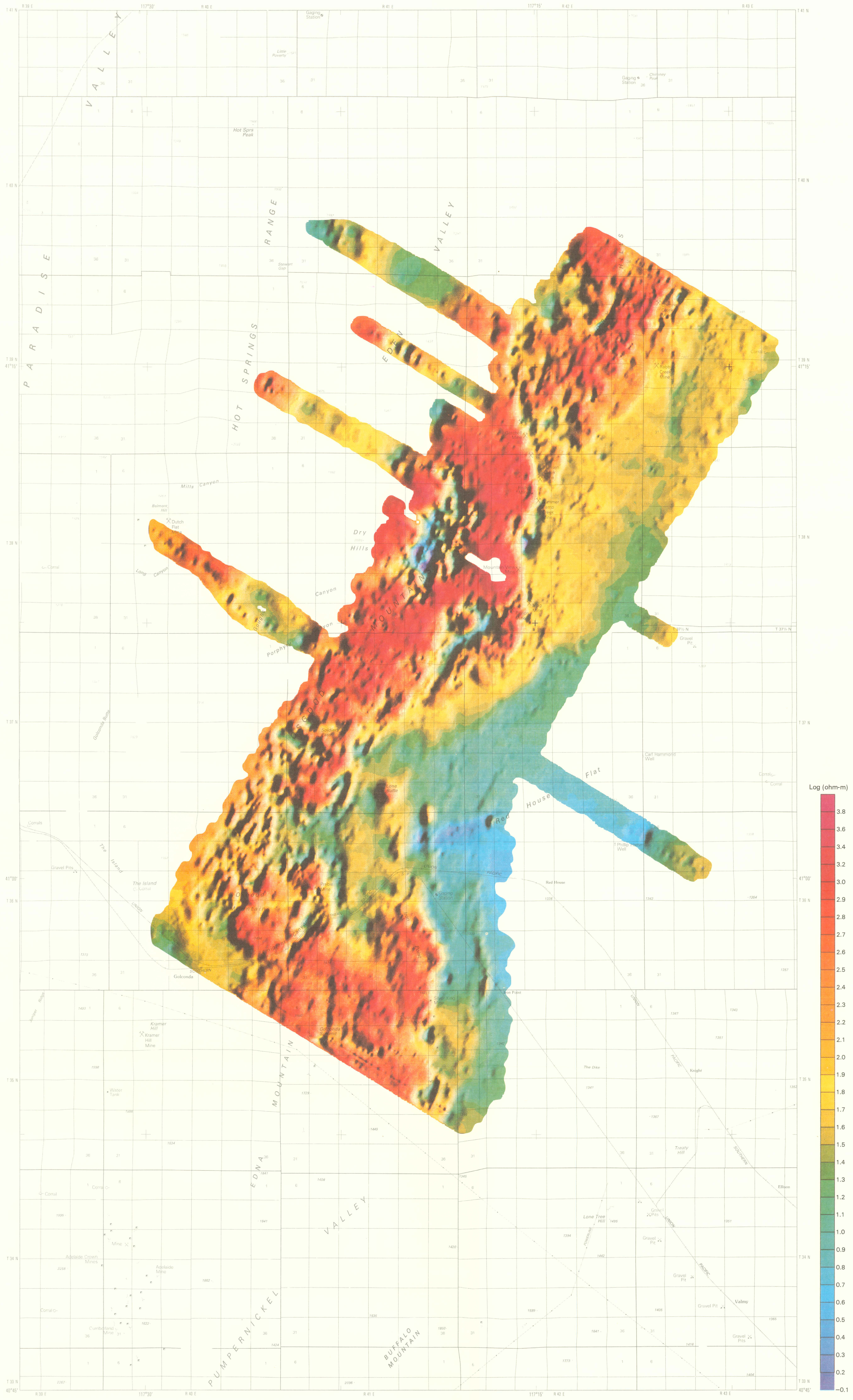
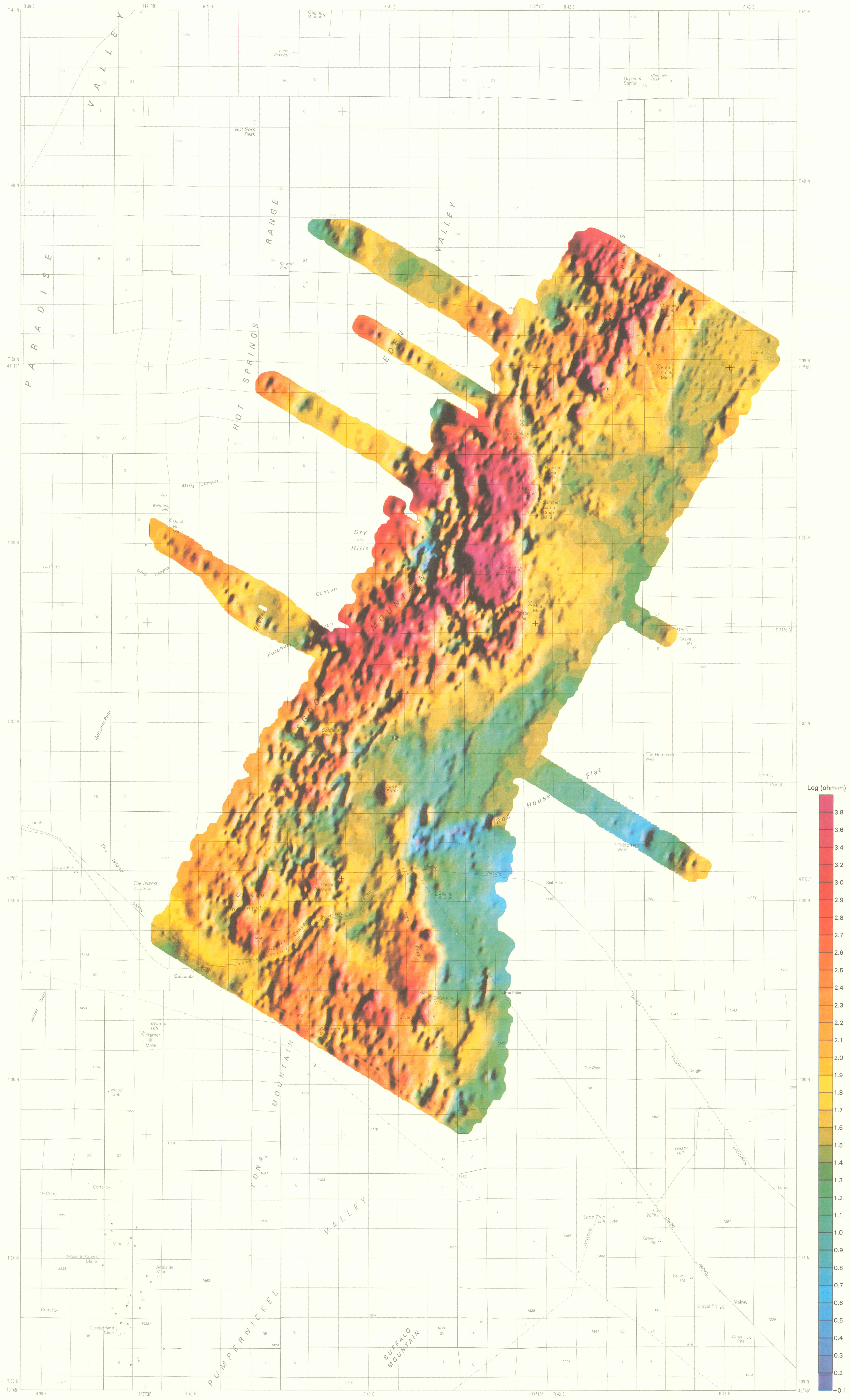
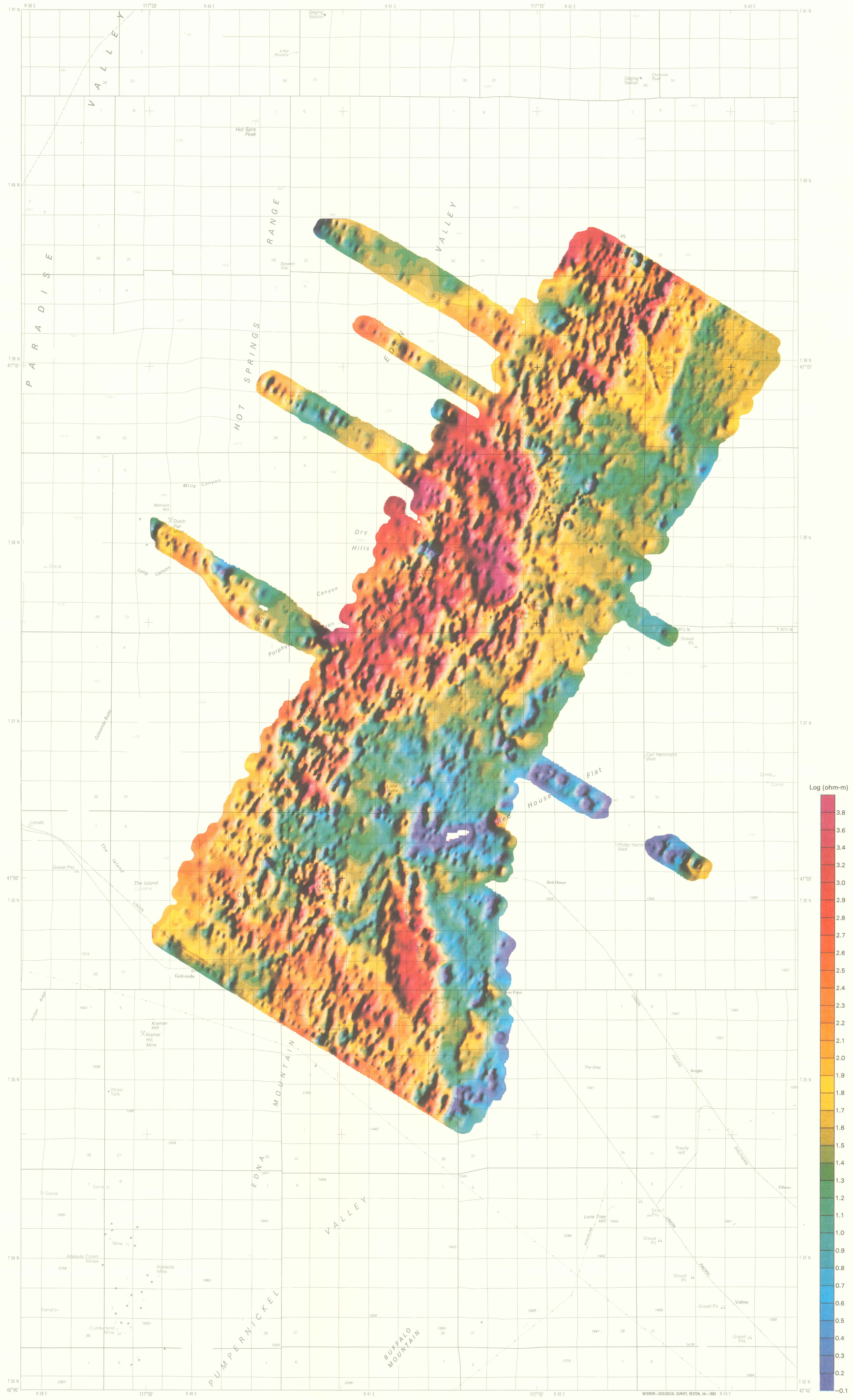


Base modified from U.S. Geological Survey
Osgood Mountains, 1985; Winnemucca, 1986

MAP A. APPARENT RESISTIVITY AT 900 HERTZ



MAP B. APPARENT RESISTIVITY AT 7,200 HERTZ



INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1993

MAP C. APPARENT RESISTIVITY AT 56,000 HERTZ

Edited by F. Craig Brunstein
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Manuscript approved for publication
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SCALE 1:100 000

INTRODUCTION

The Getchell gold trend includes six "Carlin-type" sediment-hosted disseminated gold deposits and silver, tungsten, and barite deposits. In addition, the trend has potential for other mineral deposits. Electromagnetic and aeromagnetic data were acquired in conjunction with aerial gamma-ray (TerraSense, 1989), thermal-imaging, and other remote-sensing data as part of the U.S. Geological Survey's Airborne Geophysical Demonstration Project for the Getchell trend.

Interpretations of the geophysical and remote-sensing data over the Getchell trend are discussed by Grauch and others (1991), Hoover and others (1989, 1991), Taylor (1990), and Wojniak and Hoover (1991). Additional geophysical maps of the magnetic data, and the aerial gamma-ray survey are in preparation for the Getchell trend at the same 1:100,000 scale as used for the maps in this report.

SURVEY PARAMETERS

The electromagnetic data for these maps were acquired by a helicopter DIGHEM IV survey system in 1988 using coplanar loops transmitting at frequencies of 900, 7,200, and 56,000 Hz. The flight lines were flown about 200 or 400 m apart in a N. 59° W. direction at a draped terrain clearance of a nominal 30 m. A further description of the survey, together with flight-line locations, contour maps at 1:24,000 scale, and associated magnetic and very low frequency radio (VLF) data sets, is available as U.S. Geological Survey Open-File Report 90–319 (McConnell and others, 1990). Digital data are available on 9-track tape from the National Geophysical Data Center, NOAA, Code E1GC1, 325 Broadway, Boulder, Colorado 80303 (phone 303–497-6128). The DIGHEM helicopter electromagnetic survey system is further described by Fraser (1978, 1979, 1986).

PREPARATION OF MAPS

The logarithmic apparent resistivities used in maps A–C were calculated by the survey contractor using a one-dimensional pseudolayer on a half-space model (Fraser, 1986). The authors decorrugated the data along and across the flight lines (Urquhart, 1988) before gridding the data at 75-m intervals using the minimum curvature gridding algorithm of Webring (1981). Only data points with a terrain clearance of 60 m or less were used to make the grids. The pixels in the color shaded relief maps (A–I) are 82 m wide. The maps are illuminated with a sun azimuth of 90° (east) and a sun elevation of 45°. The data points were projected using the universal transverse mercator projection-zone 11, with a central meridian of 117° W. longitude. The base map is derived from the Osgood Mountains (1985), Nevada, and Winnemucca (1986), Nevada, 1:100,000-scale 30′ × 60′ U.S. Geological Survey topographic maps.

APPARENT-RESISTIVITY MAPS

Maps A–C show the apparent-resistivity data obtained at frequencies of 900, 7,200, and 56,000 Hz, respectively. The depth of exploration of this airborne electromagnetic system is a function of the system configuration, the frequency, and the earth resistivity, providing a qualitative resistivity sounding (Fraser, 1986). An approximate measure of the maximum exploration depth for these maps are 100, 30, and 10 m, respectively.

HORIZONTAL-GRADIENT MAPS

The horizontal gradient of the apparent-resistivity maps (D–F) was calculated using the algorithm included in the program "BOUNDARY" (Blakely and Simpson, 1986), which was originally designed to analyze gravity and magnetic data. The horizontal gradient of the apparent-resistivity maps (D–F) enhances features such as faults and geologic contacts where the electrical resistivity of the earth changes abruptly.

TERRAIN-CLEARANCE AND FLIGHT-LINE MAP

The terrain-clearance map (G) shows areas where the terrain clearance deviates from the 30-m survey specification. This deviation occurs over canyons and power lines, and may produce nongeologic resistivity anomalies on the apparent resistivity data, especially at the 56,000 Hz frequencies. The long linear features on this map are caused by power lines.

COMBINATION OF ELECTROMAGNETIC APPARENT RESISTIVITY WITH TOTAL-FIELD MAGNETIC DATA

The grids of the horizontal gradients of the 900 Hz apparent-resistivity and magnetic maps were combined by multiplication in order to enhance the areas where both resistivity and magnetic rock properties change abruptly (map H). The 900 Hz apparent resistivity was chosen for combination with the magnetic data because it has the deepest penetration of the three frequencies, and it is the least contaminated by flight-line orientation and altitude change noise. The total-field magnetic data (Grauch and Bankey, in press) were reduced to the pole (RTP) before calculation of their horizontal gradients. This ensures that the maximum horizontal gradients occur above the edges of the causative magnetic bodies.

Map H is dominated by the resistivity data as can be seen by comparison with map D. Care should be taken in use of these combination maps, always keeping in mind the different source depths for the causative resistivity and magnetic bodies.

In contrast to map H, which shows enhanced coincident magnetic and electrical boundaries, map I provides enhanced discrimination between rock types based on both magnetic and electrical bulk properties. An example is the distinction between the equally resistive quartzite and granodiorite due to the difference in magnetization of the two units.

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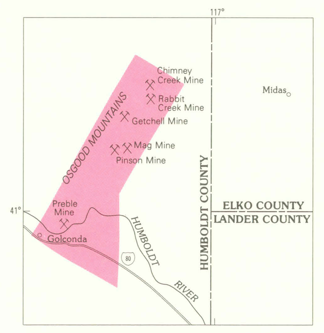

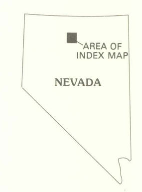

INDEX MAP SHOWING THE SURVEY AREA

ELECTROMAGNETIC SURVEY MAPS SHOWING APPARENT RESISTIVITY OF THE GETCHELL GOLD TREND, OSGOOD MOUNTAINS, NORTH-CENTRAL NEVADA

By
Wayne S. Wojniak, Donald B. Hoover, and V.J.S. Grauch
1993

For sale by U.S. Geological Survey Map Distribution, Box 25286, Federal Center, Denver, CO 80225