Rept. Bk.No.65/120
G.S. No.3858

DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

EXPLORATION SERVICES DIVISION

REPORT ON GEOPHYSICAL SURVEYS IN THE MT. COFFIN DIAPIR AREA

APPENDIX NO. I

by

B.J. TAYLOR
GEOPHYSICAL ASSISTANT
EXPLORATION GEOPHYSICS SECTION

14th June, 1968

D.M.1200/65

DEPARTMENT OF MINES
SOUTH AUSTRALIA

REPORT ON GEOPHYSICAL SURVEYS IN THE MT. COFFIN DIAPIR AREA

by

D. McPHARLIN
ASSISTANT SENIOR GEOPHYSICIST

and

B.J. TAYLOR
GEOPHYSICAL ASSISTANT

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Rept.Bk.No. 65/120
G.S. 3858
D.M. 1200/65

19th December, 1967.

DEPARTMENT OF MINES
SOUTH AUSTRALIA

Rept.Bk.No. 65/120
G.S. 3858
D.M. 1200/65

REPORT ON GEOPHYSICAL SURVEYS IN THE MT. COFFIN DIAPIR AREA

ABSTRACT

Geophysical surveys made in the Mt. Coffin diapir area show the presence of anomalous zones indicative of sulphide mineralization.

The more intense anomalies are, however, believed to be due to pyritic shales.

Geochemical anomalies within the diapir have associated small induced polarization anomalies which should be further investigated by drilling.

INTRODUCTION

At the request of the Metallic Minerals Section a reconnaissance geophysical survey of the Mt. Coffin Diapir was made to investigate the application of geophysical prospecting to the detection of copper mineralization within the diapir.

A geochemical survey of the area by W.A. Fairburn, Assistant Senior Geologist, Metallic Minerals Section, has revealed significant copper content within the area in part associated with dolomitic beds, which carry some visible copper sulphide minerals.

The main purpose of the geophysical survey was to test the response of these beds to electrical methods of geophysical prospecting. In order to do this, it was necessary

also to test the surrounding area to establish the background response.

GEOLOGY

The geology of this area is typical of the diapirs of the Flinders Ranges in that brecciated beds of probable Willouran Age sediments have been upthrust through younger sediments.

The steeply dipping sediments surrounding the upthrust area belong to the Yudnamutana Sub-group of the Umberatana Group. These sediments include siltstones with included tillitic material overlain by a shale sequence typical of the Tapley Hill Shale.

The main copper prospects in the area have been located within these beds outside the diapir boundary. These prospects occur in a pattern quite similar to the copper deposits of the White Lead area at the edge of the Lyndhurst Diapir. Some secondary carbonates have been mined from enrichment zones near the surface, but on pursuing these deposits to depth the pattern of narrow veins has not provided an economic ore body.

Within the diapir W.A. Fairburn has described a bed of dolomitic material containing disseminated copper sulphides (chalcocite and chalcopyrite). There are no apparent secondary enrichment zones of carbonate copper associated with this material, which has not been disturbed by mining

operations.

PHYSIOGRAPHY

This area is one of considerable relief particularly within the diapir area rising to a peak at Mt. Coffin several hundred feet above the surrounding terrain. The drainage of the area is by a number of small creeks originating within the diapir. Most of these show anomalous copper within the stream sediments.

The topography makes the use of continuous profiling induced polarization techniques impracticable. The climate is typically arid with very irregular rainfall.

METHODS

A survey grid was established by theodolite and tape over portion of the area covered by the geochemical survey, including part of the dolomite bed reported by W.A. Fairburn as containing copper sulphide material. The location of this grid is shown in drawing 67 - 726. The stations were pegged at 200ft. intervals along lines 800ft. apart. The base line positions were identified on large scale aerial photographs.

Spontaneous potential readings were made between adjacent stations on this grid by placing porous pots containing saturated copper sulphate at adjacent stations on the surveyed grid after wetting the ground surface with saline water. The

voltage between stations was then measured with a suitable voltmeter. The voltmeter had a sensitivity of better than one millivolt and an imput impedance in excess of one hundred megohms. Values between successive stations were added together around closed loops and closure errors were distributed to compensate for slight differences between porous pots.

Readings of total magnetic intensity at 160 stations 200ft. apart on lines 800ft. apart were measured with an Elsec Nuclear Magnetic Resonance magnetometer, the values being adjusted for errors due to diurnal variation by employing a closed loop technique.

An induced polarization traverse to completely cross the diapir was located near the centre of the surveyed area together with additional traverses across both the dolomite bed and the most intense self potential anomaly inside the diapir.

Some difficulty was experienced in early induced polarization survey work because of dry surface conditions as a result of prolonged drought. Due to poor electrical contact with the ground, the frequency effects were not reproducible and some of the results had to be repeated after rain had fallen in the area. Results for traverses on line 3200E are shown in Drawing 67 - 516 before rain and Drawing 67 - 727 after rain.

RESULTS

A contour map showing lines of equal magnetic

intensity is shown in Drawing 67 - 728.

The surface distribution of spontaneous potential effects is shown by the contour map (Drawing 67 - 729) by means of lines of equal potential.

Contours of resistivity, per centage frequency effect, and metal factor for the Induced Polarization traverses are shown in Drawings 67 - 516 and 67 - 727.

INTERPRETATION

Self potential minima exhibited outside the diapir near to its southern boundary are believed to be the product of vein type sulphide mineralization within the Yudnamutana beds and overlying shales, such mineralization having given rise to most of the copper prospects in the area.

The shales themselves cause large frequency effects where the induced polarization traverses cross them.

Within the diapir, in contrast to the shales at the diapir edge, induced polarization frequency effects are not large, the metal factors associated with the copper bearing dolomites being only two to three times background.

RECOMMENDATIONS

The association of induced polarization anomalies with areas of significant anomalous copper in the soil and visible

copper mineralization indicate that further investigation by drilling is warranted.

A drilling site to intersect the low resistance zone located between 2700N and 2900N on line 3200W is suggested.

A drill located at 3000N 3200N to drill at 45° depression in a southerly direction should intersect this zone within a drill hole length of 450 feet.

D McPharlin

DMcP:BJT:CC
19.12.1967

D. McPHARLIN
ASSISTANT SENIOR GEOPHYSICIST

and

B Taylor

B.J. TAYLOR
GEOPHYSICAL ASSISTANT

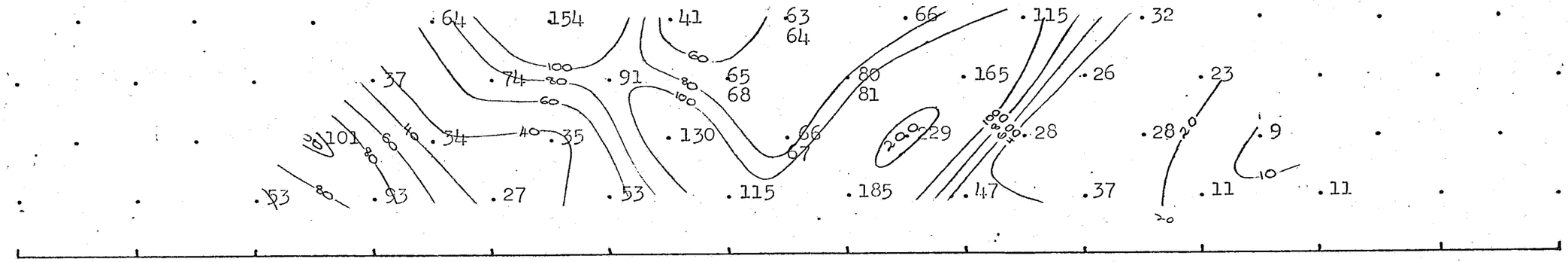
NOTE:- The Geophysical Grid does not always correspond exactly with the geochemical survey sampling points, which were obtained by airphoto estimation of ground position.

LINE

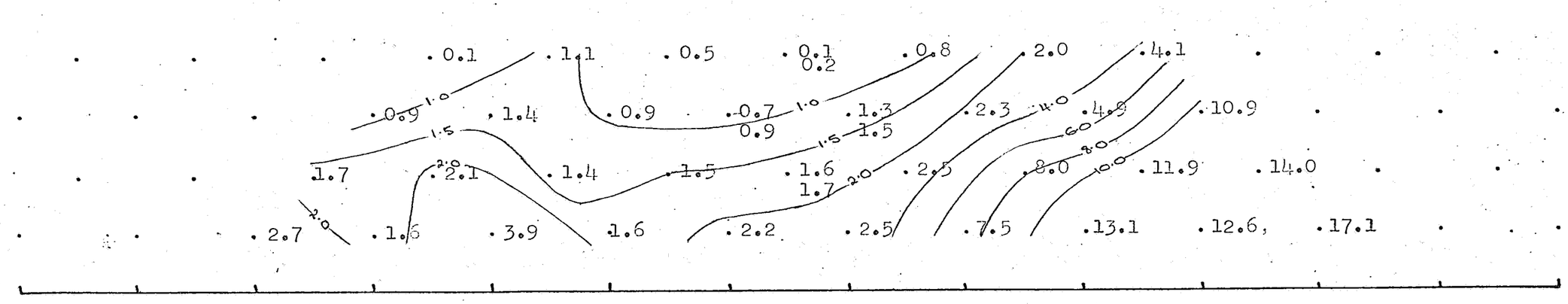
MT. COFFIN
3200W

1600N 1800N 2000N 2200N 2400N 2600N 2800N 3000N 3200N 3400N 3600N 3800N 4000N 4200N

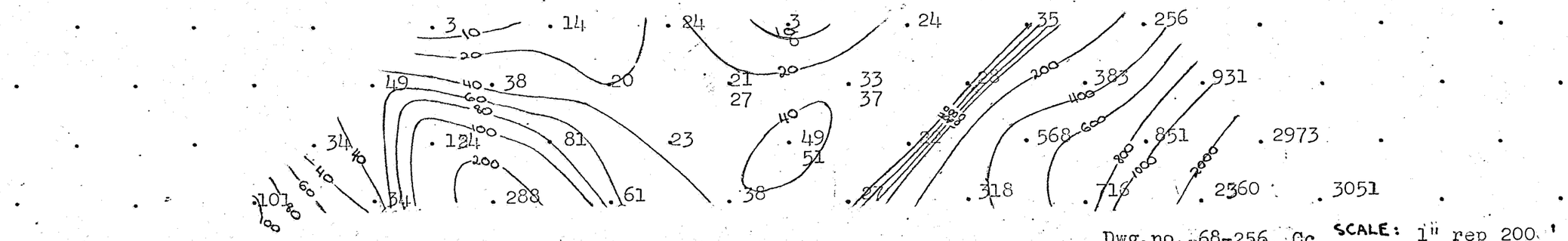
APPARENT RESISTIVITY



FREQUENCY EFFECT



METAL FACTOR



Dwg. no. 68-256. Cc. SCALE: 1" rep 200'

LINE

MT. COFFIN
3600N

1200S 1000S 800S 600S 400S 200S 0 200N 400N 600N 800N 1000N 1200N 1400N

APPARENT RESISTIVITY

64 131 70 89 91 63 173 130
48 94 84 78 79 77 77 175 149 67
32 69 46 83 40 41 210 102 68 29
50 53 64 56 109 98 59 40

FREQUENCY EFFECT

0.3 0.6 0.4 0.5 0.4 1.1 2.5 2.0
1.0 1.8 1.4 1.3 1.6 2.0 2.3 1.9 2.5 7.5
2.9 2.0 2.5 1.4 2.9 2.9 3.1 2.7 9.3 12.3
3.0 2.8 2.5 3.3 3.3 4.0 10.5 13.7

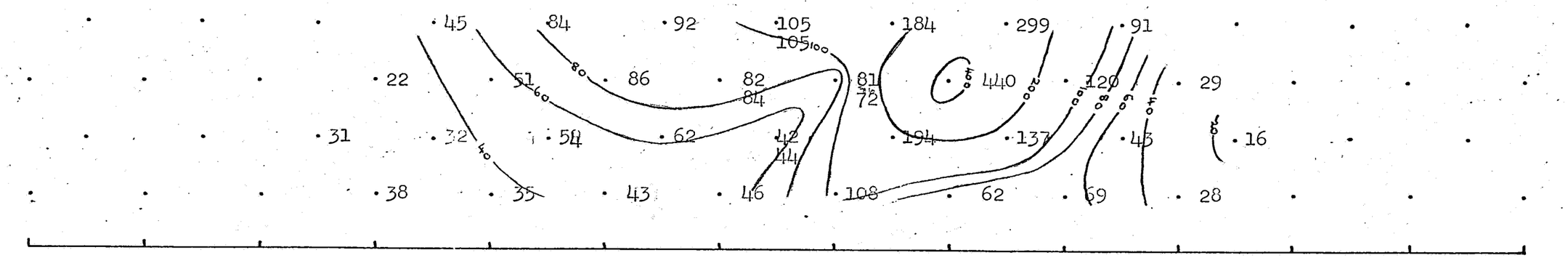
METAL FACTOR

9 10.9 11 11 9 35 29 31
42 38 40 33 33 41 52 60 22 34 223
182 58 109 34 114 111 30 53 275 245
120 106 78 114 61 82 356 678

Dwg.no. 68-257. Cc. SCALE: 1 inch rep. 200 ft

LINE MT. COFFIN 4000W

1200S 1000S 800S 600S 400S 200S 0 200N 400N 600N 800N 1000N 1200N 1400N



Dwg. no. 68-258. Cc. SCALE: 1 inch rep. 200 ft

LINE

MT. COFFIN
4400N

1200S 1000S 800S 600S 400S 200S 0 200N 400N 600N 800N 1000N 1200N 1400N

APPARENT RESISTIVITY

37 68 70 261 228 147 69
72
22 40 97 52 304 247 37 31
53
52 45 70 57 60 245 55 23 30
63
61 38 77 58 64 41 17

FREQUENCY EFFECT

1.0 1.6 1.2 2.0 2.9 1.5 5.3
1.6
1.9 1.0 1.6 0.8 2.1 3.0 8.5 13.3
1.6
2.4 1.4 2.0 1.5 2.0 4.1 11.2 16.2 14.2
3.1
2.3 2.1 3.1 5.1 11.4 16.2 16.0

METAL FACTOR

53 47 35 15 25 20 154
44
176 50 33 31 14 462 854
60
93 62 57 53 66 411 1399 941
99
75 112 81 176 359 786 1877

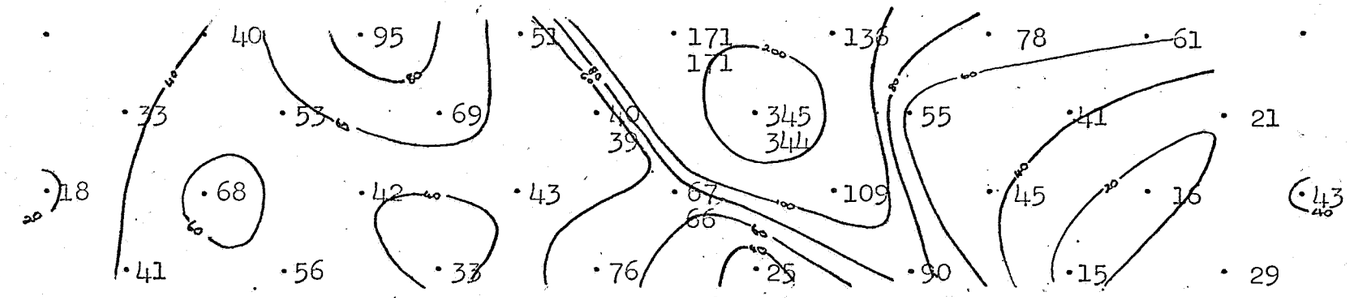
Dwg. no. 68-259. Cc.

SCALE: 1 inch rep 200 ft

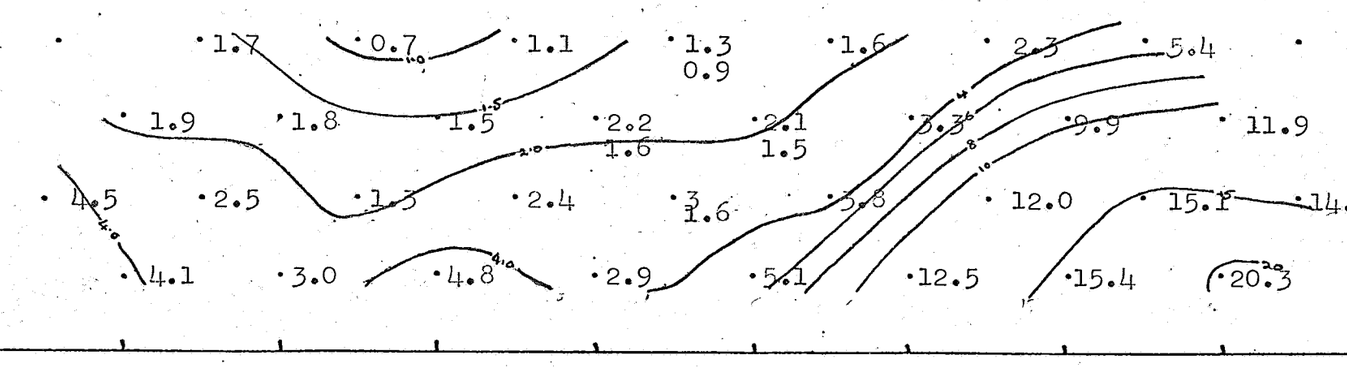
LINE MT. COFFIN 4800N

1200S 1000S 800S 600S 400S 200S 0 200N 400N 600N 800N 1000N 1200N 1400N

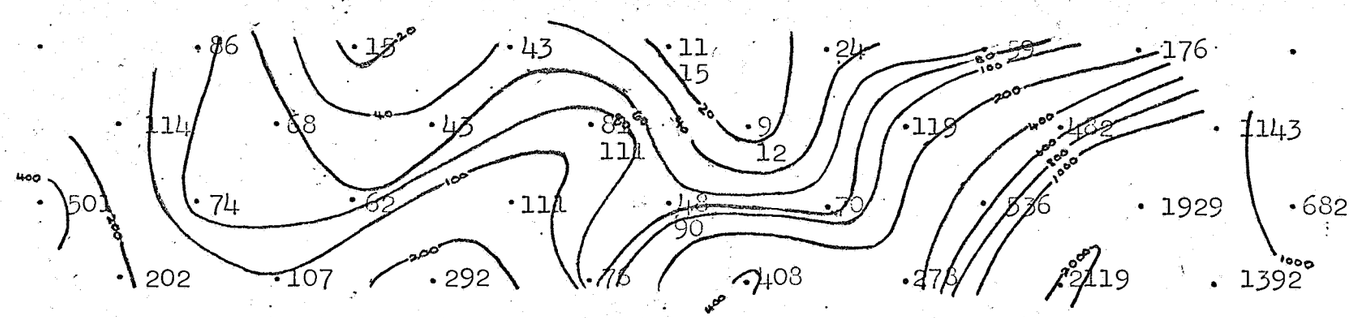
APPARENT RESISTIVITY



FREQUENCY EFFECT



METAL FACTOR



Dwg. no. 68-260. Cc.

SCALE: 1 in. rep. 200ft

LINE MT. COFFIN 5200W

1200S 1000S 800S 600S 400S 200S 0 200N 400N 600N 800N 1000N 1200N 1400N

APPARENT RESISTIVITY

52 81 61 105 103 151 116 41

43 18 128 42 42 118 130 246 30 19

22 30 38 71 43 43 148 57 20 25

14 30 23 80 80 83 45 43 17

FREQUENCY EFFECT

0.7 1.0 1.1 1.6 1.2 1.7 2.5 5.1

1.5 1.5 1.7 1.6 2.3 1.2 2.2 1.4 2.1 7.3 13.7

2.8 2.8 2.4 1.7 3.3 1.9 2.0 9.1 17.4 15.0

4.0 2.9 2.8 1.9 2.8 10.6 16.6 18.8

METAL FACTOR

27 25 36 30 23 23 43 250

70 193 25 109 58 37 22 17 490 1483

257 186 127 48 134 89 27 319 1773 1209

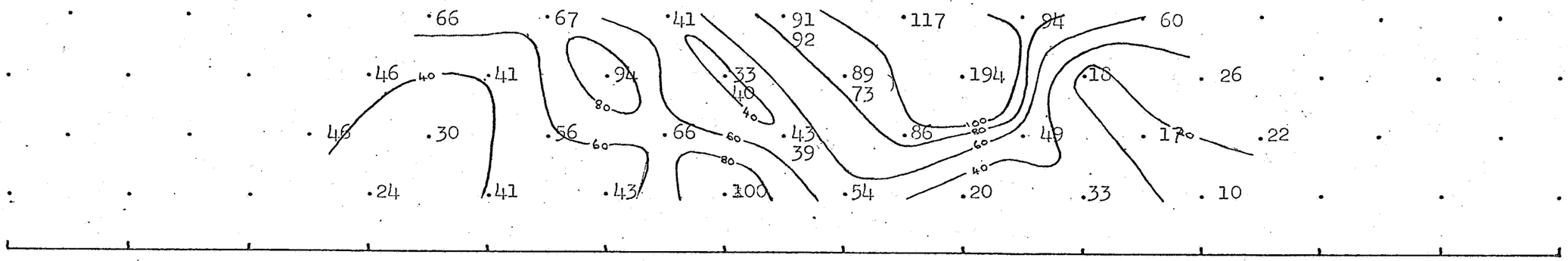
571 117 244 47 68 470 777 2173

Dwg.no. 68-261. Cc. SCALE: 1 inch rep 200 ft

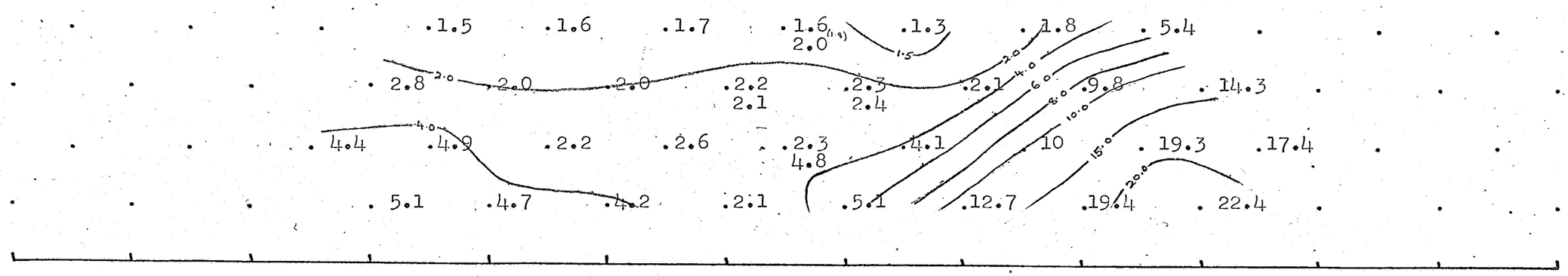
LINE MT. COFFIN 5600W

1200S 1000S 800S 600S 400S 200S 0 200N 400N 600N 800N 1000N 1200N 1400N

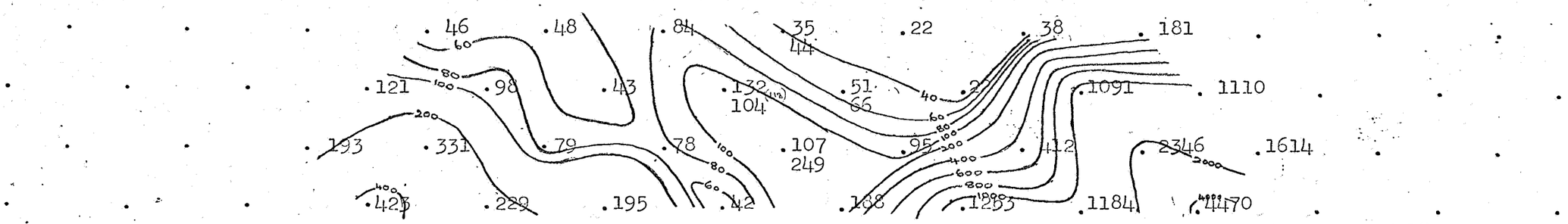
APPARENT RESISTIVITY



FREQUENCY EFFECT



METAL FACTOR



Dwg.no. 68-262. Cc. SCALE: 1" rep 200 ft

LINE MT. COFFIN 6000W

1200S 1000S 800S 600S 400S 200S 0 200N 400N 600N 800N 1000N 1200N

APPARENT RESISTIVITY

271 .43 .32 .58 58 .102 .109 .61
.73 .37 .29 .23 26 .106 105 .187 .20 .76
.68 .18 .35 .36 .62 45 .133 .40 .31 .28
.23 .16 .31 .65 .91 .27 .45 .10

FREQUENCY EFFECT

0.5 1.0 1.5 1.1 1.1 1.2 1.0 3.4
1.6 1.7 2.0 3.5 22 2.3 2.4 1.3 6.2 12.9
2.1 2.1 2.4 2.6 2.4 3.2 1.8 6.4 14.9 18.7
4.3 4.2 3.0 2.9 3.0 6.8 16.5 20.4

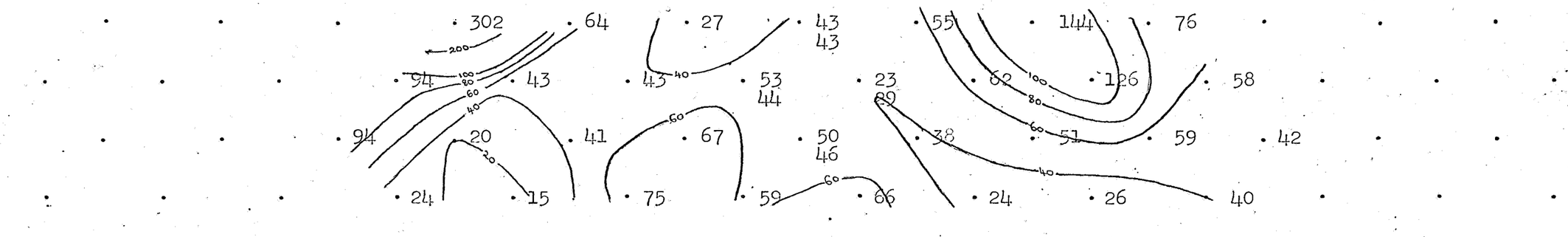
METAL FACTOR

.4 .47 .93 .38 38 .24 .18 .111
.44 .91 .137 .300 158 .44 46 620 339
.82 .254 .136 .144 .78 144 .320 .962 1361
.378 .527 .195 .90 .502 .739 3935

Dwg. no. 68-263. Cc. SCALE: 1"rep. 200'

LINE MT, COFFIN 6400W

1200S 1000S 800S 600S 400S 200S 0 200N 400N 600N 800N 1000N 1200N 1400N

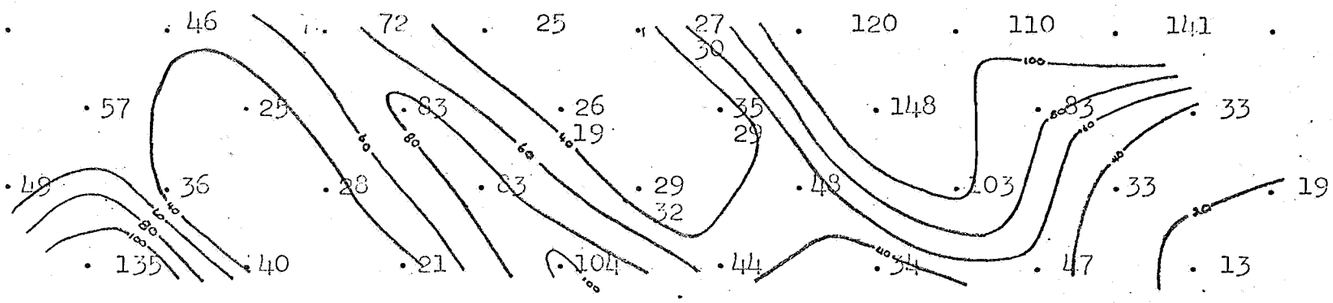


Dwg. no. 68-264. Cc. SCALE: 1 inch rep. 200 ft

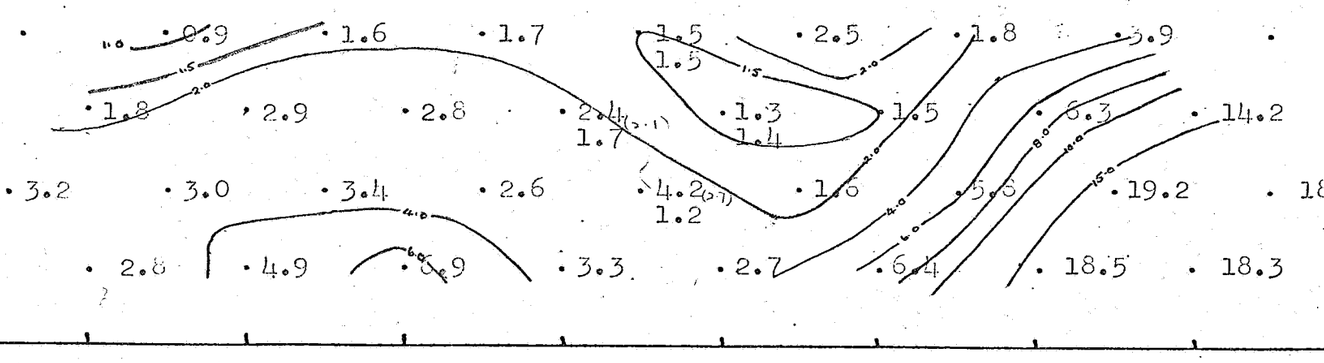
LINE MT. COFFIN 6800W

1000S 800S 600S 400S 200S 0 200N 400N 600N 800N 1000N 1200N 1400N

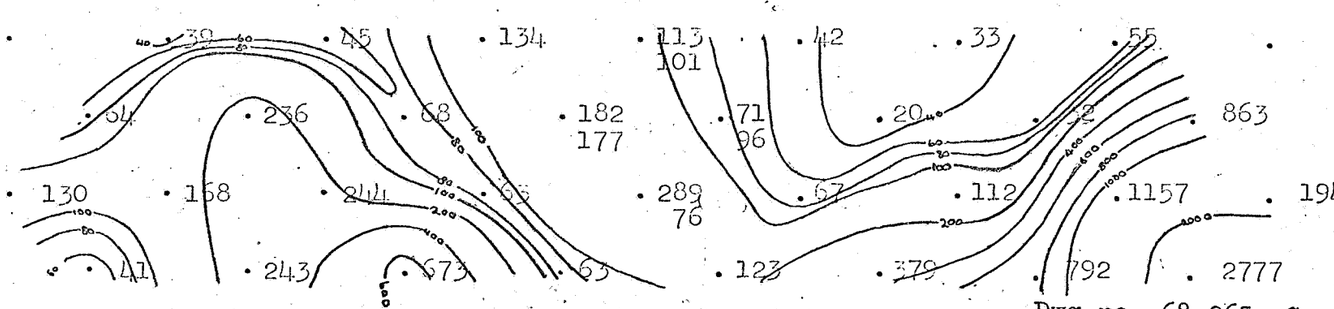
APPARENT RESISTIVITY



FREQUENCY EFFECT



METAL FACTOR

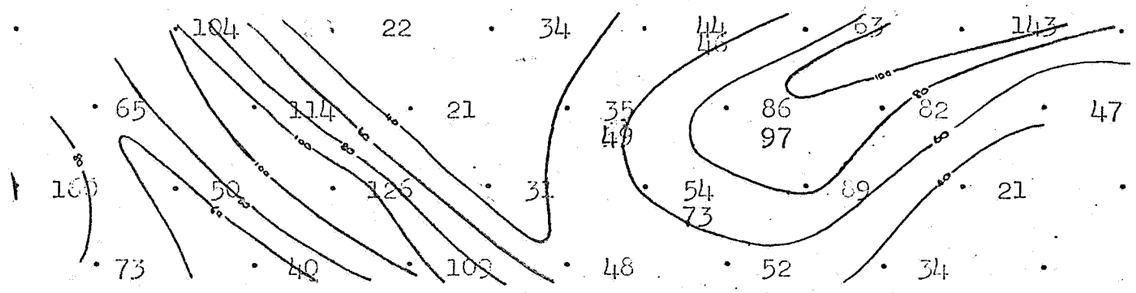


Dwg. no. 68-265. Cc. SCALE: 1 inch rep. 200 ft

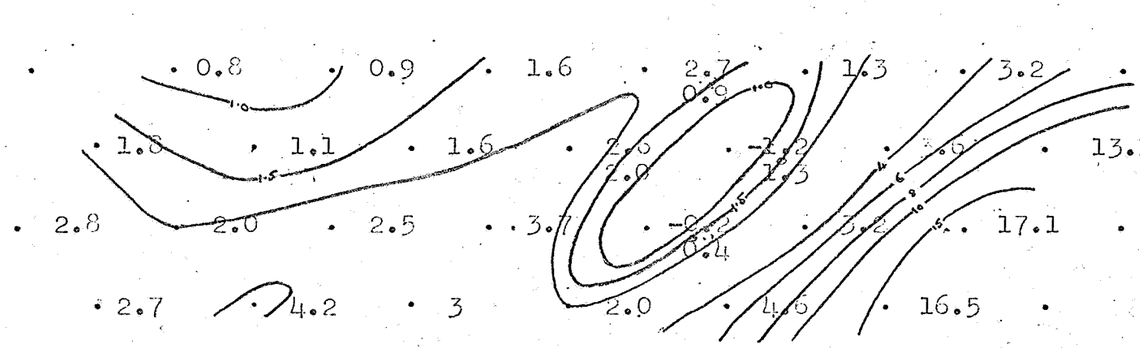
LINE MT. COFFIN 7200N

1000S 800S 600S 400S 200S 0 200N 400N 600N 800N 1000N 1200N 1400N

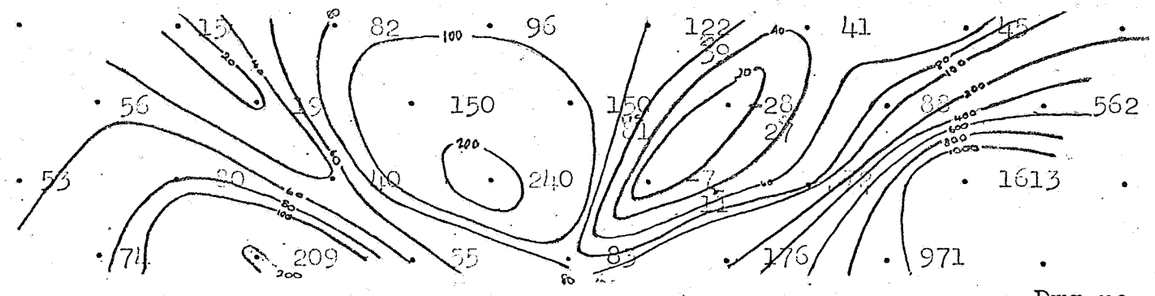
APPARENT RESISTIVITY



FREQUENCY EFFECT



METAL FACTOR

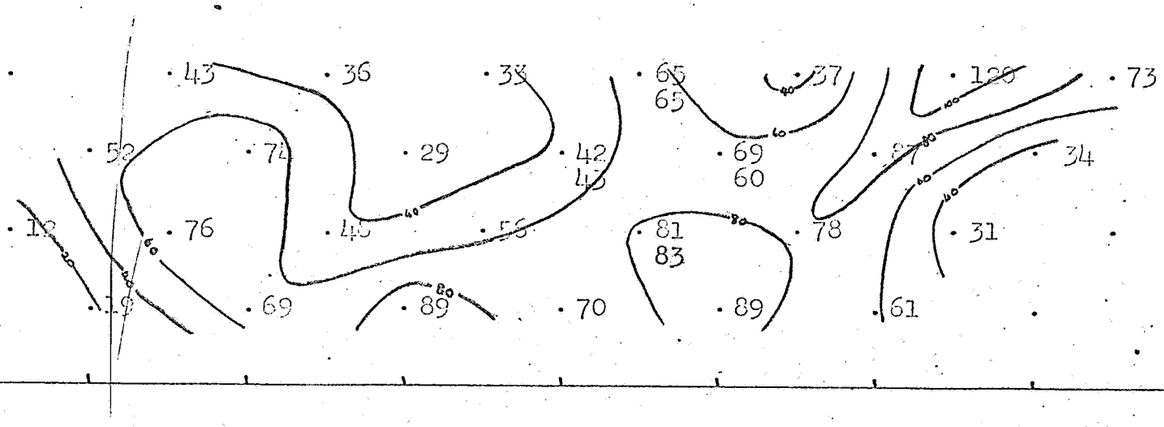


Dwg. no. 68-266. Cc. SCALE: 1 inch rep. 200 ft

LINE Mr. COFFIN 7500.

12000S 10000S 8000S 6000S 4000S 2000S 0 2000N 4000N 6000N 8000N 10000N 12000N 14000N

APPARENT RESISTIVITY



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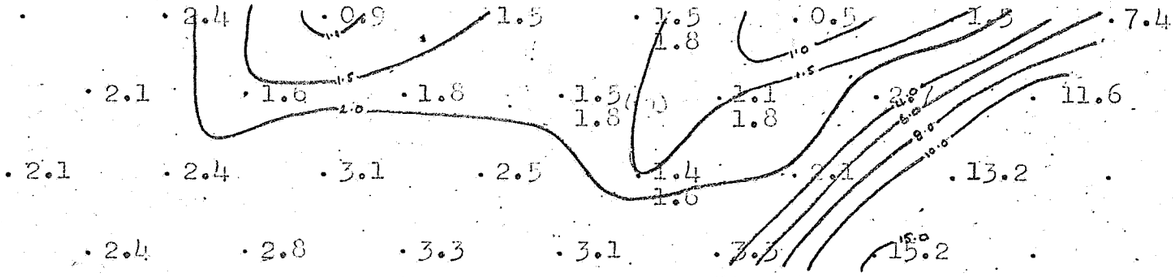
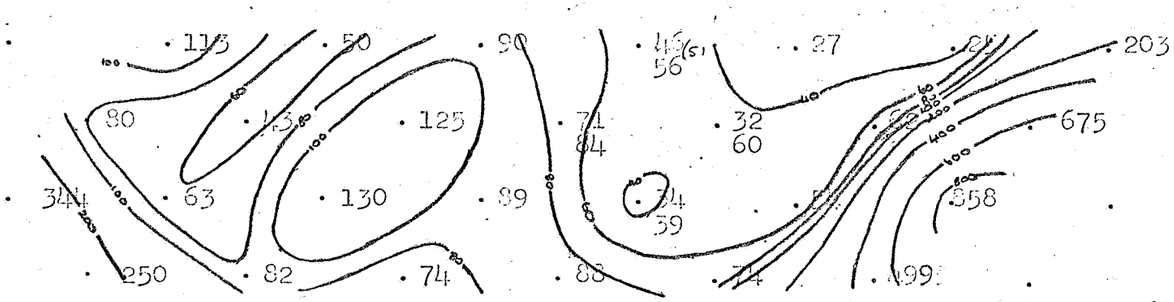


METAL FACTOR

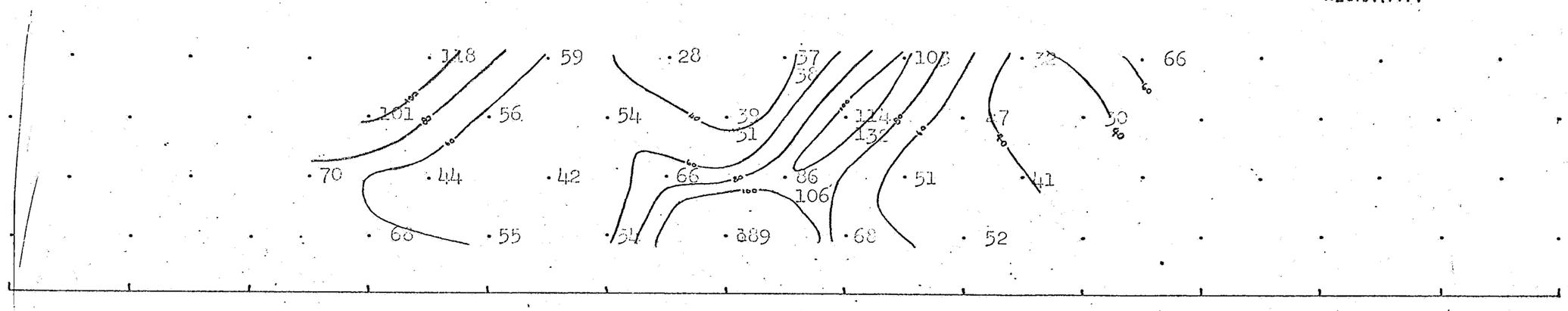


Dwg. no. 68-267. Cc. SCALE: 1" rep 200'

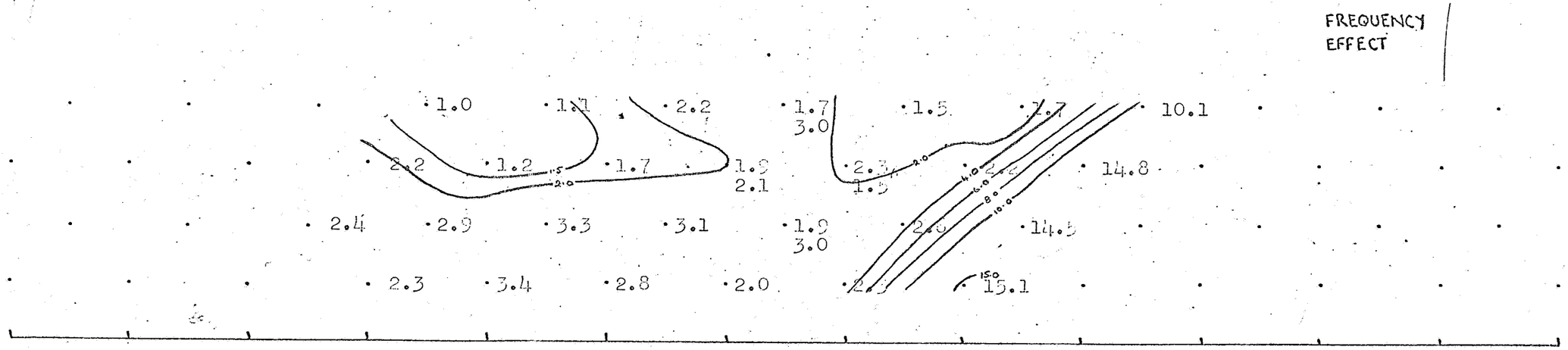
LINE MT. COFFIN 8000W

1200S 1000 800 600 400 200 0 200 400 600 800 1000 1200 1400N

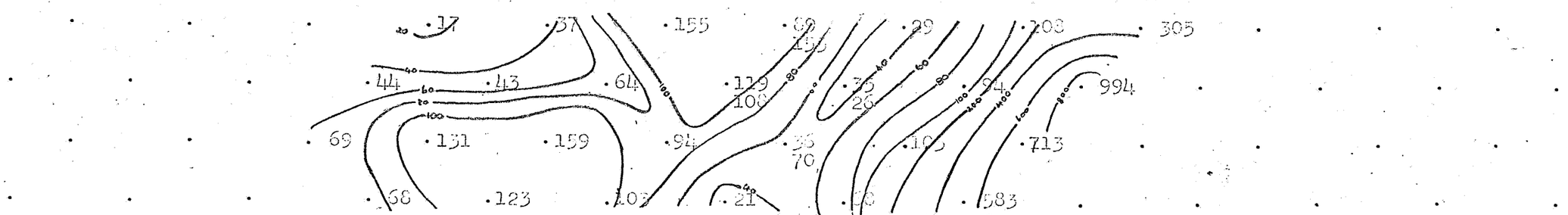
APPARENT RESISTIVITY



FREQUENCY EFFECT



METAL FACTOR



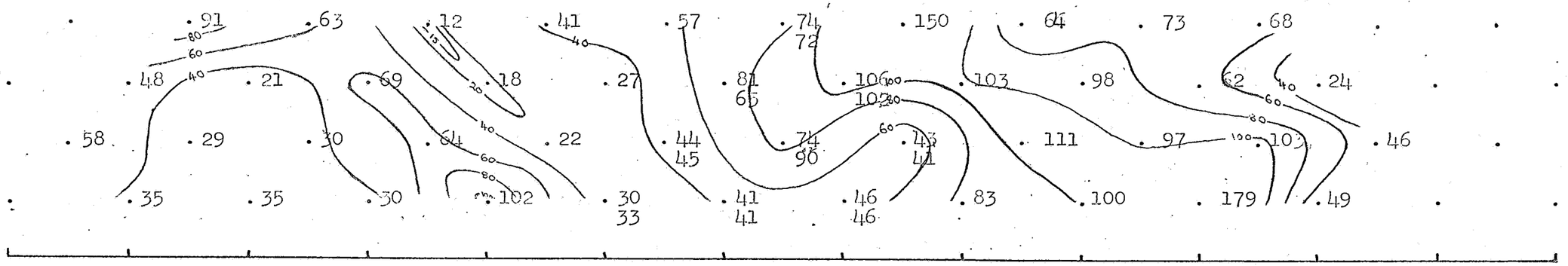
Dwg. no. 68-268. Cc.

SCALE: 1 in. rep. 200 ft

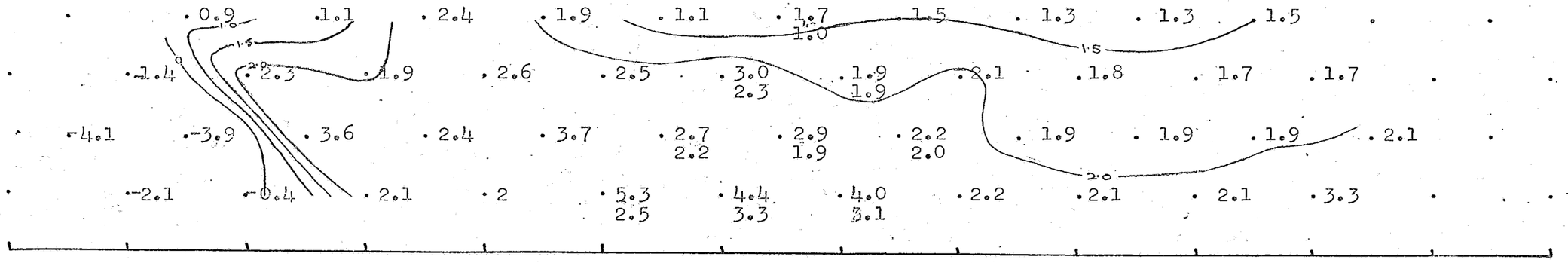
LINE MT. COFFIN 5600N

600S 500S 400S 300S 200S 100S 0 100N 200N 300N 400N 500N 600N 700N

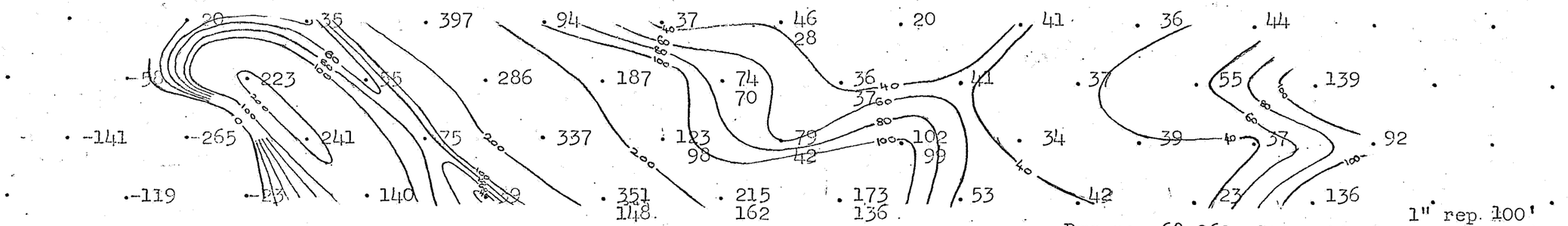
APPARENT RESISTIVITY



FREQUENCY EFFECT



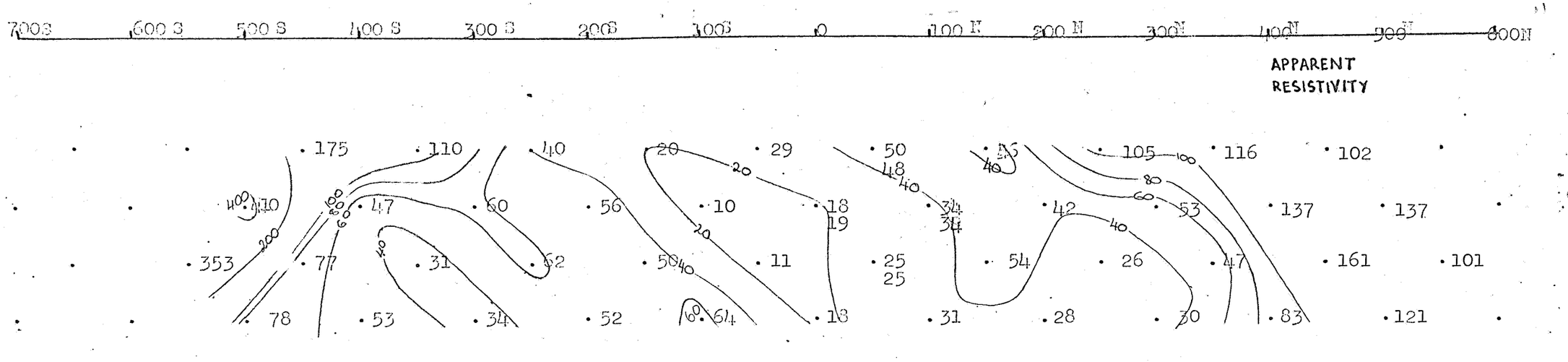
METAL FACTOR



Dwg. no. 68-269. Cc. SCALE: 1" rep. 100'

LINE MT. COFFIN 6400N

700S 600 S 500 S 400 S 300 S 200S 100S 0 100 N 200 N 300N 400N 500N 600N



Dwg. no. 68-270. Cc. SCALE: 1 inch rep 100 ft

LINE MT. COFFIN
6800N

700S 600 500 400 300 200 100 0 100 200 300 400 500 600N

APPARENT RESISTIVITY

.145 .32 .24 .23 .13 .28 .37 .102 .149 .95
.37 .200 .23 .22 .20 .20 .28 .26 .147 .157 .78
.46 .42 .149 .28 .18 .28 .19 .26 .49 .141 .100 .114
.42 .37 .102 .25 .29 .27 .11 .31 .87 .87 .188

FREQUENCY EFFECT

.0.9 .1.1 .1.2 .1.3 .1.2 .2.1 .1.5 .1.6 .1.4 .1.9
.1.8 .1.4 .1.5 .0.9 .1.3 .1.6 .2.5 .2.4 .1.7 .2.1 .2.2
.2.0 .1.9 .1.8 .2.4 .3.2 .2.3 .3.8 .3.0 .1.8 .1.5 .1.7 .4.0
.3.9 .2.3 .2.7 .2.1 .1.9 .2.2 .4.4 .3.8 .2.3 .2.4 .3.4

METAL FACTOR

.12 .70 .102 .115 .191 .152 .80 .31 .19 .40
.96 .14 .131 .82 .131 .162 .178 .188 .23 .27 .57
.87 .80 .24 .174 .354 .165 .395 .235 .74 .21 .34 .71
.188 .140 .53 .169 .129 .165 .789 .223 .117 .55 .36

Dwg.no. 68-271. Cc. SCALE: 1 in. rep. 100 ft.

LINE MT. COFFIN 7200N

600S 500S 400S 300S 200S 100S 0 100N 200N 300N 400N 500N 600N

APPARENT RESISTIVITY

35 28 26 34 40 34 34 16 40 43
75 29 34 23 29 49 49 27 27 38 55 72
161 78 26 19 24 32 32 32 55 37 92 90
147 64 27 17 30 35 64 54 57 81

FREQUENCY EFFECT

0.7 0.4 0.6 0.8 0.6 1.4 1.2 1.5 1.0 1.0
1.6 0.6 1.1 0.9 0.8 1.0 2.1 1.7 1.3 2.6 1.8 1.8
2.0 0.8 0.8 1.5 1.1 1.2 1.1 2.3 1.4 1.9 2.9 4.0
1.5 2.5 2.7 1.3 3.0 1.5 2.1 2.5 2.9 3.8

METAL FACTOR

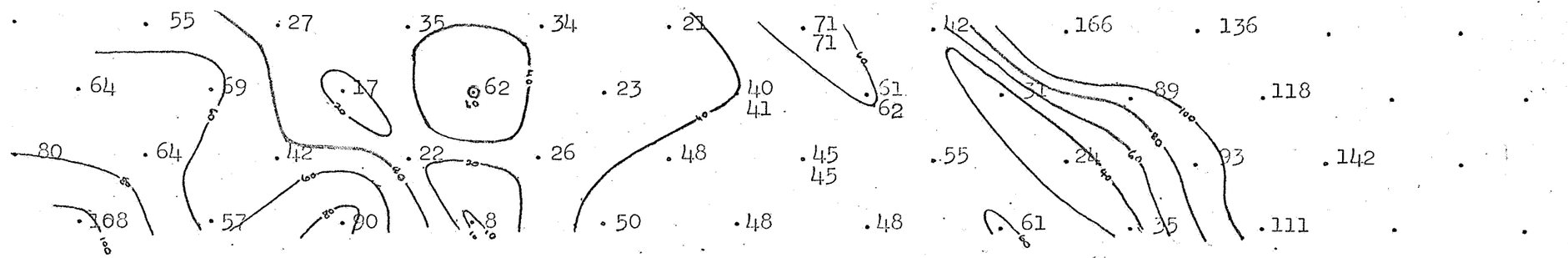
40 28 46 48 25 83 71 190 50 46
27 41 153 79 55 47 86 128 97 138 66 50
25 23 62 162 92 74 70 145 51 102 63 89
20 78 203 156 199 86 65 93 103 94

Dwg. no. 68-272. Cc. SCALE: 1 inch rep. 100 ft

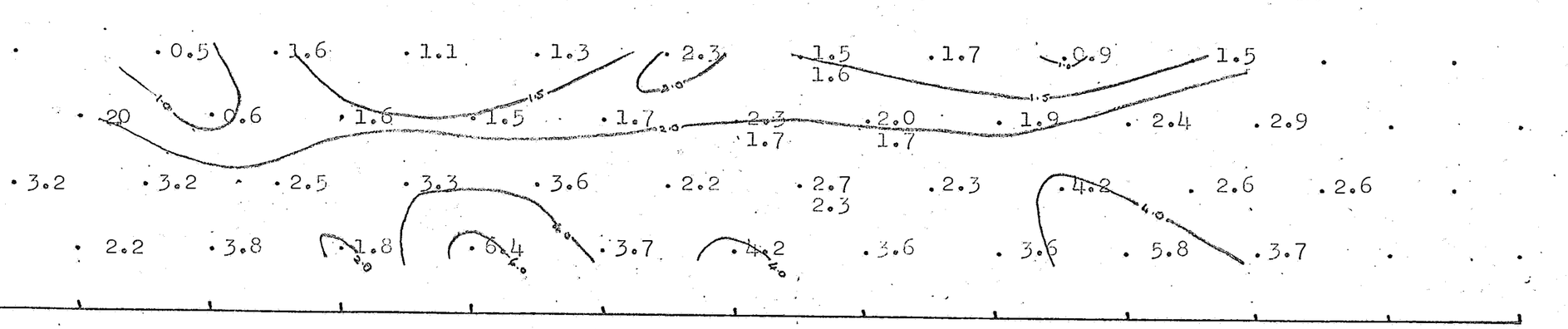
LINE MT. COFFIN 7600N

600S 500S 400S 300S 200S 100S 0 100N 200N 300N 400N 500N 600N

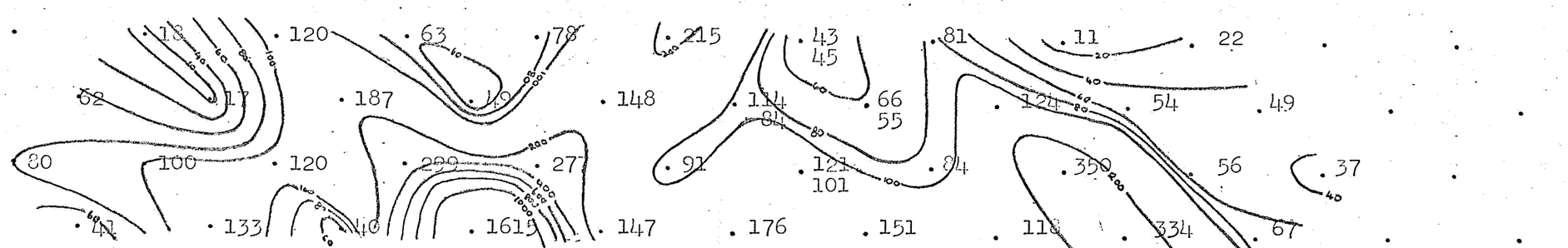
APPARENT RESISTIVITY



FREQUENCY EFFECT



METAL FACTOR



Dwg. no. 68-273. Cc. SCALE: 1 inch rep. 100 ft

LINE MT. COFFIN 8000W

600S 500S 400S 300S 200S 100S 0 100N 200N 300N 400N 500N 600N

APPARENT RESISTIVITY

115 45 29 32 39 28 29 21 61 66
146 27 41 40 47 16 24 24 19 20 29 116 48
124 45 41 64 40 18 26 27 56 80 42
40 44 58 54 55 13 48 87 79 70

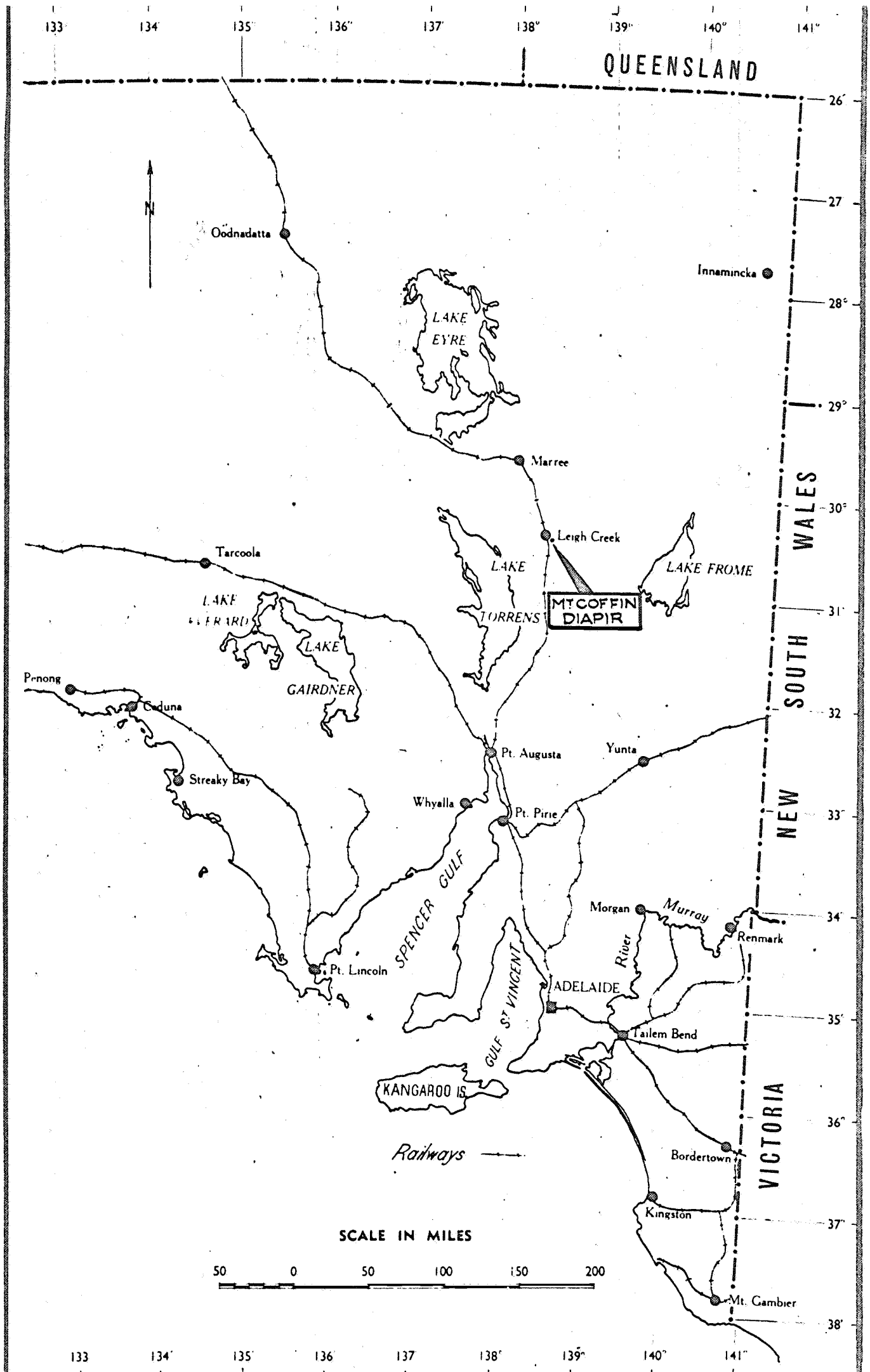
FREQUENCY EFFECT

1.2 1.3 2.4 1.6 1.7 2.0 2.4 1.3 1.9
1.8 1.8 1.9 1.9 2.2 2.2 2.8 2.9 2.8 2.4 2.3 0.9
1.7 1.7 2.2 2.4 2.4 3.0 2.8 3.5 3.4 2.7 2.3 2.6
3.4 3.6 3.0 2.6 3.1 4.5 3.6 3.2 2.5 3.0

METAL FACTOR

21 58 167 100 88 127 139 232 43 57
25 132 94 81 270 185 215 305 285 184 40 37
27 80 107 75 121 445 220 264 179 97 57 124
171 163 184 96 114 885 149 74 64 85

Dwg.no. 68-274. Cc. SCALE: 1 inch rep. 100 ft.



DEPARTMENT OF MINES — SOUTH AUSTRALIA

	Drn. D.M°P	MT COFFIN DIAPIR LOCALITY MAP	SCALE:
	Tcd. AM°D		S 6183 Cc
	Ckd. L.V.W.		
	Exd.		DATE: 25-10-67

P.F. No. S 5850 994·2

138°30'

30°30'

30°32'

MT COFFIN

MT COFFIN MINE

ELSIE ADAIR MINES

"SOUTH ADAIR" WORKINGS

FIRST JUBILEE WORKINGS

DIAMOND JUBILEE MINE

JUBILEE

To Parkerston

To Copley

To Mt Serle

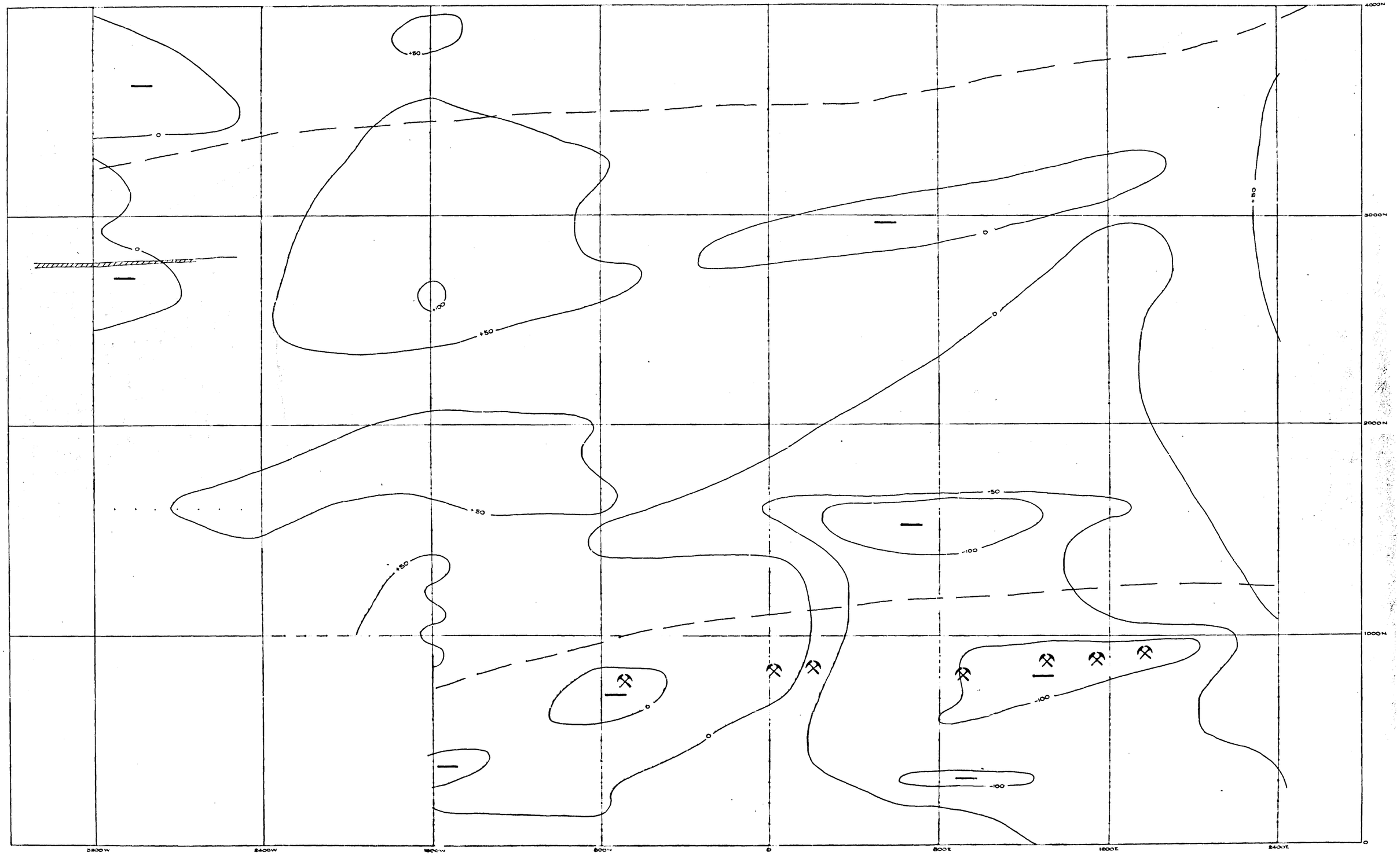
Hope Springs - Leigh Creek Sth. boundary fence

LEIGH CREEK

SCALE

FEET 800 600 400 200 0 800 1600 2400 3200 4000 4800 5600 6400 FEET

DEPARTMENT OF MINES — SOUTH AUSTRALIA			
MT. COFFIN DIAPIR GEOPHYSICAL SURVEY LINES			
EXPLORATION GEOPHYSICS SECTION	GEOPHYSICIST.	Drn. D.M.P.	SCALE: 1"=800 Feet
		Tot. A.M.D.	67-726 Cc
		Chd. L.V.W.	
Director of Mines	SEN. GEOLOGIST.	Enl.	DATE: 20-10-67



Dolomite Bed (showing Disseminated Copper Sulphide)

DIAPIR BOUNDARY

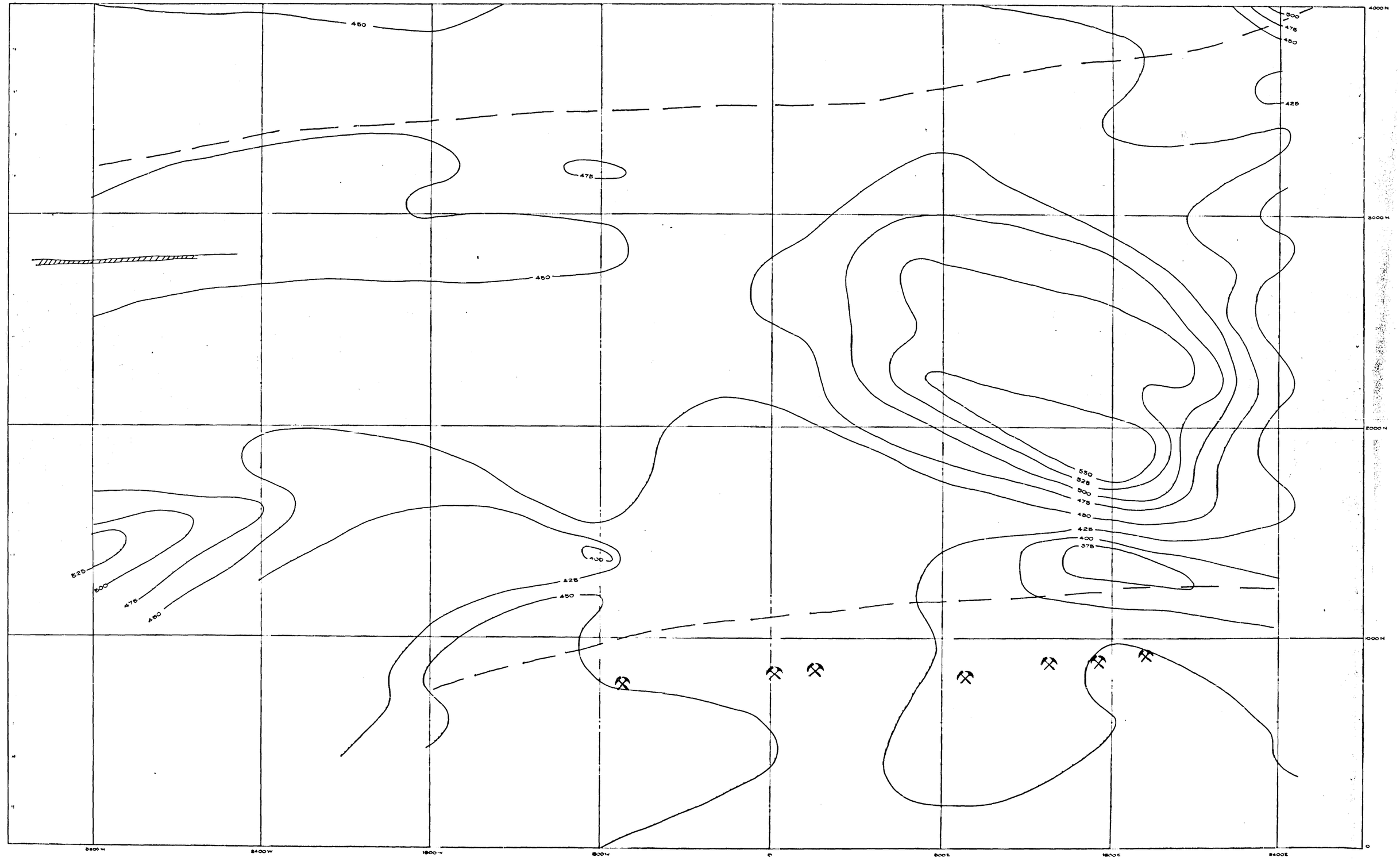
Copper Prospects

Contour Interval 50 Millivolts

DEPARTMENT OF MINES -- SOUTH AUSTRALIA

MT. COFFIN DIAPIR
CONTOURS OF EQUAL SPONTANEOUS POTENTIAL

EXPLORATION GEOPHYSICS SECTION	GEOPHYSICIST	Drn. D.M.C.P.	SCALE: 1" = 200 FEET
		Tcd. A.M.D	67-729 Cc
		Chd. L.Y.W	
Director of Mines	SE.N GEOLOGIST	Exd.	DATE: 23-10-67



Dolomite Bed (Showing Disseminated Copper Sulphide)

DIAPIR BOUNDARY

Copper Prospects

Contour Interval 25 gammas

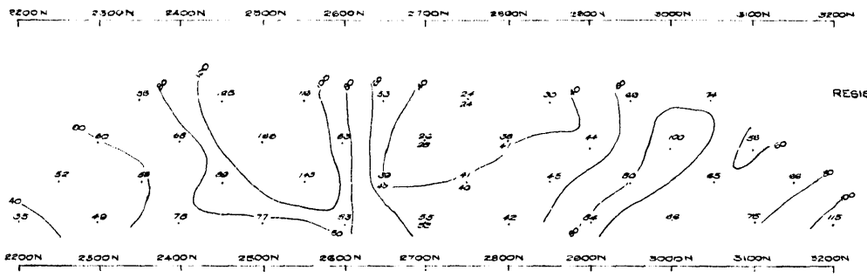
DEPARTMENT OF MINES — SOUTH AUSTRALIA

MT. COFFIN DIAPIR
CONTOURS OF EQUAL TOTAL MAGNETIC INTENSITY

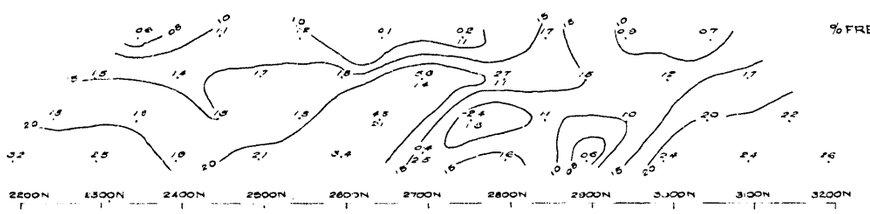
EXPLORATION GEOPHYSICS SECTION	GEOPHY SICIST	Drn. D.M.P.	SCALE: 1" = 200 FEET
		Tcd. A.M.D.	67-728
		Chd. L.V.W.	
Director of Mines	SEN GEOLOGIST	Exd.	DATE: 28-10-67

LINE 3200W (BEFORE RAIN)

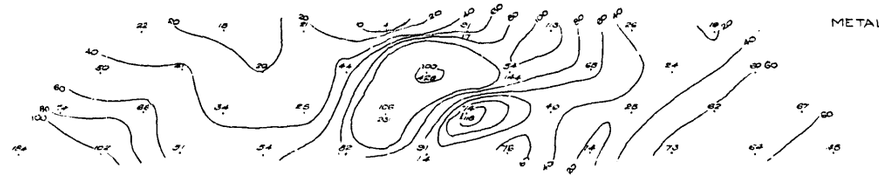
Scale 1" = 100 FT.



RESISTIVITY Ω·M



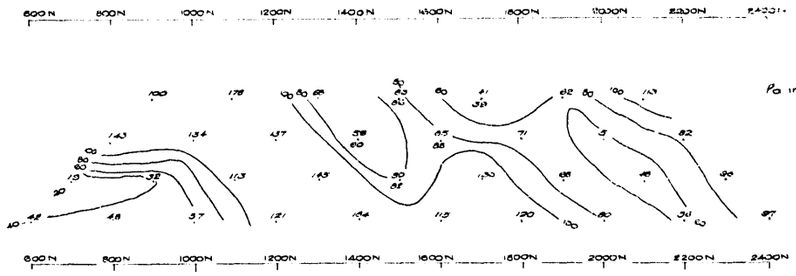
% FREQUENCY EFFECT



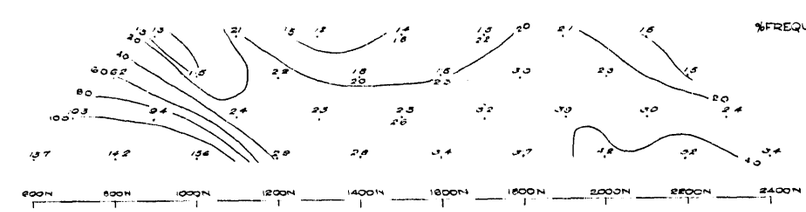
METAL FACTOR

LINE 800E

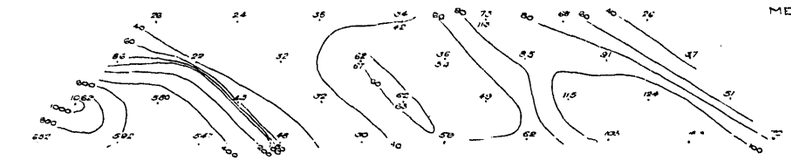
Scale 1" = 200 FT



Ρa in Ω·M



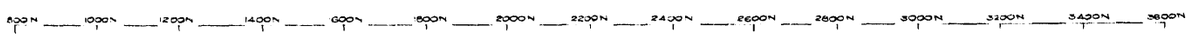
% FREQUENCY EFFECT



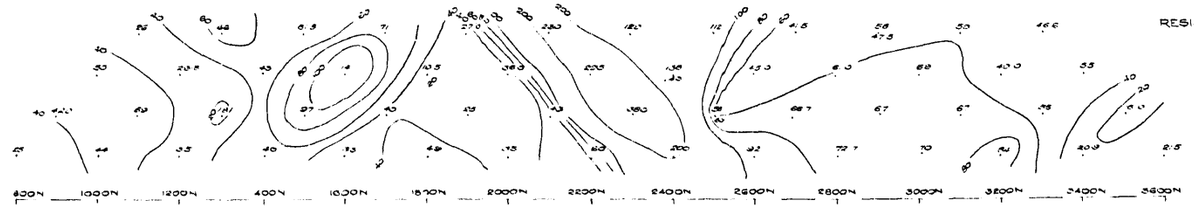
METAL FACTOR

LINE 200E

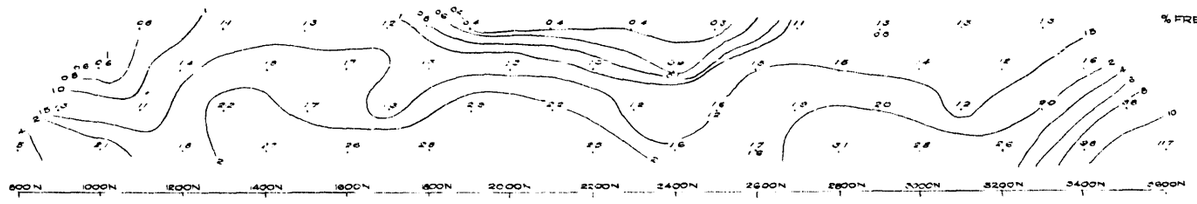
Scale 1" = 200 FT



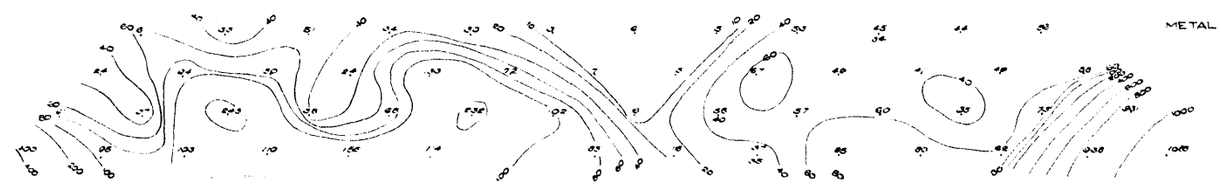
RESISTIVITY



% FREQUENCY EFFECT



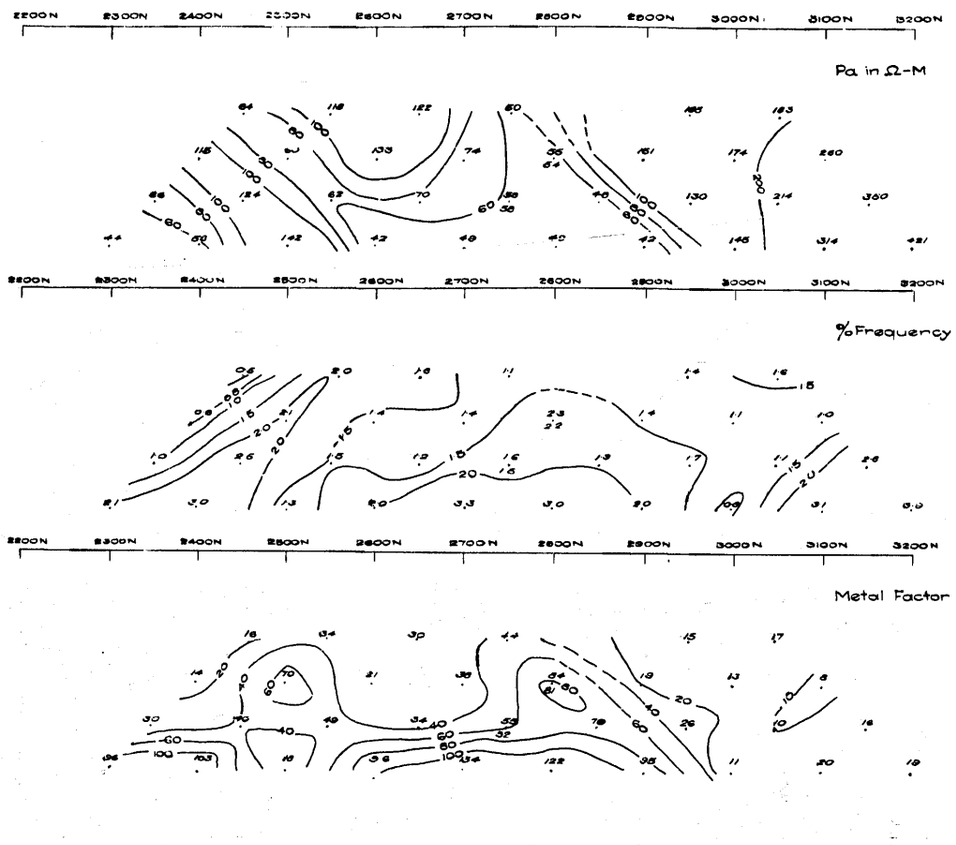
METAL FACTOR



DEPARTMENT OF MINES — SOUTH AUSTRALIA			
MT COFFIN DIAPIR LINES 3200W, 00E, 800E. CONTOUR OF RESISTIVITY MF AND FE.			
EXPLORATION GEOPHYSICS SECTION	GEOPHYSICIST	Drn. BT	SCALE: As shown.
		Tcd. AH+CD	67-516 CC
		Ckd. LVW	
Director of Mines	SEN GEOLOGIST	Exd.	DATE: 22-7-67

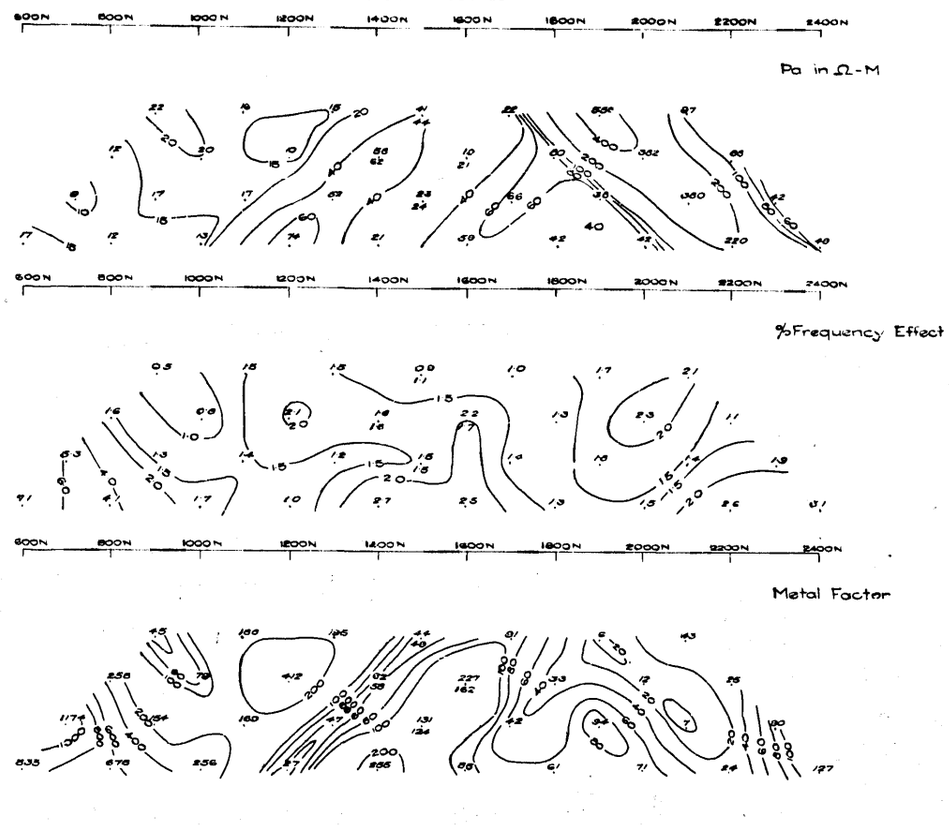
LINE 4000W

Scale : 1" = 100 feet



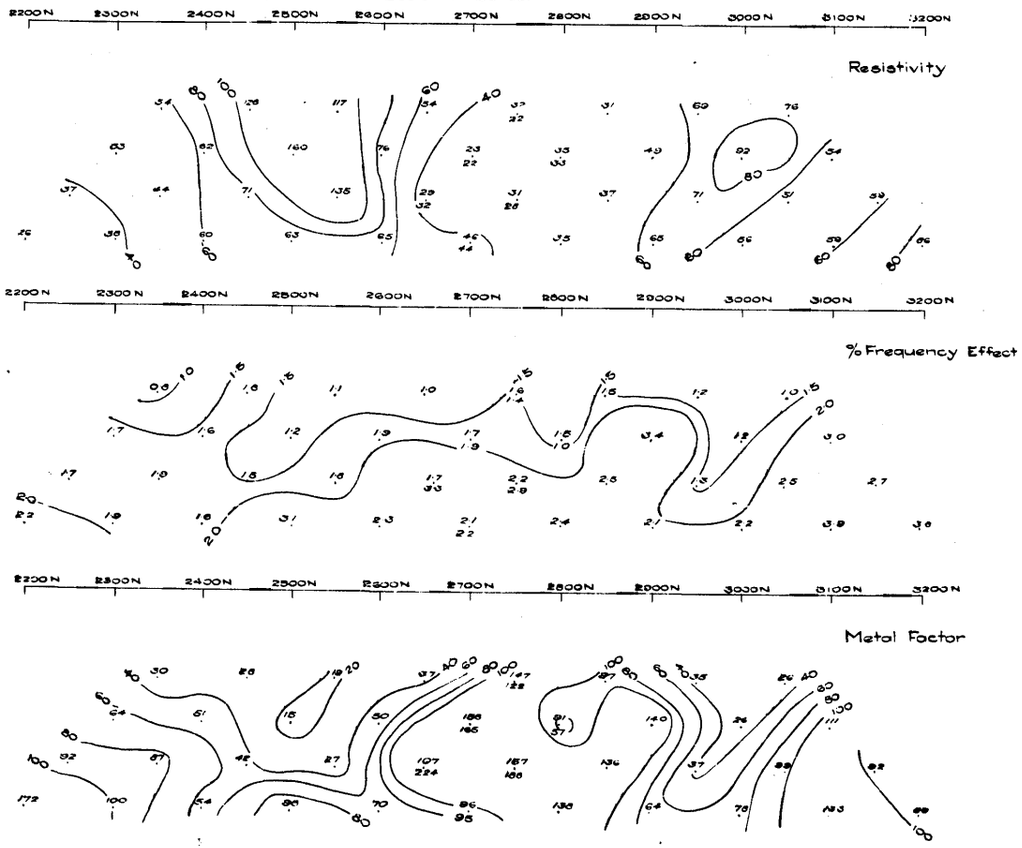
LINE 800W

Scale : 1" = 200 feet



LINE 3200W (AFTER RAIN)

Scale : 1" = 100 feet



DEPARTMENT OF MINES — SOUTH AUSTRALIA			
MT. COFFIN DIAPIR LINES 800W, 3200W, 4000W CONTOURS OF RESISTIVITY, % FREQUENCY EFFECT AND METAL FACTOR			
EXPLORATION GEOPHYSICS SECTION	GEOPHYSICIST	Drn. D.M.P.	SCALE: As Shown
		Tcd. A.M.C.D.	67-727 Cc
		Chd. L.V.W.	
Director of Mines	SEN GEOLOGIST	Exd.	DATE: 23-10-67