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GRAVITY SURVEY

PEARCE PROJECT (6-29 AND 9-30)

COCHISE COUNTY, ARIZONA

FOR

STILL, LOWELL & STILL ASSOCIATES

PROJECT 0254C

mining
geophysical surveys

6-29

mining
geophysical surveys

2400 EAST GRANT ROAD - TUCSON, ARIZONA 85719

TELEPHONE – 602 326-8619

March 29, 1973

Still, Lowell & Still Associates
5115 North Oracle Road
Tucson, Arizona 85704

ATTN: L. Clark Arnold

Dear Clark: RE: Pearce Project

We made density measurements on the limestone samples from the titled property as per the chart below:

DH SMH-2:

Depth	Density
280'-282.5'	2.80
500'-504.0'	2.80

DH SMH-3:

240'-242.5'	2.86
not recorded	2.53

Considering that the rhyolite could have an average density of 2.6, then a density contrast of 0.2 exists laterally between rhyolite and the dense limestone (2.8) indicated in the drill holes. This contrast likely accounts for the near surface gravity high northeast of Pearce.

Sincerely,

Gordon

W. Gordon Wieduwilt

WGW/nw

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ACCOMPANYING THIS REPORT:

1 PROFILE PRESENTATION

1 PLAN MAP

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mining geophysical surveys

GRAVITY SURVEY
PEARCE PROJECT (6-29 and 9-30)
COCHISE COUNTY, ARIZONA
FOR
STILL, LOWELL & STILL ASSOCIATES

INTRODUCTION:

During the periods of January 15 through January 19, and January 25 through January 27, 1973, a reconnaissance gravity survey on the titled property was completed. The field survey and interpretation were under the direction of Raymond M. Sadowski, geophysical engineer for Mining Geophysical Surveys.

Six lines were run west and northeast of Pearce. Two lines extend eastward from outcrop in the Dragoon Mountains to Sixmile Hill south of Pearce. Three lines extend northerly from the rhyolitic hills east of Pearce to the Sulphur Springs Hills. Additional coverage on Lines 2 and 3 was obtained north beyond the Sulphur Springs Hills and eastward from Pearce to Turkey Creek Canyon in the Chiricahua Mountains. This additional coverage was felt necessary to better understand the extreme density contrast that lies between Pearce and the Sulphur Springs Hills.

The area west of Sixmile Hill is estimated to have less than 500' of alluvial cover. A pediment scarp having a northwest trend is located from 1000' to 3000' east of outcrop in the

Dragoon Mountains.

The area northeast of Pearce has a thin alluvial blanket over a rock of higher density than the Tertiary rhyolite which outcrop in the local hills. Near vertical contacts are interpreted as forming the northern boundary of the high density zone. The southern boundary is interpreted as a low angle contact formed by overlying rhyolites.

The data from the regional east-west line (1) provides additional information on the location of the higher density rock and (2) describes a wedge-shaped basin which thickens eastward. A depth estimate northeast of the Squaretop Hills was calculated to be 2100'±. The eastern boundary of the basin is a near vertical scarp which occurs at the entrance of Turkey Creek Canyon in the Chiricahua Mountains.

SURVEY PROCEDURE:

A LaCoste & Romberg, Inc. Model G (#282) gravity meter was used for the survey. The gravity was referenced to the Tombstone and Willcox Base Stations of the Arizona Base Station Network. The gravity data were reduced using standard gravity corrections from a computer program written by R. E. West (University of Arizona, 1970). Terrain and tidal corrections were not made.

Elevation control was obtained from the 15-minute series

U.S.G.S. topographic maps. A ±15' error in elevation would result in a ±0.9 milligals error in the Bouguer gravity. The majority of scatter in the data falls within this range, with the largest errors occurring over the topographic highs.

The Bouguer gravity is expressed for densities of 2.57, 2.67 and 2.77 gm/cm^3 in the computer printout. The value of 2.67 was used for the profile and plan map presentation.

DESCRIPTION OF LINES:

LINE 1

Data from this line indicates that shallow bedrock has a higher density than the Tertiary volcanic rocks which outcrop on the north and south sides of the line. There is also some indication that the rhyolites on the south end are resting on top of the more dense material.

LINE 2

The buried high density rock ends rather abruptly at a near vertical contact, interpreted between stations 0.5S and 0.1S. This contact occurs inside the limit of outcrop located at station 2.0S. North of 2.0S are the low density volcanics of the Sulphur Springs Hills which possibly extend under alluvial cover beyond a scarp located at station 5.25N. Hand specimens of tuff which lies to the east of the line indicate a density range of 2.0 - 2.2 gm/cm^3.

The data on the south side of this line indicates that the rhyolitic hill north of the highway is resting on the flank of the higher density material. The boundaries of the rhyolite are defined by two contacts; at 19,250' on Line 2 and 44,500' on Line 5 (essentially an extension of Line 2).

LINE 3

The data from the south end of the line indicates that the south boundary of the high density material has not been identified. Hand specimens of limestone, rhyolite and andesite from this area gave densities of 2.6-2.7, 2.6 and 2.6, respectively. The volcanic hill located at station 13.5S apparently rests on top of the high density material. Limestone outcrop at station 14.5 suggests the source of the high density material could be a block of Paleozoic limestone or Precambrian rocks. The high density material is bounded to the north by a vertical contact near outcrop at station 1.0S. Hand specimens from this area indicate a density of 2.4-2.6 gm/cm^3 for rhyolite. Rhyolite probably continues northward beneath alluvium after station 11.0N. A possible rhyolite-gravel scarp is indicated at station 12.0N.

LINE 4

A regional gradient was applied to this line based on the location of outcrop in the Dragoon Mountains and at Sixmile Hill. The regionally corrected data indicates two scarps,

one at station 12.5 and a second at station 23.0. A Bouguer slab model yielded a depth of 200'± to bedrock between stations 13.0 to 22.0 and a depth of 400'± between stations 22.0 and 31.0. A hand specimen of quartzite from the west end of the line yielded a density of 2.6. The area between stations 4.5 to 9.0 shows a mass deficiency which indicates either a lower density rock or a shallow alluvial cover.

LINE 5

A regional gradient was applied to this line based on the location of outcrop in the Dragoon Mountains and at the south end of Sixmile Hill. The location of the pediment scarp at station 9.0 together with the location of the scarp on Line 4 follow the northwest trend of outcrop in the Dragoons (see plan map). A shallow basin with a depth to bedrock of 200'± is located from station 9.0 to station 24.0.

LINE 6

This line crossed the high density material and positioned contacts at stations 0.5E and 13.0E. An additional contact occurs at station 8.0 where Tertiary rhyolite and andesite outcrop. East of Turkey Creek Ridge alluvial cover thickens as a wedge-shaped basin is crossed. A near surface vertical scarp located at station 41.0 lies on the eastern edge of the basin. A depth estimate at station 28.0 near the middle of the basin was calculated to be 1600'± or 2100'± using $\Delta\sigma = 0.4$ or

0.3, respectively. The depth of bedrock can be considerably greater if cemented Pantano or equivalent sediments fill the basin.

SUMMARY:

A high density material occurs under a thin alluvial cover in the valley northeast of Pearce. The lower density Tertiary rhyolites in the Sulphur Springs Hills and Three Sisters Buttes occur at the northern boundary of the high density zone. The low lying volcanic hills on the south ends of Lines 1, 2 and 3 apparently lie on the flank of the high density material. Turkey Creek Ridge and Township Butte are possibly resting on top of the high density material. Two solutions for the gravity high are (1) a thick section of high density Paleozoic or Precambrian sediments or (2) a high density intrusive body.

The data west of Pearce indicates a shallow alluvial basin from Sixmile Hill to the Dragoon Mountains. A Bouguer slab model indicates 200'± to 400'± of alluvium on Line 4 and 400'± of alluvium on Line 5.

A large wedge-shaped basin occurs east of Turkey Creek Ridge and extends to a large scarp located at the entrance to Turkey Creek Canyon. A depth estimate near the middle of the basin is calculated at 2000'±, assuming an ordinary gravel-bedrock density contrast.

Respectfully submitted,

Raymond M. Sadowski
Geophysical Engineer

W. Gordon Wieduwilt
Geophysicist

February 23, 1973

Tucson, Arizona

P.P. Gravity File

RÉSUMÉ

ROBERT E. WEST, B.S., 1961, University of Idaho, Major: Physics M.S., 1970, Ph.D., 1972, University of Arizona, Major: Geosciences Minor: Geological Engineering Special emphasis on the application of geophysical, geochemical and geological methods to the exploration for and evaluation of ore deposits.

In May 1974, joined Mining Geophysical Surveys, Tucson, Arizona. Conducts field work, data reduction, and interpretation of induced polarization, resistivity, gravity, and magnetic data used in the exploration for minerals in the Western United States. From 1972 to 1974, worked for Exxon Co., U.S.A., Houston, Texas. Interpreted gravity and magnetic data in the exploration for petroleum in the Basin and Range province of Arizona and New Mexico and in the offshore areas of the northern Gulf of Mexico. From 1968 to 1972, worked for various mining and petroleum companies as a consultant. Conducted gravity and magnetic surveys and interpreted this data in order to delineate areas for porphyry copper exploration.

From 1965 to 1972, worked as research assistant at the University of Arizona, Tucson, Arizona. Conducted research in gravity and electrical methods of exploration for minerals and ground water in the Basin and Range province. A method was developed for estimating ground water volumes in intermontane basins. Data collection and compilation were completed for a 1:1,000,000 scale Bouguer gravity anomaly map of Arizona, published in 1973. The gravity effects of shallow crustal, deep

crustal, and upper mantle structures were interpreted and related to the regional geology of Arizona.

From 1961 to 1962 and in 1965, worked for Phillips Petroleum Company, Idaho Falls, Idaho, as a Physicist, Atomic Energy Division, Nuclear Technology Branch. Conducted experiments to determine slow neutron scattering cross sections of potential moderators, including deuterated methane gas, liquid sodium, and solid methane.

From 1962 to 1965, served in the United States Air Force as a Project Officer. Was assigned to duty at the Air Force Rocket Propulsion Laboratories, Edwards AFB, California. Assisted in research and development of thixotropic rocket propellants.

Member of American Geophysical Union and Society of Exploration Geophysicists. Registered professional engineer (geophysical) in Arizona.

<u>Publications and Theses</u>: With R. M. Brugger and G. W. Griffing, 1966, Intramolecular Coherent Scattering of Neutrons by CD_4 Gas: The Physical Review, vol. 143, p. 163-160.

With J. S. Sumner, 1969, The University of Arizona's Gravity Survey Program: Transactions, American Geophysical Union, vol. 50, p. 541-542.

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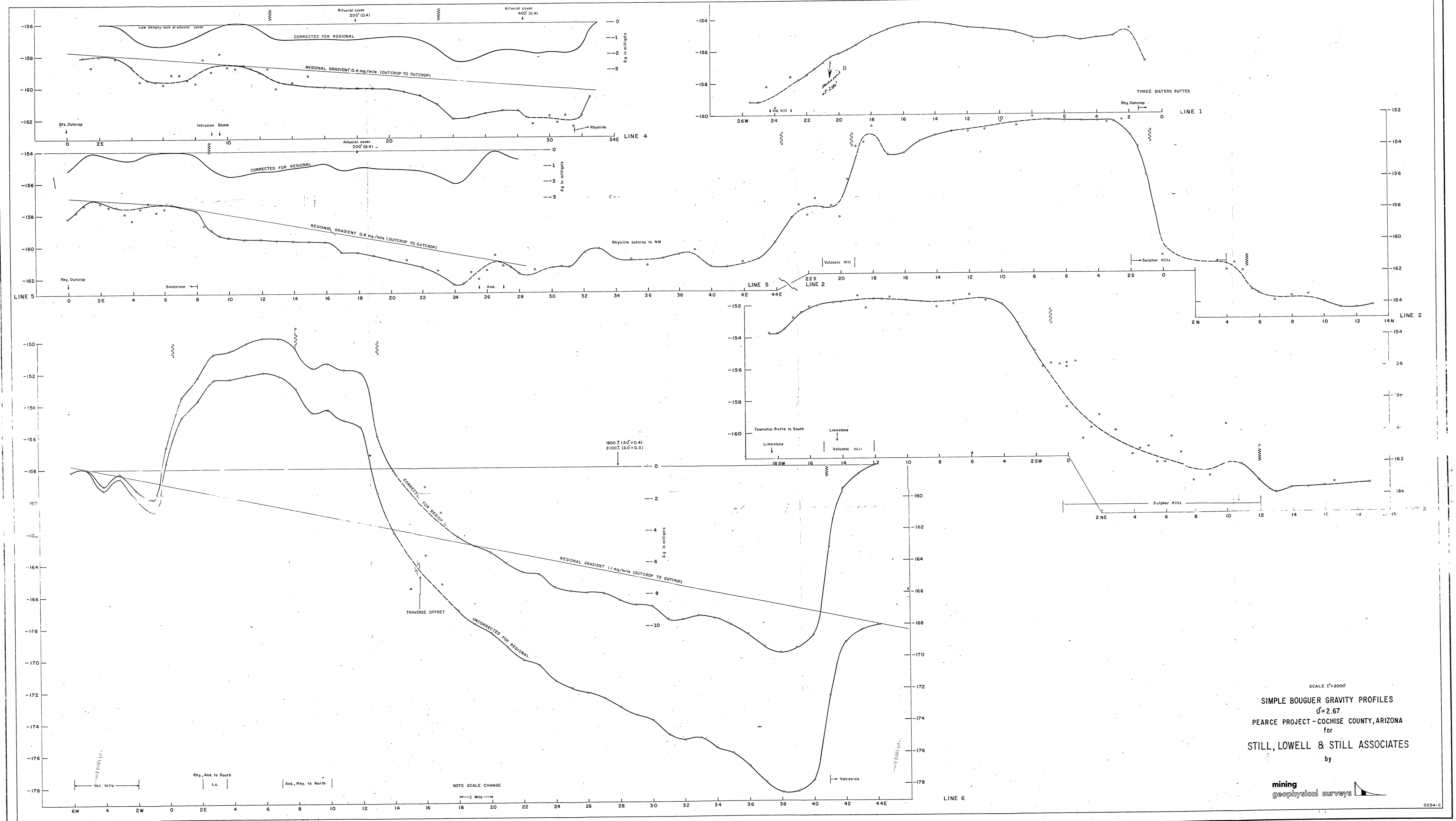
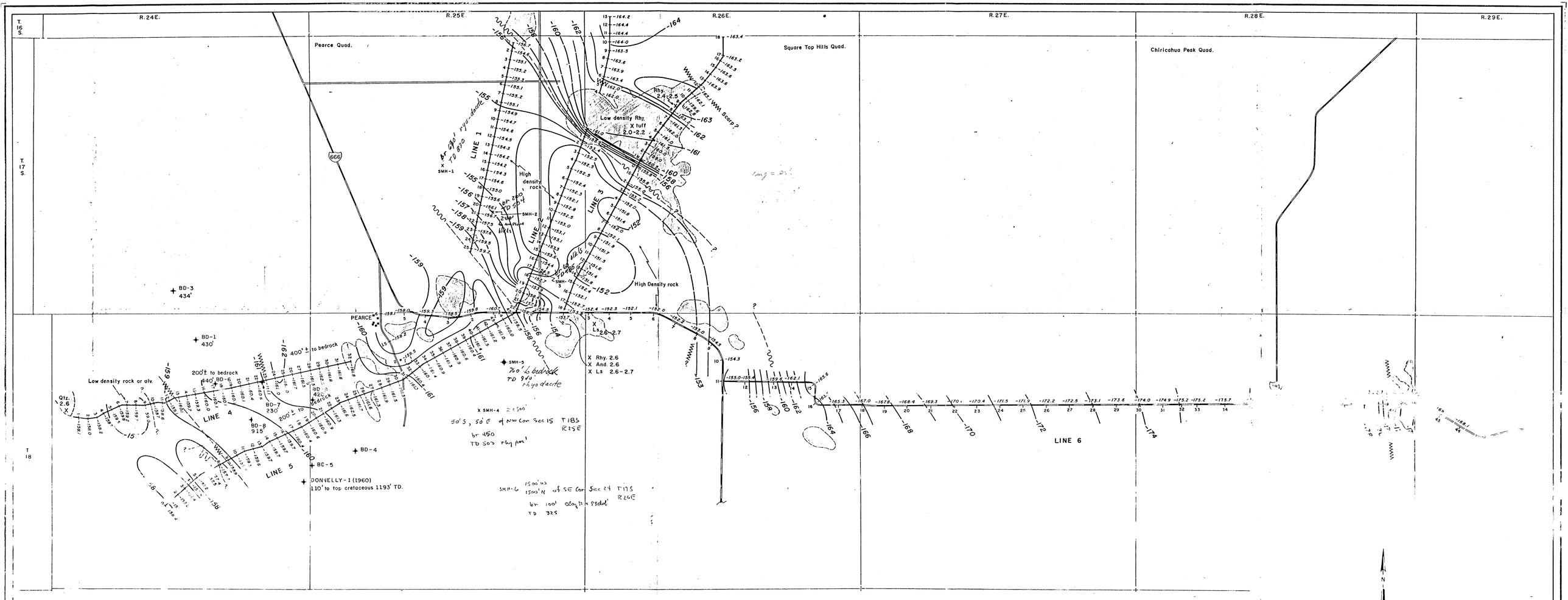
Water, vol. 10, no. 3, p. 24-32. In 1972, A Regional Bouguer Gravity Anomaly Map of Arizona: Unpublished University of Arizona Ph.D. dissertation.

With J. S. Sumner, 1973, Bouguer Gravity Anomaly Map of Arizona, Laboratory of Geophysics, Department of Geosciences, University of Arizona, Tucson, Arizona.

Presented at the 50th Annual International SEG Meeting, November 18, 1980 in Houston, Discovery of a Mineralized Breccia Pipe Using Gradient Array Induced Polarization.


LINE 4
Alluvial cover 200' (0.4)
Alluvial cover 400' (0.4)
Low density rock or alluvial cover
CORRECTED FOR REGIONAL
REGIONAL GRADIENT 0.4 mg/mile (OUTCROP TO OUTCROP)
Qtz. Outcrop
Intrusive Shale
Rhyolite
Δg in milligals
LINE 5
Alluvial cover 200' (0.4)
CORRECTED FOR REGIONAL
REGIONAL GRADIENT 0.9 mg/mile (OUTCROP TO OUTCROP)
Rhyolite outcrop to NW
Rhy. Outcrop
Sandstone
And.
LINE 1
THREE SISTERS BUTTES
Vol. hill
Rhy. Outcrop
LINE 2
Volcanic Hill
Sulphur Hills
LINE 6
1600 ± (Δσ = 0.4)
2100 ± (Δσ = 0.3)
CORRECTED FOR REGIONAL
REGIONAL GRADIENT 1.1 mg/mile (OUTCROP TO OUTCROP)
UNCORRECTED FOR REGIONAL
TRAVERSE OFFSET
Vol. hills
Rhy., And. to South
Ls.
And., Rhy. to North
NOTE SCALE CHANGE
1 Mile
Volcanics
Township Butte to South
Limestone
Volcanic Hill
Sulphur Hills
SCALE 1" = 2000'
SIMPLE BOUGUER GRAVITY PROFILES
σ = 2.67
PEARCE PROJECT - COCHISE COUNTY, ARIZONA
for
STILL, LOWELL & STILL ASSOCIATES
by
mining geophysical surveys
0254-C



SCALE 1:62500

SIMPLE BOUGUER GRAVITY
PLAN MAP
PEARCE PROJECT
COCHISE COUNTY, ARIZONA
for
STILL, LOWELL & STILL ASSOCIATES
by

mining geophysical surveys

LEGEND

- CONTACT
- FAULT
- OUTCROP
- X 2.6 DENSITY SAMPLE

NOTE: BOUGUER GRAVITY FOR DENSITY 2.67 gm/cm^3
CONTOUR INTERVAL 1 mg.

0254-C