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HIGH-PRECISION MULTILEVEL AEROMAGNETIC SURVEY

over

DIXIE VALLEY, NEVADA

PART 2

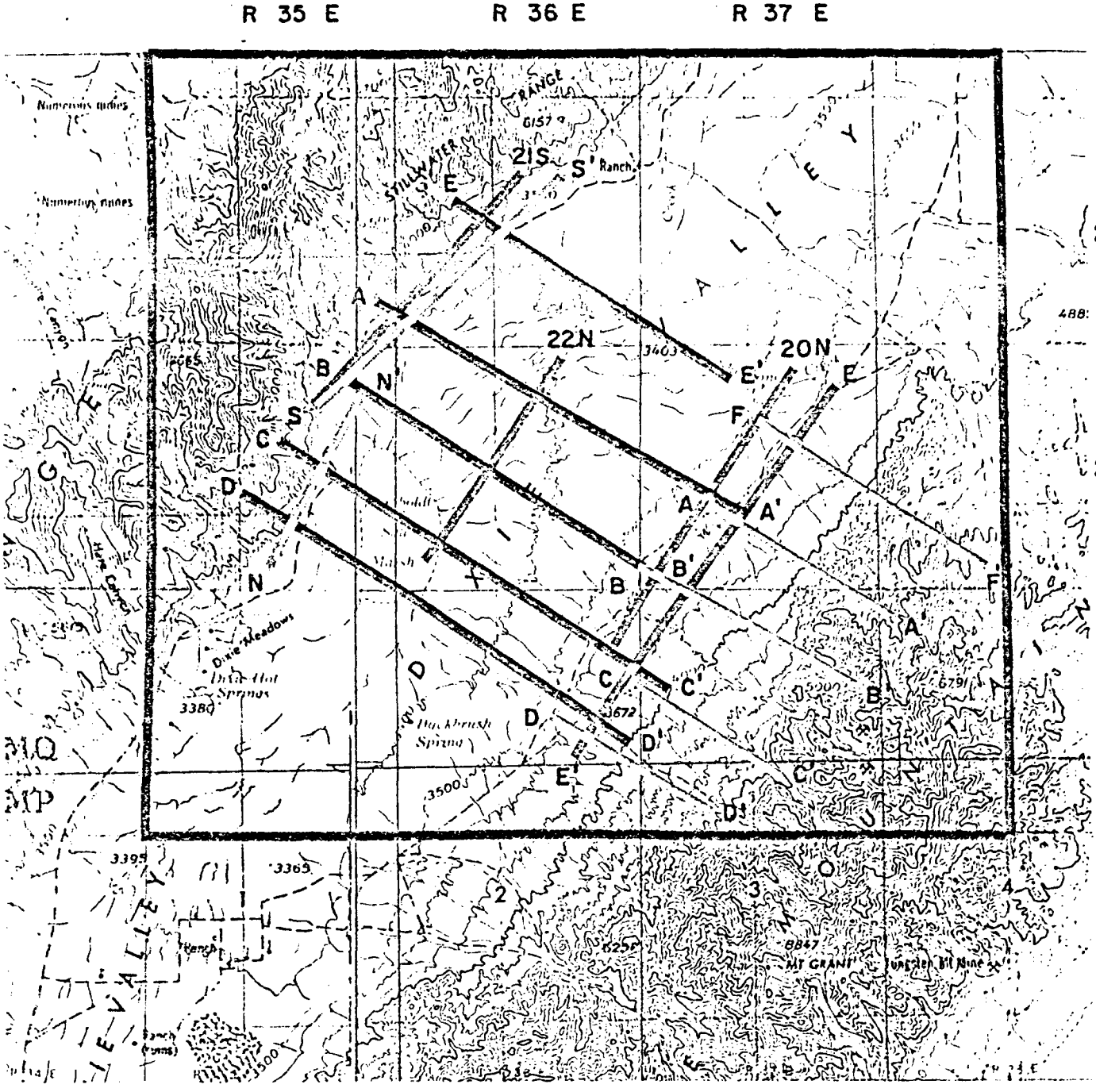
Townships 21 North to 24 North
Ranges 35 East to 38 East
In Churchill County, Nevada

June, 1978

Senturion Sciences, Inc., has performed the field work, analyzed the data, and interpreted the results for this task. All the data and information resulting from this survey are the property of Southland Royalty Company.

SURVEY SPECIFICATIONS

LOCATION:	Dixie Valley, Nevada
AREA COVERED:	Approximately 50 square miles
ACQUISITION DATE:	May, 1978
CREW:	Senturion Sciences #8
CODE:	South Dixie #2, 243
NUMBER OF PROFILES:	MultiLevel - seven Single-level - one
NUMBER OF CONGRUENT LEVELS PER PROFILE:	Five
MULTILEVEL GROUND MILES:	40
SINGLE-LEVEL GROUND MILES:	15
GEOPHYSICIST:	M.D. Quigley



SOUTH DIXIE VALLEY, NEV.
AEROMAGNETIC SURVEY

SENTURION SCIENCES, INC.

SCALE: 1/4" = 1 MILE

FIGURE 1

SOUTHLAND ROYALTY COMPANY'S

SOUTH DIXIE #2, NEVADA

MULTILEVEL AEROMAGNETIC SURVEY REPORT

INTRODUCTION

The original South Dixie, Nevada report of October, 1977, developed extraordinary gradients which were indicative of heat. Scalar magnetotelluric data interpreted by Mr. Will Czimer of Senturion Sciences, Inc., (See South Dixie Scalar Magnetotelluric Report, February, 1978) detected two separate heat source anomalies within the original area of abnormal magnetic gradients. Based on these surveys, additional MultiLevel aeromagnetics (shown on Figure 1 and Plate 1) verified the existence of two separate heat source anomalies. Two additional tensor magnetotelluric stations were also programmed. But, after 16 days of unsuccessful recording due to the completely saturated ground conditions at the sites, it was necessary to discontinue the surface program.

SUMMARY

All MultiLevel profiles were flown at five (5) altitudes while the single level was flown at 7,000 feet ASL. On the east side, the significance of the magnetic low east of Mud Fault was negated by extended Profiles A through D. However, a new area of interest was revealed at the intersection of Section 19 and 30, T38N, R23E; Sec, 24, 25, T37N, R23E, by Profile F. On the western border, Profile S delineated the abnormal gradients previously reported.

DATA ACQUISITION

Senturion flew seven (7) MultiLevel profiles with each profile consisting of five congruent flight lines. On the western portion, elevations were at 5000, 5500, 6000, 6500, and 7500 feet above sea level. On the eastern portion, the profiles were flown at 6000, 6500, 7000, 7500 and 8500 feet above sea level since these extensions carried over the Clan Alpine Mountain Range on the eastern border of the valley.

The survey area did include an aircraft restriction zone (Naval Target Range), which hampered and delayed data acquisition.

The high-precision survey used Senturion's Aztec N5176Y, which is equipped with Doppler navigation and optically-pumped helium magnetometer. The data was acquired at the rate of 18 magnetic readings per flight mile with a photograph of the ground position below each sample; both the magnetic reading and photograph were triggered by the Doppler navigation system. The magnetic readings were recorded digitally on magnetic tape concurrently with clock times and Doppler down-track and off-track information.

A base line at a constant elevation was reflown after each pass along the profiles to record diurnal variations in the earth's magnetic field, Figure 2.

DATA PROCESSING

After diurnal corrections were computed and applied, each line for each elevation was plotted along with its first and second horizontal derivatives. Next, the MultiLevel total field readings were plotted to graphically show the total field changes at consecutive 1000 foot intervals (Plates 10-16). Finally, the MultiLevel gradients (derivatives) were computed and plotted.

The MultiLevel 1000- foot gradient profiles were interpreted in terms of subsurface geology, and this interpretation is presented on the profiles (Plates 2-9), which are in the pocket of this report.

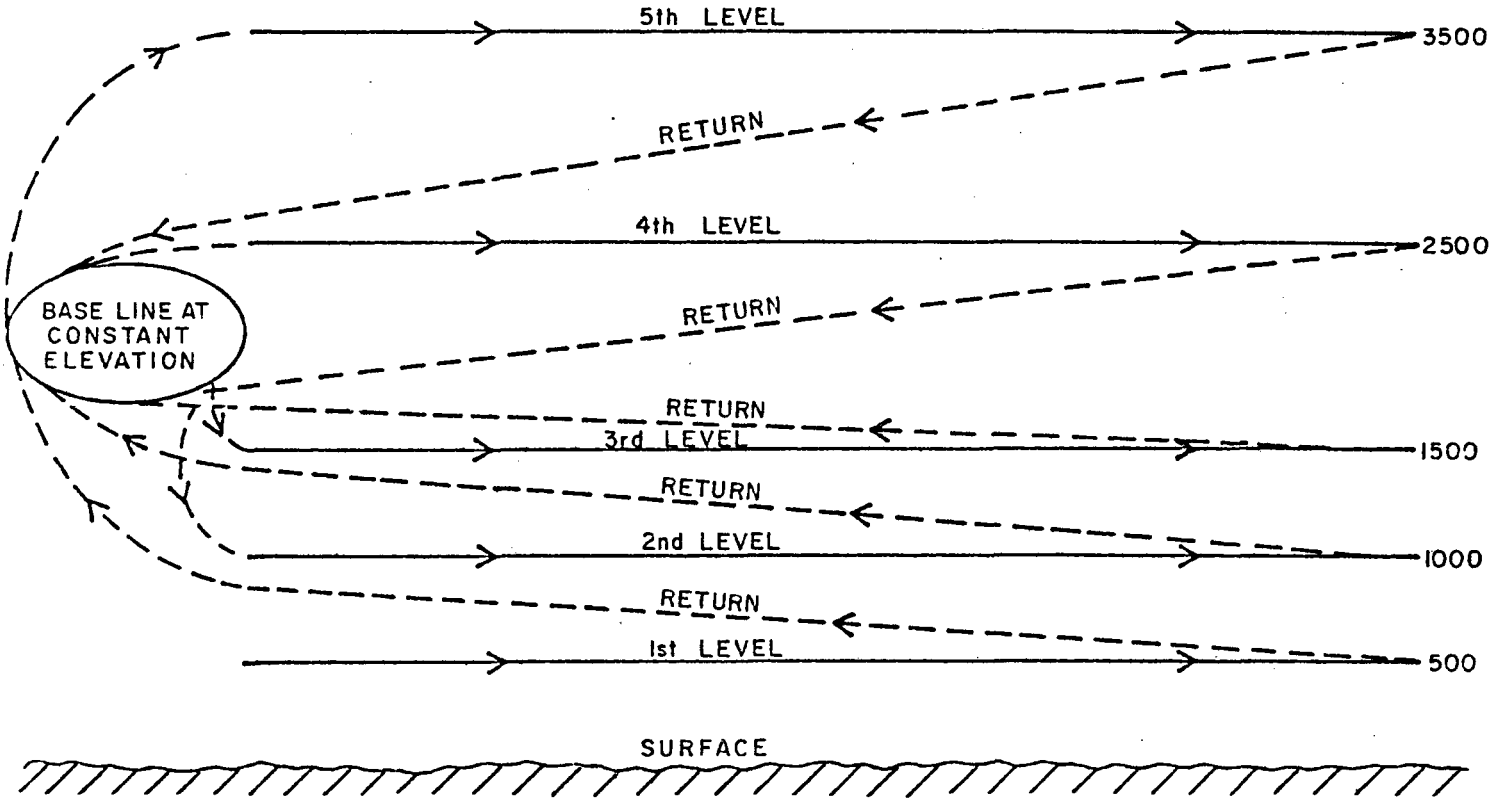
- 6500' - 7500' = 1000-foot gradient
- 7500' - 8500' = 1000-foot gradient
- (6500' - 7500') - (7500' - 8500') = Second 1000-foot difference

For the western portion of the survey, 1000' must be subtracted from the above elevations

RESULTS

Eastern Part

The extension profiles, A through D (Plates 2-5), eliminated any real significance of the magnetic low east of the Mud Fault as mapped by the previous survey. However, Profile F, (Plate 6), revealed evidence of a new area of geothermal interest. It crosses a magnetic high of exceptionally sharp relief at the intersection of Section 19, 30, T38N, R23E; Sec. 24, 25, T37N, R23E. The anomaly has a range of 557.5 gammas in three miles. This amplitude compares with the relief of 664 gammas in five miles over the known intrusive of Profile D. Unlike Profile D, which exhibits very normal gradients east of the intrusive, Profile F shows gradient falloff rate east of the magnetic apex that is one-and-one half times greater than the falloff rate over the apex. The unusual falloff rate in Section 25, T37N, R23E, indicates an abnormal loss of magnetism at depth. This loss can most reasonably be explained by a sudden increase in temperature at relatively shallow depths.



MULTI-LEVEL AEROMAGNETIC PROFILING WITH BASE LINE FLOWN TO ELIMINATE HEADING EFFECTS

As indicated on the map (Plate 1), the intrusive is probably 100 feet to 300 feet below the surface. Some alteration of surface rocks should be evident confirming the existence of the intrusive. Certainly, the abnormal gradient area east of the intrusive should be tested by drill-hole to determine the temperature gradient.

One other magnetic axis occurs on Profile F and Profile A. This magnetic high is not expected to have geothermal significance since the gradients are seen to be normal. Correlations from profile to profile are arbitrary due to the distances involved.

Western Part

Profile S (Plate 8) was flown along the long axis of the abnormal gradient area indicated by the previous survey. Indeed, the gradients are abnormal as shown in the plots of several of the data stations (Figures 3 to 7). Aside from the fact that all the plots indicate reverse polarities in the shallow volcanics, stations 1303 and 1409 are most abnormal. Upper level gradients as well as lower level gradients are reversed. This suggests mineralization at depth possibly associated with the existence of hot mineralizing fluids.

The Stillwater Fault was crossed at the South end of this profile. As true previously, the evidence is consistent that the fault hades to the west. The inflection point on the flight lines moves 1500 feet to the southwest with a 2500 foot change in elevation.

Profile N (Plate 7) adds little new information. The profile nearly parallels the Stillwater Fault at the southwest end and obliquely crosses a magnetic low at the northeast end of the profile.

CONCLUSION

Profile S verifies the abnormal gradients previously mapped and also indicates a westward hade to the Stillwater Fault.

Profile F added valuable, new information concerning an area of geothermal interest in Section 19 and 30 of T23N, R38E. This is probably the most significant result of the survey.

The magnetic low east of the Mud Fault does not appear to be significant as determined by the extended Profiles A through D.

Aside from this new development, the survey shows rather clearly that flying MultiLevel profiles at random prior to a controlled, closely gridded single-level survey is a questionable procedure.

ADDENDUM

I have reviewed the results from the additional MultiLevel aeromagnetics May 31, 1978.

Profile S-S' indicates:

1. Two zones of abnormal magnetic gradients exist and are directly associated with the heat source anomalies identified by the Dixie Valley Magnetotelluric Survey, February, 1978.

2. Faulted scalar MT station #11 should now be included in the heat source anomaly associated with the Stillwater geothermal anomaly.

3. Abnormal magnetic gradients, associated with the Stillwater heat source anomaly are stronger than those associated with the Mine anomaly because:

   a. The environment is hotter
   b. The environment is hotter and closer to the surface
   c. The environment is cooler, but closer to the surface

   Magnetotelluric data (ρ_a at T=30,100 seconds) supports the "a" theory and one-dimensional modeling suggests the conductive zone associated with the Stillwater anomaly is up to 2Km closer to the surface.

At this time, I still feel the Stillwater heat source anomaly reflects the "b" theory, and the Stillwater MT anomaly presents the greatest geothermal potential.

William J. Czimer

SENTURION SCIENCES, INC.

May 31, 1978

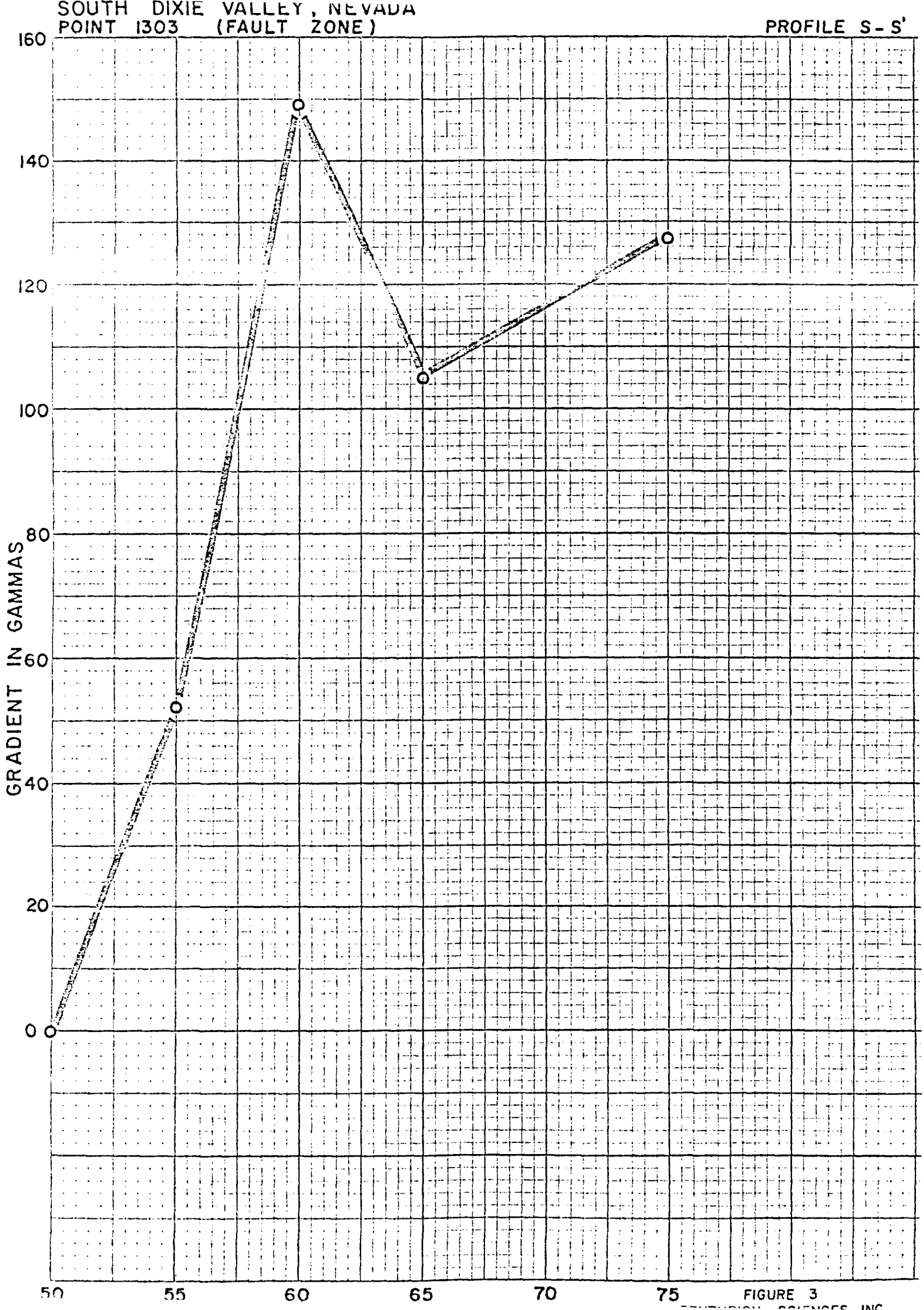

SOUTH DIXIE VALLEY, NEVADA
POINT 1303 (FAULT ZONE)
PROFILE S - S'
GRADIENT IN GAMMAS
160
140
120
100
80
60
40
20
0
50
55
60
65
70
75

FIGURE 3

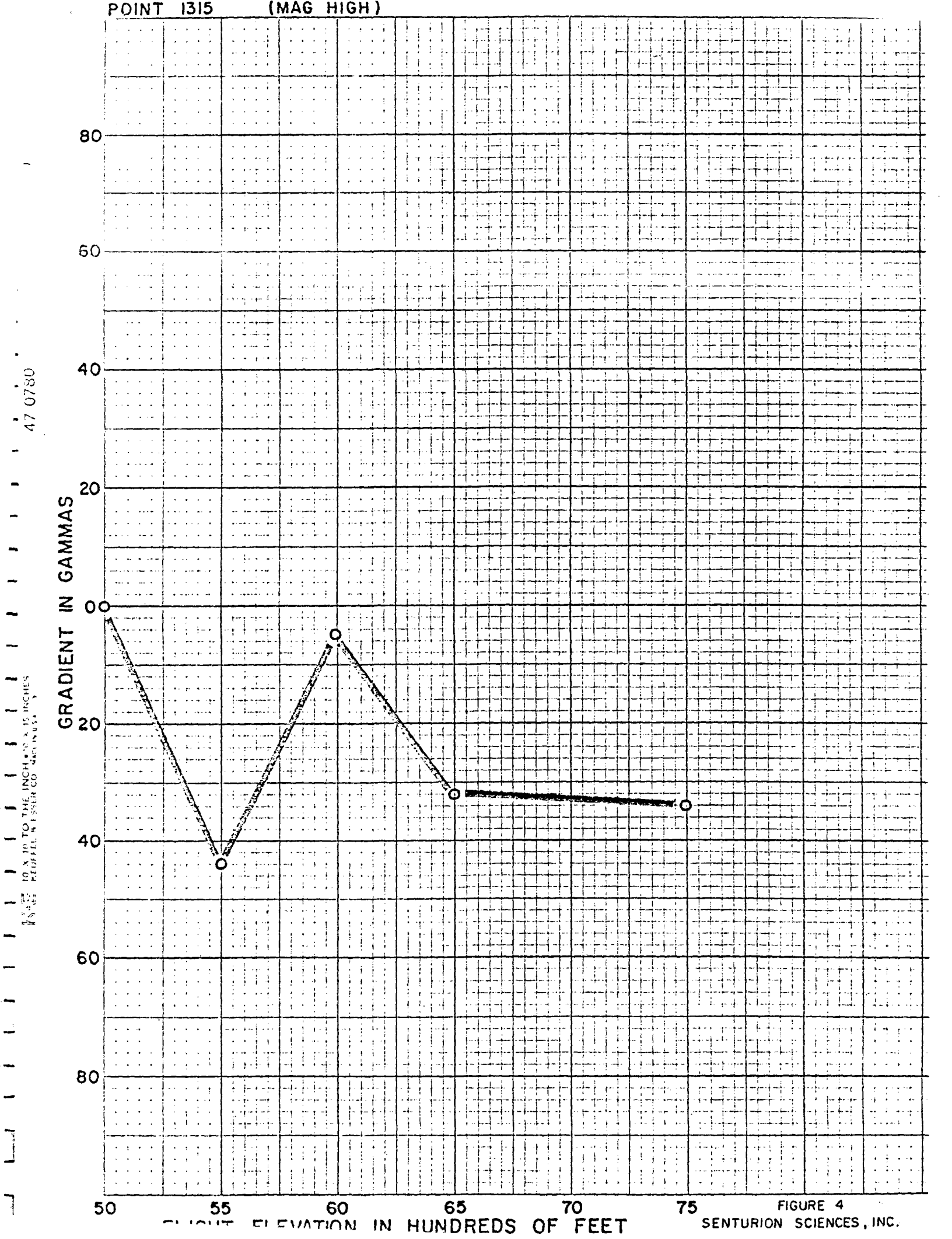


FIGURE 4
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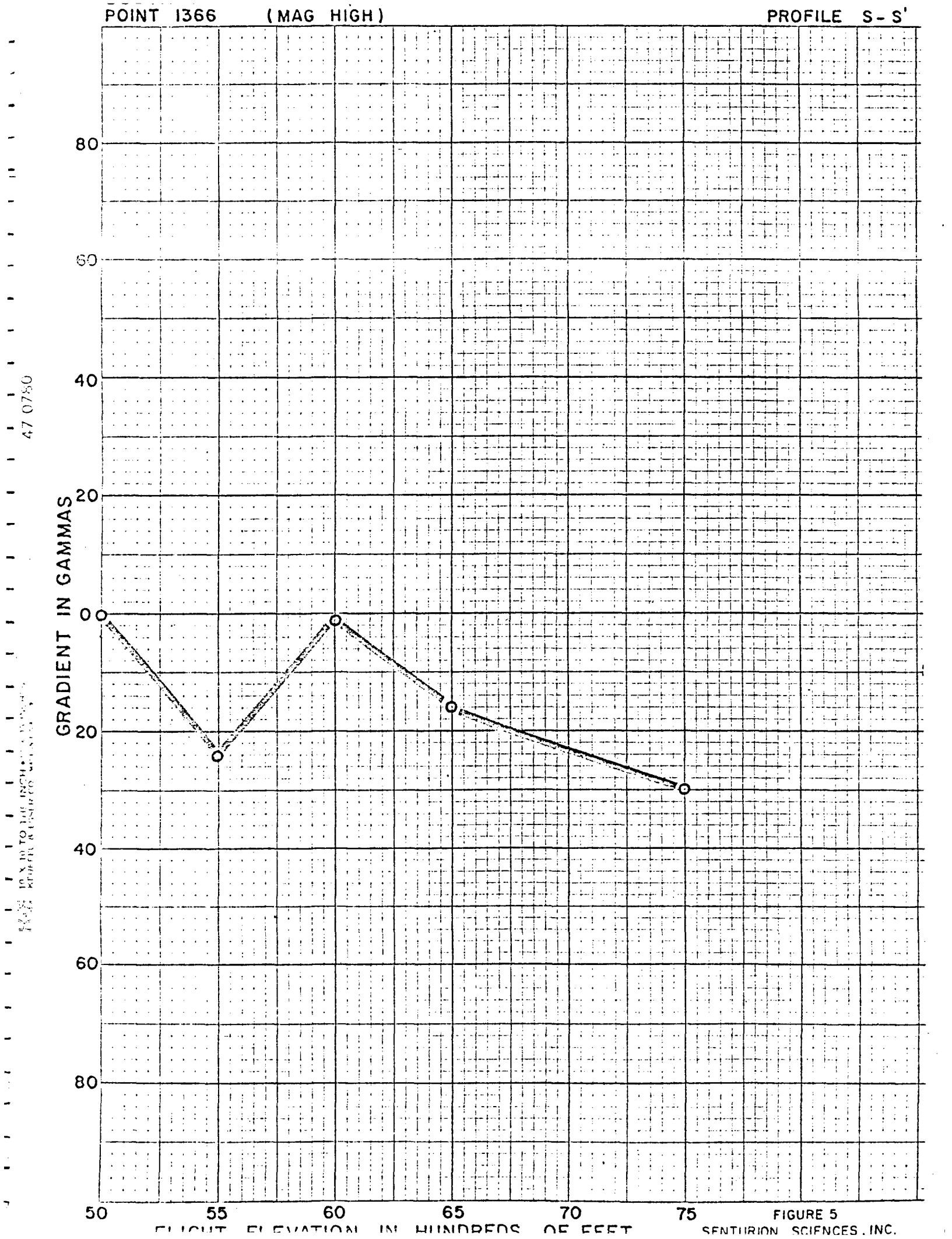

FIGURE 5
SENTURION SCIENCES, INC.

SOUTH DIXIE VALLEY, NEVADA
POINT 1409 (MAG SHELF ANOMALY)

PROFILE S-S'

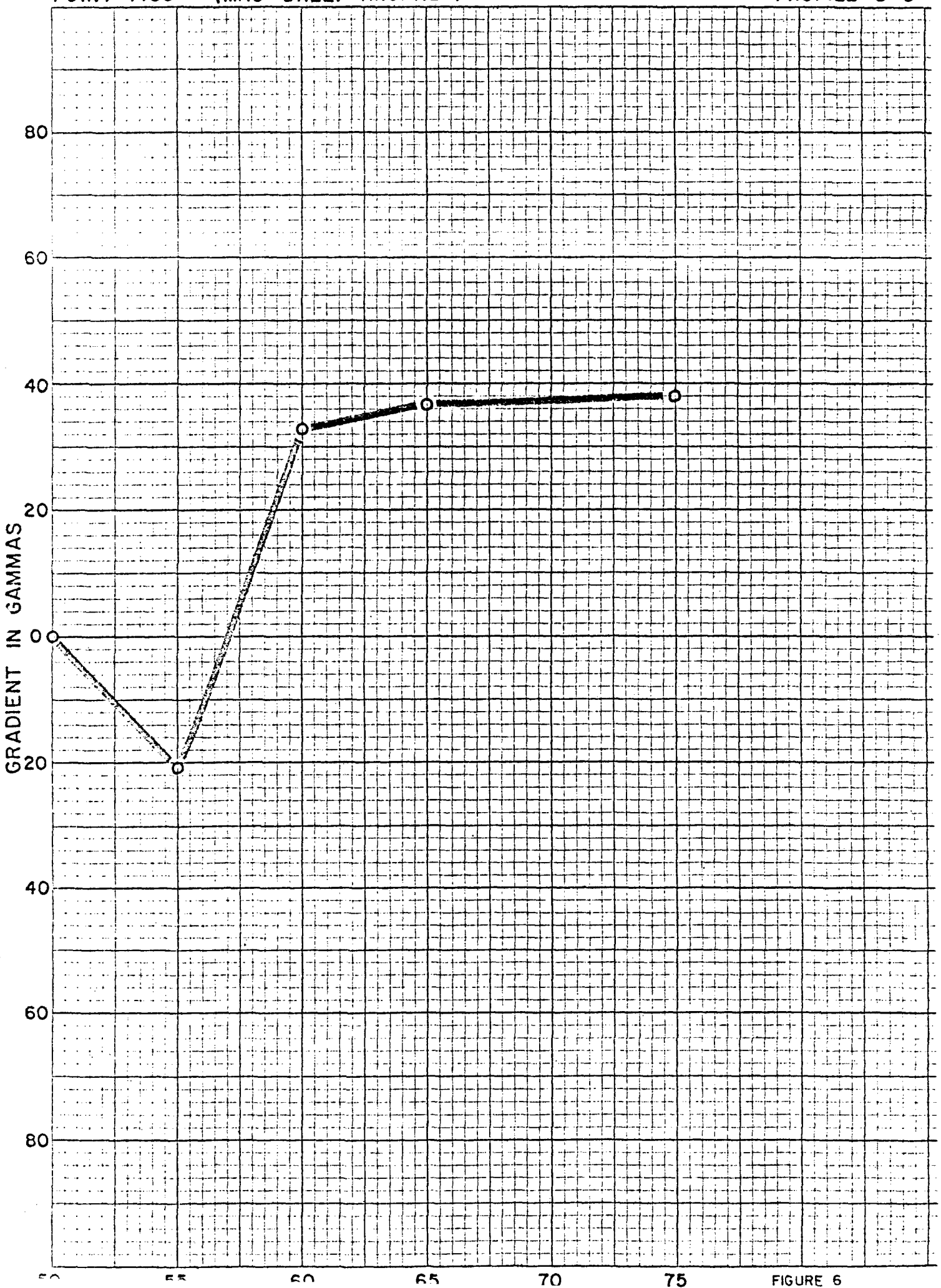

FIGURE 6

SOUTH DIXIE VALLEY, NEVADA

POINT 1502 (MAG HIGH)

PROFILE N - N'

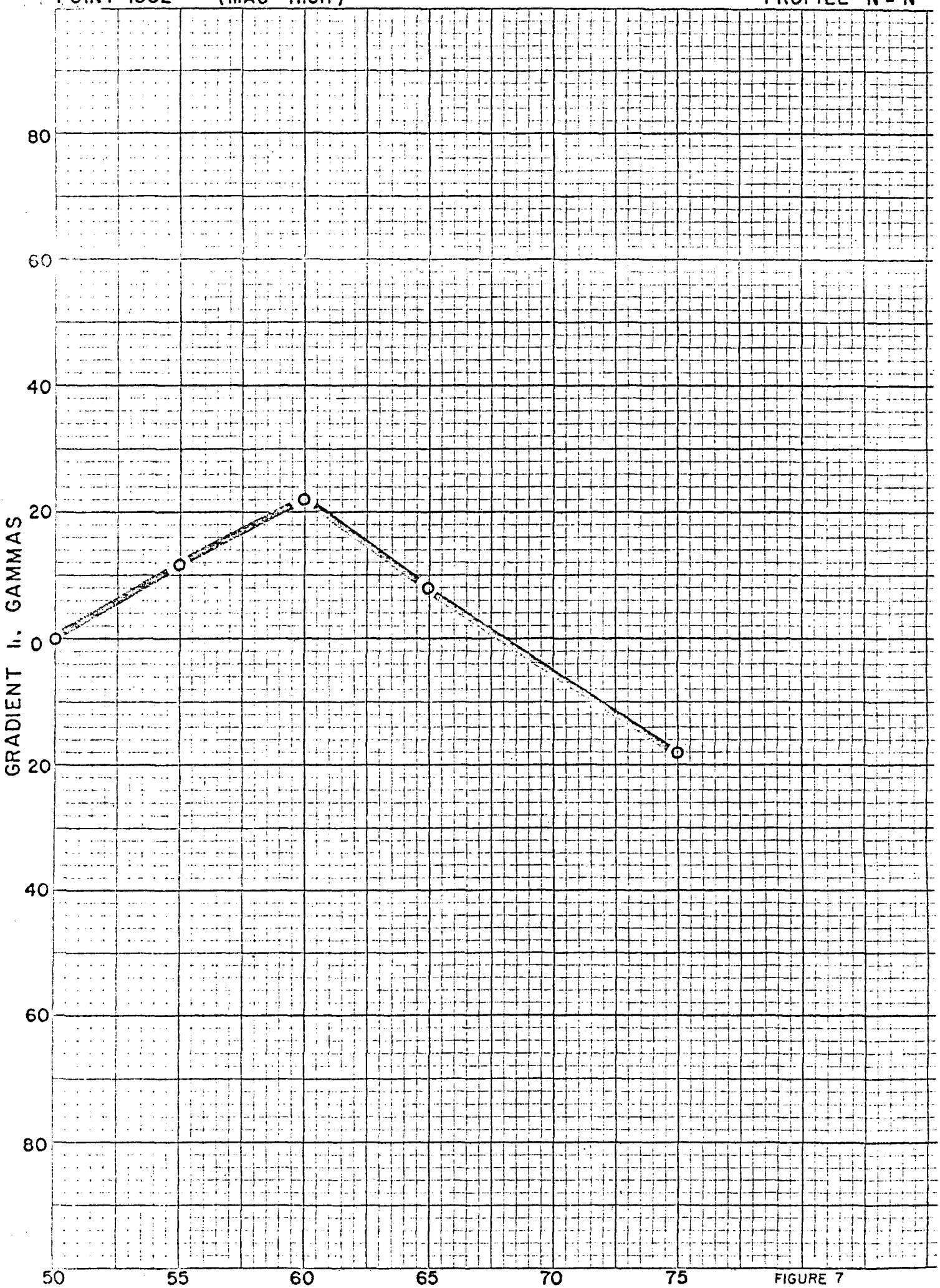

FIGURE 7

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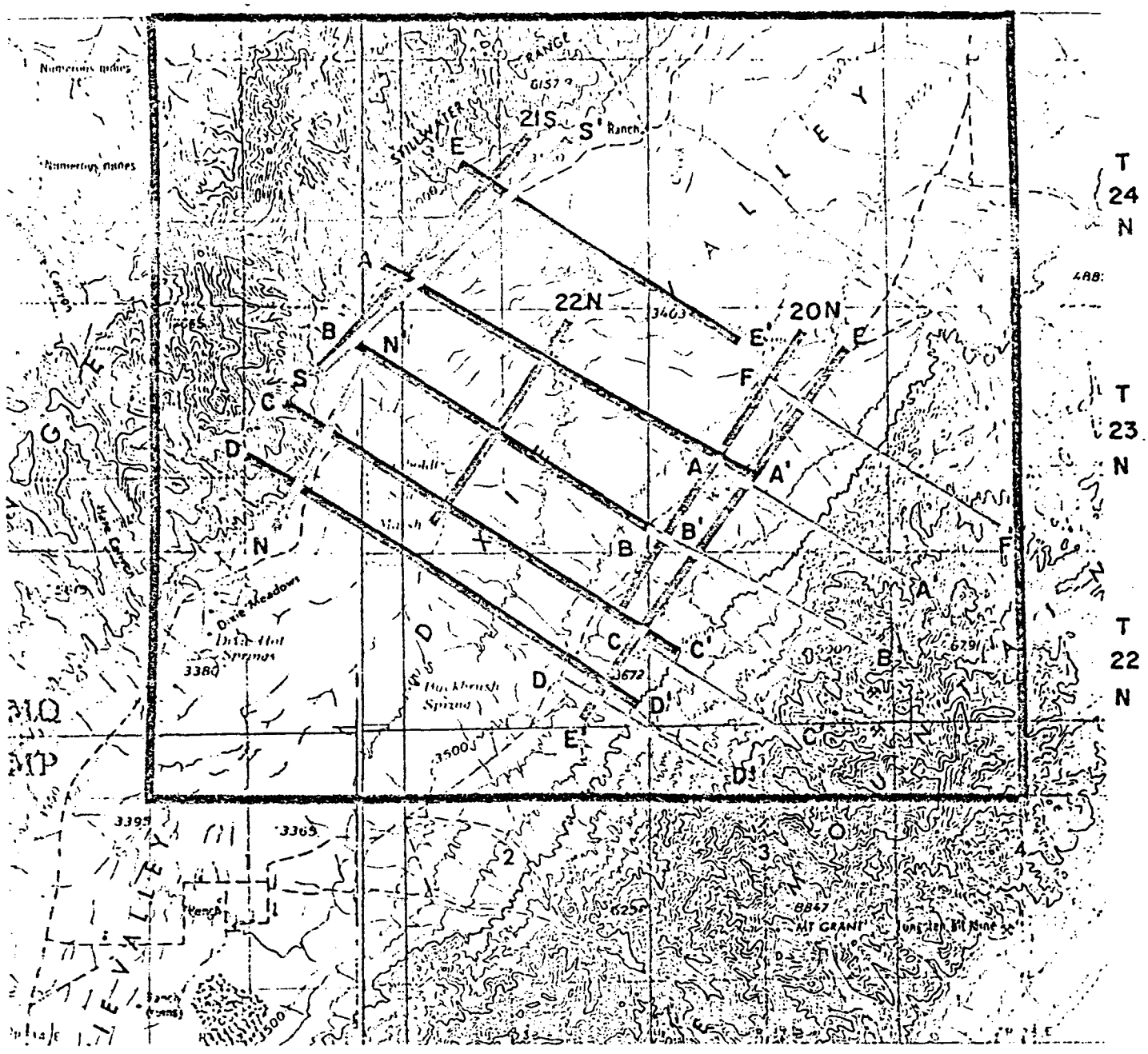

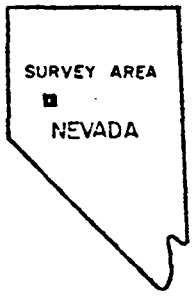

	DIXIE NO. 1	DIXIE NO. 2
SINGLE LEVEL		
MULTILEVEL		

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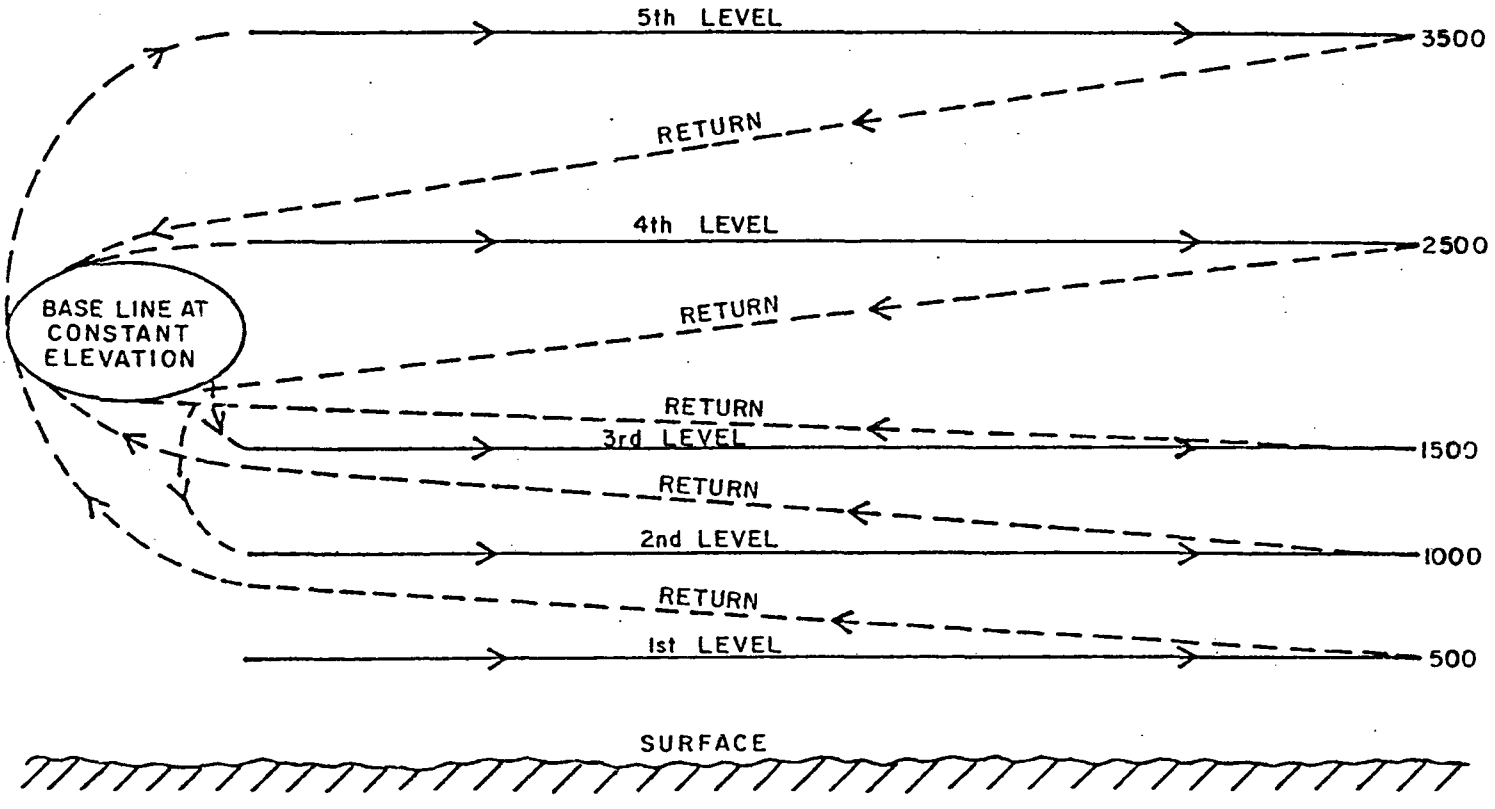

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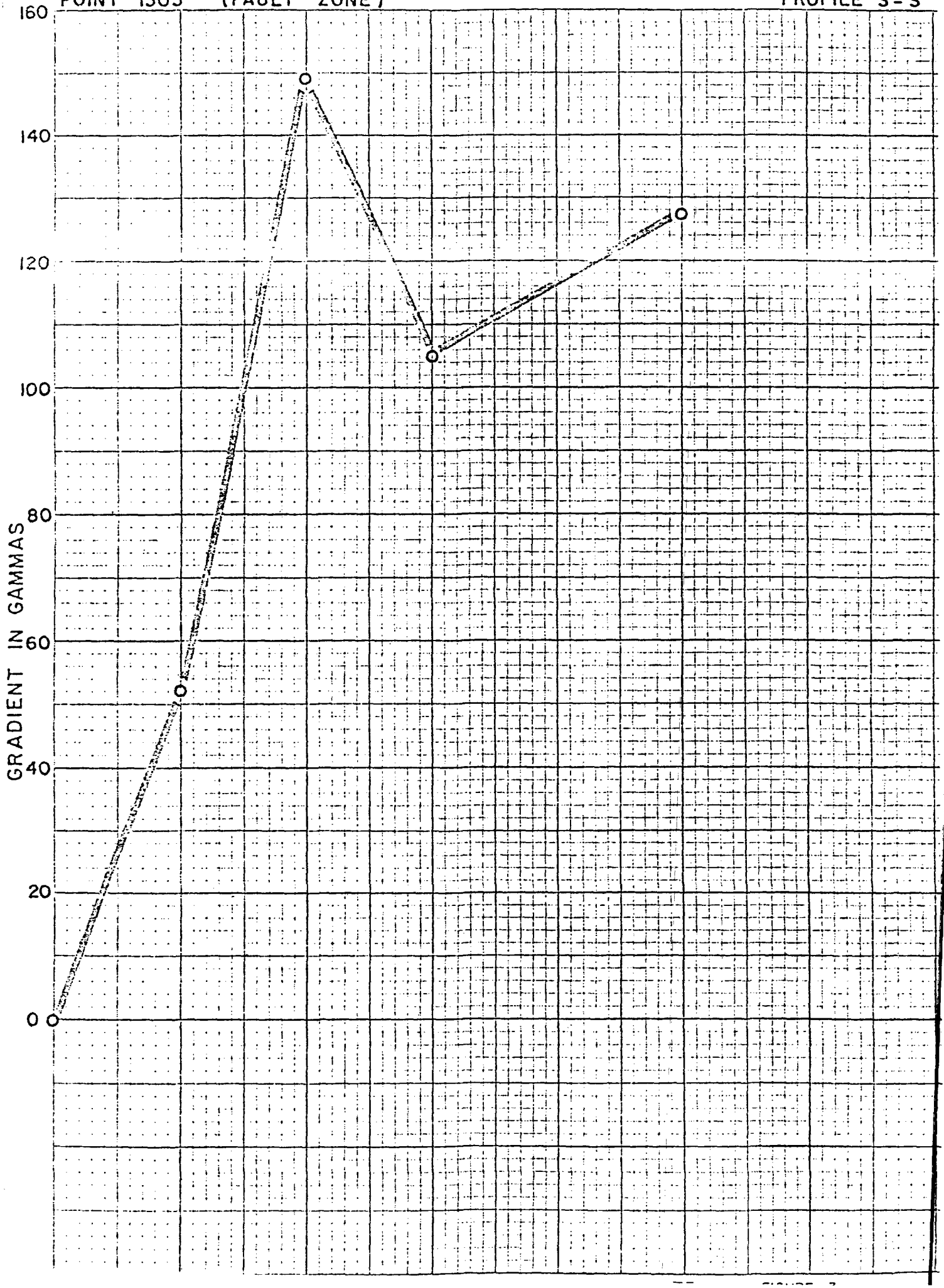

SOUTH DIXIE VALLEY, NEVADA
POINT 1303 (FAULT ZONE)
PROFILE S - S'
GRADIENT IN GAMMAS
160
140
120
100
80
60
40
20
0

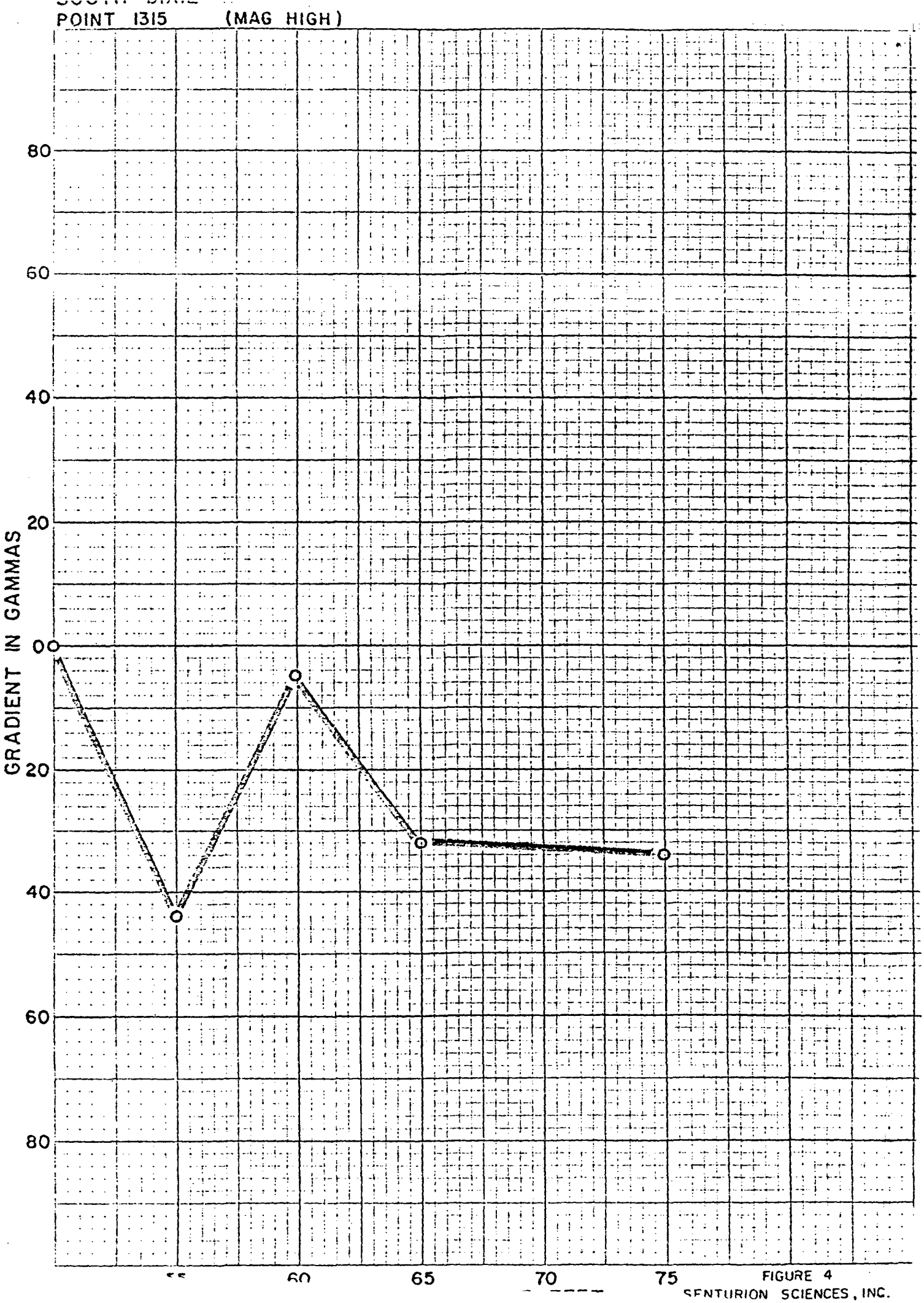


FIGURE 4

SENTURION SCIENCES, INC.

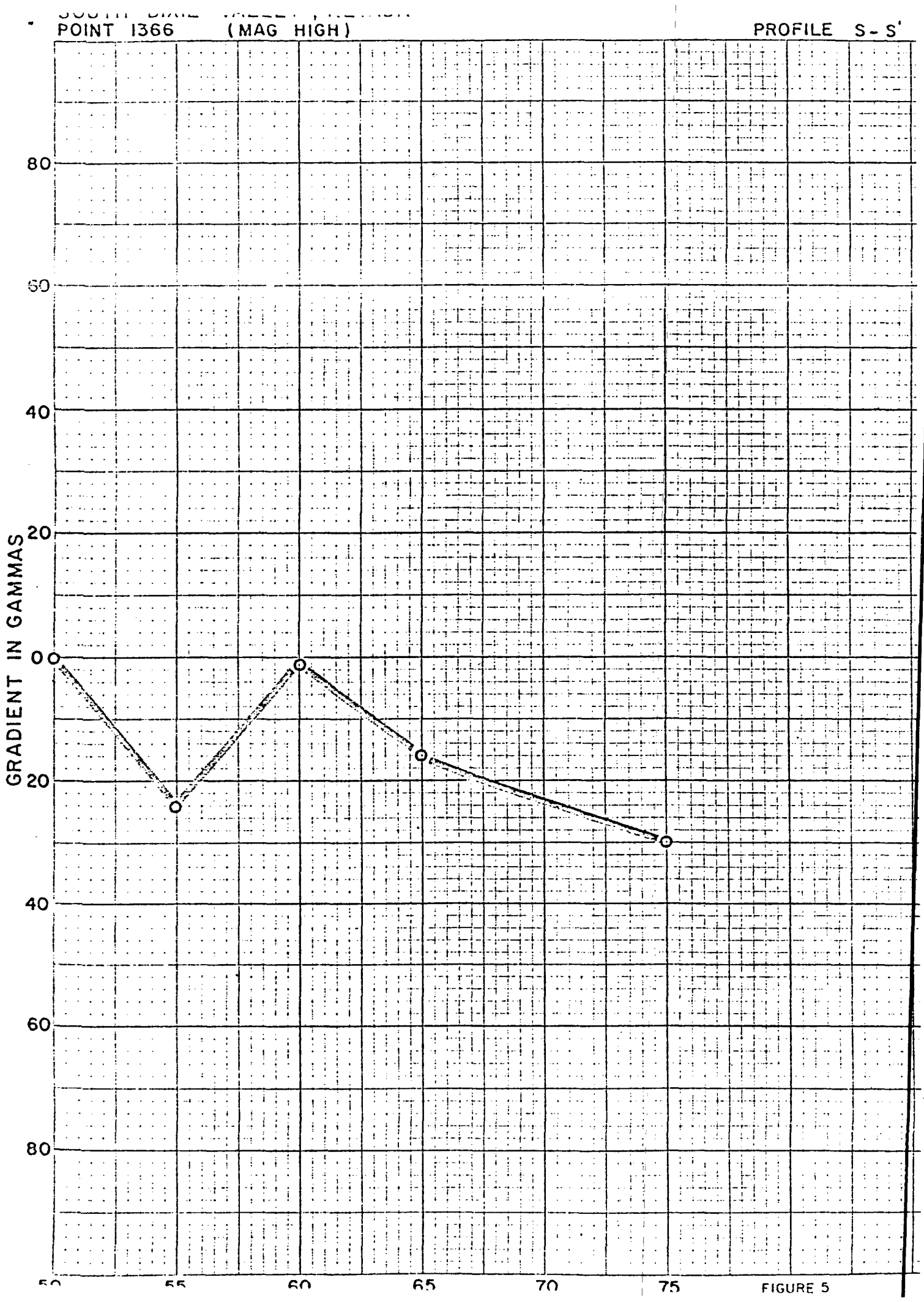
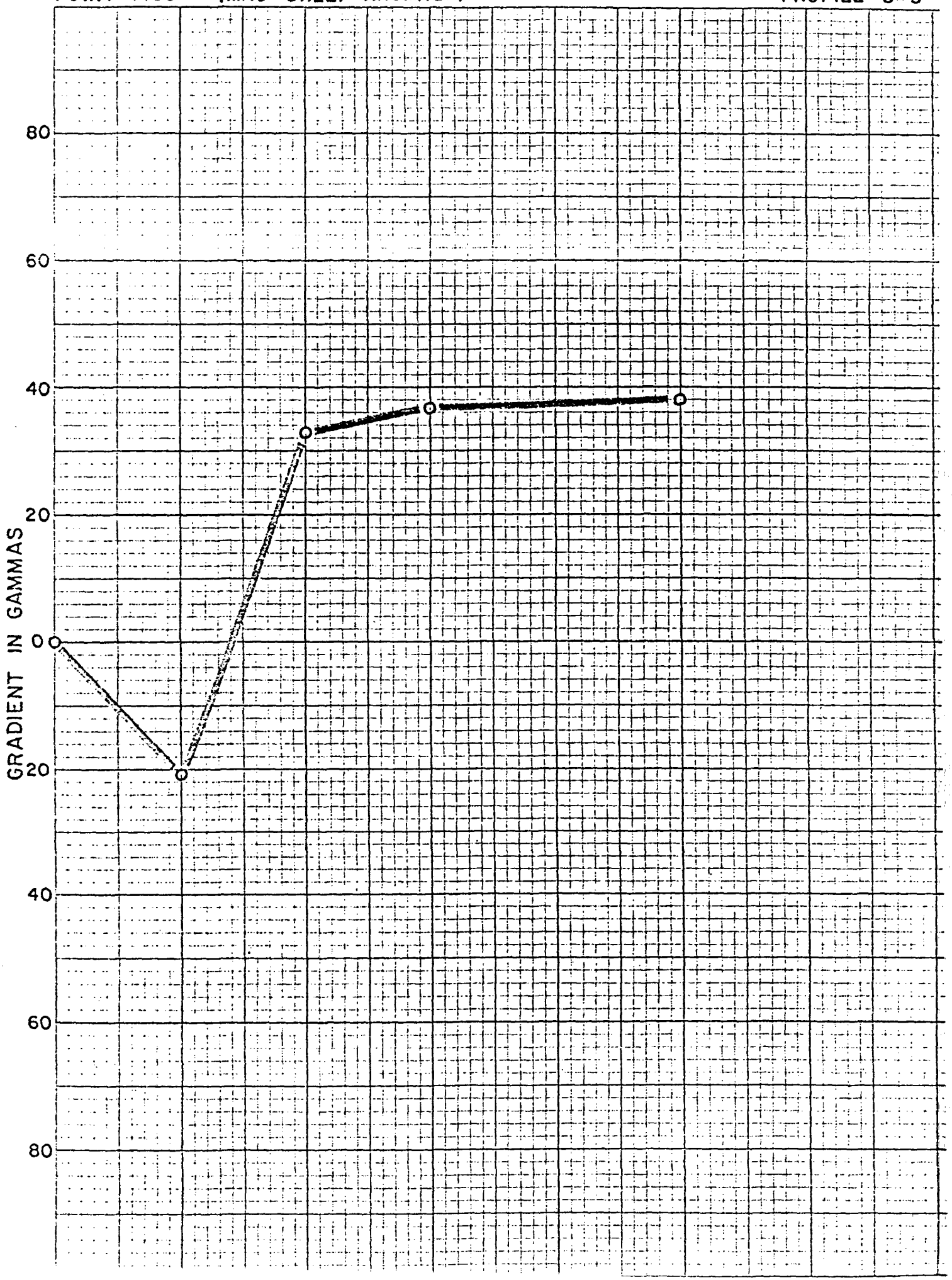

POINT 1366 (MAG HIGH)
PROFILE S - S'
GRADIENT IN GAMMAS
80
60
40
20
0
20
40
60
80
50
55
60
65
70
75

FIGURE 5

SOUTH DIXIE VALLEY, NEVADA
POINT 1409 (MAG SHELF ANOMALY)
PROFILE S-S'



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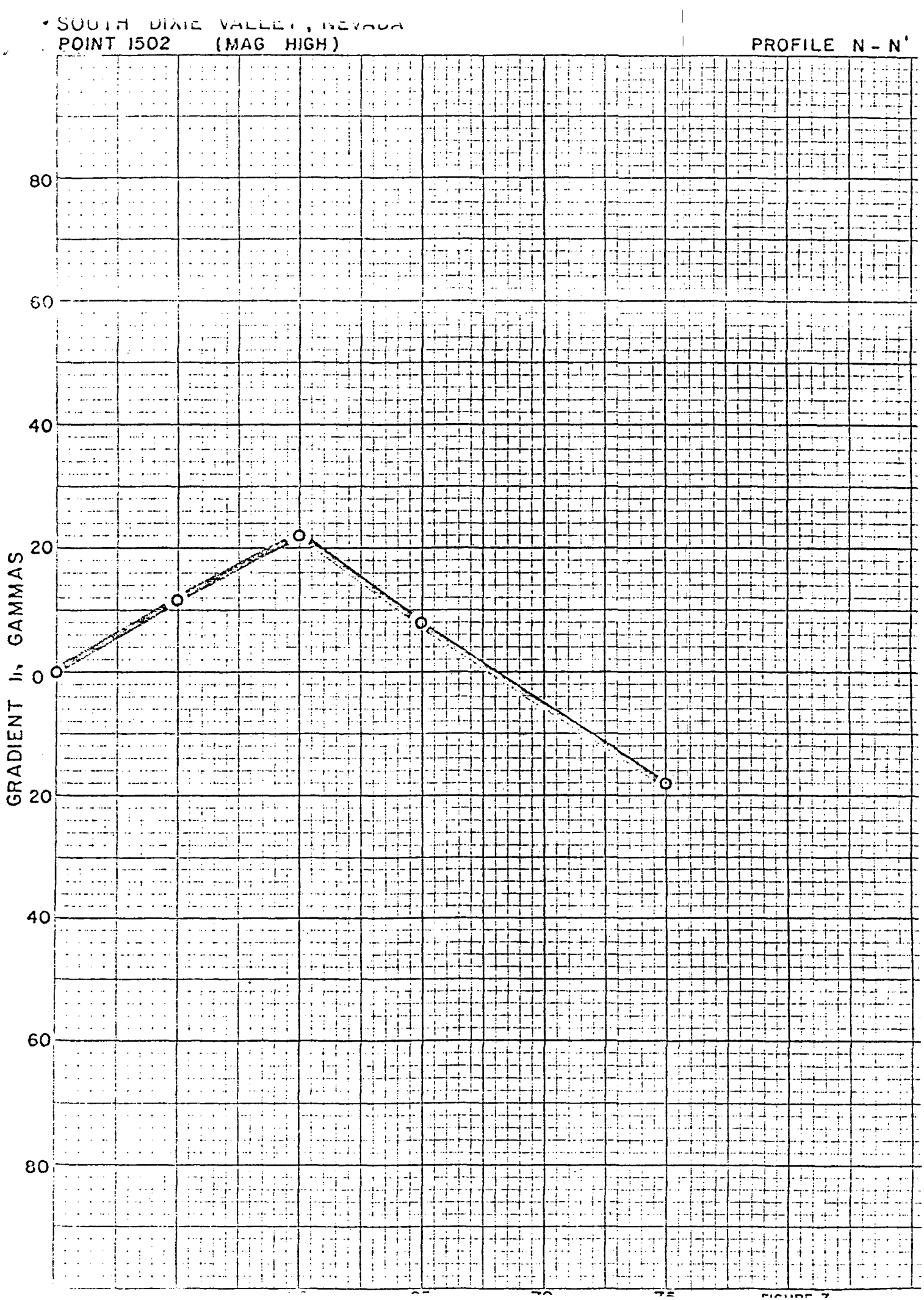
SOUTH DIXIE VALLEY, NEVADA
POINT 1502 (MAG HIGH)
PROFILE N - N'
80
60
40
20
0
20
40
60
80
GRADIENT IN GAMMAS

FIGURE 7