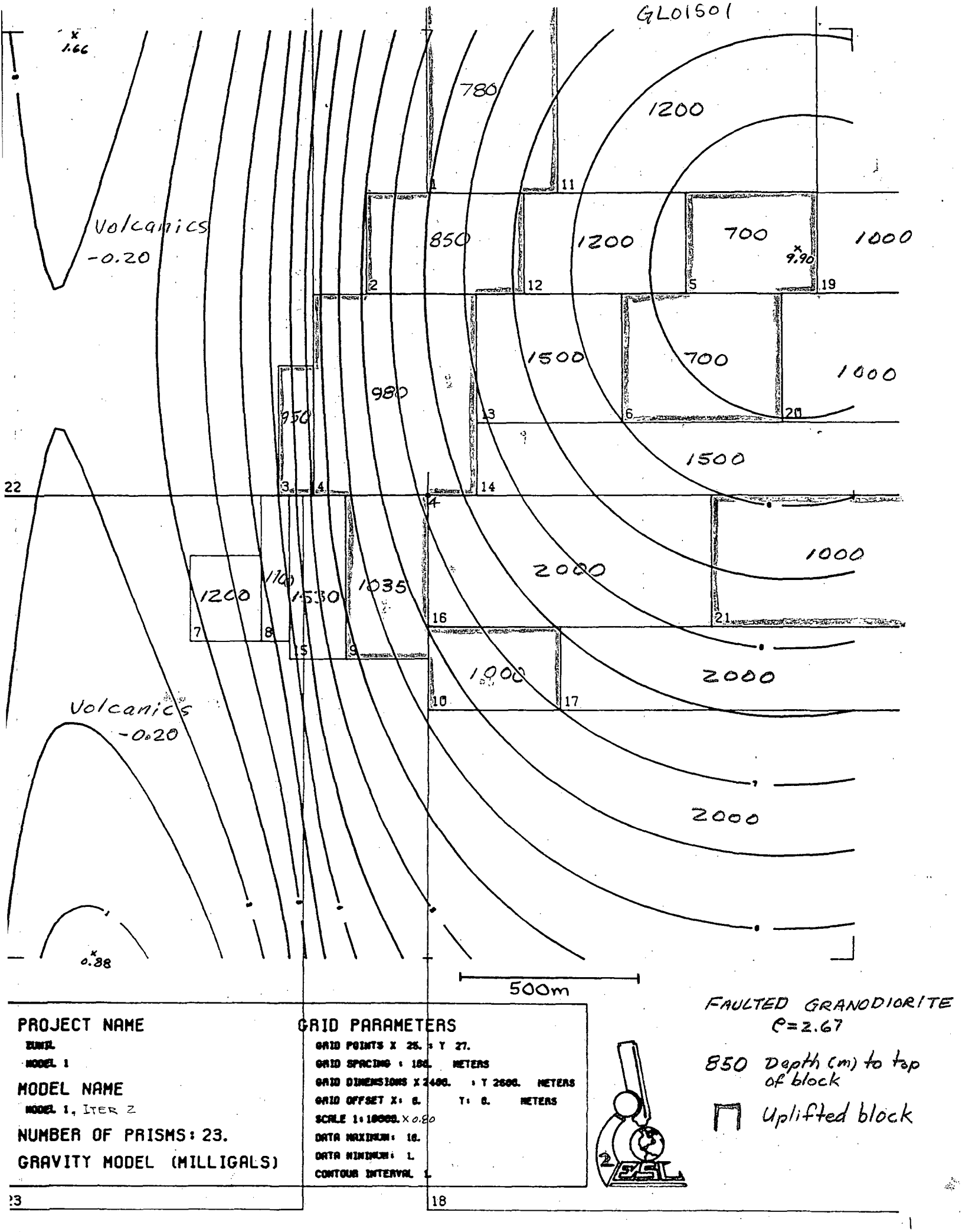


PROJECT NAME

BUNDL

MODEL 1

MODEL NAME

MODEL 1, ITER 2

NUMBER OF PRISMS: 23.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS

GRID POINTS X 25. : Y 27.

GRID SPACING : 100. METERS

GRID DIMENSIONS X 2400. : Y 2600. METERS

GRID OFFSET X: 0. Y: 0. METERS

SCALE 1:18000. X 0.80

DATA MAXIMUM: 18.

DATA MINIMUM: 1.

CONTOUR INTERVAL 1.

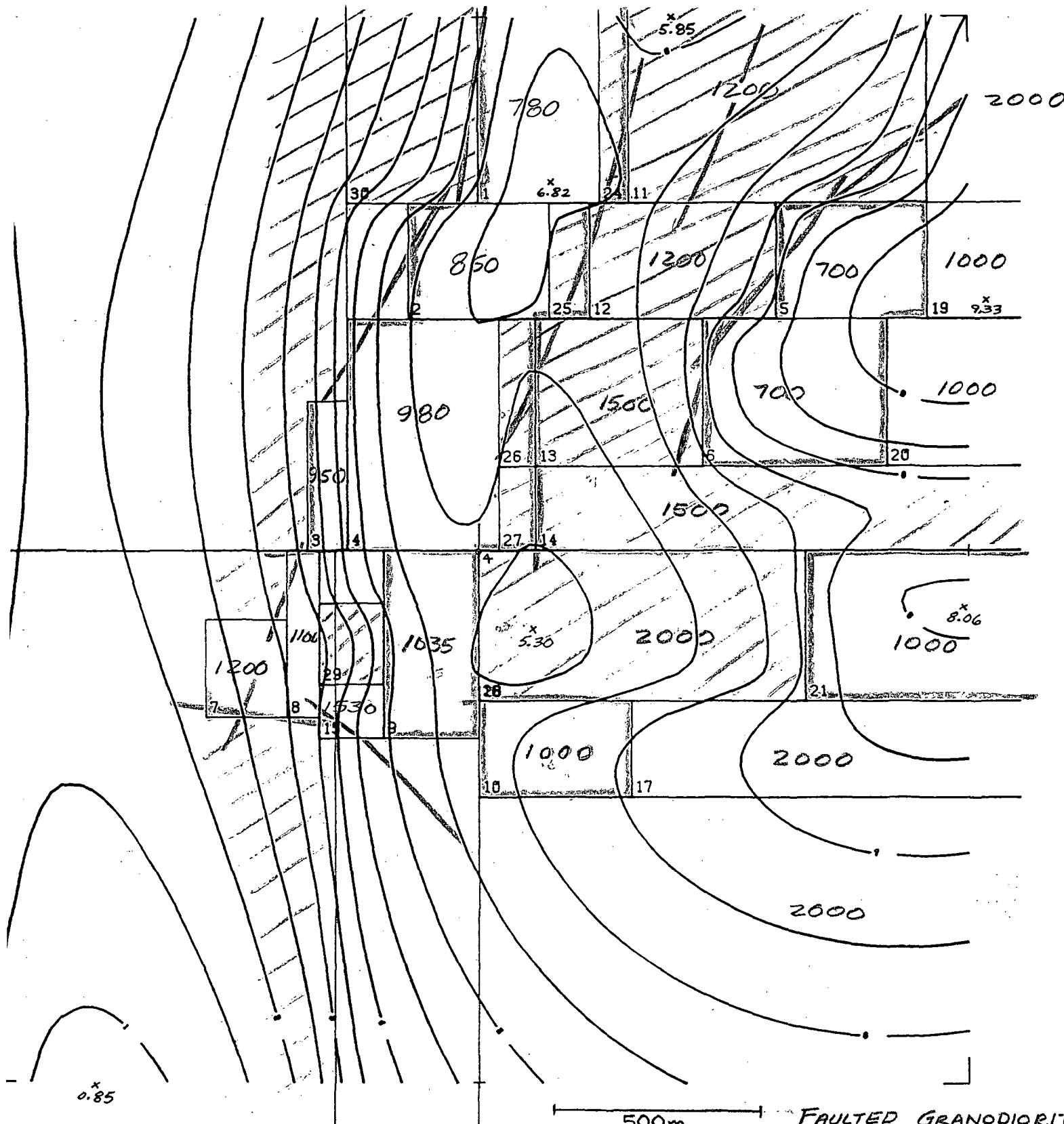
FAULTED GRANODIORITE
$\rho = 2.67$

850 Depth (m) to top of block

Uplifted block

23

18



FAULTED GRANODIORITE AND VARIABLE VOLCANICS

Shallow Granodiorite
ρ=2.67

Volcanics, ρ=2.00
depth 0-500m

Background
ρ=2.20

PROJECT NAME

MODEL 1

MODEL NAME

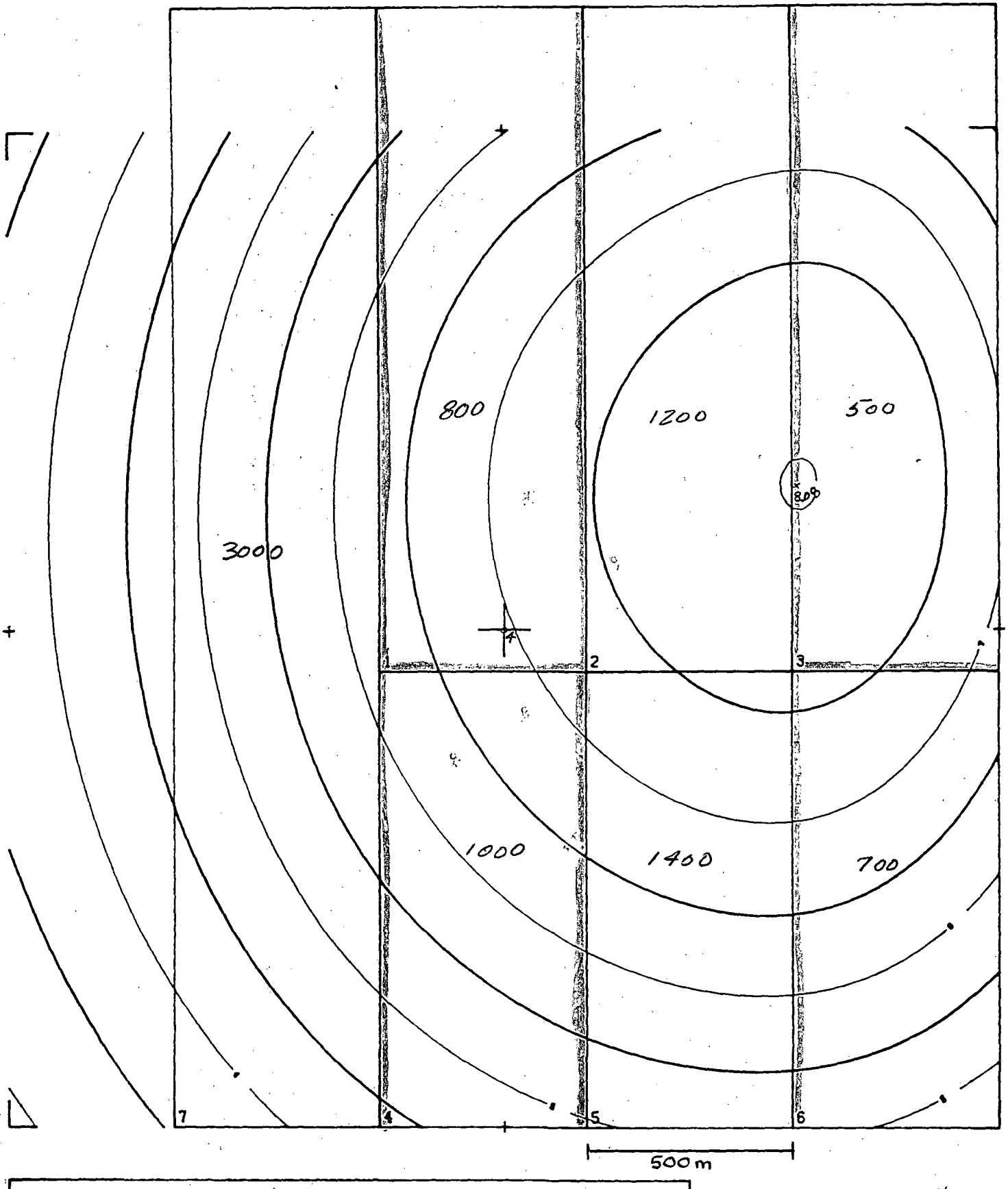
MODEL 1, ITER 4

NUMBER OF PRISMS: 30.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS

GRID POINTS X 28. : Y 27.
GRID SPACING : 100. METERS
GRID DIMENSIONS X 2400. : Y 2600. METERS
GRID OFFSET X: 0. Y: 0. METERS
SCALE 1: 10000. X.80
DATA MAXIMUM: 8.
DATA MINIMUM: 1.
CONTOUR INTERVAL 1.



PROJECT NAME

ELMIL

DEEP GRANITE STRUCTURE

MODEL NAME

DEEP GRANITE STRUCTURE

NUMBER OF PRISMS: 7.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS

GRID POINTS X 25. : Y 25.

GRID SPACING : 100. METERS

GRID DIMENSIONS X 2400. : Y 2400. METERS

GRID OFFSET X: 0. Y: 0. METERS

SCALE 1: 19000. X .80

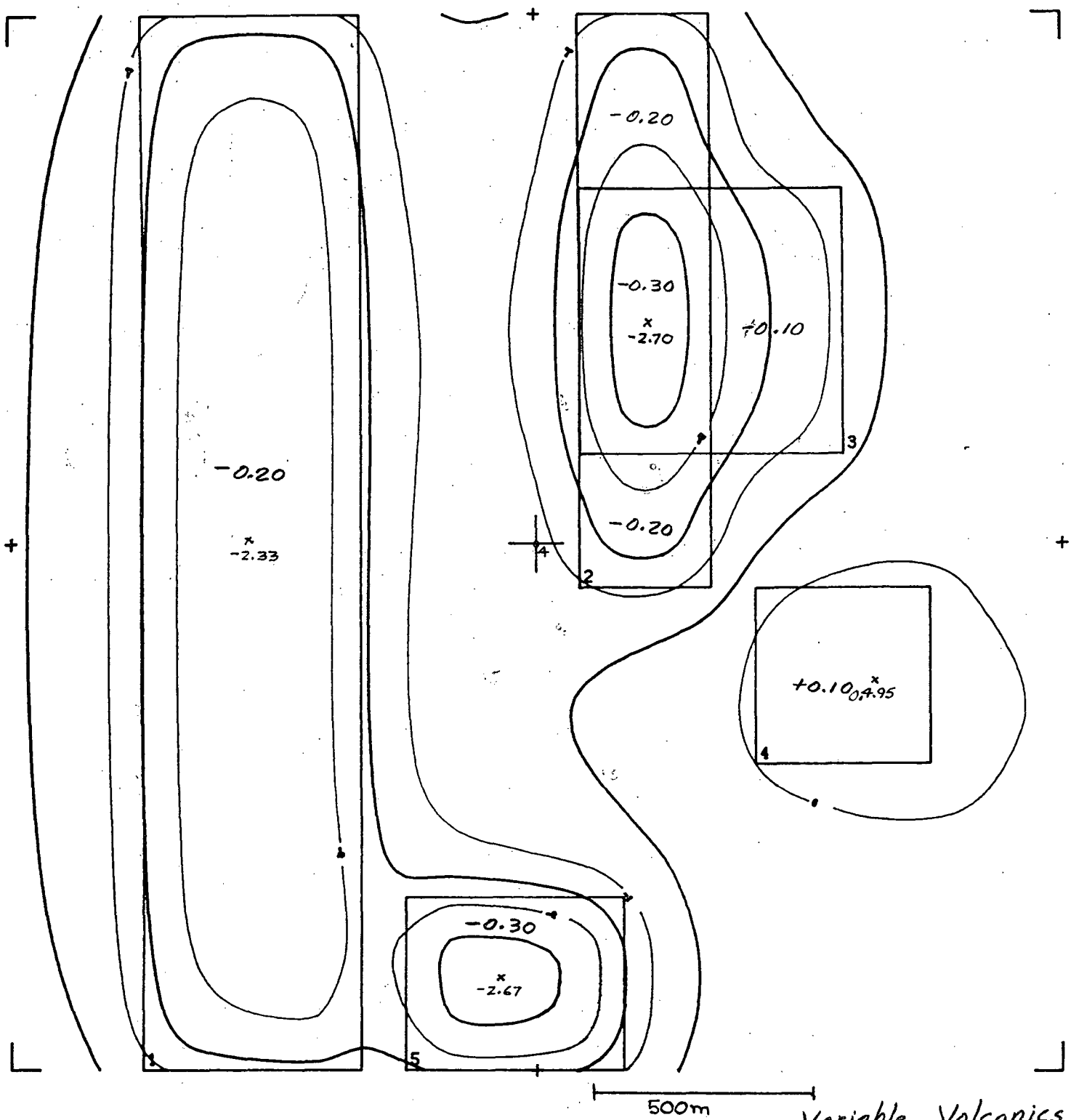
DATA MAXIMUM: 8.

DATA MINIMUM: 3.

CONTOUR INTERVAL 1.

1000 Depth (m) to granodiorite
P = 0.47

← Uplifted block



PROJECT NAME
ZUNIL
SURFACE VOLCANICS

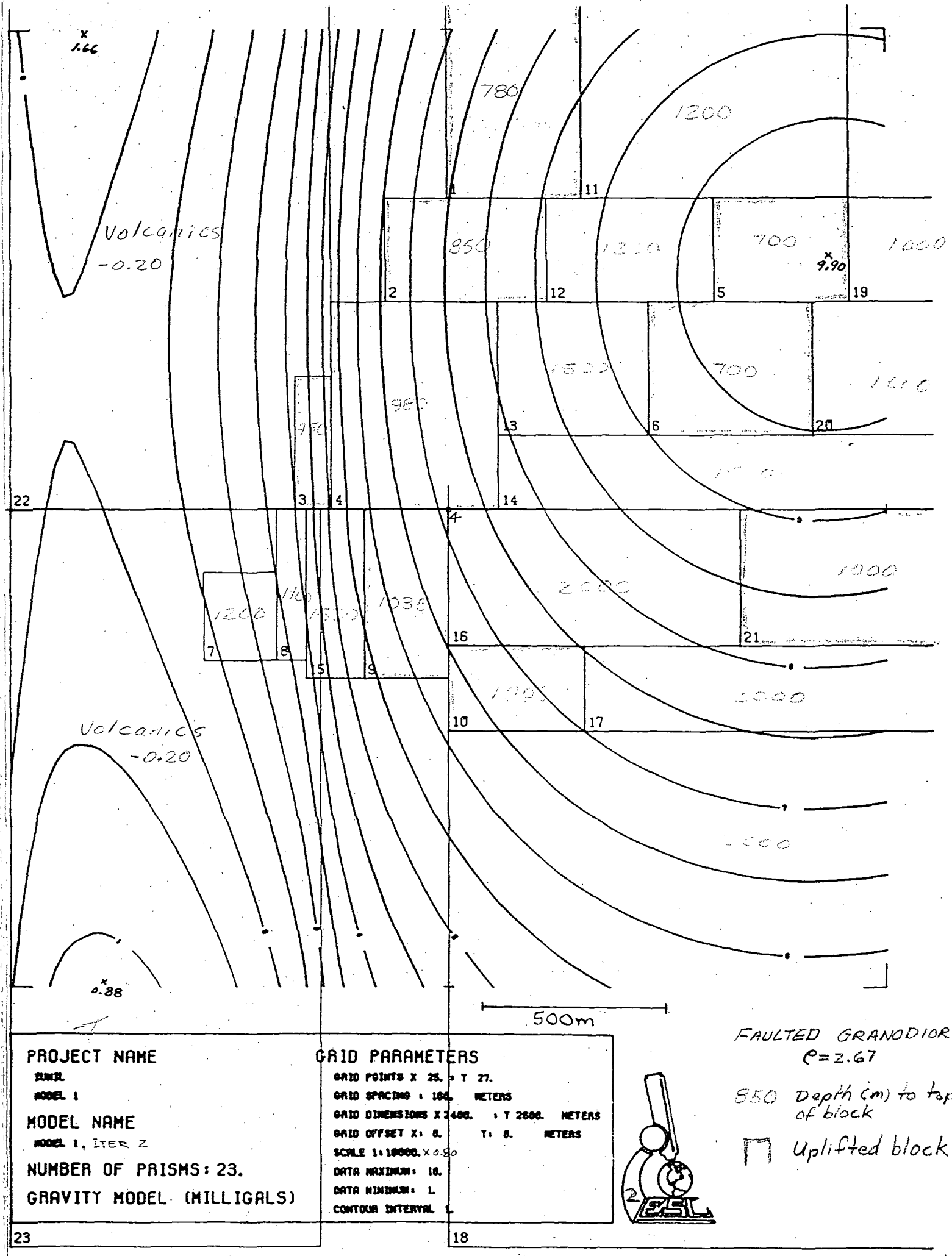
MODEL NAME
SURFACE VOLCANICS

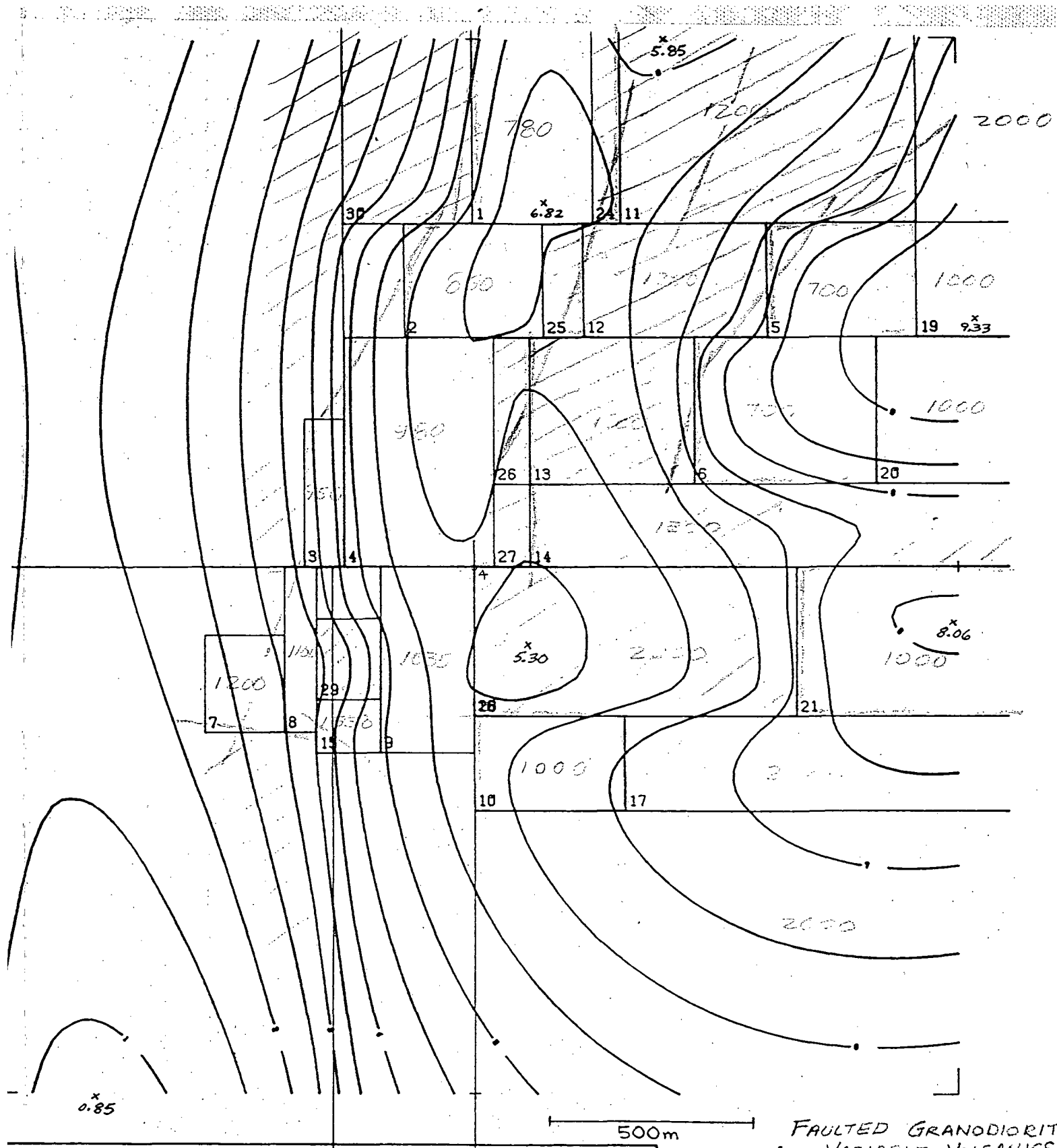
NUMBER OF PRISMS: 5.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS
GRID POINTS X 25. : Y 25.
GRID SPACING : 100. METERS
GRID DIMENSIONS X 2400. : Y 2400. METERS
GRID OFFSET X: 0. Y: 0. METERS
SCALE 1:19000. X.80
DATA MAXIMUM: 0.
DATA MINIMUM: -0.
CONTOUR INTERVAL 1.

Variable Volcanics
-0.20 Density Contrast (g/cc)
All blocks depth 0-500m


1.66
780
1200
Volcanics
-0.20
850
700
9.90
1000
700
1000
1200
1000
1000
Volcanics
-0.20
0.88
500m
PROJECT NAME
ZUNIL
MODEL 1
MODEL NAME
MODEL 1, ITER 2
NUMBER OF PRISMS: 23.
GRAVITY MODEL (MILLIGALS)
GRID PARAMETERS
GRID POINTS X 25. Y 27.
GRID SPACING : 100. METERS
GRID DIMENSIONS X 2400. Y 2600. METERS
GRID OFFSET X: 0. Y: 0. METERS
SCALE 1:10000. X 0.80
DATA MAXIMUM: 16.
DATA MINIMUM: 1.
CONTOUR INTERVAL 1.
FAULTED GRANODIOR
ρ=2.67
850 Depth (m) to top of block
Uplifted block



PROJECT NAME

KUKIL

MODEL 1

MODEL NAME

MODEL 1, ITER 4

NUMBER OF PRISMS: 30.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS

GRID POINTS X 28. : Y 27.

GRID SPACING : 100. METERS

GRID DIMENSIONS X 2400. : Y 2600. METERS

GRID OFFSET X: 0. Y: 0. METERS

SCALE 1:10000. X.80

DATA MAXIMUM: 8.

DATA MINIMUM: 1.

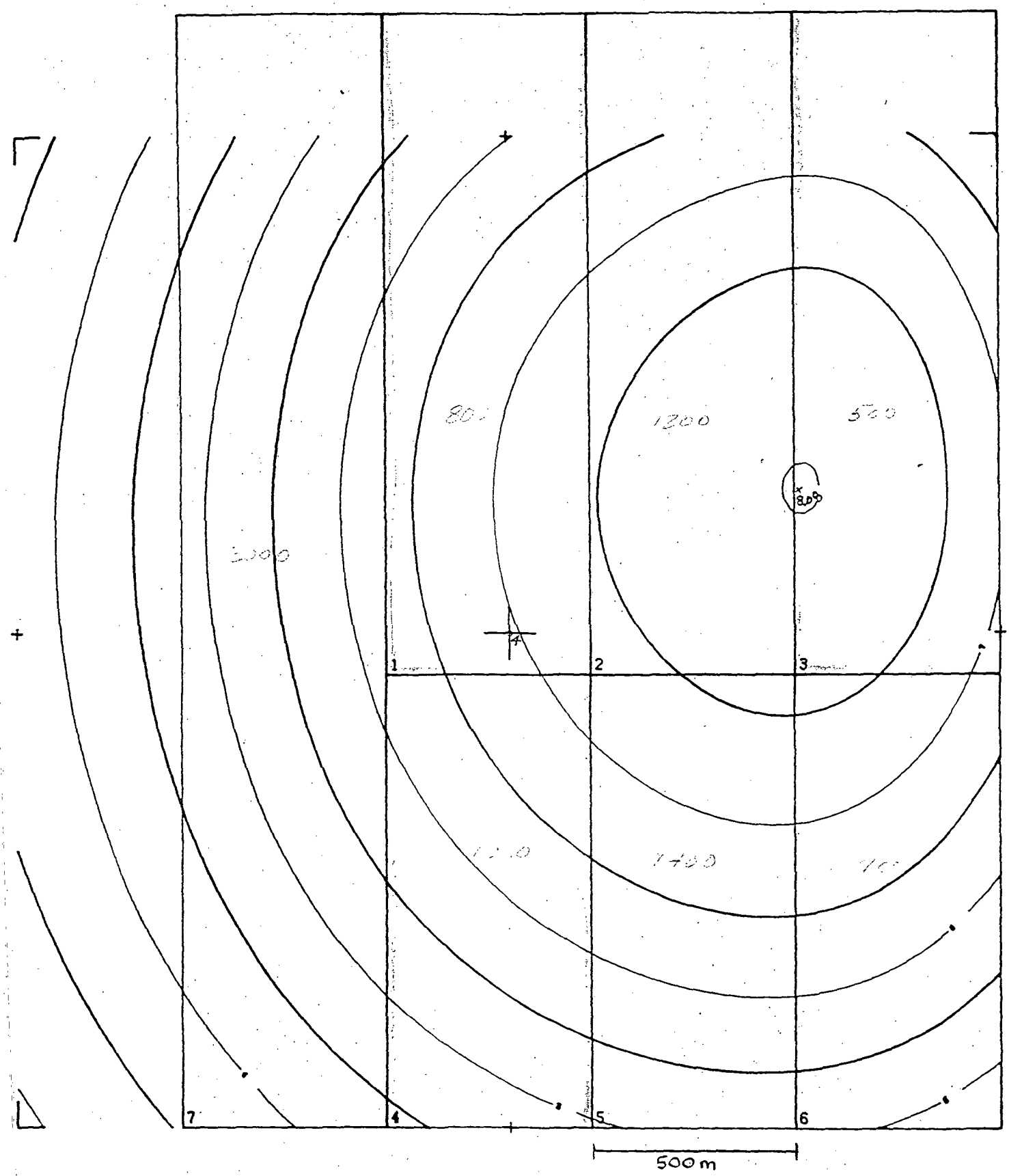
CONTOUR INTERVAL 1.

FAULTED GRANODIORITE AND VARIABLE VOLCANICS

Shallow Granodiorite
ρ=2.67

Volcanics, ρ=2.00
depth 0-500m

Background
ρ=2.20



PROJECT NAME

RUN1.

DEEP GRANITE STRUCTURE

MODEL NAME

DEEP GRANITE STRUCTURE

NUMBER OF PRISMS: 7.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS

GRID POINTS X 25. : Y 25.

GRID SPACING : 100. METERS

GRID DIMENSIONS X 2400. : Y 2400. METERS

GRID OFFSET X: 0. Y: 0. METERS

SCALE 1:19036. X .80

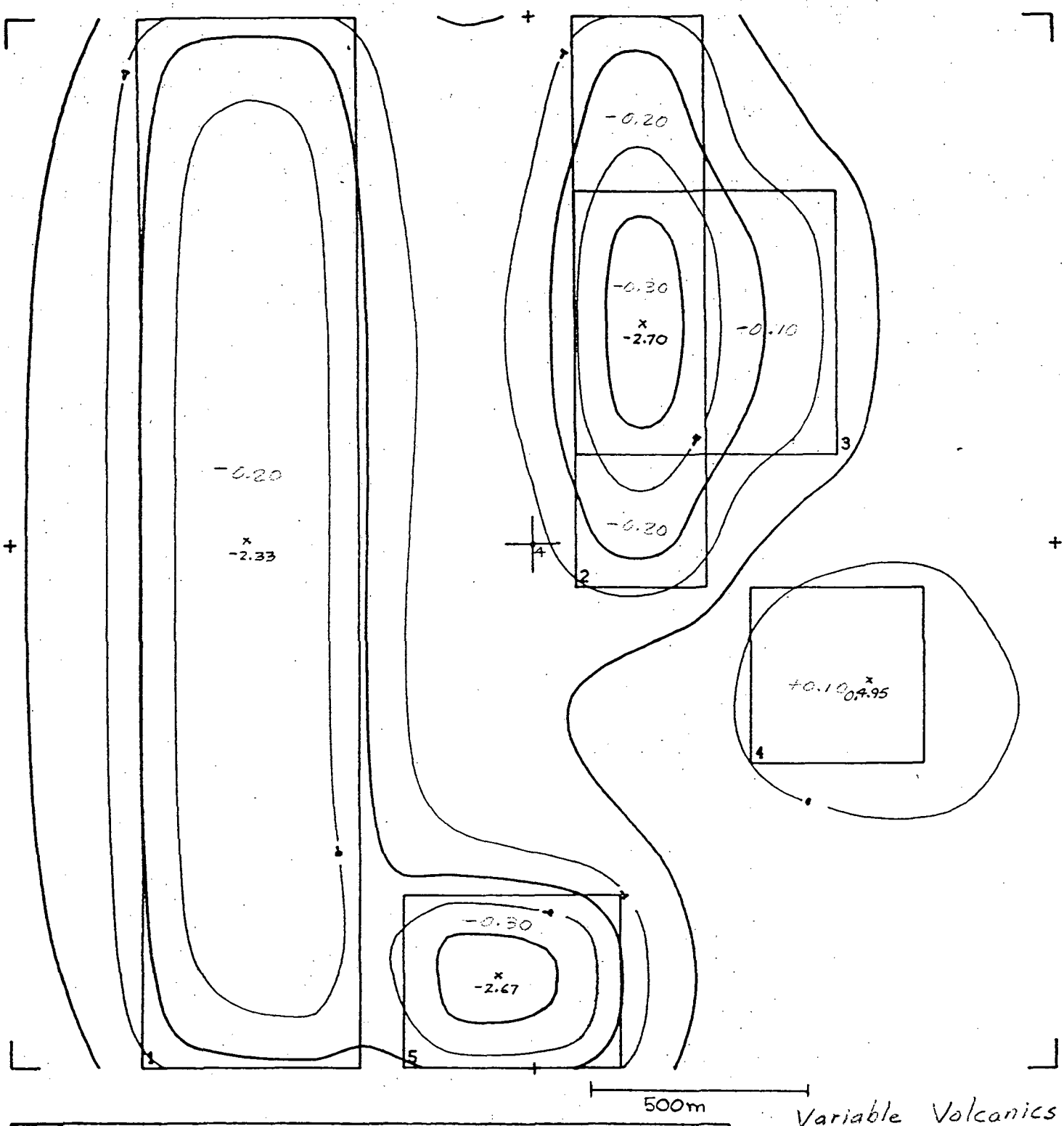
DATA MAXIMUM: 8.

DATA MINIMUM: 3.

CONTOUR INTERVAL 1.

1000 Depth (m) to granodiorite P=0.47

← Uplifted block



PROJECT NAME
BASAL
SURFACE VOLCANICS

MODEL NAME
SURFACE VOLCANICS

NUMBER OF PRISMS: 5.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS
GRID POINTS X 25. : Y 25.
GRID SPACING : 100. METERS
GRID DIMENSIONS X 2400. : Y 2400. METERS
GRID OFFSET X: 0. Y: 0. METERS
SCALE 1:10000. X.80
DATA MAXIMUM: 0.
DATA MINIMUM: -0.
CONTOUR INTERVAL 1.

Variable Volcanics
-0.20 Density Contrast (g/cc)
All blocks depth 0-500m

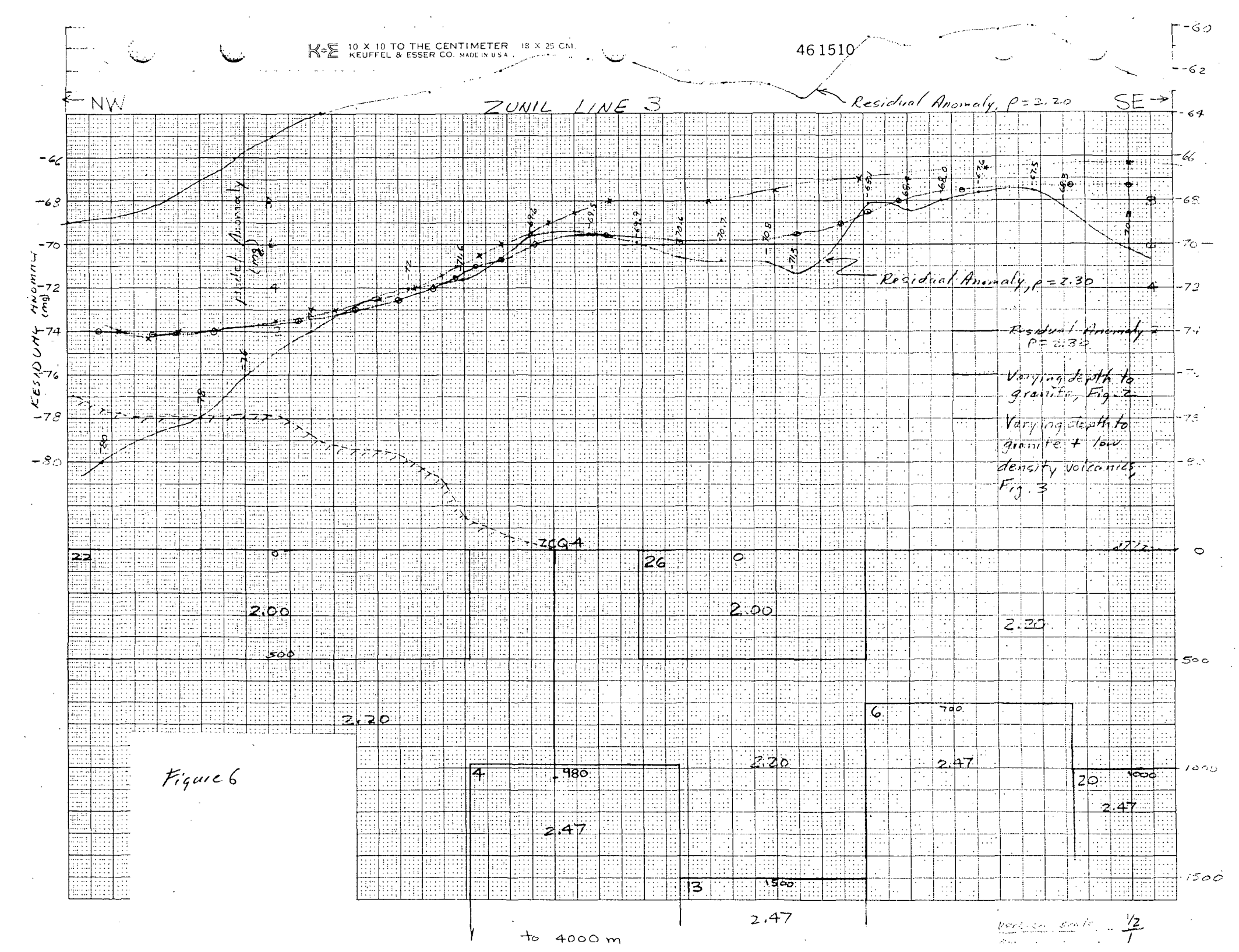

K+E 10 X 10 TO THE CENTIMETER 18 X 25 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 1510
NW
SE
ZUNIL LINE 3
Residual Anomaly, ρ = 2.20
Residual Anomaly, ρ = 2.30
Residual Anomaly ρ = 2.30
Varying depth to granite, Fig. 2
Varying depth to granite + low density volcanics, Fig. 3
RESIDUAL ANOMALY (mgl)
-60
-62
-64
-66
-68
-70
-72
-74
-76
-78
-80
0
500
1000
1500
22
0
2.00
26
0
2.00
2.20
2.20
6
700
2.47
4
980
2.47
3.20
20
1000
2.47
13
1500
2.47
to 4000 m
Vertical Scale 1/2 / 1

Figure 6

461510

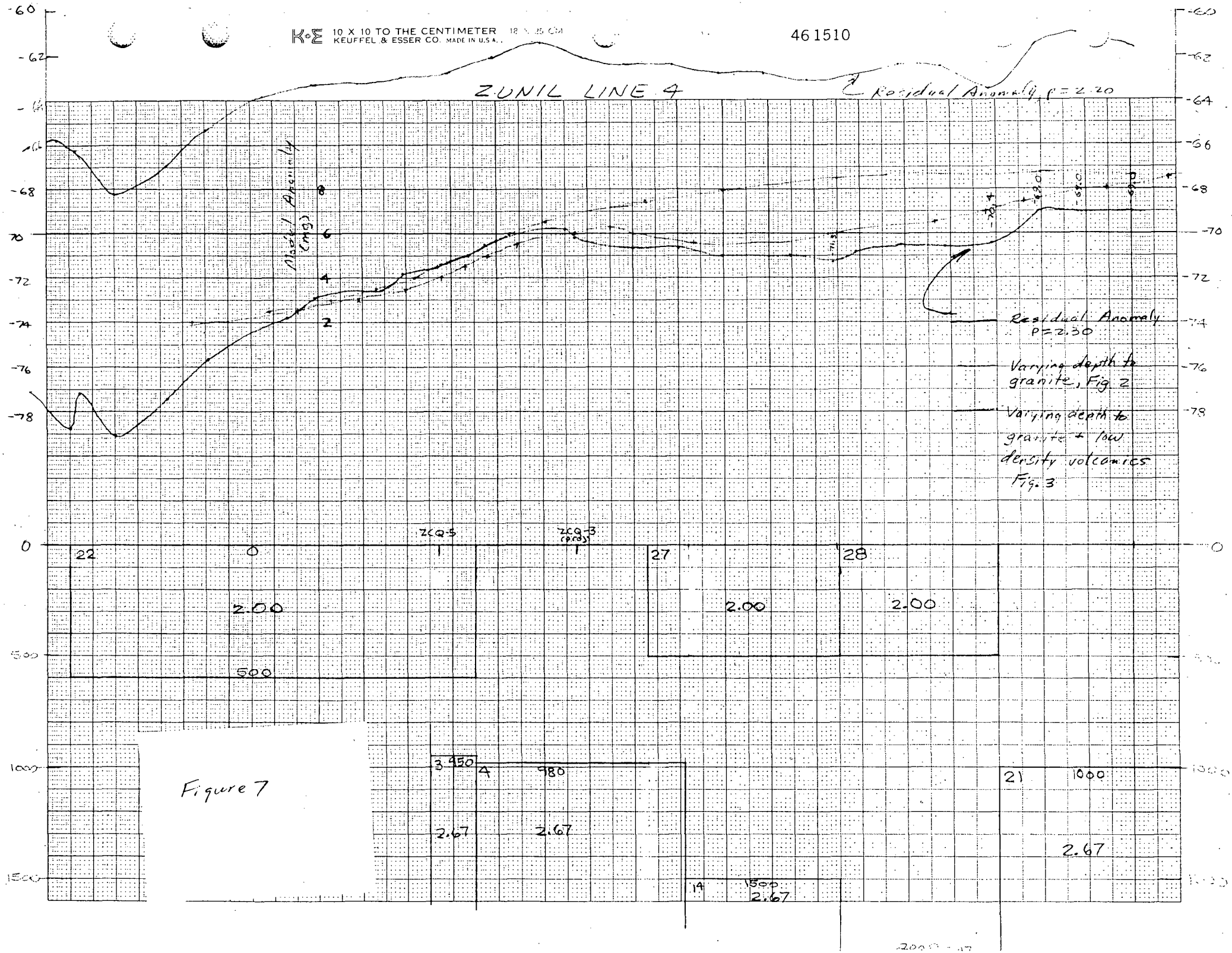


Figure 7

ZUNIL PAPER

Duncan Foley et al.

ZUNIL GEOPHYSICS -- COMMENTS

Introduction

Zunil geophysical studies have included gravity, magnetics, resistivity, seismic, and thermal studies. The gravity and electrical resistivity studies relate closely to geologic structures and effects of the thermal system, and will be briefly be reviewed here.

Schlumberger resistivity plot

A large number of Schlumberger soundings (VES), more than 50, were completed by INDE and JICA in the greater Zunil area. Of most interest are approximately 30 VES in the vicinity of the well field. Surveys have been conducted in this very rugged terrain since 1976.

Twelve of the better behaved (i.e. more two-dimensional) VES, such as the one shown here, were inverted to determine the resistivity structure using a 1-D algorithm. Most soundings could be interpreted with a 4-layer model as shown here. The upper two layers are thin, of high resistivity; then a low resistivity intermediate layer; and then a deep resistive layer. The depth to the deep resistive layer is not generally well resolved.

Zunil Resistivity Studies

The principal results of the interpretation are summarized here. Ambiguity limits the uniqueness of the interpretation, but the conductivity-thickness product is relatively well resolved, and seems to relate to geologic properties of the geothermal system.

Resistivity Map

This map summarizes the location of the 30 VES, the interpreted depth to the resistive layer (in red) and the conductivity-thickness product. This parameter increases away from the area around ZCQ-3 (shown by amber arrows), and seems to correlate with the increased development of conductive clay minerals such as smectite. Extensive smectite development occurs as the thermal fluids are diluted and cooled, as one progresses further from ZCQ-3 and ZCQ-6.

Zunil Gravity Studies

Both regional and detailed gravity studies were conducted at Zunil, as summarized here. The detailed survey was the subject of a specific interpretation reported here. Because of the extreme topographic relief, the terrain corrections are very large and probable errors related to them could be substantial. Several topographic corrections exceed 12 mGal.

Gravity Map

The residual gravity map for the detailed survey is shown here. The data were carefully terrain corrected, fully reduced to Bouguer gravity values, and a Northeast trending regional gradient was removed. An interpretation in terms of density contrasts along structures is shown here. Note the NE trending gravity high, roughly coincident with a deep granodiorite intercepted by the ZCQ wells. The amplitude of this high is 2-3 mGals.

Gravity Model in Cross section

Numerical modeling was undertaken to evaluate the density distributions giving rise to this low amplitude gravity high. The contribution to the high from a deep granite body (1000 m) is quite small. Most of the gravity high is due to more dense volcanic units (noted to be altered in drill holes). The density contrast is present at shallow depths (0-500m). A NW trending section taken from the complex 3-D model is shown here. Observed and calculated residual anomaly values are shown.

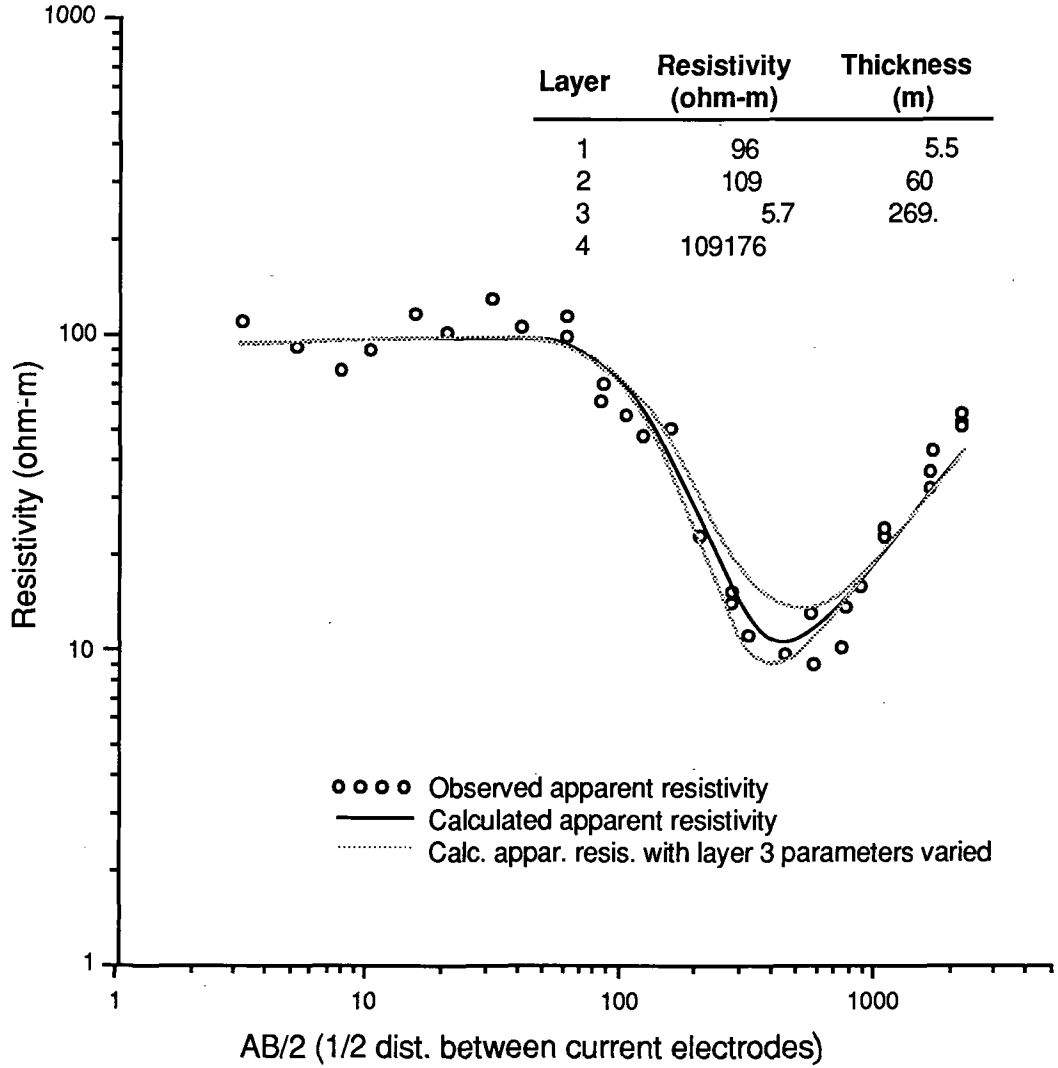
Interpretation Summary

The main interpretational results of the gravity are summarized here.

Zunil Resistivity Studies

- 30 Schlumberger soundings (VES) in vicinity of well field
  - Topographic relief > 700 m
  - Several soundings show slopes > 45° on resistivity vs AB/2 plots; indicates extreme topography and/or lateral resistivity contrasts
- Interpretation
  - Computer inversion and parameter sensitivity analysis
  - 2 types of soundings:
    - a. N & W of well field - high resistivity, little variation
    - b. Well field, S & E - 4 layer model
      - 1 & 2 - thin, high resistivity
      - 3 - thick, low resistivity
      - 4 - High resistivity (200-400 m deep)
  - Resistivity, thickness of layer 3 not well resolved
  - Conductivity x thickness ($\delta \cdot t$) is well resolved
- $\delta \cdot t$ is proportional to conductive clay minerals in layer
  - Increases away from ZCQ-3 (~ smectite)
  - Depth to resistive layer ~ less conductive clays

Zunil VES No. 115



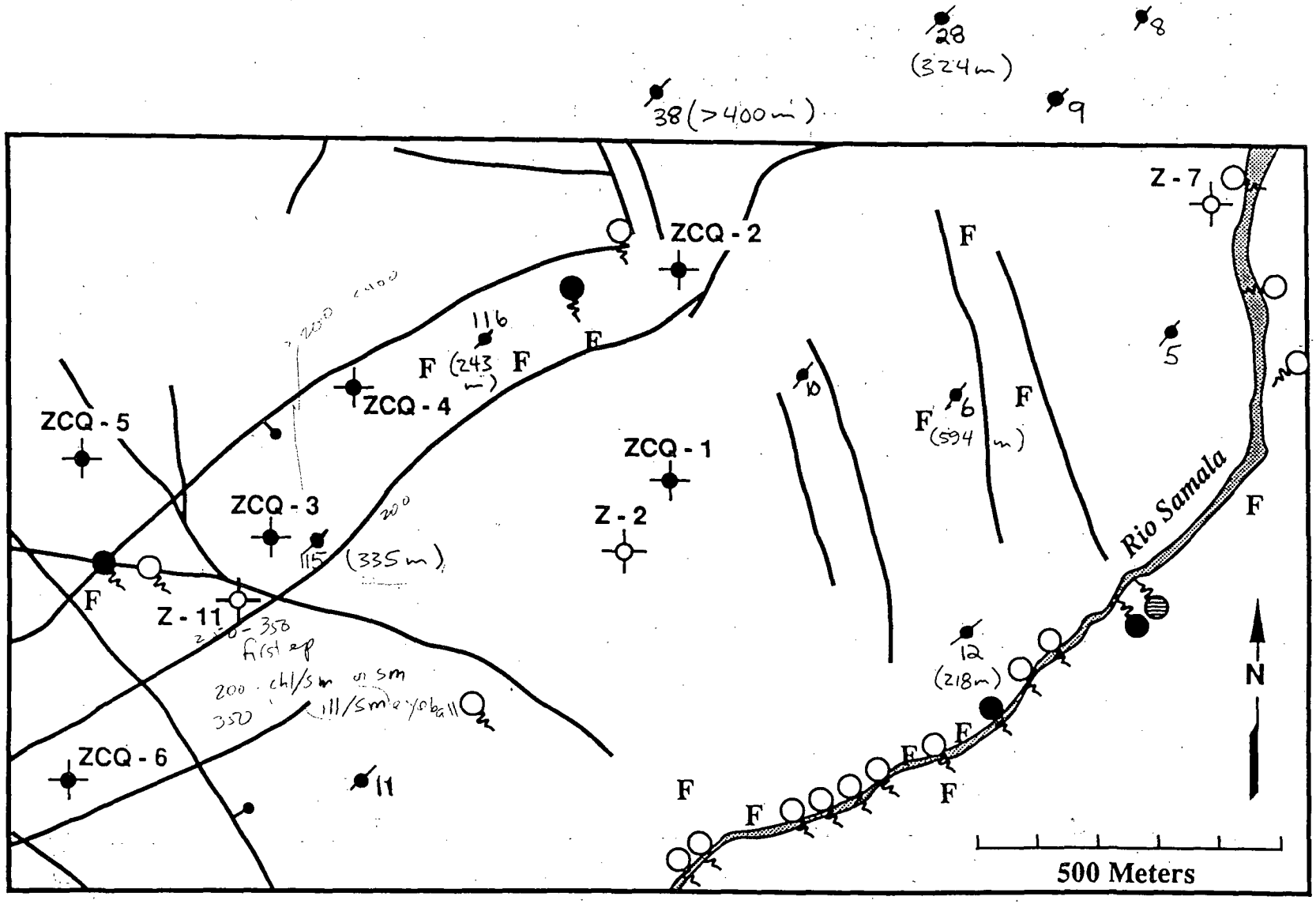
Zunil Gravity Studies

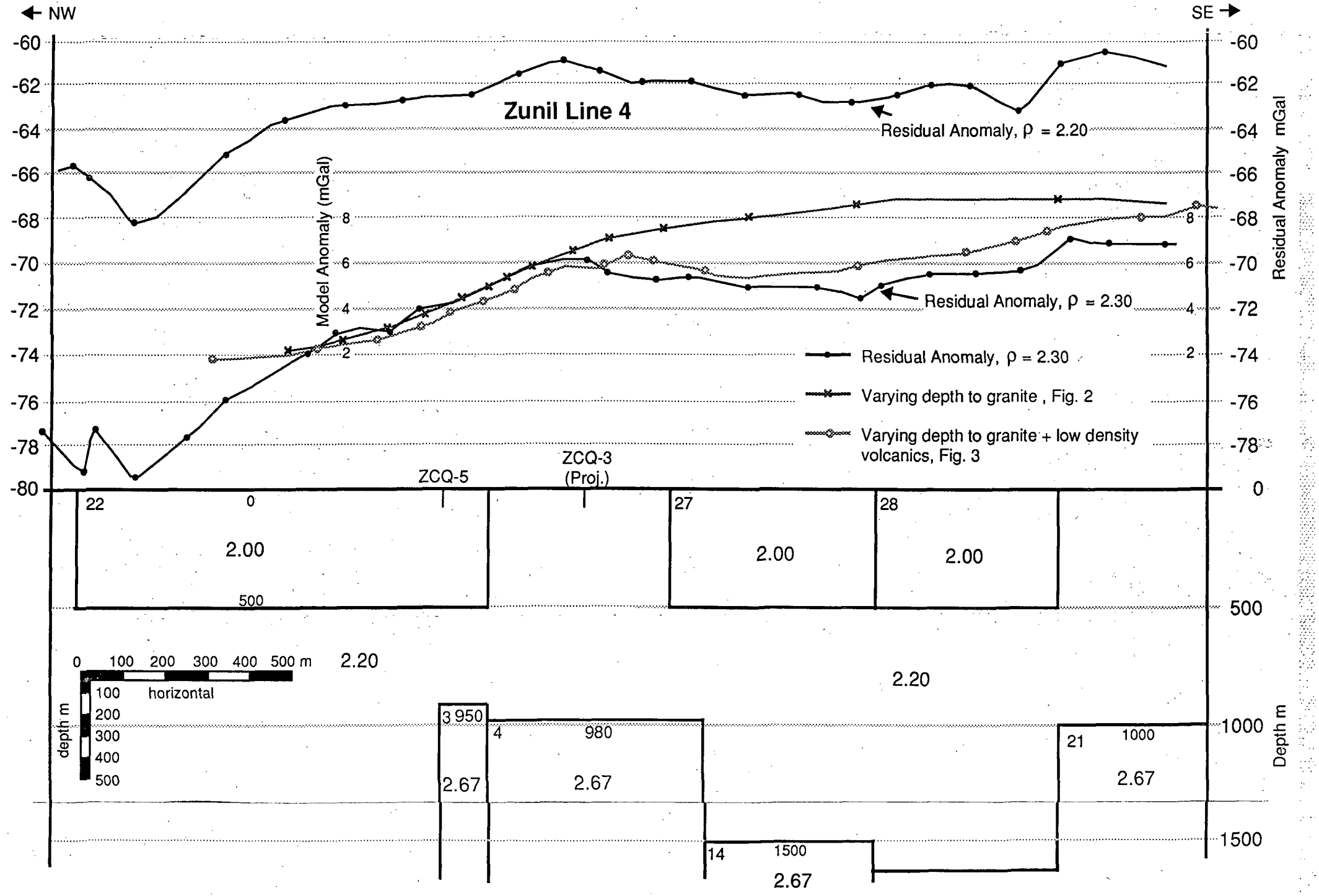
- Regional Survey of 90 sq km
  - Quetzaltenango (N) to south of Cerro El Galapago
- Detailed Survey of 6 sq km
  - Well field area
  - 8 NW lines, Δs = 70 to 200 m
  - Extreme topographic relief, Δ elev > 1,000 m
  - Many topo corrections $\geq$ 12 mGal; Max = 13.6 mGal
  - Densities of 2.20, 2.30 g/cm^3 for Bouguer, topographic corrections (core measurements, Nettleton profiles)
  - Regional gradient removed - 5.0 mGal/Km, N45°E

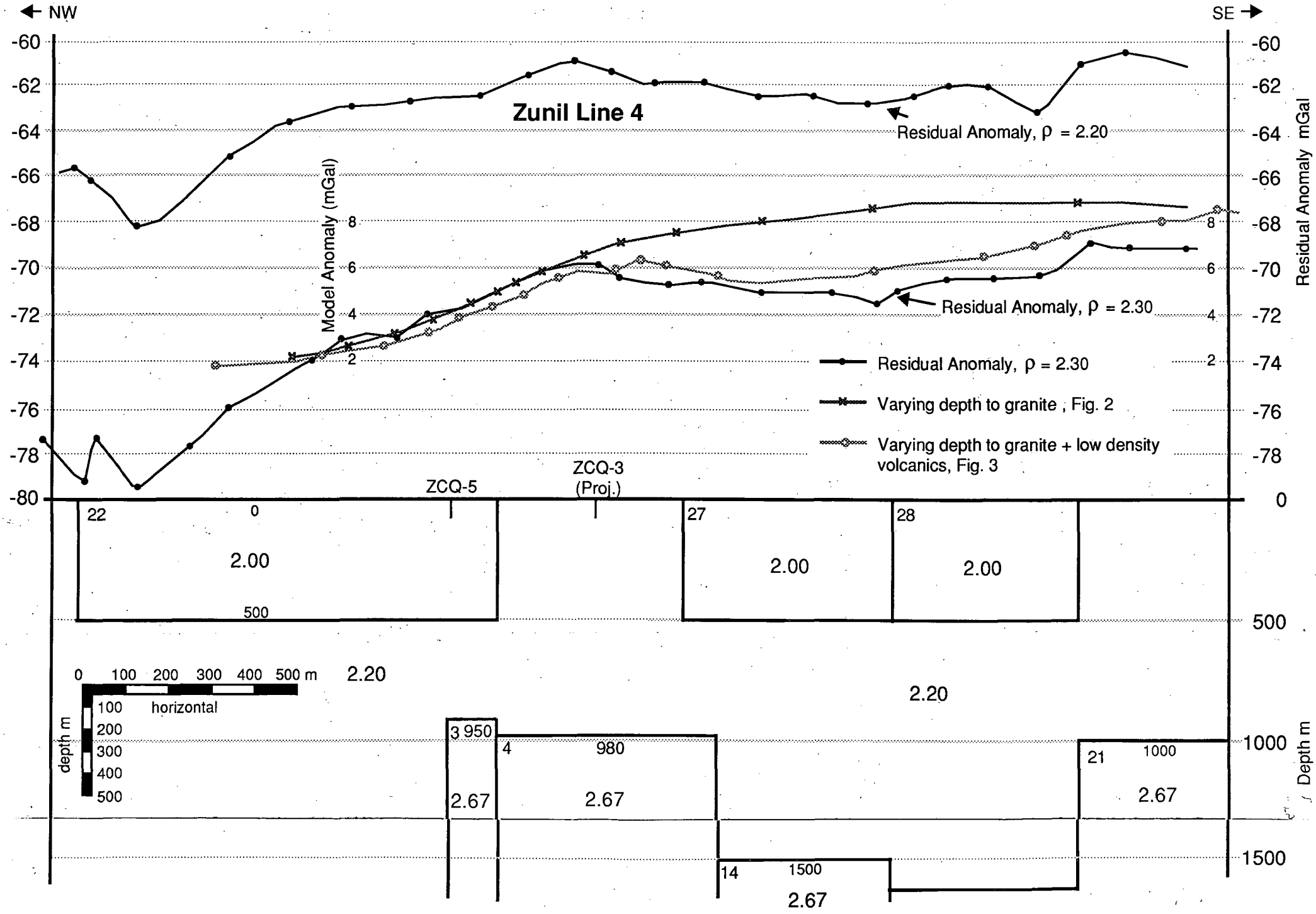
Zunil Gravity Studies

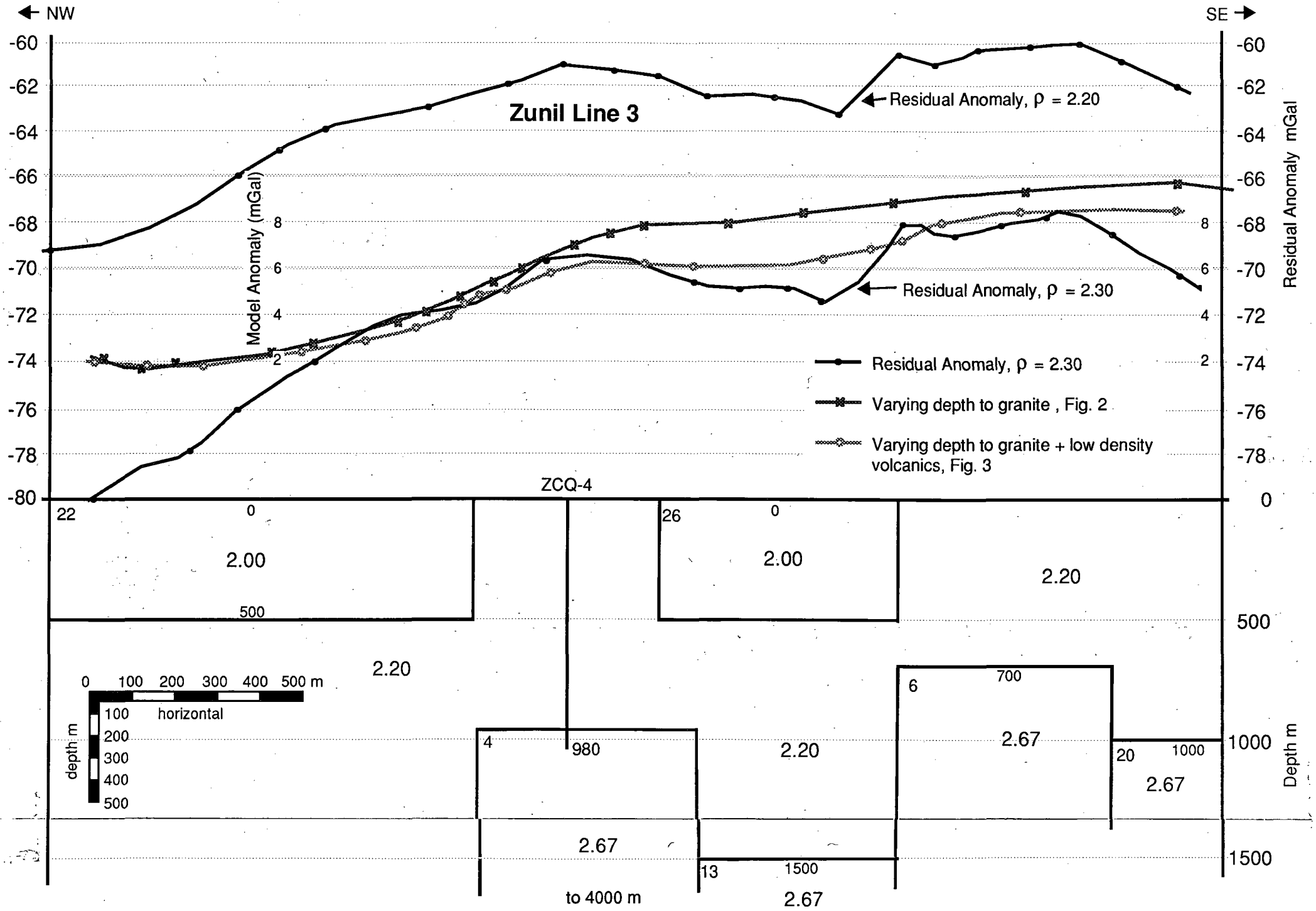
Interpretation

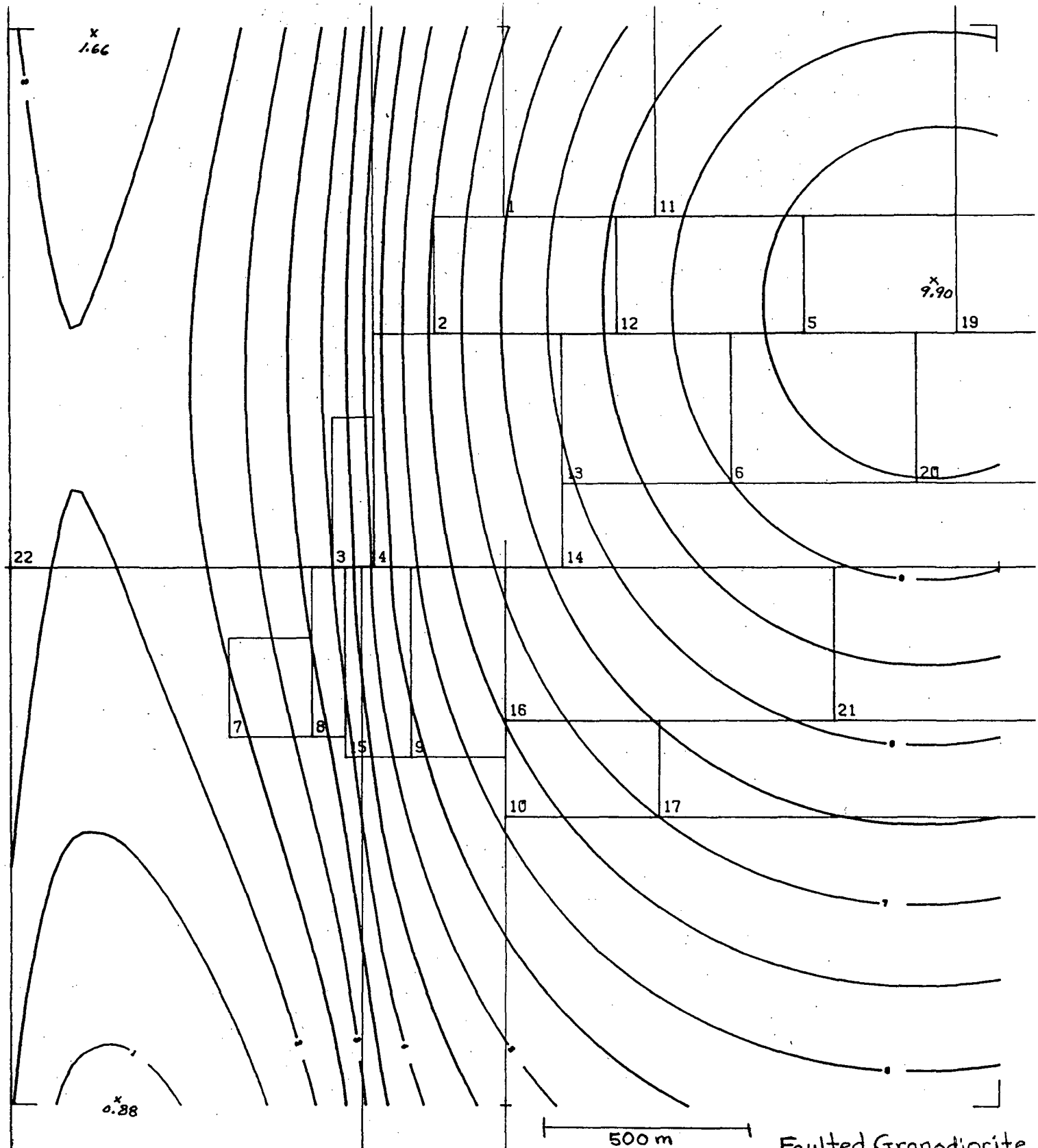
- 1 to 3 mGal high trends NE
- High includes ZCQ-2, -3, -4, -5, -6
- Probable NE and NW faults identified
- 3-D Numerical Modeling demonstrates:
  - Anomaly due to deep granodiorite is smooth, < 1 mGal
  - Residual anomalies are due to shallow density contrasts in overlying volcanics, i.e. $2.00 \leq \rho \leq 2.40$ g/cm^3, $0 \leq d \leq 500$ m
  - Complex, 30 prism 3-D model closely duplicates observed amplitudes and contour pattern.
- Good agreement between interpreted structures and mapped faults, considering noise level and station/line spacing
- Denser volcanic rocks include ZCQ-wells which are altered, silicified


28
(324m)
8
38(>400m)
9
Z-7
ZCQ-2
F
116
F (243 m) F
F
ZCQ-4
ZCQ-5
5
4(
b
6
F
F (594 m)
ZCQ-1
ZCQ-3
Z-2
200
115 (335m)
Rio Samala
F
F
Z-11
12
(218m)
N
ZCQ-6
11
F
F
F
F
F
F
500 Meters
Acid-sulfate spring
NaCl spring
F Fumarole
Fault
Bicarbonate spring
Production well
Thermal gradient well
SOUNDING LOCATION (AND DEPTH)
116
250 m = 220°C
BEST ESTIMATED DEPTH TO RESISTIVE LAYER: (m)


NW
SE
Zunil Line 4
Residual Anomaly, ρ = 2.20
Residual Anomaly, ρ = 2.30
Model Anomaly (mGal)
Residual Anomaly mGal
Residual Anomaly, ρ = 2.30
Varying depth to granite , Fig. 2
Varying depth to granite + low density volcanics, Fig. 3
ZCQ-5
ZCQ-3 (Proj.)
22
0
2.00
500
27
2.00
28
2.00
0 100 200 300 400 500 m
horizontal
depth m
100
200
300
400
500
2.20
2.20
3 950
2.67
4
980
2.67
14
1500
2.67
21
1000
2.67
Depth m


NW
SE
Zunil Line 4
Residual Anomaly, ρ = 2.20
Residual Anomaly, ρ = 2.30
Model Anomaly (mGal)
Residual Anomaly mGal
Residual Anomaly, ρ = 2.30
Varying depth to granite , Fig. 2
Varying depth to granite + low density volcanics, Fig. 3
ZCQ-5
ZCQ-3 (Proj.)
22
0
27
28
2.00
2.00
2.00
500
0 100 200 300 400 500 m
100 horizontal
200
300
400
500
depth m
2.20
2.20
3 950
4
980
2.67
2.67
21
1000
2.67
14
1500
2.67
Depth m


NW
SE
Zunil Line 3
Residual Anomaly, ρ = 2.20
Residual Anomaly, ρ = 2.30
Model Anomaly (mGal)
Residual Anomaly mGal
Residual Anomaly, ρ = 2.30
Varying depth to granite , Fig. 2
Varying depth to granite + low density volcanics, Fig. 3
ZCQ-4
22
0
2.00
500
26
0
2.00
2.20
500
2.20
0 100 200 300 400 500 m
100 horizontal
200
300
400
500
depth m
4
980
2.20
6
700
2.67
20
1000
2.67
1000
2.67
13
1500
2.67
to 4000 m
1500
Depth m



PROJECT NAME

ZUNIL

MODEL 1

MODEL NAME

MODEL 1, ITER 2

NUMBER OF PRISMS: 23.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS

GRID POINTS X 25. : Y 27.

GRID SPACING : 100. METERS

GRID DIMENSIONS X 2400. : Y 2600. METERS

GRID OFFSET X: 0. Y: 0. METERS

SCALE 1:10000.

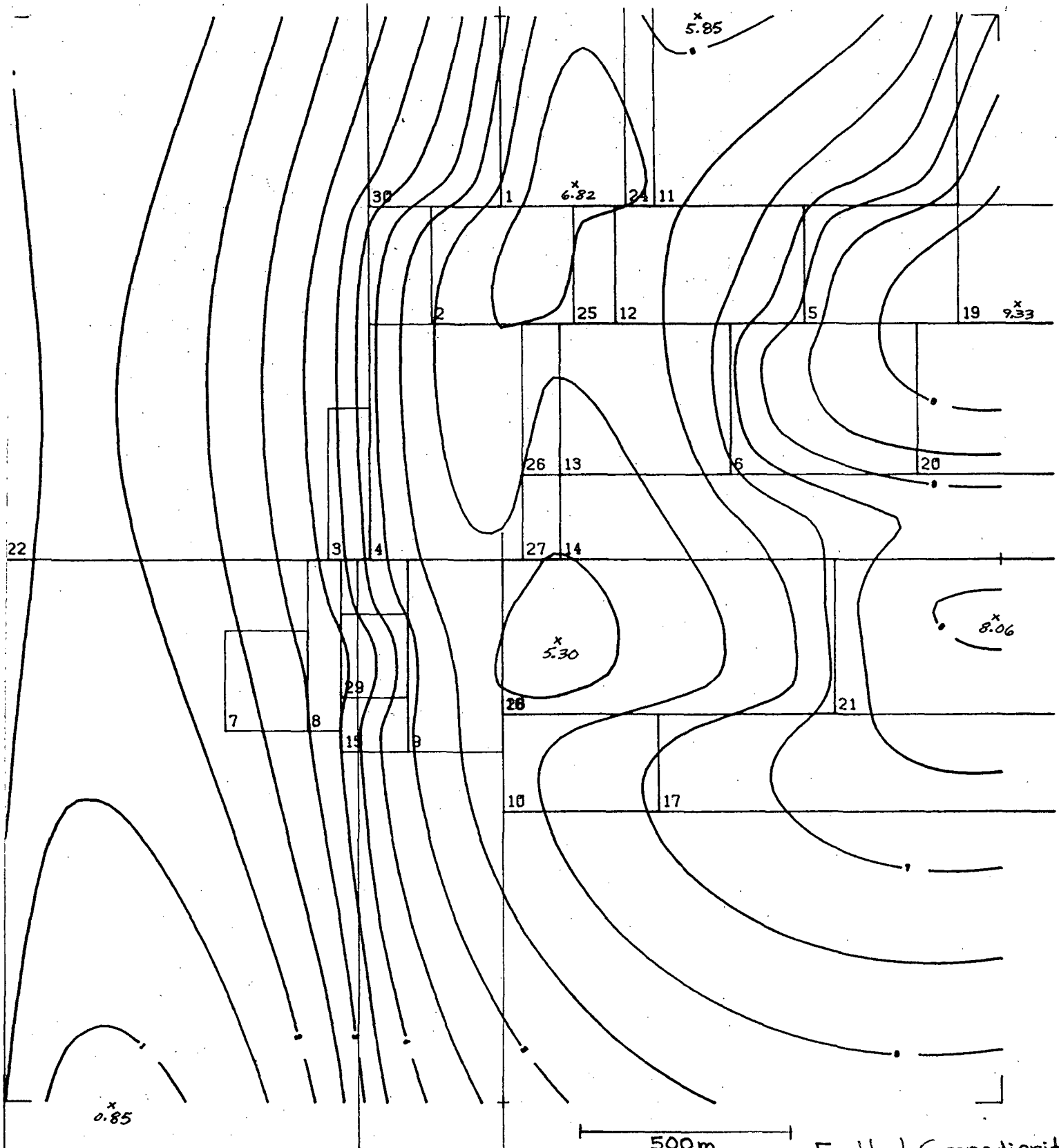
DATA MAXIMUM: 18.

DATA MINIMUM: 1.

CONTOUR INTERVAL 1.

23

18



PROJECT NAME

RUN1L

MODEL 1

MODEL NAME

MODEL 1, ITER 4

NUMBER OF PRISMS: 30.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS

GRID POINTS X 28. : Y 27.

GRID SPACING : 150. METERS

GRID DIMENSIONS X 2400. : Y 2600. METERS

GRID OFFSET X: 0. Y: 0. METERS

SCALE 1:18000.

DATA MAXIMUM: 8.

DATA MINIMUM: 1.

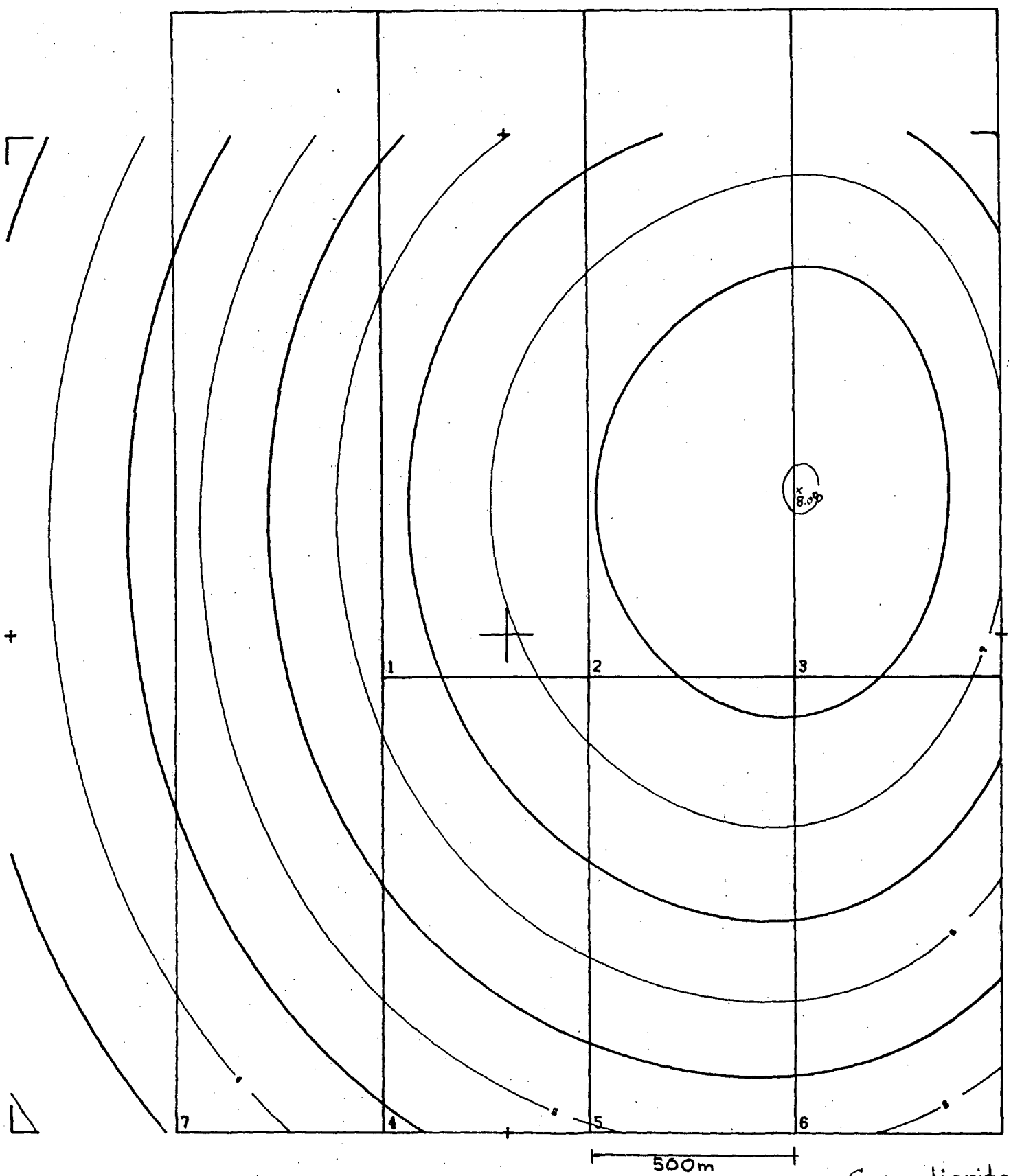
CONTOUR INTERVAL 1.

Faulted Granodiorite & Variable Volcanics

Shallow Granodior (ρ = 2.67)

Volcanics, ρ = 2.00 (0 - 500 m)

Volcanics, bkgd, ρ = 2.20



PROJECT NAME

ZUNIL

DEEP GRANITE STRUCTURE

MODEL NAME

DEEP GRANITE STRUCTURE

NUMBER OF PRISMS: 7.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS

GRID POINTS X 25. : Y 25.

GRID SPACING : 100. METERS

GRID DIMENSIONS X 2400. : Y 2400. METERS

GRID OFFSET X: 0. Y: 0. METERS

SCALE 1:19200.

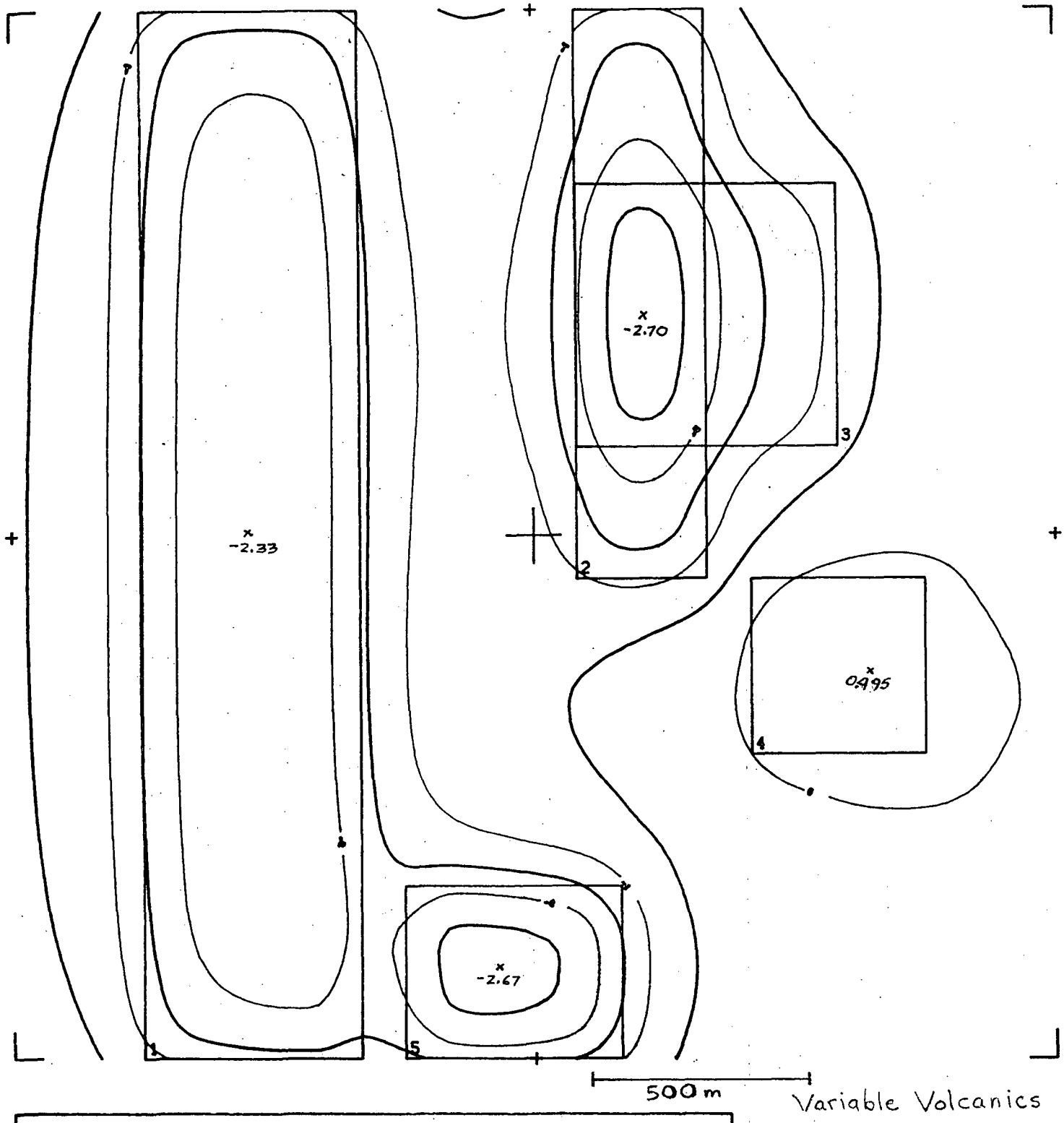
DATA MAXIMUM: 8.

DATA MINIMUM: 3.

CONTOUR INTERVAL 1.

Granodiorite
(ρ=2.47)
depth (m) to top
Uplifted block

Volcanics, ρ=2.20



Variable Volcanics

PROJECT NAME
BURIL
SURFACE VOLCANICS

MODEL NAME
SURFACE VOLCANICS

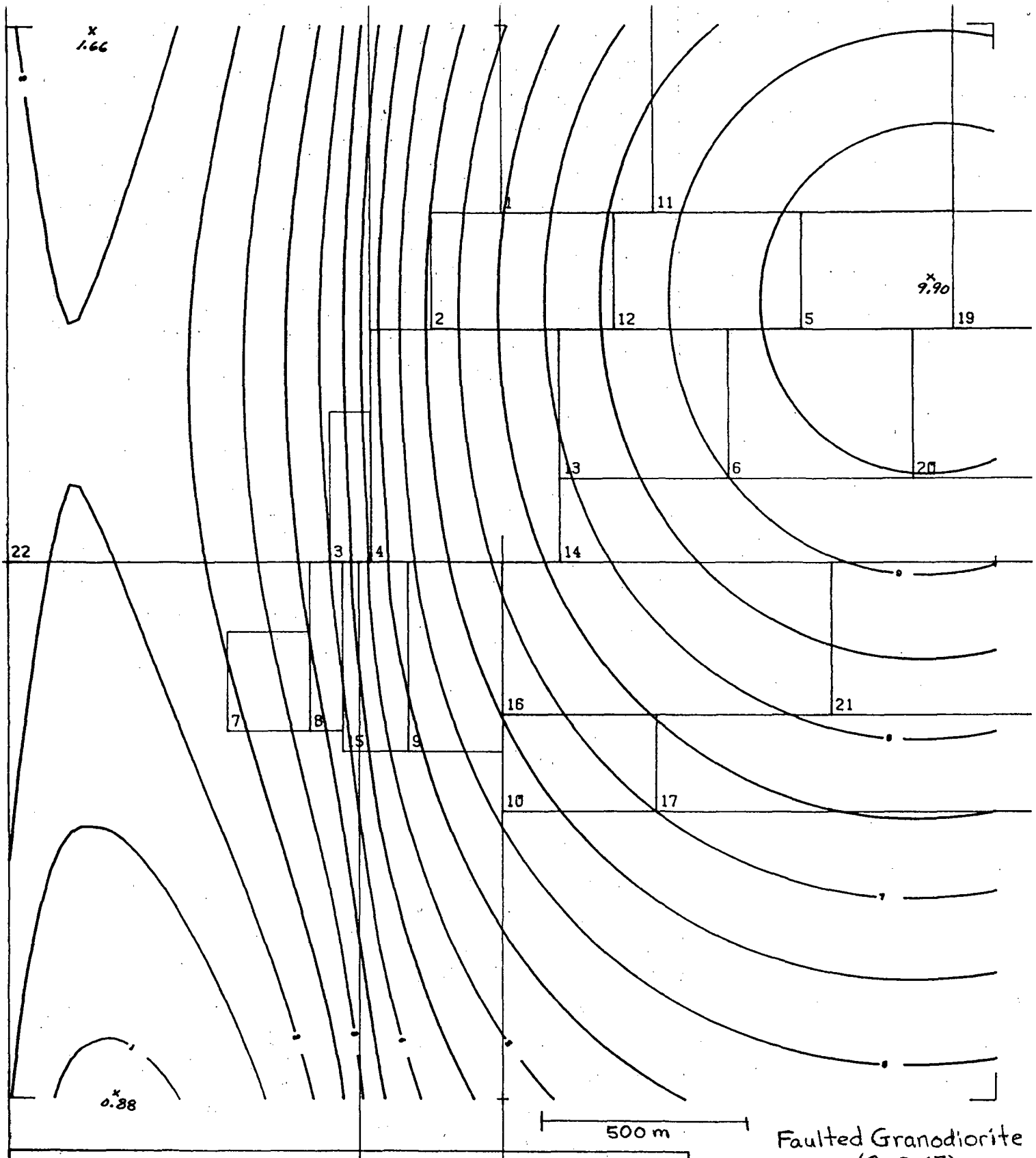
NUMBER OF PRISMS: 5.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS
GRID POINTS X 25. : Y 25.
GRID SPACING : 100. METERS
GRID DIMENSIONS X 2400. : Y 2400. METERS
GRID OFFSET X: 0. Y: 0. METERS
SCALE 1:19000.
DATA MAXIMUM: 0.
DATA MINIMUM: -3.
CONTOUR INTERVAL 1.

Density Contrast (g/cc)

All blocks are 0-500 m deep.



Faulted Granodiorite
(ρ = 2.67)

Depth (m) to top of block

Uplifted block

PROJECT NAME

ZUNIL

MODEL 1

MODEL NAME

MODEL 1, ITER 2

NUMBER OF PRISMS: 23.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS

GRID POINTS X 25. : Y 27.

GRID SPACING : 100. METERS

GRID DIMENSIONS X 2400. : Y 2600. METERS

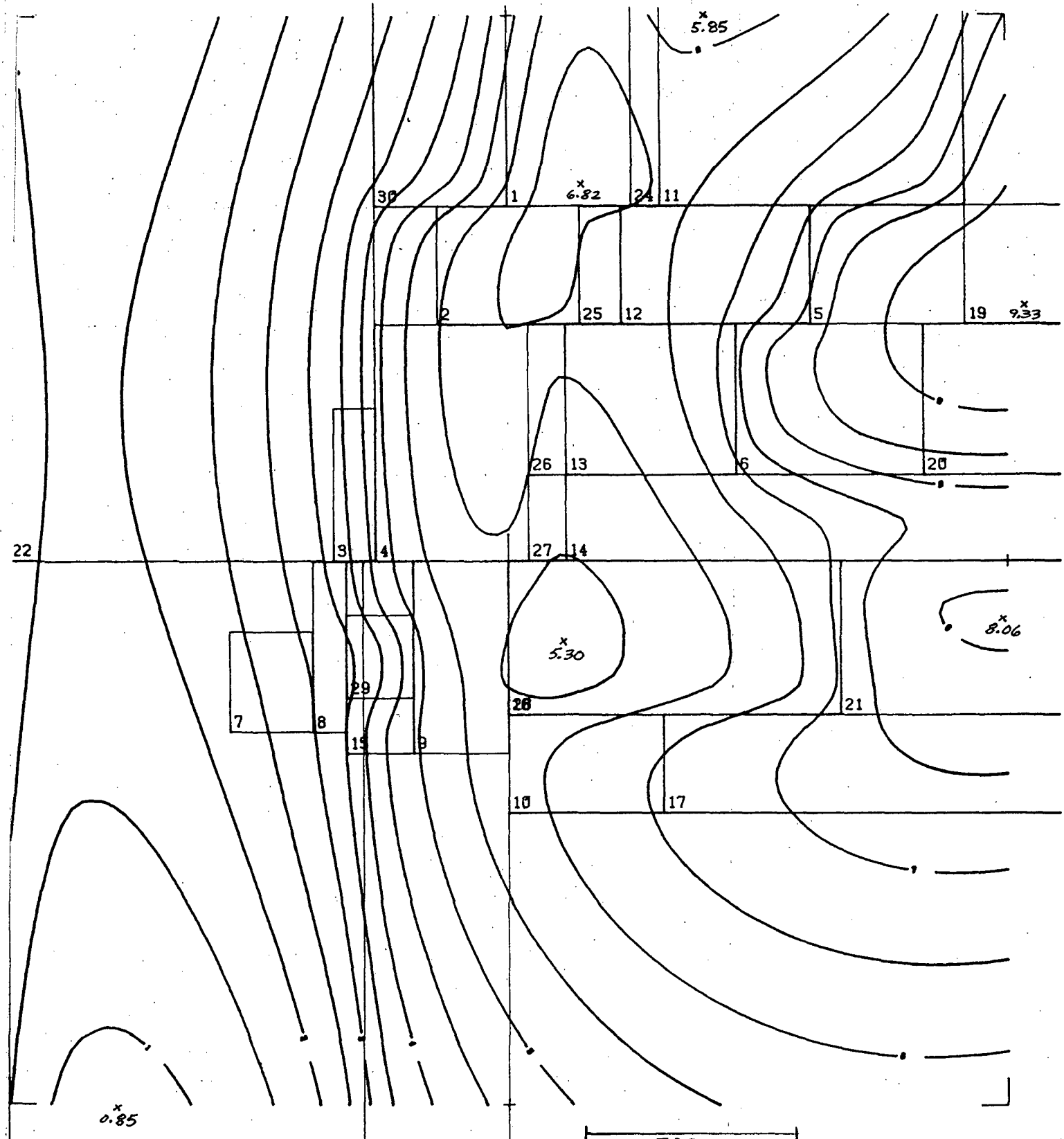
GRID OFFSET X: 0. Y: 0. METERS

SCALE 1:10000.

DATA MAXIMUM: 10.

DATA MINIMUM: 1.

CONTOUR INTERVAL 1.



PROJECT NAME

RUN1L

MODEL 1

MODEL NAME

MODEL 1, ITER 4

NUMBER OF PRISMS: 30.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS

GRID POINTS X 26. : Y 27.

GRID SPACING : 100. METERS

GRID DIMENSIONS X 2400. : Y 2600. METERS

GRID OFFSET X: 0. Y: 0. METERS

SCALE 1:10000.

DATA MAXIMUM: 9.

DATA MINIMUM: 1.

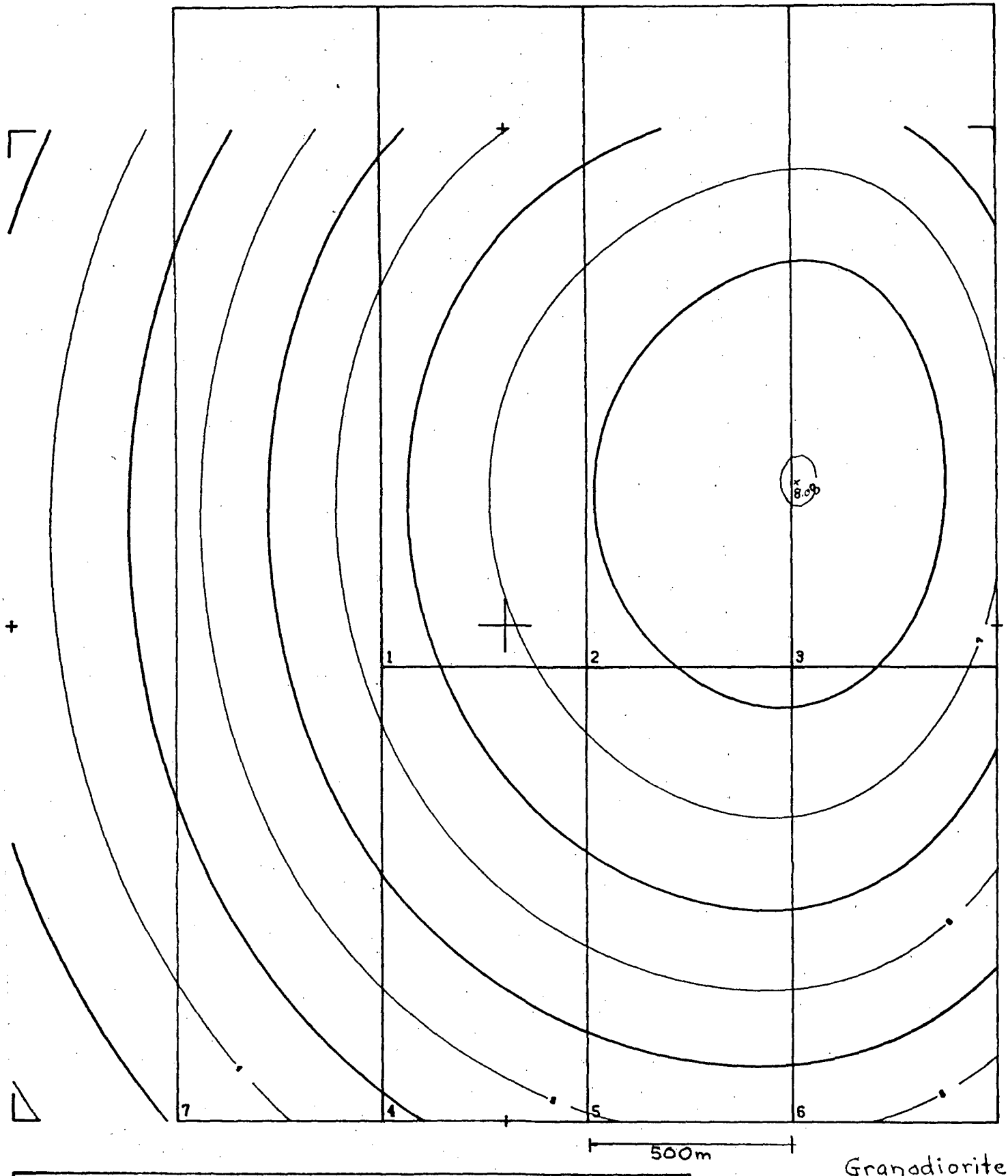
CONTOUR INTERVAL 1.

Faulted Granodiorite & Variable Volcanics

Shallow Granodio
(ρ = 2.67)

Volcanics, ρ = 2.00
(0 - 500 m)

Volcanics, bkgd,
ρ = 2.20



PROJECT NAME

ZUNIL

DEEP GRANITE STRUCTURE

MODEL NAME

DEEP GRANITE STRUCTURE

NUMBER OF PRISMS: 7.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS

GRID POINTS X 25. : Y 25.

GRID SPACING : 100. METERS

GRID DIMENSIONS X 2400. : Y 2400. METERS

GRID OFFSET X: 0. Y: 0. METERS

SCALE 1:19000.

DATA MAXIMUM: 0.

DATA MINIMUM: 0.

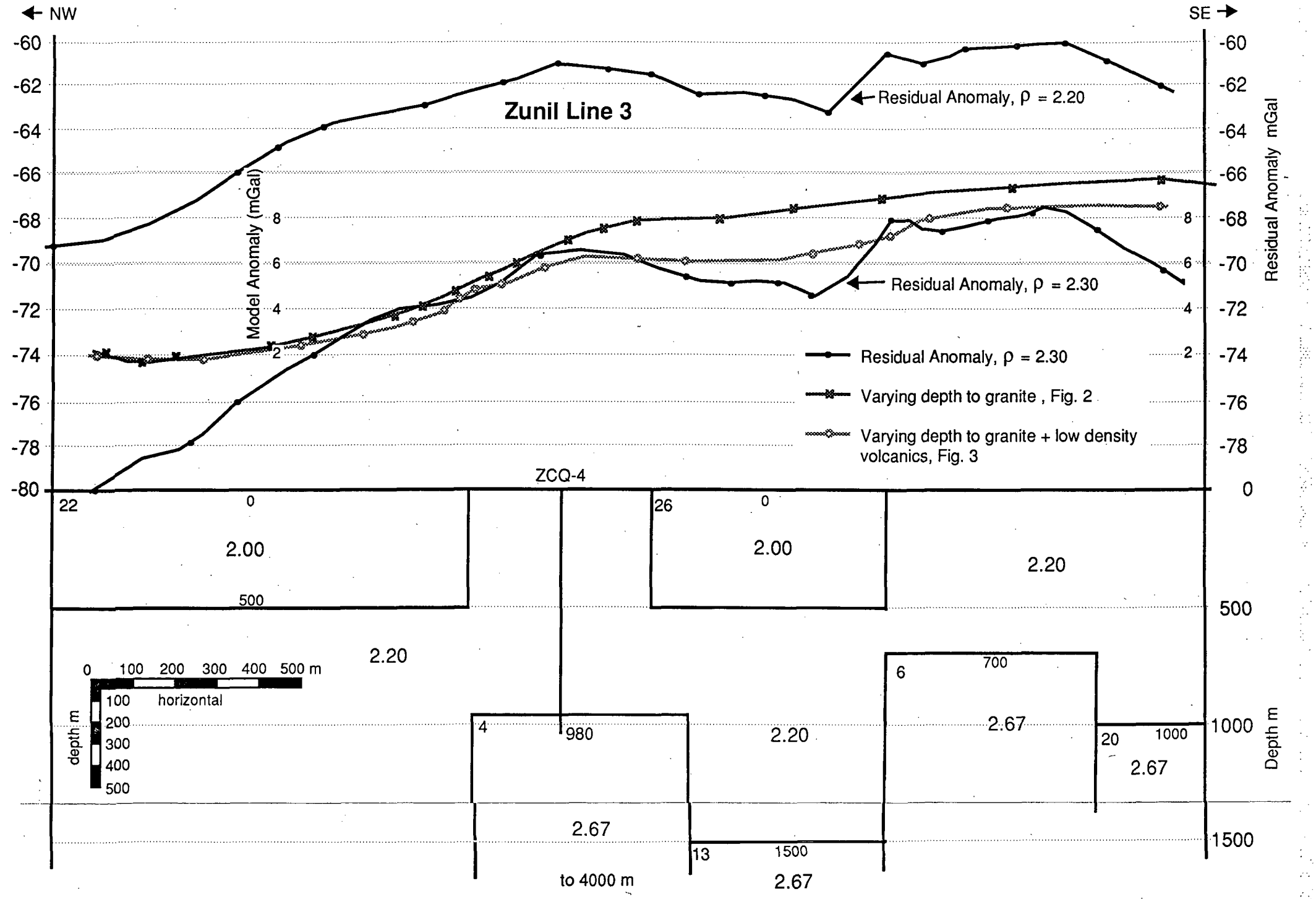
CONTOUR INTERVAL 1.

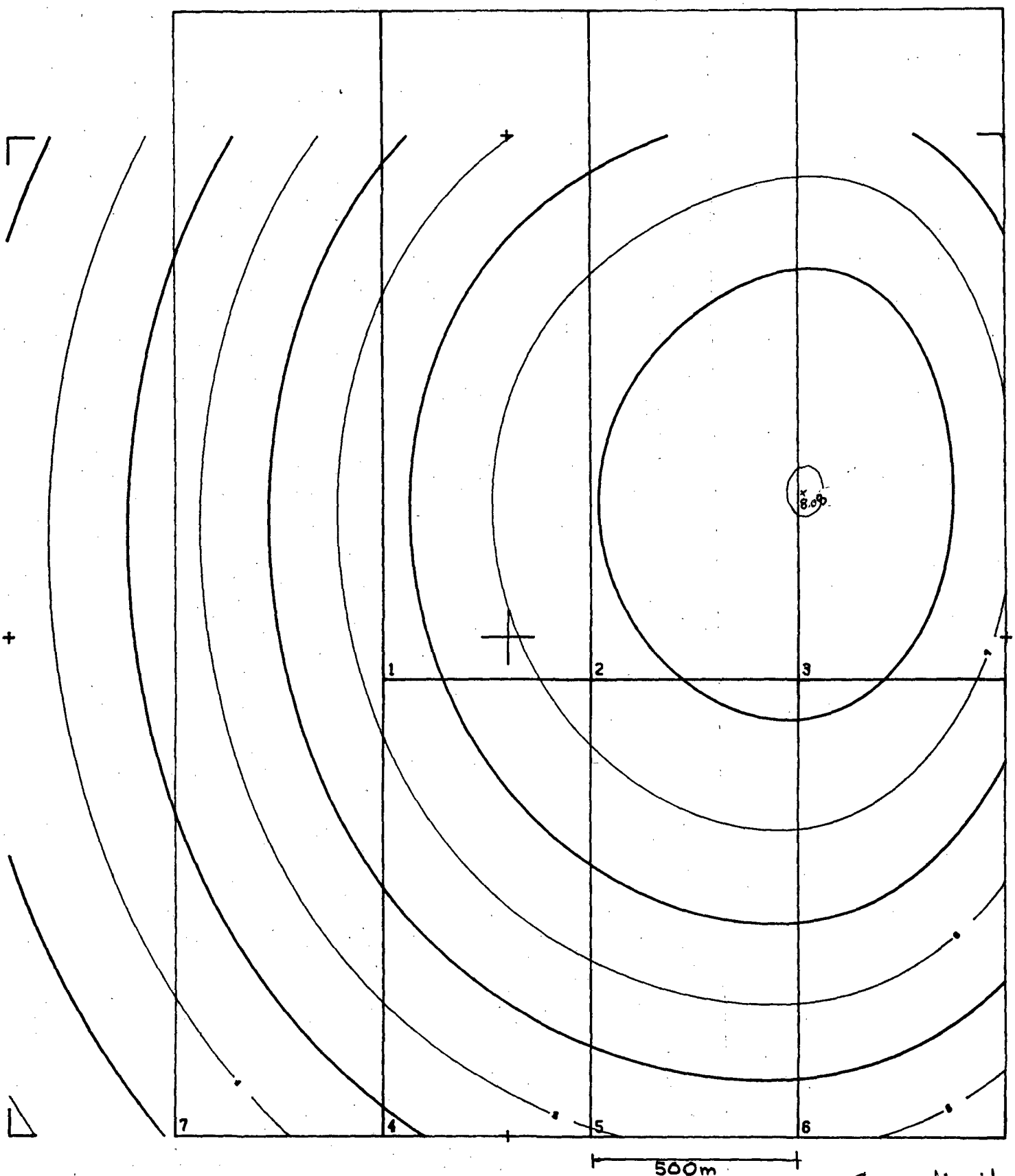
Granodiorite
(ρ=2.47)
depth (m) to top
Uplifted block

Volcanics, ρ=2.20

TABLE 1. DENSITY MEASUREMENTS OF ZUNIL CORE SAMPLES

Sample #	Dry weight (g)	Suspended weight (g)	Saturated weight (g)	Vol (cu. cm)	Density (g/cu. cm)
Z-11 89m	283.61	167.95	297.30	129.35	2.19
Z-11 476m	211.00	130.30	222.65	92.35	2.28
Z-11 165m	305.30	173.05	312.60	139.55	2.19
Z-2 580m	295.05	175.65	308.00	132.35	2.23
Z-11 590m	148.50	89.21	152.10	62.89	2.36
ZCQ-2 103m	610.06	365.00	616.50	251.50	2.43
Z-2 624m	205.80	119.12	218.60	99.48	2.07
ZCQ-4 1015m (granodiorite)	821.00	512.50	830.40	317.90	2.58
				Average:	2.29


NW
SE
Zunil Line 3
Residual Anomaly, ρ = 2.20
Residual Anomaly, ρ = 2.30
Model Anomaly (mGal)
Residual Anomaly mGal
Residual Anomaly, ρ = 2.30
Varying depth to granite , Fig. 2
Varying depth to granite + low density volcanics, Fig. 3
ZCQ-4
22
0
2.00
500
26
0
2.00
2.20
2.20
0 100 200 300 400 500 m
100 horizontal
200
300
400
500
depth m
4
980
2.20
6
700
2.67
20
1000
2.67
2.67
13
1500
2.67
to 4000 m
Depth m



PROJECT NAME
ZUNIL
DEEP GRANITE STRUCTURE

MODEL NAME
DEEP GRANITE STRUCTURE

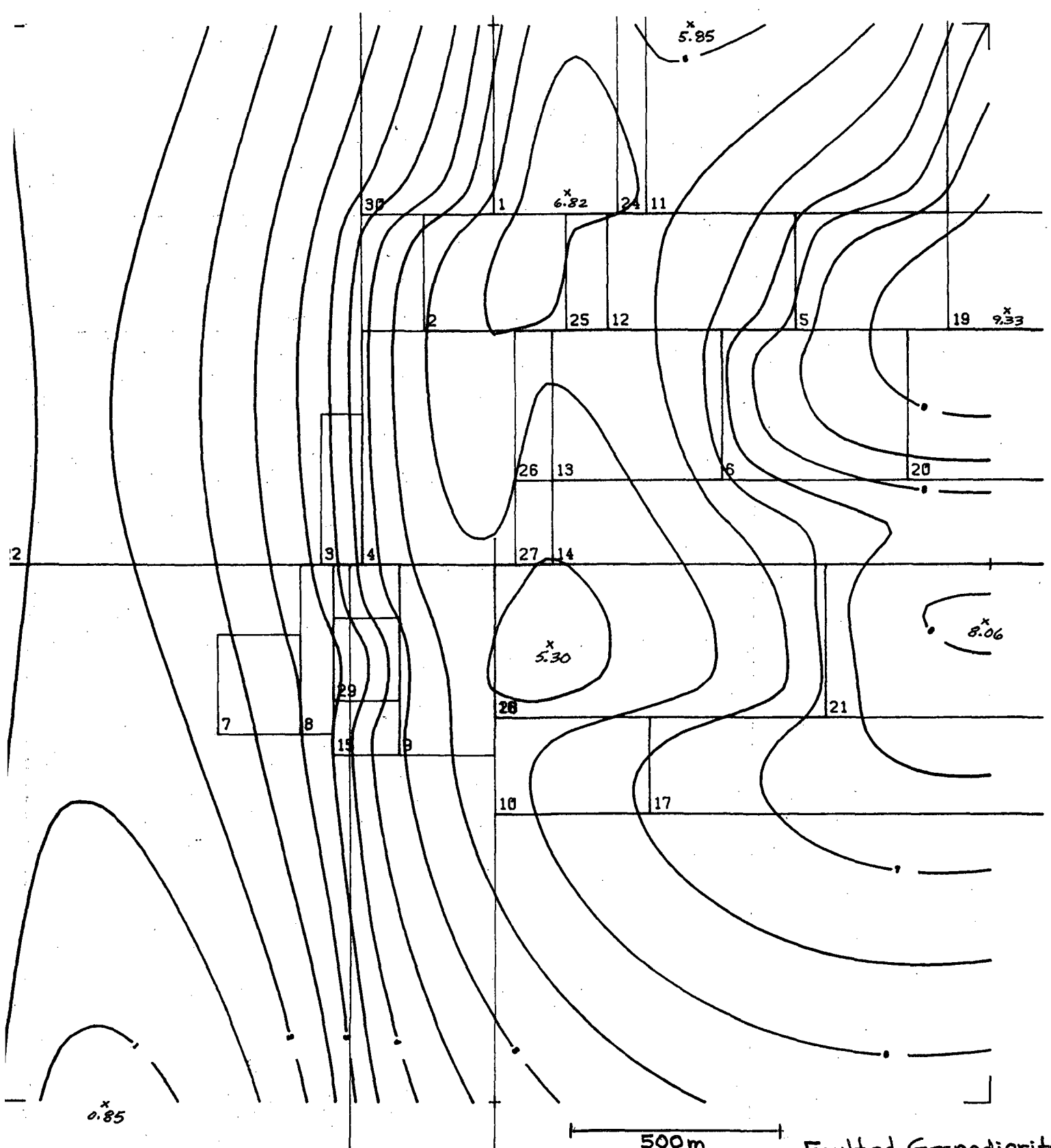
NUMBER OF PRISMS: 7.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS
GRID POINTS X 25. : Y 25.
GRID SPACING : 100. METERS
GRID DIMENSIONS X 2400. : Y 2400. METERS
GRID OFFSET X: 0. Y: 0. METERS
SCALE 1:10000.
DATA MAXIMUM: 0.
DATA MINIMUM: 0.
CONTOUR INTERVAL 1.

Granodiorite
(ρ=2.47)
depth (m) to top
Uplifted block

Volcanics, ρ=2.20



PROJECT NAME

BUNTL

MODEL 1

MODEL NAME

MODEL 1, ITER 4

NUMBER OF PRISMS: 30.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS

GRID POINTS X 25. : Y 27.

GRID SPACING : 100. METERS

GRID DIMENSIONS X 2400. : Y 2600. METERS

GRID OFFSET X: 0. Y: 0. METERS

SCALE 1:10000.

DATA MAXIMUM: 0.

DATA MINIMUM: 1.

CONTOUR INTERVAL 1.

Faulted Granodiorite & Variable Volcanics

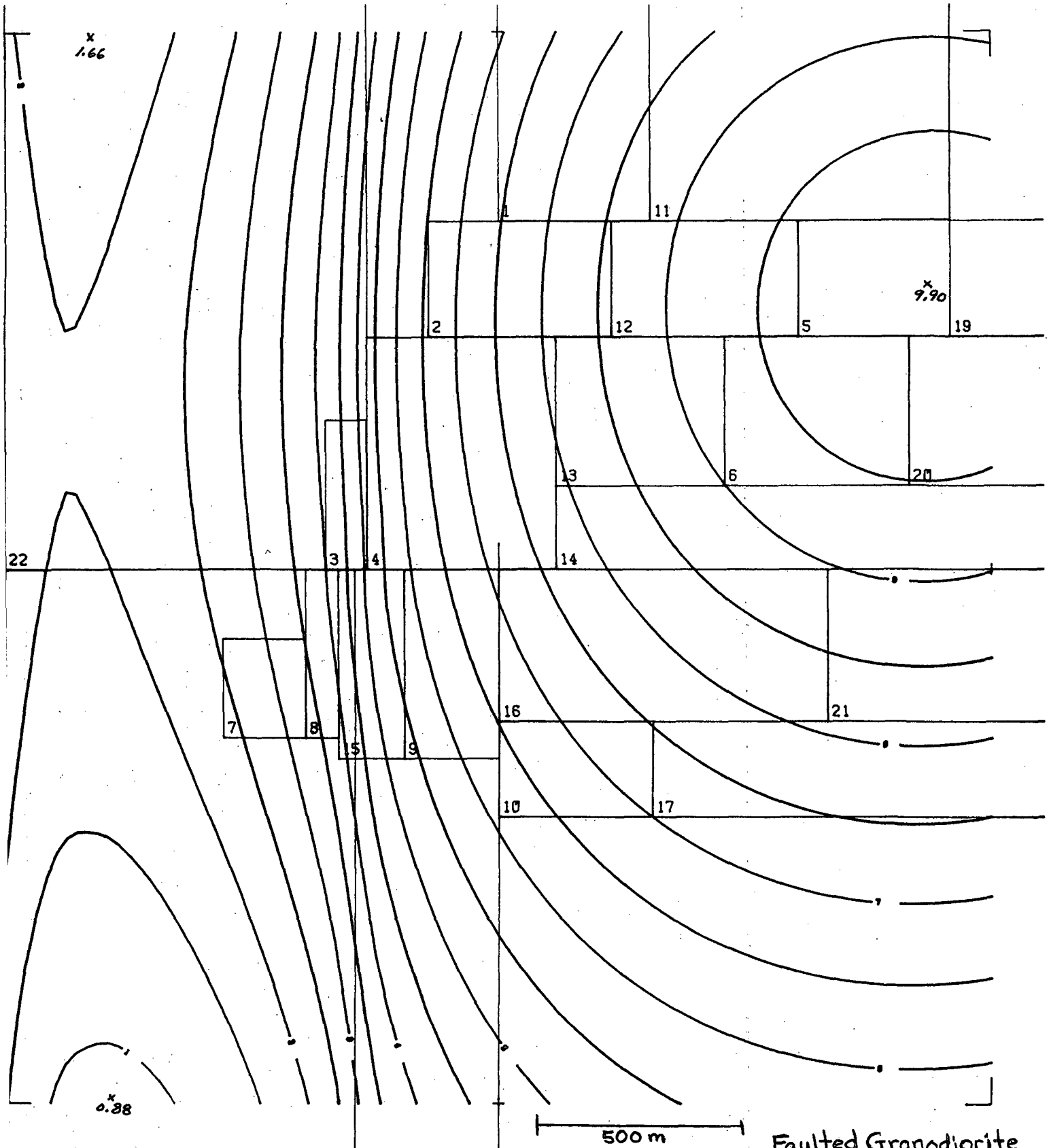
Shallow Granodiorite ($\rho = 2.67$)

Volcanics, $\rho = 2.00$ (0 - 500 m)

Volcanics, bkgd, $\rho = 2.20$

23

18



Faulted Granodiorite
(ρ = 2.67)

Depth (m) to top of block

Uplifted block

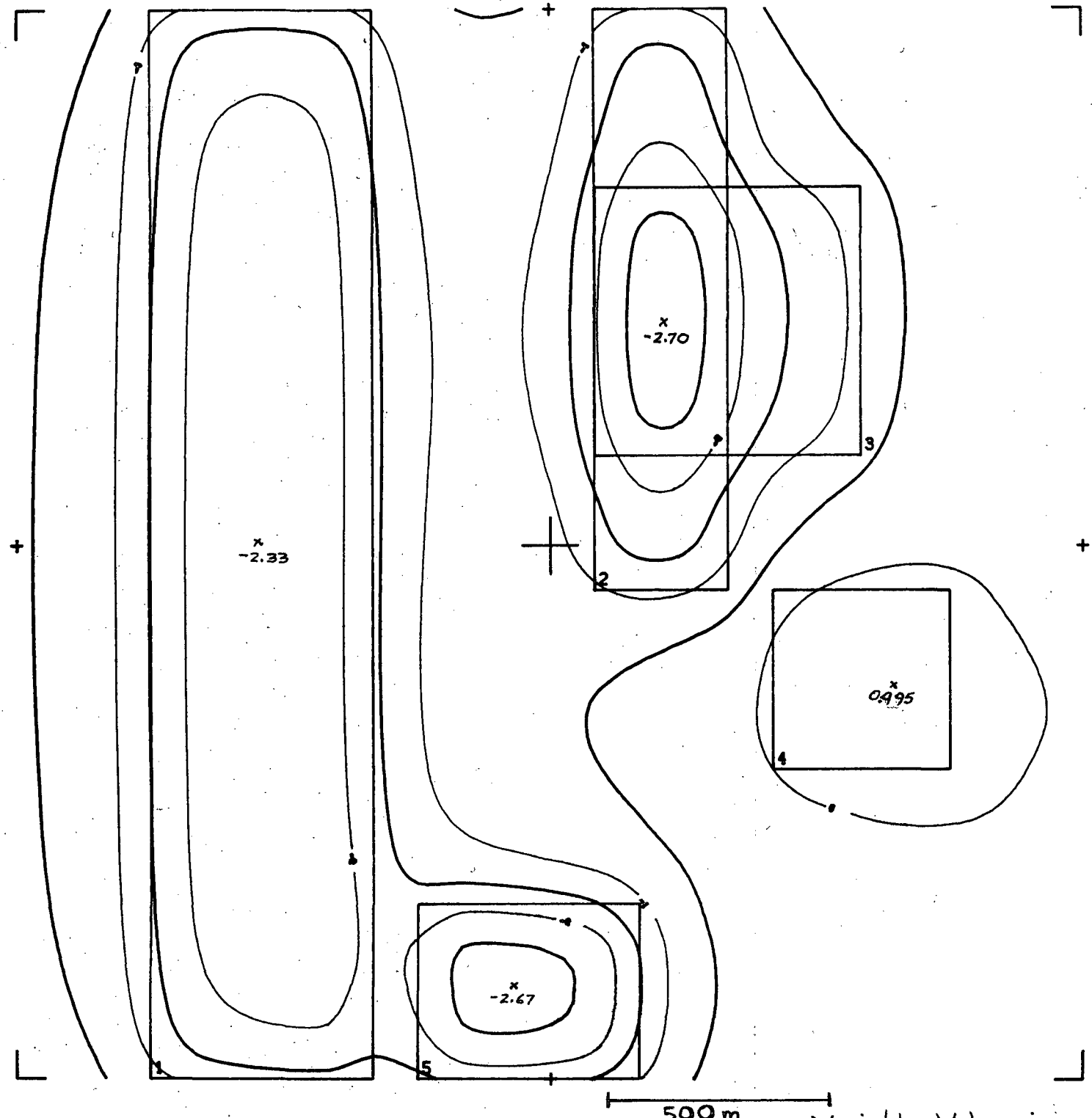
PROJECT NAME
ZUNIL
MODEL 1

MODEL NAME
MODEL 1, ITER 2

NUMBER OF PRISMS: 23.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS
GRID POINTS X 25. : Y 27.
GRID SPACING : 100. METERS
GRID DIMENSIONS X 2400. : Y 2600. METERS
GRID OFFSET X: 0. Y: 0. METERS
SCALE 1:10000.
DATA MAXIMUM: 10.
DATA MINIMUM: 1.
CONTOUR INTERVAL 1.



Variable Volcanics

PROJECT NAME
ZUNIL
SURFACE VOLCANICS

MODEL NAME
SURFACE VOLCANICS

NUMBER OF PRISMS: 5.

GRAVITY MODEL (MILLIGALS)

GRID PARAMETERS
GRID POINTS X 25. : Y 25.
GRID SPACING : 100. METERS
GRID DIMENSIONS X 2400. : Y 2400. METERS
GRID OFFSET X: 0. Y: 0. METERS
SCALE 1: 10000.
DATA MAXIMUM: 0.
DATA MINIMUM: -3.
CONTOUR INTERVAL 1.

Density Contrast (g/cc)

All blocks are 0-500 m deep.

B.C. = Boug. corrs!

Calculation of datum plane elevation

$$\Delta G_{B_{anom}} = G_{B_{2.67}} - G_{B_{2.0}} = G_{obs} - B.C.(2.67)h - (G_{obs} - B.C.(2.0)h$$

$$\Delta G_B = B.C.\, h\,(2.0 - 2.67)$$

$$\Delta G_B = -BC\, h\,(.67) \qquad B.C. = 4.185 \cdot 10^{-2} \text{ mgals/m}$$

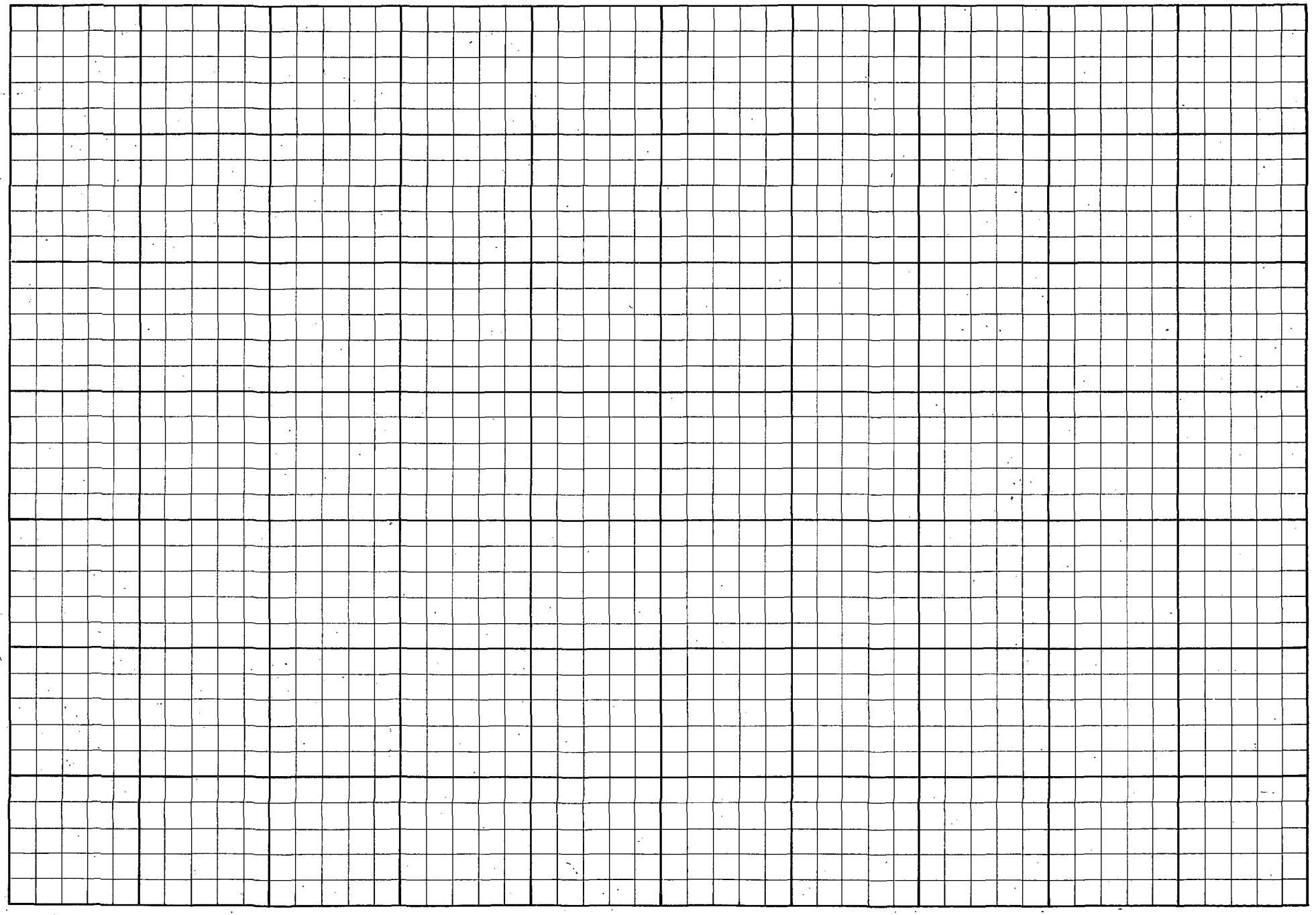
(p. 67 monograph series #1)

$$h = -\Delta G_B / (4.185 \cdot 10^{-2}) \times (.67)$$

$$h = -\frac{\Delta G_B}{2.8039 \cdot 10^{-2}}$$

line #	station	elevation m	G (2.67) mgals	G (2.0) mgals	delta G mgals	h m	Datum m above sea level
1	1 + 297.70	2031.93	-112.297	-55.302	-56.995	2032.63	-0.70
2	0 + 661.85	2226.04	-121.26	-58.84	-62.42	2226.11	-0.07
3	1 + 000.00	2006.5	-110.341	-54.058	-56.283	2007.24	-0.74
4	0 + 575.80	2402.01	-121.989	-54.613	-67.376	2402.85	-0.84
5	1 + 400.09	1864.17	-106.235	-53.944	-52.291	1864.87	-0.70

it appears that they used sea level as the datum plane



$$G_{B_{2.30}} = G_{B_{2.67}} + \underset{\rho=2.67}{\text{Boug corr}} - \underset{\rho=2.30}{\text{Boug corr}}$$

(add in corr. prev. subtracted; subtract out correct correction)

$$G_{B_{2.30}} = G_{B_{2.67}} + B.C.(2.67)h - B.C.(2.30)h$$

$$G_{B_{2.30}} = G_{B_{2.67}} + B.C.\,h\,(2.67 - 2.30)$$

$$G_{B_{2.30}} = G_{B_{2.67}} + 4.185\cdot10^{-2}\,(.37)\,h$$

$$\boxed{G_{B_{2.30}} = G_{B_{2.67}} + 1.5485\cdot10^{-2}\,h}$$

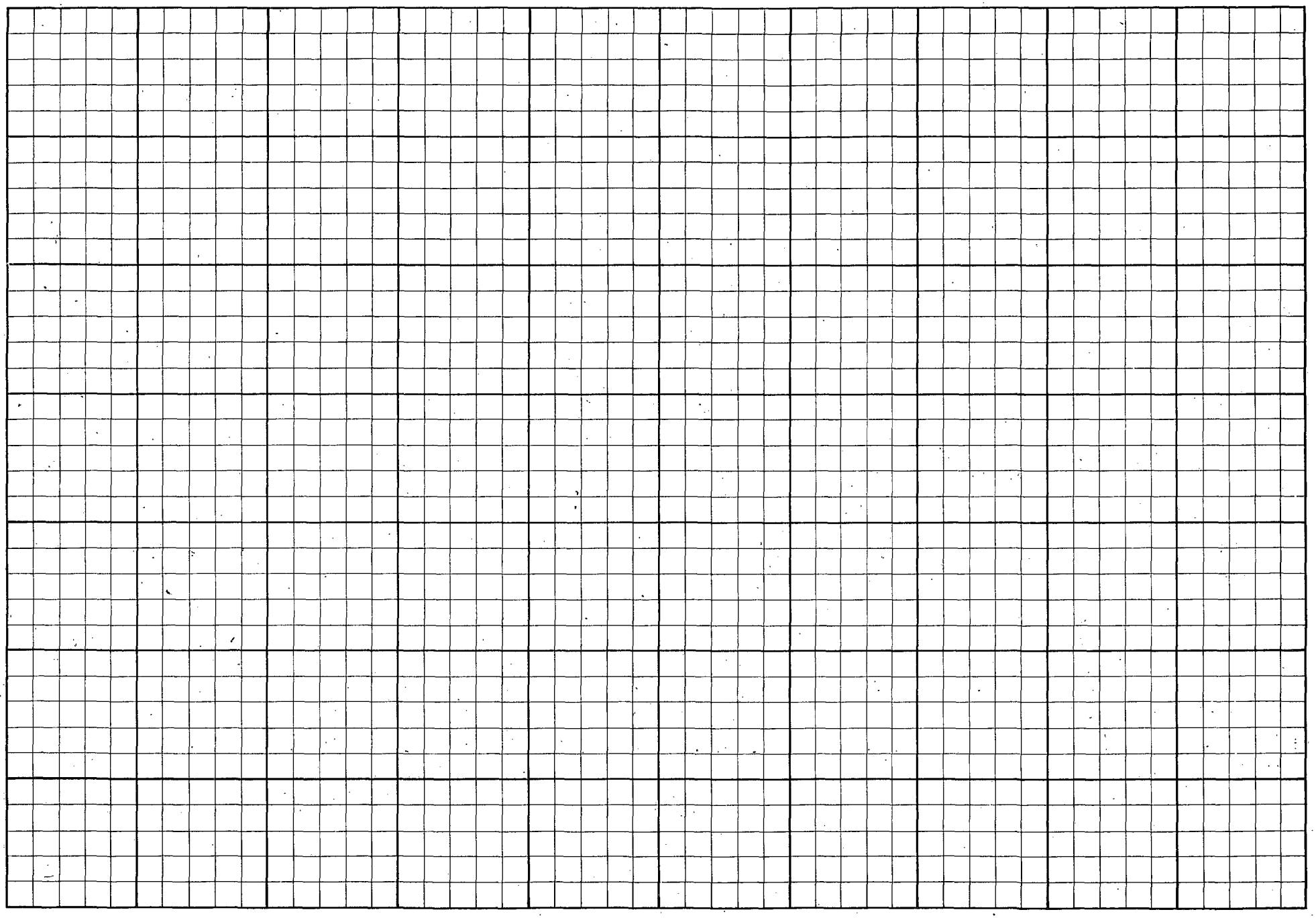
$$G_{B_{2.30}} = G_{B_{2.00}} + \underset{\rho=2.0}{\text{Boug corr}} - \underset{\rho=2.30}{\text{Boug corr}}$$

$$G_{B_{2.30}} = G_{B_{2.0}} + B.C.\,h\,(2.00 - 2.30)$$

$$G_{B_{2.30}} = G_{B_{2.0}} - 4.185\cdot10^{-2}\,(.30)\,h$$

$$\boxed{G_{B_{2.30}} = G_{B_{2.0}} - 1.255\cdot10^{-2}\,h}$$

Check: - Should Equal



DENSITY = 2.3

LINE #	STATION #	ELEVATION m	G boug (dens. = 2.67) mgals	G boug (new dens.) mgals	TOPO CORR. (orig.)	TOPO CORR. (new)	G boug (with topo corr)
1	1 + 297.70	2031.93	-112.297	-80.83	6.668	5.74	-75.09
1	1 + 200.00	2036.75	-112.238	-80.70	6.836	5.89	-74.81
1	1 + 211.91	2069.28	-112.642	-80.60	6.396	5.51	-75.09
1	1 + 000.00	2084.36	-112.763	-80.49	6.432	5.54	-74.95
1	0 + 900.00	2090.32	-113.772	-81.40	6.07	5.23	-76.18
1	0 + 800.00	2086.59	-113.772	-81.46	6.342	5.46	-76.00
1	0 + 706.80	2097.98	-114.693	-82.21	7.256	6.25	-75.96
1	0 + 600.00	2111.87	-116.174	-83.47	8.376	7.22	-76.26
1	0 + 493.00	2136.12	-117.200	-84.12	9.158	7.89	-76.23
1	0 + 408.00	2146.18	-118.000	-84.77	10.362	8.93	-75.84
1	0 + 302.00	2201.37	-120.309	-86.22	10.907	9.40	-76.83
1	0 + 197.00	2249.83	-122.055	-87.22	10.672	9.19	-78.02
2	0 + 928.67	2014.73	-108.622	-77.42	8.871	7.64	-69.78
2	0 + 820.69	2041.99	-109.779	-78.16	7.460	6.43	-71.73
2	0 + 741.68	2080.72	-112.292	-80.07	9.100	7.84	-72.23
2	0 + 637.72	1984.49	-111.141	-80.41	10.074	8.68	-71.73
2	0 + 525.00	1890.87	-112.058	-82.78	14.385	12.39	-70.39
2	0 + 412.10	1953.69	-110.882	-80.63	10.655	9.18	-71.45
2	0 + 330.31	1953.90	-110.844	-80.59	10.369	8.93	-71.66
2	0 + 240.78	1992.83	-111.478	-80.62	8.519	7.34	-73.28
2	0 + 130.02	2018.32	-112.739	-81.49	8.298	7.15	-74.34
2	0 + 850.00	2042.36	-112.551	-80.93	8.079	6.96	-73.97
2	0 + 071.51	2032.90	-113.394	-81.92	8.449	7.28	-74.64
2	0 + 168.49	2017.82	-113.929	-82.68	9.956	8.58	-74.11
2	0 + 274.86	2031.34	-114.128	-82.67	10.623	9.15	-73.52
2	0 + 372.00	2042.06	-116.608	-84.99	12.448	10.72	-74.26
2	0 + 470.47	2082.97	-117.840	-85.59	12.968	11.17	-74.42
2	0 + 570.63	2152.43	-119.222	-85.89	12.144	10.46	-75.43
2	0 + 661.85	2226.04	-121.260	-86.79	11.240	9.68	-77.11
3	1 + 000.00	2006.50	-110.341	-79.27	8.549	7.36	-71.91
3	0 + 871.00	1908.13	-109.093	-79.55	10.948	9.43	-70.12
3	0 + 800.00	1881.82	-109.031	-79.89	12.340	10.63	-69.26
3	0 + 718.20	1877.49	-109.455	-80.38	12.694	10.93	-69.45
3	0 + 593.20	1904.29	-109.897	-80.41	12.102	10.42	-69.99
3	0 + 510.20	1916.59	-110.605	-80.93	12.25	10.55	-70.38
3	0 + 434.00	1948.15	-110.514	-80.35	11.764	10.13	-70.21
3	0 + 285.00	2010.22	-111.651	-80.52	8.139	7.01	-73.51
3	0 + 203.00	2018.54	-111.628	-80.37	8.532	7.35	-73.02
3	0 + 100.00	2027.70	-112.087	-80.69	8.992	7.75	-72.94
3	0 + 364.98	2038.92	-112.944	-81.37	9.869	8.50	-72.87
3	0 + 101.70	2060.05	-113.700	-81.80	11.12	9.58	-72.22
3	0 + 200.00	2089.17	-114.741	-82.39	12.136	10.45	-71.94
3	0 + 300.00	2117.23	-116.884	-84.10	13.913	11.98	-72.11
3	0 + 491.00	2253.21	-120.846	-85.96	13.635	11.75	-74.21

4	1 + 221.70	1858.08	-108.227	-79.46	12.64	10.89	-68.57
4	1 + 125.50	1878.11	-108.470	-79.39	12.517	10.78	-68.61
4	1 + 034.70	1902.97	-108.775	-79.31	12.239	10.54	-68.77
4	0 + 922.70	1977.20	-109.691	-79.08	10.24	8.82	-70.25
4	0 + 825.00	1998.27	-109.355	-78.41	9.242	7.96	-70.45
4	0 + 725.00	2010.85	-109.314	-78.18	8.963	7.72	-70.46
4	0 + 625.00	2026.27	-107.78	-76.40	8.637	7.44	-68.96
4	0 + 518.00	2035.44	-110.248	-78.73	8.503	7.32	-71.41
4	0 + 425.00	2050.85	-110.305	-78.55	8.557	7.37	-71.18
4	0 + 325.00	2057.29	-110.886	-79.03	8.989	7.74	-71.29
4	0 + 225.00	2067.44	-111.467	-79.45	9.828	8.47	-70.99
4	0 + 125.00	2072.36	-112.449	-80.36	10.779	9.29	-71.07
4	0 + 100.30	2070.24	-113.833	-81.78	12.877	11.09	-70.68
4	0 + 071.40	2089.03	-114.122	-81.77	13.327	11.48	-70.29
4	0 + 175.00	2127.05	-115.567	-82.63	13.576	11.69	-70.94
4	0 + 249.80	2182.34	-116.79	-83.00	12.589	10.84	-72.15
4	0 + 375.00	2249.97	-118.668	-83.83	13.094	11.28	-72.55
4	0 + 474.00	2328.34	-120.579	-84.53	13.051	11.24	-73.28
4	0 + 575.80	2402.01	-121.989	-84.80	12.892	11.11	-73.69
5	1 + 400.09	1864.17	-106.235	-77.37	12.306	10.60	-66.77
5	1 + 200.07	1899.01	-107.573	-78.17	12.424	10.70	-67.47
5	1 + 000.23	1937.96	-108.573	-78.56	12.381	10.67	-67.90
5	1 + 797.32	1981.4	-110.109	-79.43	11.817	10.18	-69.25
5	0 + 600.02	2049.13	-109.91	-78.18	8.833	7.61	-70.57
5	0 + 399.81	2083.37	-110.741	-78.48	8.21	7.07	-71.41
5	0 + 200.22	2104.22	-111.303	-78.72	8.448	7.28	-71.44
5	0 + 290.04	2116.74	-112.465	-79.69	10.431	8.99	-70.70
5	0 + 199.99	2131.44	-114.332	-81.33	12.364	10.65	-70.68
5	0 + 399.84	2234.86	-117.537	-82.93	11.943	10.29	-72.64
6	0 + 311.58	2167.96	-111.145	-77.58	9.255	7.97	-69.60
6	0 + 200.30	2167.47	-111.218	-77.66	8.992	7.75	-69.91
6	0 + 117.63	2192.56	-111.37	-77.42	8.548	7.36	-70.06
6	0 + 510.00	2171.03	-111.059	-77.44	9.738	8.39	-69.05
6	0 + 105.69	2189.53	-112.088	-78.18	10.259	8.84	-69.35
6	0 + 198.73	2237.6	-113.825	-79.18	9.511	8.19	-70.98
6	0 + 303.82	2242.3	-115.084	-80.36	10.630	9.16	-71.21
6	0 + 405.11	2223.24	-116.054	-81.63	13.250	11.41	-70.21
6	0 + 488.99	2288.97	-117.197	-81.75	11.282	9.72	-72.03
6	0 + 602.34	2342.58	-118.271	-82.00	11.806	10.17	-71.83
7	0 + 462.60	2268.37	-112.959	-77.83	10.872	9.37	-68.47
7	0 + 280.00	2235.93	-111.179	-76.56	10.130	8.73	-67.83
7	0 + 145.70	2271.2	-111.575	-76.41	9.709	8.36	-68.04
7	0 + 080.00	2259.46	-111.672	-76.69	9.338	8.04	-68.64
7	0 + 655.00	2234.38	-111.374	-76.78	9.253	7.97	-68.80
7	0 + 120.00	2247.7	-111.885	-77.08	9.789	8.43	-68.65
7	0 + 320.00	2303.88	-114.44	-78.77	9.568	8.24	-70.52
7	0 + 540.00	2355.97	-116.706	-80.22	11.199	9.65	-70.58
7	0 + 598.00	2374.57	-117.499	-80.73	11.250	9.69	-71.04
8	0 + 394.80	2503.02	-121.109	-82.35	15.797	13.61	-68.74
8	0 + 144.00	2464.35	-117.37	-79.21	11.375	9.80	-69.41
8	0 + 268.00	2493.16	-120.678	-82.07	13.386	11.53	-70.54
8	0 + 400.80	2520.91	-122.384	-83.35	13.558	11.68	-71.67
8	0 + 737.60	2578.17	-123.735	-83.81	12.009	10.34	-73.47

check I

G boug (dens. = 2.00) mgals	G boug (new dens.) mgals	TOPO CORR. (orig.)	TOPO CORR. (new)	G boug (with topo corr) mgals
-55.302	-80.81	4.986	5.734	-75.08
-55.106	-80.68	5.052	5.810	-74.87
-54.601	-80.58	4.791	5.510	-75.07
-54.296	-80.47	4.745	5.457	-75.01
-54.588	-80.83	4.546	5.228	-75.60
-55.243	-81.44	4.751	5.464	-75.98
-55.847	-82.19	5.435	6.250	-75.94
-56.935	-83.45	6.274	7.215	-76.23
-57.283	-84.10	6.87	7.900	-76.20
-57.802	-84.75	7.762	8.926	-75.82
-58.560	-86.20	8.17	9.395	-76.80
-58.945	-87.19	7.994	9.193	-78.00
-52.110	-77.40	6.645	7.642	-69.76
-52.504	-78.14	5.605	6.446	-71.70
-53.948	-80.07	6.817	7.840	-72.23
-55.476	-80.39	7.546	8.678	-71.71
-59.018	-82.76	10.776	12.392	-70.37
-56.081	-80.61	7.981	9.178	-71.43
-56.037	-80.57	7.768	8.933	-71.64
-55.581	-80.60	6.381	7.338	-73.26
-56.126	-81.47	6.216	7.148	-74.32
-55.262	-80.90	6.052	6.960	-73.94
-56.371	-81.89	6.329	7.278	-74.62
-57.330	-82.66	7.455	8.573	-74.09
-57.782	-83.29	7.952	9.145	-74.14
-59.330	-84.97	9.325	10.724	-74.24
-59.410	-85.56	9.714	11.171	-74.39
-58.847	-85.87	9.096	10.460	-75.41
-58.840	-86.79	8.445	9.712	-77.08
-54.058	-79.25	6.404	7.365	-71.89
-55.571	-79.53	8.2	9.430	-70.10
-56.247	-79.87	9.234	10.619	-69.25
-56.791	-80.36	9.48	10.902	-69.46
-56.484	-80.39	9.065	10.425	-69.97
-56.845	-80.91	9.176	10.552	-70.36
-55.867	-80.33	8.693	9.997	-70.33
-55.265	-80.50	6.097	7.012	-73.49
-55.010	-80.35	6.391	7.350	-73.00
-55.210	-80.67	6.737	7.748	-72.92
-55.747	-81.35	7.392	8.501	-72.84
-55.914	-81.78	8.364	9.619	-72.16
-56.139	-82.37	9.09	10.453	-71.92
-57.497	-84.08	10.42	11.983	-72.10
-57.644	-85.93	10.22	11.753	-74.18
-56.107	-79.44	9.498	10.923	-68.51
-55.789	-79.37	9.396	10.805	-68.56
-55.399	-79.29	9.167	10.542	-68.75

-54.231	-79.05	7.671	8.822	-70.23
-53.303	-78.39	6.949	7.991	-70.40
-52.909	-78.16	6.714	7.721	-70.43
-52.942	-78.38	6.53	7.510	-70.87
-53.156	-78.71	6.367	7.322	-71.39
-52.777	-78.53	6.409	7.370	-71.16
-53.179	-79.01	6.733	7.743	-71.27
-53.477	-79.43	7.362	8.466	-70.97
-54.318	-80.34	8.074	9.285	-71.05
-55.764	-81.76	9.646	11.093	-70.66
-55.626	-81.85	9.983	11.480	-70.37
-55.902	-82.61	10.17	11.696	-70.91
-55.577	-82.98	9.426	10.840	-72.14
-55.558	-83.81	9.81	11.282	-72.52
-55.27	-84.50	9.776	11.242	-73.26
-54.613	-84.77	9.657	11.106	-73.66
-53.944	-77.35	9.222	10.605	-66.74
-54.306	-78.15	9.234	10.619	-67.53
-54.236	-78.57	9.277	10.669	-67.90
-54.531	-79.41	8.712	10.019	-69.39
-52.433	-78.16	6.617	7.610	-70.55
-52.302	-78.46	6.149	7.071	-71.39
-52.28	-78.70	6.328	7.277	-71.42
-53.091	-79.67	7.814	8.986	-70.68
-54.546	-81.31	9.263	10.652	-70.65
-54.848	-82.91	8.946	10.288	-72.62
-50.335	-77.55	6.933	7.973	-69.58
-50.42	-77.63	6.733	7.743	-69.89
-49.818	-77.35	6.403	7.363	-69.98
-50.163	-77.42	7.267	8.357	-69.06
-50.673	-78.16	7.684	8.837	-69.33
-51.061	-79.15	7.093	8.157	-71.00
-52.188	-80.34	7.964	9.159	-71.18
-53.693	-81.61	9.925	11.414	-70.19
-52.993	-81.73	8.379	9.636	-72.10
-52.561	-81.97	8.815	10.137	-71.83
-49.331	-77.81	8.143	9.364	-68.45
-48.462	-76.53	7.588	8.726	-67.81
-47.868	-76.38	7.271	8.362	-68.02
-48.293	-76.66	6.968	8.013	-68.65
-48.699	-76.75	6.942	7.983	-68.77
-48.837	-77.06	7.333	8.433	-68.62
-49.815	-78.74	7.178	8.255	-70.49
-50.637	-80.22	8.389	9.647	-70.57
-50.892	-80.70	8.413	9.675	-71.03
-50.9	-82.33	11.831	13.606	-68.72
-48.244	-79.18	8.523	9.801	-69.38
-50.744	-82.05	10.026	11.530	-70.52
-51.673	-83.32	10.17	11.696	-71.63
-51.416	-83.78	8.763	10.077	-73.71

check II

G boug (prior to topo corr) (G boug 2.67 + G boug 2.0)/2 mgals	G boug (with topo corr)	Q/A summary for given density G boug (2.67 data)	G boug (2.00 data)	G boug (interpolated)
-83.80	-75.08	-75.090	-75.079	-75.084
-83.67	-74.84	-74.811	-74.868	-74.839
-83.62	-75.08	-75.091	-75.071	-75.081
-83.53	-74.98	-74.947	-75.008	-74.978
-84.18	-75.89	-76.176	-75.604	-75.890
-84.51	-75.99	-75.999	-75.976	-75.988
-85.27	-75.95	-75.956	-75.937	-75.947
-86.55	-76.25	-76.257	-76.234	-76.246
-87.24	-76.22	-76.234	-76.201	-76.218
-87.90	-75.83	-75.841	-75.821	-75.831
-89.43	-76.81	-76.826	-76.803	-76.815
-90.50	-78.01	-78.024	-77.999	-78.011
-80.37	-69.77	-69.783	-69.763	-69.773
-81.14	-71.71	-71.734	-71.695	-71.715
-83.12	-72.23	-72.234	-72.232	-72.233
-83.31	-71.72	-71.734	-71.713	-71.724
-85.54	-70.38	-70.387	-70.365	-70.376
-83.48	-71.44	-71.452	-71.431	-71.442
-83.44	-71.65	-71.657	-71.635	-71.646
-83.53	-73.27	-73.282	-73.263	-73.272
-84.43	-74.33	-74.338	-74.318	-74.328
-83.91	-73.96	-73.967	-73.944	-73.955
-84.88	-74.63	-74.637	-74.616	-74.627
-85.63	-74.10	-74.108	-74.090	-74.099
-85.96	-73.83	-73.523	-74.141	-73.832
-87.97	-74.25	-74.265	-74.244	-74.255
-88.63	-74.40	-74.415	-74.391	-74.403
-89.03	-75.42	-75.432	-75.410	-75.421
-90.05	-77.09	-77.108	-77.076	-77.092
-82.20	-71.90	-71.907	-71.885	-71.896
-82.33	-70.11	-70.116	-70.098	-70.107
-82.64	-69.26	-69.262	-69.254	-69.258
-83.12	-69.45	-69.448	-69.461	-69.454
-83.19	-69.98	-69.985	-69.968	-69.976
-83.73	-70.37	-70.375	-70.355	-70.365
-83.19	-70.27	-70.214	-70.329	-70.272
-83.46	-73.50	-73.513	-73.492	-73.502
-83.32	-73.01	-73.022	-73.003	-73.013
-83.65	-72.93	-72.943	-72.920	-72.932
-84.35	-72.86	-72.871	-72.845	-72.858
-84.81	-72.19	-72.222	-72.159	-72.191
-85.44	-71.93	-71.937	-71.915	-71.926
-87.19	-72.11	-72.115	-72.096	-72.105
-89.25	-74.20	-74.211	-74.180	-74.195
-82.17	-68.54	-68.567	-68.512	-68.540
-82.13	-68.58	-68.606	-68.563	-68.585
-82.09	-68.76	-68.766	-68.749	-68.757

-81.96	-70.24	-70.254	-70.233	-70.244
-81.33	-70.43	-70.452	-70.400	-70.426
-81.11	-70.45	-70.456	-70.434	-70.445
-80.36	-69.92	-68.964	-70.872	-69.918
-81.70	-71.40	-71.406	-71.389	-71.397
-81.54	-71.17	-71.177	-71.155	-71.166
-82.03	-71.28	-71.287	-71.265	-71.276
-82.47	-70.98	-70.988	-70.967	-70.978
-83.38	-71.06	-71.074	-71.051	-71.063
-84.80	-70.67	-70.684	-70.663	-70.673
-84.87	-70.33	-70.294	-70.373	-70.334
-85.73	-70.92	-70.936	-70.912	-70.924
-86.18	-72.14	-72.153	-72.136	-72.145
-87.11	-72.54	-72.549	-72.525	-72.537
-87.92	-73.27	-73.283	-73.260	-73.272
-88.30	-73.68	-73.690	-73.665	-73.677
-80.09	-66.76	-66.769	-66.743	-66.756
-80.94	-67.50	-67.465	-67.529	-67.497
-81.40	-67.90	-67.899	-67.899	-67.899
-82.32	-69.32	-69.249	-69.389	-69.319
-81.17	-70.56	-70.571	-70.550	-70.561
-81.52	-71.40	-71.409	-71.387	-71.398
-81.79	-71.43	-71.443	-71.421	-71.432
-82.78	-70.69	-70.703	-70.681	-70.692
-84.44	-70.67	-70.677	-70.654	-70.665
-86.19	-72.63	-72.643	-72.619	-72.631
-80.74	-69.59	-69.603	-69.581	-69.592
-80.82	-69.90	-69.910	-69.890	-69.900
-80.59	-70.02	-70.056	-69.982	-70.019
-80.61	-69.06	-69.053	-69.063	-69.058
-81.38	-69.34	-69.347	-69.326	-69.336
-82.44	-70.99	-70.984	-70.997	-70.991
-83.64	-71.19	-71.206	-71.181	-71.194
-84.87	-70.20	-70.214	-70.192	-70.203
-85.10	-72.07	-72.035	-72.095	-72.065
-85.42	-71.83	-71.827	-71.835	-71.831
-81.15	-68.46	-68.469	-68.446	-68.457
-79.82	-67.82	-67.831	-67.808	-67.819
-79.72	-68.03	-68.043	-68.021	-68.032
-79.98	-68.64	-68.641	-68.647	-68.644
-80.04	-68.79	-68.805	-68.768	-68.787
-80.36	-68.64	-68.648	-68.624	-68.636
-82.13	-70.50	-70.523	-70.486	-70.504
-83.67	-70.57	-70.578	-70.569	-70.573
-84.20	-71.03	-71.039	-71.030	-71.034
-86.00	-68.73	-68.743	-68.720	-68.731
-82.81	-69.40	-69.412	-69.382	-69.397
-85.71	-70.53	-70.542	-70.516	-70.529
-87.03	-71.65	-71.670	-71.628	-71.649
-87.58	-73.59	-73.468	-73.707	-73.588