

GRAVITY SURVEY
BIG VALLEY } *Pickens*
LASSEN AND MODOC COUNTIES
for
WATER RESOURCES DEPARTMENT
STATE OF CALIFORNIA

by
United Geophysical Corporation
July 1959



BIG VALLEY
LASSEN AND MODOC COUNTIES

This report gives the results of a gravity survey of Big Valley, Lassen and Modoc Counties, California. The survey was made to determine the basement configuration of the valley to aid in a study of ground water movement.

The valley is relatively flat, lies at approximately 4200 feet above sea level, and is drained to the southwest by the Pit River.

FIELD OPERATIONS

The field work began on May 22, 1959 and was completed on June 17, 1959. During this time 391 stations were surveyed and 389 observed.

A compass-stadia traverse survey with transits was used for both horizontal and vertical control. Both horizontal and vertical loop closure maps were kept and all loops were adjusted to zero. The vertical accuracy of the survey is ± 1.0 foot and the horizontal accuracy is 1:400.

The gravity observations were made with Worden gravity meter number 246 which has a dial constant of 0.09779 mg. per dial division. Nine bases were observed and these bases were adjusted in five loops. Base 101 was assigned a station gravity of 100.00 mg. All bases were marked with an iron rod and descriptions were made of each base.

A density profile was run in the valley and from this profile the surface density was determined to be 1.30. This low density is confirmed by the specific gravity determinations made on core samples by the Department of Water Resources. A density of 1.30 is equivalent to an elevation correction of 0.07748 mg. per foot which includes both the Bouguer and free air corrections.

All field computations were made according to United's standard procedure and were computed from arbitrary datums, i.e., station 101 was given a station gravity value of 100.00 mg, the elevations were reduced to 4100 feet above sea level, and the latitude correction was computed from an arbitrary zero line north of the surveyed area.

ANALYSIS OF THE GRAVITY ANOMALY

Big Valley is a faulted structural basin near the edge of the Modoc Plateau lava beds. The valley is bounded on all sides by volcanic rocks such as lava flows and pyroclastics, which erupted at diverse times from about mid-Tertiary to late Pleistocene. These volcanic rocks are exposed in the tilted faulted block ridges on the east and west margins of the valley, in the complexly faulted mountainous terrane south of the valley, and in the faulted lava plateau north of the valley.

Fine grained lake sediments comprise the bulk of the sedimentary deposits which fill the structural basin that is now Big Valley. These sediments include well-bedded tufaceous and diatomaceous silts and clays with interbedded thin sand lenses. The lake sediments are overlain by Pleistocene and recent stream deposited silt, sand, and gravel which blanket most of the floor of Big Valley.*

The densities used in all computations were taken from the density data obtained by the Water Resources Department. By averaging these densities a density of 2.60 was obtained for the volcanic rocks and 1.20 for the sedimentary deposits in the valley, which gives a density contrast of 1.40.

A regional gradient could not be removed from the observed gravity map since there is no gravity control outside the immediate area of the valley.

*State of California, Department of Water Resources, "Geology of Big Valley Ground Water Basin (Preliminary Report)."

The analysis was made using a standard two dimensional chart, also theoretical curves were computed for appropriate geometric forms as an aid in the interpretation. The results of these procedures are shown on the enclosed map. The map shows the principal structural features of the valley and the depths to the basement where these could be computed accurately.

The predominant structural features are five northwest trending faults. These faults are probably normal and have apparent displacements of 800 to 2100 feet.

If the density contrast is less than 1.40 then the depth estimates of course will be larger. But it is felt that the contrast used is probably correct since it was obtained from actual measurements and the densities thus obtained are well within the known density range for these rocks.

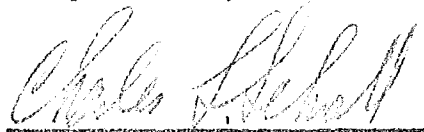
SUMMARY

It must be emphasized that if gravity surveys such as this are contemplated in the future the survey should be extended by isolated lines into the area surrounding the valley so that a more accurate interpretation can be made.

ENCLOSURES

Bouguer anomaly map, uncountoured
Bouguer anomaly map, countoured
Structural map

Respectfully submitted,



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CLS/dk
7/20/59