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PROGRESS REPORTS TO LICENCE EXPIRY/RENEWAL, FOR THE PERIOD 6/7/1973 TO 5/7/1975

Submitted by
South Australia. Director of Mines
1975

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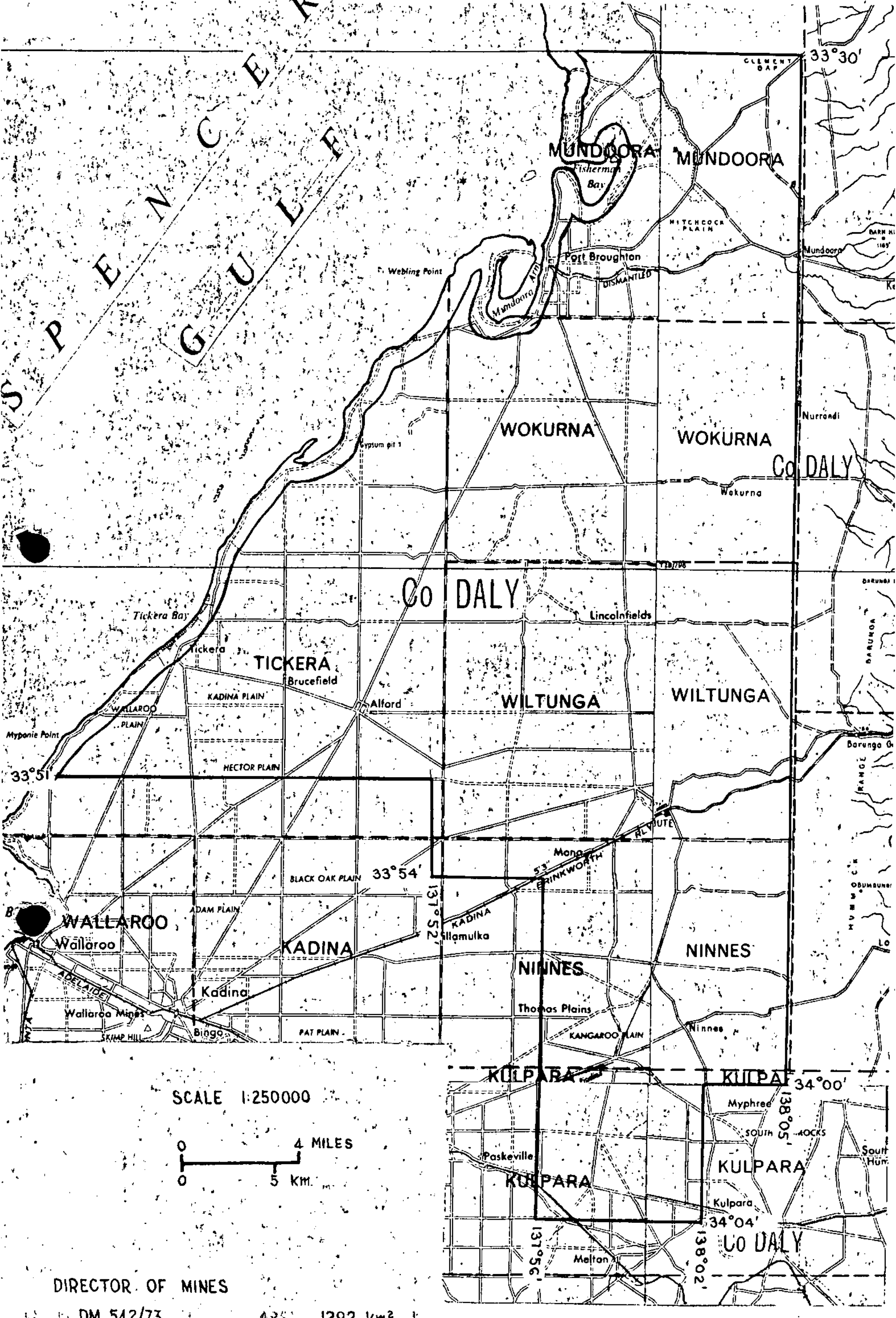

DIRECTOR OF MINES

DM 542/73 AR... 1282 km²

PLANS WHYALLA BURRA
MAITLAND ADELAIDE

BUTE AREA — APPROX. 20 km. NE OF WALLAROO

EL. No. 75 EXRIRY 5·7·75

DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOPHYSICAL INVESTIGATION OF THE TICKERA ALFORD - PORT BROUGHTON AREA

in Wallaroo and Broughton 1:63 360 sheet areas.

by.

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Rept.Bk.No.		74/~~463~~ 164
G.S.	No.	5482
D.M.	No.	195/74

14th August, 1974

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TICKERA REGION

GEOPHYSICAL INVESTIGATION OF THE TICKERA-ALFORD-PORT BROUGHTON AREA in Wallaroo and Broughton 1:63 360 sheet areas

ABSTRACT

The Tickera-Alford-Port Broughton area located in Broughton and Wallaroo is an area of relatively shallow metamorphic rock, covered by a thin veneer of Quarternary and Tertiary sediments, which contain clays and highly saline layers. A systematic quantitative interpretation of Schlumberger Vertical Electrical Soundings was undertaken to delineate areas of high electrical transmissivity and the depth to the resistive basement as a feasibility study for future Electromagnetic and Induced Polarization surveys. A number of areas for future geophysical surveys have been outlined. Incoroporated in the report is an appraisal of previous geophysical data, namely Induced Polarization and Vertical Magnetic Intensity, performed by Western Mining Corporation Ltd. in a relinquished portion of Special Mining. Lease No. 87.

1. INTRODUCTION

The Tickera-Alford-Port Broughton area shown in drawing No. S10352, is a region of shallow metamorphic or granitic basement covered by a thin veneer of Quaternary and Tertiary sediments. The main outcrops of metamorphic basement are restricted to the coastal section, south of Tickera township, see drawing No. 73-709.

The main geophysical problem in this region is caused by the high salinity horizons within the cover rocks, which have caused considerable difficulties for the

Induced Polarization surveys conducted by Western Mining Corporation Ltd. and have caused 'skin effect' experienced by Sheard and Taylor (1973) in the area south of the Port Broughton Aeromagnetic Anomaly.

The Schlumberger, Vertical Electrical Sounding Depth Probes (V.E.S.) arranged approximately on a 2000 yard grid (Military) were undertaken to establish the following:-

(i) The depth and thickness of the low resistivity layers.

(ii) The depth to the top of the weathered metamorphic basement.

(iii) The depth to the high resistive basement, which correlates with either consolidated metamorphic basement or an intermediate consolidated horizon.

(iv) To define the percentage of the area, which is <u>not</u> covered by low resistivity layers, thereby being able to establish the feasibility of conducting an airborne electromagnetic survey.

The V.E.S. survey was carried out between the 16th to the 19th April, 1973 and the 30th April to the 23rd May, 1973.

The interpreted results of the V.E.S. are compared later with the apparent resistivity results interpreted from the Induced Polarization resistivities for a 200 foot dipoledipole configuration, recorded by Western Mining Corporation Ltd. (W.M.C.) in 1964/65.

The W.M.C. Induced Polarization frequency effects and vertical magnetic results were appraised to define possible likely target areas for mineralization investigations.

The area under investigation is shown in drawing No. S10352 and the locations of the V.E.S. for both the Tickera and Port Broughton surveys are shown in drawing No. 73-709, together with the W.M.C. Induced Polarization Coverage. The vertical magnetic coverage and magnetic contours, after W.M.C. are shown in drawing No. 74-247.

2. GEOLOGY

The geology of Wallaroo was compiled from photo interpretation by Crawford (1960) and included some detailed geological mapping of Jack (1917). The most recent compilation of the geology of Broughton is shown in the 1:250 000 preliminary sheet of WHYALLA.

W. McCallum (report in preparation) under the direction of B.P. Thomson remapped the Broughton and Wallaroo sheet areas within the current area of the Exploration Licence Area. The Concurrent subsurface geology after McCallum is shown in drawing No. 73-709.

3. PREVIOUS GEOPHYSICAL SURVEYS

3.1. REGIONAL DATA

A. Aeromagnetic

In 1952, the Bureau of Mineral Resources flew an aeromagnetic survey of Wallaroo at an elevation of 500 feet above ground level (a.g.l.) along lines orientated north-south and spaced 1 mile apart. This latter survey was flown as part of the exploration for iron in the northern portion of Yorke Peninsula. Later, in 1960, the Bureau of Mineral Resources, whilst surveying BURRA and the eastern portion of WHYALLA, reflew Wallaroo, Wells (1962). This survey data was obtained along lines orientated east-west, with a flight line spacing of 1 mile, at an elevation of 500 feet a.g.l.

B. Regional Gravity

In 1967, the Exploration Geophysics Section of the Geological Survey of South Australia conducted a regional gravity survey of BURRA and the eastern portion of WHYALLA, with a station density of approximately 1 station per 16 square miles.

The Bouguer gravity contours in the Tickera area show a distinctive gravity low, probably explained by the presence of the Tickera granite, Jack (1917) intruding the Cleve Metamorphics (?).

The station density of this regional data is unsatisfactory for the exploration and delineation of geophysical structures within an area of shallow metamorphic terrains.

3.2. DETAILED GEOPHYSICAL DATA

A. Vertical Magnetics and Induced Polarization

During the period 1963-1965, Western Mining Corporation Ltd. (W.M.C.) undertook reconnaissance vertical magnetic and Induced Polarization surveys of the whole of Special Mining Lease 87. These reconnaissance surveys consisted of a number of lines orientated north-south, approximately ½ mile apart. The geophysical coverage of this geophysical data is shown in drawing Nos. 74-247 and 73-709, for the Magnetic and Induced Polarization data respectively. The vertical magnetic intensity contours after W.M.C. are shown in drawing No. 74-247.

Details of the geophysical data of this area is tabulated below for both the Magnetics and Induced Polarization.

	MAGNETICS	INDUCED POLARIZATION
Number of Lines	38	16
Station Interval	300 feet	200 feet (dipole-dipole)
Total Mileage Covered	221.72 miles	72.23 miles
	(384.1 km)	(125.13 km)

Approximate Area Covered 78.0 square miles.

A reinterpretation of this data is given later in this report.

B. Electrical Vertical Soundings

In December 1972, the Exploration Geophysics Section of the South Australian Geological Survey undertook a resistivity survey of the Port Broughton Aeromagnetic Anomaly, Sheard (1973) unpublished report. This survey consisted of 24 V.E.S. of which 50% are unsatisfactory for depth interpretation due to:

(a) The skin effect produced by highly conductive overburden for a frequency of 3 Hertz; and

(b) the comparatively small current electrode half spacings AB/2 distance used.

The remaining V.E.S. using frequencies of 0.3 and 0.1 Hertz, have been reinterpreted and are incorporated in this report.

4. REINTERPRETATION OF PREVIOUS GEOPHYSICAL DATA

The reinterpretation of the previous geophysical data is restricted to the reconnaissance Induced Polarization and Vertical Magnetic Traverses surveyed by Western Mining Corporation Ltd. in the Tickera area, located immediately north of Exploration Licence No. 32 held by North Broken Hill Pty. Ltd.

4-1.1. Induced Polarization Traverse Data

The I.P. data available from the W.M.C. reconnaissance traverses is in the form of diagonal plotted pseudo-sections of the apparent resistivity, metal factors, and uncontoured frequency effect data, for a dipole-dipole configuration. The dipole spacing 'a' used was 200 feet, for n=1, and 2 and 3, where 'na' is the smallest distance between the transmitting and receiving dipoles.

Line profiles of apparent resisitivity and percentage frequency effect were replotted with respectively logarithmic and linear scales for the vertical axis for the condition where the number of dipole separations (n) = 3 for each traverse.

A value of n = 3, was chosen to minimize local variations of the upper cover rocks presenting an apparent depth of penetration of approximately 400 feet (122 m) for the pseudosections. The apparent resistivity at this depth should reflect:

(a) the regional scale undulations of the bedrock surface probably filled with saline material, and

(b) lithological changes within the basement.

The frequency results should reflect broad lithological units and possible local frequency effects worthy of reinvestigation.

The interpretation of the profile data of the apparent resistivity and frequency effect will be discussed below.

4.1-2 Apparent Resistivity Data

The inspection of the apparent resistivity logarithmic-linear plots of each traverse showed a considerable amount of high frequency noise, due to statistically distributed reading errors or surface geological noise. The latter is produced by either the positions of the dipole electrodes with respect to lateral changes in resistivity of near surface bedrock, or, rapid changes in depth of overburden, as shown by Van Nostrend et. al., (1966)

This profile data was smoothed and contour intervals of 10, 20, 50, 75 and 100 ohm metres were selected for the convenience of compiling a contour map of the area, shown in drawing No. 73-710.

The areas showing resistivities of less than 20 ohm metres are considered to be probably areas of deep overburden containing saline layers. The areas with apparent resistivity of 20 to 50 ohm metres are considered to represent areas with either thin saline layers or low resistive basement. The areas indicated as greater than 50 ohm metres probably correlate with either basement highs or areas of high resistive basement.

4.1-3 Percentage Frequency Effect Data

The inspection of the percentage frequency effect of each traverse showed a considerable amount of statistical and geological noise. The major frequency effects were located at the northern ends of the eastern lines and occurred probably due to electromagnetic coupling. Other frequency effects were also present, and it was considered necessary to estimate their degree of significance with respect to the surrounding noise level, and to relate these anomaly values with the magnetic and resistivity data.

Frequency effects were first classified on whether they were statistically significant considering the magnitude of local statistical noise envelopes. This principle has been applied to outboard radiometrics in Western Australia, Tipper and Gerdes (1971).

Significant I.P. anomalies shown in drawing No. 73-708 were classified into four types, based on their correlation with the magnetics and apparent resistivities, shown below:

INDUCED POLARIZATION ANOMALY TYPE

TYPE	COMMENTS AND CLASSIFICATION
A	I.P. anomaly associated with a magnetic peak.
B	I.P. anomaly located on the flank of a magnetic anomaly.
C	I.P. anomaly associated with a low resistivity anomaly.
D	I.P. anomaly possibly associated with a man-made feature.

The type A, I.P. anomaly associated with a magnetic feature has been known to correlate with graphite and magnetite in the area south of this region.

The type B, I.P. anomaly may correlate to graphite, but has been known to correlate with amphibolites in this region.

The type C, I.P. anomaly may be explained by saline layers but should not be discounted as a possible zone of mineralization.

The type D, I.P. anomaly has been found in this area to relate to water mains and pipes, and high tension power lines, the latter being located just south of Alford. It is interesting to note, that the I.P. effect of the water pipe along the southern boundary of the survey area is intermittent, and similarly those located on the Tickera-Wallaroo road. The larger frequency effects should be resurveyed to verify the existence and non existence of I.P. effects associated with these water pipes.

The frequency anomalies of importance are generally of type B and perhaps of type A.

4.2. VERTICAL MAGNETIC INTENSITY TRAVERSE DATA

The profiles of the vertical magnetic intensity traverse data were plotted on an extended sheet, shown in drawing No. 74-107, for better resolution. Original data contoured at an interval of 250 gammas, by W.M.C. is shown in drawing No. 74-247, and indicates some false trend directions.

An inspection of these profiles showed that it was very difficult to establish definite trends, as this data was considerably noisy.

The method adopted was to subdivide the data into magnetic zone types shown in drawing No. 74-454, and these zone types would define the overall grain of the basement rocks.

The Magnetic Zones and their significance

The magnetic zone boundaries were located at the position of the outermost inflexion point of a set of magnetic anomalies with most, but not necessarily all, of the anomalies in any zone being of that type. The zone type classification and anomaly characterisitic are given in table 1.

TABLE 1

Zone type	Amplitude Range	Characteristic
1	less than 50 gammas	Poor Linearity
2	50 to 200 gammas	" "
3	200 to 300 gammas	" "
4	300 to 500 gammas	" "
5	500 to 750 gammas	" "
6	750 to 1000 gammas	" "
7	1000 to 2000 gammas	" "
8	greater than 2000 gammas	" "

Type 1-zones are interpreted as being either non-ferruginous metasedimentary rocks or near homogenous acidic igneous and/or gneissic masses. Included in this zone type are areas of possible relatively deep basins i.e. up to 300 m deep filled with Tertiary and Quaternary sediments.

<u>Type 2 - zones</u> are interpreted as being slightly more magnetic than type 1 zones and correlate with the so called 'Tickera granite'.

<u>Type 3 - zones</u> are considered as being areas of weakly magnetic sediments and 'intermediate' type gneisses and schists. <u>The zone type 4</u> is slightly more magnetic than type 3 zones.

<u>Types 5 and 6 zones</u> are considered as being areas of magnetic metasediments, and meta-basic rocks.

<u>Types 7 and 8 zones</u> are interpreted to correlate with iron rich metasediments and/or iron rock meta-basics.

The zone types 6 and 7 in the southwestern corner are considered to correlate with hornblende schists and hornblende graphite schist. The zone type 8 located in the north of the area correlates with a magnetite - quartz rich rock, assumed rock source of the Port Broughton Aeromagnetic Anomaly.

5. SURVEY PROCEDURES FOR THE VERTICAL ELECTRICAL SOUNDINGS

The electrical resistivity method adopted for this investigation was the Schlumberger electrode configuration for the vertical electrical sounding (V.E.S.). This system consists of four electrode positions placed in a line and located symmetrically about a centre point. The current, generated by the Landrover, and modified by the Geoscience Induced Polarization, Lower Power Transmitter, operating at 3, 0.3, 0.1 Hertz, was passed into the ground by means of the outer electrodes A and B. The 0.3 and 0.1 Hertz were used to overcome the 'skin effect' caused by a low resistivity layer.

The resulting voltage was measured by a McPhar P660 Induced Polarization Receiver between the two inner potential electrodes M and N.

The field data for the Schlumberger V.E.S. had the electrodes spaced so that the distance between the two centre potential electrodes MN/2 is less than 20% the distance the outer current electrode pair AB/2. For the V.E.S. the outer current electrodes are progressively moved farther away from the centre, whilst the inner potential electrodes are moved only when the voltage between them becomes small. The electrode half spacings for the potential electrodes MN/2 and current electrodes AB/2 are given in Gerdes et.al.,(1973).

6. REDUCTION AND METHOD OF INTERPRETATION OF THE V.E.S. DATA

The apparent resistivity for each particular electrode spacing was calculated, based on the formula for the Schlumberger configuration, shown in drawing No. S 9364. The apparent resistivity in ohm metres was plotted on bilogarithmic graph paper as a function of half the current electrode spacing AB/2 (in metres). Each curve was then interpreted by a curve matching of the Standard 2 and 3 layer master curves prepared by Orellana and Mooney (1966), using the Auxillary Point Method, advocated by Zohdy (1965). The latter method permits a substantial reduction in the required number of master curves.

The interpreted model, assuming horizontal homogeneous and isotropic layers consisting of layer thickness and resistivities, were subjected to a computer programme called AUTORESCUR developed by G. Pilkington (Mathematical Geophysicist) in Fortran 4. This produced better thickness and resistivity values for the particular layers of the specified model. A better solution was obtained for approximately 60% of the V.E.S. It was found for the remaining 40% the major draw back of AUTORESCUR was that for steeply descending curves interpreted as double descending Q types curves, the computer results were unable to improve the solution. In this case, the computer solution was unsatisfactory, and the original model was in most cases a better fit, when the RESCUR plots were compared with the field curve.

In general, the AUTORESCUR programme is unable to accommodate resistivity contrasts greater than 200:1.

The models of the AUTORESCUR results and some original models were then processed using another computer programme called RESCUR, also developed by the above, in Fortran 4; see Pilkington (1973) for details of programme. The results from this programme enabled a direct comparison of the interpreted theoretical model curve to be compared with the field curve.

7. INTERPRETATION OF THE V.E.S. RESULTS

The interpretation of the V.E.S. assumes that the layers can be represented by a series of homogeneous horizontal layers. Small dip components up to 15 degrees, can be considered to approximate the horizontal layers if the sub-surface of the dipping bed is planar, for the case of a schlumberger spread orientated parallel to strike. The apparent resistivity curve for the spread orientated normal to the dipping interface would produce a steeper curve, and be discontinuous as the electrodes crossed the surface interaction, see Kunetz (1966).

If the interface were buried, the apparent resistivity curve might show a slight irregularity, which would be considered as a lateral effect.

The interpreted results for all the V.E.S. are shown in drawing No. 74-458, and the pseudo-geological vertical sections are shown in drawing No. 74-451. The significance of the layers in the pseudo-sections is unknown at present, as no drill hole data is available in this area for a direct comparison of these layers with geological units or resistivity logs. It may be possible after a number of drill holes have been drilled and geophysically logged, to revise these interpretations based on the principle of equivalence (Kunetz, (1966)), to obtain a better understanding of the subsurface geology.

The interpretation procedures adopted for this area are as follows:-

1. To estimate the depth to fresh (unweathered basement), which is represented by the high resistive basement.
2. To estimate the ease which surface currents can flow above the infinite basement. This is represented by the Total Longitudinal Conductance of the layers above this basement. A thin conductor restricts the current flow, whereas thick conductors spread the current flow.
3. To estimate the possible depths to the top of the weathered basement and the variation in thickness of this horizon, and, to indicate conductive layers within this composite layer.
4. To estimate the conductance of the near surface saline or clay layers.

7.1. RESISTIVITY BASEMENT

In terms of resistivity, the infinite resistivity basement can be considered as a well cemented formation with approximately zero porosity and permeability to aqueous solutions. In the present, area of investigation, this may be considered geologically as unweathered 'Cleve Metamorphics' or possibly overlying Upper Proterozoic Rocks, i.e. Shelf Adelaidean.

Of the 105 V.E.S. interpreted from the Port Broughton and Tickera data, 74% were interpreted as being terminated a high resistivity layer. This layer can be assumed relative to the previous layer to have a minimum resistivity contrast of 40 times, and have a thickness at least three times the depth to its top surface i.e. a transmissivity of 120 ~~ohms~~ SIEMENS, based on the two layer curves of Orellina and Mooney (1966). For the case stated, if the current electrode half distance AB/2 exceeds the above thickness ratio, then the apparent resistivity curve departs from the 45° asymptote, and becomes asymptotic to the true resistivity of that layer. In this survey, it was considered that for practical purposes half the current electrode AB/2 distance of the V.E.S. should not exceed 500 metres, as depths greater than these would not be economic for investigations of basement mineralization.

The interpreted final layer resistivity for the remaining 26% (i.e. 27) of the V.E.S. showed resistivities ranging from 4 to 760 ohm metres

The overall mean and standard deviation of these values were 187 and 184.2 ohm metres respectively. It was considered that the distribution represents two populations, the lower one, assumed to be less than 100 ohm metres, correlating with weathered basement and the other fresh basement. The parameters of these two groups are in Table 2 below.

TABLE 2

RESISTIVITY (IN OHM METRES)

RESISTIVITY BASEMENT TYPE	NO.OF INTERPRETED VALUES	RANGE	MEAN	STANDARD DEVIATION	RANGE FOR 84% CONFIDENCE LIMITS (mean + S.D.)
Weathered Basement	12	4 to 98	52	32	20 to 84
Fresh Basement	15	102 to 760	296	184	112 to 480

The purpose of the discussion of Table 2 was to estimate a possible range of resistivities for weathered basement, as there is no drill hole information available in this area.

7. 1.2. CONTOURS OF RESISTIVITY BASEMENT

The contours of the depth to the resistive basement are shown in drawing No. 74-268. This is a composite, complied from the depth to the infinite resistive layer and the depth to the final finite resistive layers. The latter was assumed to be representative of the basement. The results show that the top of this horizon is very irregular, and may reflect either old topographic features or different rates of erosion, which in turn reflect differences in basement lithology.

7.2. TOTAL LONGITUDINAL CONDUCTANCE

The longitudinal conductance (S) in metres/ohm metre of any layer having a thickness Ei (in metres) and a resistivity Ri (in ohm metres) is defined as the ratio of the thickness to the resistivity of the ith. layer is given by Si = Ei/Ri.

Then the total conductance of a series of layers is given by the sum of these ratios.

$$\text{i.e. } S_T = \sum_{i=1}^{m} Ei/Ri.$$

In the case of an infinite resistive final layer in a series of horizontal layers, the rise of the curve is asymptotic to a 45 degree line. An estimate of the total conductance af all the layers can be determined by the ratio of the abscissa reading to the ordinate reading at the point on the line corresponding to the apparent resistivity value of unity.

The total conductance was estimated by the above method for the infinite layer case, and the total conductance for a finite resistivity last layer was determined as the sum of conductances using the interpreted results.

The contours of the total longitudinal conductance is shown in drawing No. 74-248. The areas of low overall conductance, located south of Tickera township and south-west of Alford, indicates thin saline areas of very shallow basement. The area in the north, however, having total conductance ranging from 40 to 320 metres per ohm metre indicates a region of highly conductive material, which probably correlates with an area of salt water incursion. The remaining area indicates irregularities in total conductance values, and regional increase towards the northwest.

The interpreted anomalous frequency, I.P. effects, shown in drawing No. 73-708 suggested for further investigations occur in the areas of low conductivity, except for those located to the north and northwest of Alford. The latter is in the area of an older copper prospect, see drawing No. 73-709.

7.3. WEATHERED RESISTIVITY BASEMENT

The resistivity values estimated above for the 84% confidence limit, Table 2 range from 20 to 84 ohm metres for an assumed normal distribution. These values compare with those interpreted from known shallow basement areas, south of Tickera township. Therefore, if the layer above the resistivity basement falls within the range greater than 20 ohm metres, it is assumed that this layer is weathered basement. However Gemco drilling AH6, near VES 26 by Sibenaler (1974) intersected quartz, mica and weathered felspar? at 1.9 m, which indicated that the weathered basement could be compared with resistivity values as low as 15.5 ohm metres.

It must be noted, that geologically the top of the weathered basement is very ill defined, as most of the area is covered by a red clay or red sandy clay. Firman (pers. comm.), considered that this clay horizon in the Bute area, is purely an in-situ weathering product of the underlying basement, as it contains considerable relic features of the basement. It is probable that the same situation occurs in this area. The clay horizon has been sampled geochemically to define the geochemical basement, by J. Lynch, Chief Geologist of North Broken Hill Pty. Ltd. at Moonta. This geochemical basement occurs within this oxidized and weathered clay layer. The depth of weathering recorded in the drill holes at Kadina, extends to a depth of a few hundred metres. Therefore, using the following criteria a hypothesis for the weathered basement is tentatively defined.

1. The resistive weathered basement, has value greater than 20 ohm metres and generally occurs above the infinite basement.
2. In conductive environments, the final upturn or rising branch of the apparent resistivity curve generally with a slope of less than 45 degrees, was considered as a significant resistivity change, to represent the possible top of weathered basement. The shape of this curve may have been interpreted by either an 'A' or 'K' type curves.

The contours of the depth to the top of this interpreted weathered unit is shown in drawing No. 74-452. This in turn corresponds to the depth to the base of the low resistivity zone.

The area confined by the 30 metres contour can be considered as relatively shallow. The isopachs contours of the interpreted thickness of this weathered zone are shown in drawing No. 74-457. The shaded areas in this plan are areas, in which the thickness of weathered zone is unknown, as it was not possible to resolve the weathered material in the V.E.S. The contours of the Transverse Resistance of the interpreted weathered layer shown in drawing No. 74-456, indicate areas of high resistance, i.e. grater than 1 000 ohm metre^2, and the areas of low resistances, i.e. less than 250 ohm metre^2. Some of these areas correlate with weathered basement clay, in the neighbourhood south of Alford.

7.4.1. LOW RESISTIVITY LAYERS

The low resistivity layers were considered to be saline if the resistivities were less than 5 ohm metres. However the Gemco drilling, Sibenaler (1974) (DM 195/74) near V.E.S. Nos. 31 and in the neighbourhood of Alford, A.H. 1 near V.E.S. 66; AH 2 at VES 31; and AH 3, near VES 64 showed a thick sequence of red clays and sandy clays, which correspond to resistivities given below.

GEMCO DRILL HOLE NO.	DEPTH OF DRILL HOLE	RESISTIVITY VALUES OF CLAY (IN OHM METRES)
AH. 1	6.8 m	3.6 to 6.2
AH. 2	9.3 m	1.8 to 9.1

Results of the overburden rocks from an auger hole near AH1, drilled by North Broken Hill, Lynch (pers. comm.), showed that the clay extended down to approximately 30 metres, and by comparing this with the results of the first

30 m in VES 66, indicates that the clay can have resistivity of 3.66 ohm. Therefore as the clay has resistivities between 1.8 to 9.1 ohm metres, it is relatively impossible to distinguish between saline layers and clay in this resistivity range.

7.4.2. TOTAL CONDUCTANCE OF THE SALINE LAYER ABOVE THE INTERPRETED WEATHERED BASEMENT

The sum of the individual conductances of the layers above the interpreted weathered basement are shown in drawing No. 74-453. These contours indicate conductive rocks in the areas, east of Alford near Peela Weela Bore; in the vicinity of VES BP 13; and in the large region in the north of the survey area. The contours of the depth to the top of interpreted weathered basement drawing No. 74-452 shows that these areas already mentioned above, have thick saline deposits.

8. THE FEASIBILITY OF FUTURE INDUCED POLARIZATION AND ELECTROMAGNETIC METHODS BEING USED IN THE TICKERA AREA

The major problem with this area is the relatively thick cover of saline layers, highly conductive clays and the relatively deep high resistivity basement as can be seen in drawing Nos. 74-248 and 74-268. For the investigation of sulphides within the high resistivity basement, equipment will be required which can be used to separate the source signal from the induced coupling. This can be obtained by using the new time domain I.P. equipment, equivalent to the McPhar Multi-Mode system, which uses a mean stacking process to obtain a representative phase values in the areas of high noise level. A number of phase-shifts can be recorded.

In the V.E.S. the AB/2 distance where the inductive coupling became significant was seen by the separation of the apparent resistivity curves for frequencies of 3 and 0.3 hz for each probe, and the half current electrode distance AB/2 (in metres) were recorded and compared with the interpreted depths results. The areas shown in drawing No. 74-455 indicate areas of strong electromagnetic coupling before the basement is reached. Therefore I.P. is not recommended to be undertaken in these areas.

8.1. EXPECTED I.P. RESPONSE IN THE TICKERA AREA

The main type of mineralized zone in this region is a vien. Geophysically this can be represented by a thin vertical sheet of infinite vertical and lateral extent, i.e. dyke.

EXPECTED SURFACE FREQUENCY EFFECT RESPONSE OF A MINERALISED DYKE.

Approximate frequency effect responses to outcropping and buried dykes can be predicted using data produced by Geoscience Inc. theoretical curves. The measured frequency effect depends on the following ratios;

(1) Dipole spacing to dyke width.

(2) Overburden resistivity to basement resistivity.

(3) Overburden resistivity to dyke resistivity.

(4) Dipole spacing to overburden thickness.

and (5) the true frequency effect of the dyke.

It is thus necessary to specify these parameters in any representative model. Using the parameters applicable to the Tickera area; Table 3 has been constructed illustrating the resulting surface frequency effects with varying overburden, thickness and differing overburden resistivities.

The results are represented in terms of the dipole spacing (a) and at n = 4.

In the model, it is assumed that the resistivity ratio of the overburden to basement is 1:10, and that the dyke has a true frequency effect of 25%. The model and its parameters are shown in drawing No. S 10933.

The independent parameters (i.e. a, and n) are assumed to represent the range of values, which would give optimum frequency effect values.

The frequency effect is defined as the difference of resistivity measured at two frequencies, i.e. 3 and 0.3 hz. In this report the change in frequency response is given as the difference in frequency effect recorded for two different overburden resistivities with other factors remaining constant.

Table 3, shows that the change in frequency response decreases by 25% as the resistivity of the overburden decreases from 10 ohm metre to 5 ohm metre. Further extrapolation to say, 1 ohm metre overburden material is not considered to be justified as the frequency effect would be very small.

The former implies, that by using an I.P. dipole spacing approximately equal to the interpreted depth to the resistive basement based on the VES data; it is possible to resolve a thin vein of width a/3 at a depth equal to the dipole spacing at n = 4. Thinner bodies will not be resolved. For wider models, the I.P. response is larger and more persistent.

In the case of finite bodies having a square cross section 'a', where 'a' is the width and depth of body, the source is resolvable, if the overburden thickness is less than, or equal to, 'a'. If the overburden thickness is greater than the width of the body, then source will not be clearly resolved.

TABLE 3

Expected frequency effect for different resistivity surface layers.

EXPECTED FREQUENCY EFFECT

Overburden Thickness	Overburden Resistivity	10 ohm metre	5 ohm m
a/3		8%	6%
a		3.5%	2.6%
2a		2%	1.5%

8.2. Electromagnetic Response in the Tickera Area

In considering, the electromagnetic response in the Tickera area, we can assume that the effective depth of penetration is twice the skin depth for a particular frequency.

The skin depth (s) equals $\left\{\frac{2R}{Wu}\right\}^{1/2}$

where R = resistivity (in ohm metres)

$W = 2\pi f$, where f is the frequency

$u = 4\pi \times 10^{-7}$

i.e. the skin depth $S = 503.8 \left(\frac{R}{f}\right)^{1/2}$

The presence of both saline and clay layers, representing conductive overburden have resistivities ranging between 1.8 to 9.1 ohm metres. The skin depth for the V.L.F. - EM frequency of 22.3 KHz ranges between 4.5 to 10.2 metres. In areas of lower resistivities, i.e. due to salt, having resistivities of less than 1 ohm metre the effective depth of penetration is 3.27 m. These depths of basement for VLF - EM frequencies is unsatisfactory, except in areas of resistive overburden.

The two other electromagnetic systems held by the section, are the McPhar Dual frequency R.E.M. system and the Turam E.M. system which operate at the following frequencies 1000 and 5000 hz, and 660 and 220 hz respectively. The skin depths for these frequencies for particular resistivities can be seen on (drawing No. 74-328) the monograph of skin depth versa frequency. It can be seen that the skin depth for the above measured frequencies for 1 ohm metre material are small compared with the skin depth estimate for the low frequencies of 3, 0.3. and 0.1 hz used for the V.E.S., which are 293 m, 928 m and 1607 m respectively.

If we consider using the Turam system, using both frequencies, the skin depth for 2 ohm metre material is 29 m and 50 m respectively i.e. the original signal has been reduced to 1/e of the amplitude i.e. 30% of the original amplitude. The depth of penetration for this low resistivity materials is at the most 60 to 100 m for the two specified frequencies. In this case the amplitude is only 10% of the original signal.

It is considered that the Turam system shouldbbe used in areas, where the total conductance is less than 25 metres per ohm metre for any success of this EM system using 220 hz. This area is shown in drawing No. 74-248. If 440 hz is all that can be obtained using 400 cycle I.P. supply generator. The areas to be investigated should have a total conductance of less than 18 metres per ohm metre.

9. CONCLUSIONS

The qualitative interpretation of the vertical magnetic intensity profiles has outlined possible areas of granite or acidic gneiss, other than the so-called Tickera Granite. It is interesting to note that an old copper prospect is reputed to be situated near Tickera township. [redacted].

The re-appraisal of the original induced polarization data has revealed a number of additional frequency effects, which have been classified into a number of types, based on the correlation with apparent resistivity and magnetic data. A number of possibly significant I.P. anomalies for further verification with the new time domain equipment have been outlined, as shown in drawing No. 73-708.

The results of the feasibility study of future Induced Polarization and electromagnetic surveys being undertaken in this area, show that both methods are appropriate, but will have to be undertaken with considerable caution, and in the case of electromagnetic surveys, using a low frequency of the order of 440 hz or less. The areas for these future surveys and areas of relatively shallow depth i.e. 60 metres are outlined in drawing No. 74-455 together with the priority areas.

10. RECOMMENDATIONS

Most of the future geophysical and geochemical surveys will have to be undertaken between the time, when the cereal crops are harvested and sown i.e. from January to May as most of the area is under cultivation. It is recommended that a number of auger holes using the Mayhew drill, be undertaken to obtain geochemical picture of the in-situ clays and samples of bedrock. These drill holes should be geophysically logged to obtain a better understanding of the interpreted resistivity layers. The geochemical data should provide additional target areas for geophysical investigation.

A number of areas where both Turam, and Input E.M. System, and Induced Polarization methods can be used, have been recommended for the future geophysical investigations and are outlined in Drawing No. 74-455.

PRIORITY AREA 1 - This area is relatively shallow and the a number of probable I.P. anomalies are present. In addition some unrecorded copper and gold prospects are said by the locals to exist in the Tickera township area.

PRIORITY AREA 2 - The interpreted area of possible granitic gneiss, based on the magnetic results and the location of some I.P. effects near the location of an old Copper prospect, make this area worthy of further investigation.

PRIORITY AREA 3 - This area contains a magnetic zone type 1, which is comparable with the zone type 1 located south and southeast of Alford, where promising secondary mineralization has been found by a company.

These three areas recommended based on areas for best geophysical results and need not represent the best areas for mineralization. All zone type 1 and 2 areas, should be investigated geochemically especially the areas east of Alford, in areas of conductive overburden.

R.A. GERDES
ASSISTANT SENIOR GEOPHYSICIST
EXPLORATION GEOPHYSICS SECTION

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Geophysics Vol. 30 pp. 644-600

APPENDIX 1

PERSONAL AND SURVEY EQUIPMENT

PERSONNEL

			DATE
R.A. GERDES	ASSISTANT SENIOR GEOPHYSICIST		6.4.73 to 19.5.73
		and	30.4.73 to 23.5.73
W.E. WIGHTMAN	GEOPHYSICIST		6.4.73 to 19.4.73
		and	30.4.73 to 11.5.73
L. WEST	TECHNICAL OFFICER		6.4.73 to 19.4.73
G. GAILBRATH	FIELD ASSISTANT		9.4.73 to 19.4.73
P. TSANAKAS	FIELD ASSISTANT		30.4.73 to 23.5.73
C. MOSKOS	FIELD ASSISTANT		30.4.73 to 23.5.73

SURVEY EQUIPMENT

Geophysical Equipment

Geoscience Induced Polarization Low Power Transmitter

Two McPhar P600/Induced Polarization Receivers

Reels of Wire (i) 4 x 500 metres

(ii) 2 x 50 metres

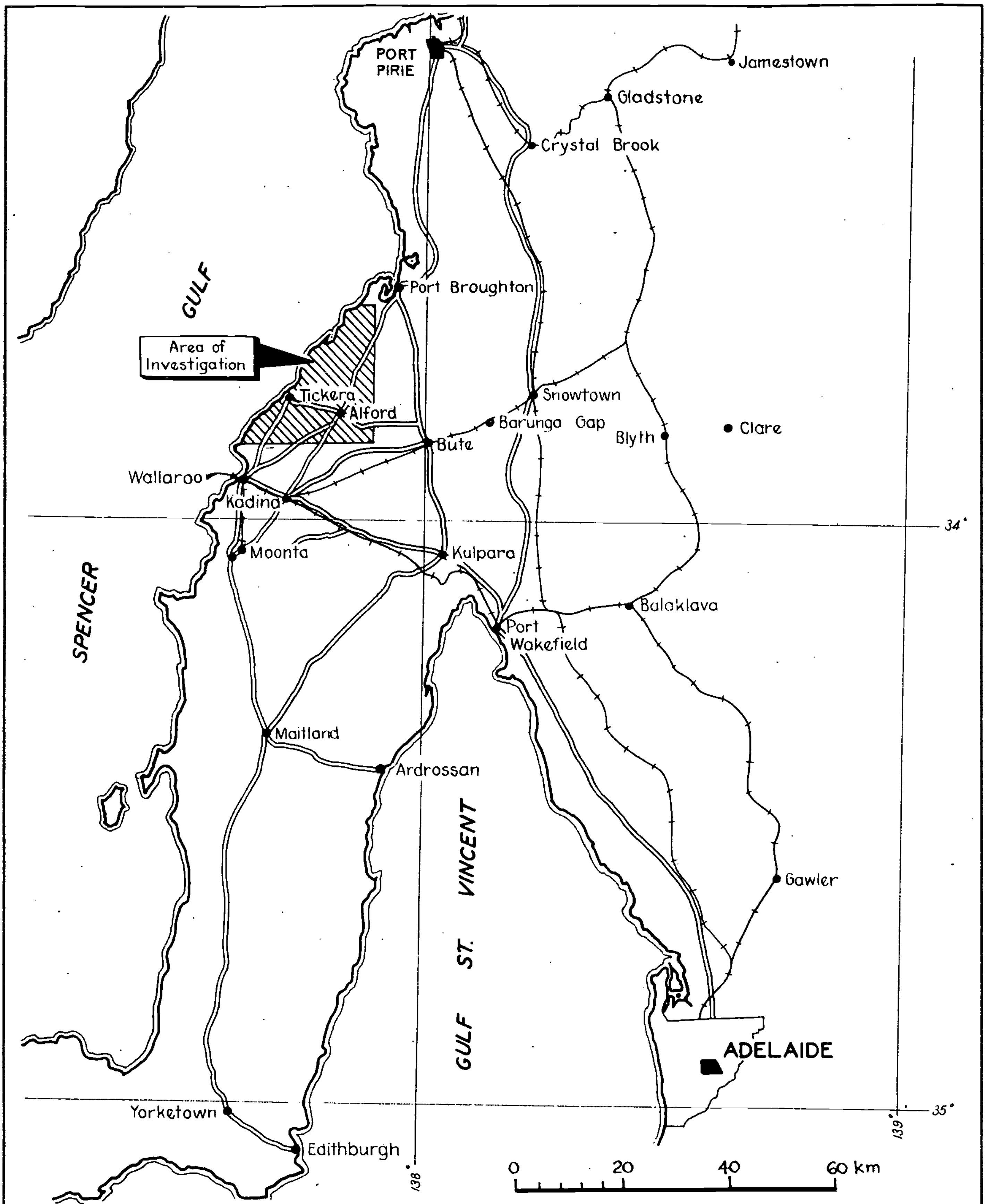
Stakes etc.

Vehicles

Landrover DM. 168 with power take off (to power 115 volts 400 c/s 800W generator)

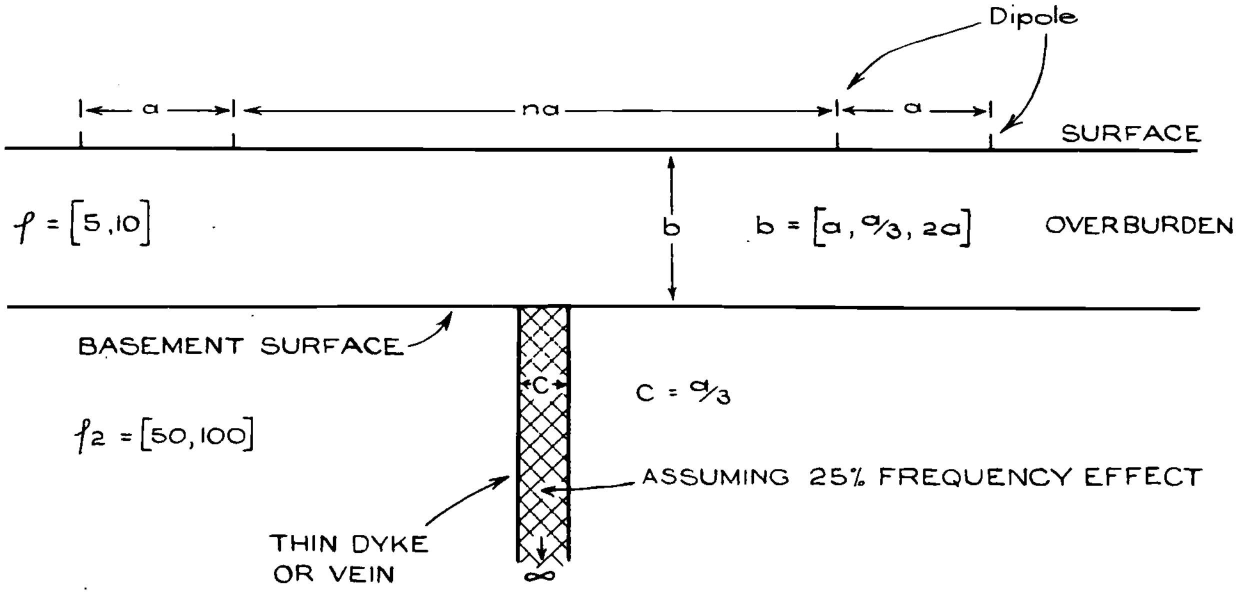
" DM. 25 Flat top

Caravans DM. 39 and 73.



EXPLORATION GEOPHYSICS SECN.	DEPARTMENT OF MINES – SOUTH AUSTRALIA	Scale: 1:1000 000
Compiled: R.A.G	TICKERA AREA GEOPHYSICAL INVESTIGATION LOCALITY PLAN	Date: 6 June 1973
Drn. TJE | Ckd.		Drg. No. S 10352 Gc 13

300–6.72 C5552



$\rho_2/\rho_1 = 10$

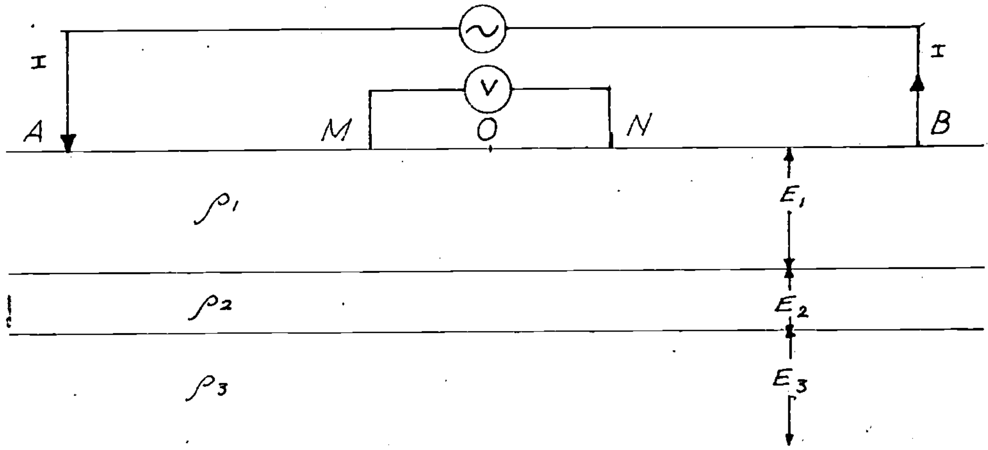
LEGEND

- a = Dipole spacing.
- b = Overburden thickness taken on values a, a/3 and 2a.
- c = Width of dyke or vein. Has width a/3.
- ρ_1 = Resistivity of overburden taken on values 5 and 10 ohm metres.
- ρ_2 = Resistivity of basement taken on values 50 and 100 ohm metres.

DEPARTMENT OF MINES — SOUTH AUSTRALIA

EXPLORATION GEOPHYSICS SECTION	**Drn.** R.A.C.	TICKERA AREA GEOPHYSICAL SURVEY	**SCALE :**
	Tcd. J.W.	DIAGRAM SHOWING THIN DYKE	S10933 Gc 13
R. A. GERDES GEOLOGIST	**Ckd.** A.F.	MODEL FOR INDUCED POLARIZATION	
	Exd.		**DATE :** 31st July 1974

SCHLUMBERGER ARRAY



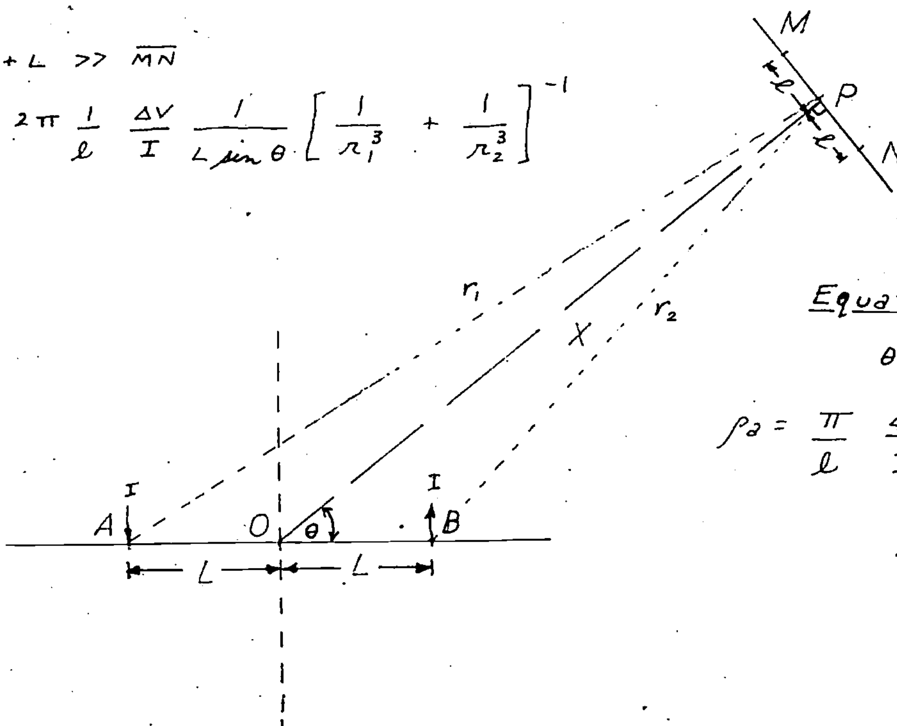
$$AB/2 = L \quad ; \quad L/\overline{MN} > 1{\cdot}5$$

$$\rho_a = \pi \frac{\Delta V}{I} \left[\left(\frac{L}{\overline{MN}} \right)^2 - \frac{1}{4} \right] \overline{MN}$$

AZIMUTHAL DIPOLE ARRAY

$$X + L >> \overline{MN}$$

$$\rho_a \cong 2\pi \frac{1}{\ell} \frac{\Delta V}{I} \frac{1}{L \sin\theta} \left[\frac{1}{r_1^3} + \frac{1}{r_2^3} \right]^{-1}$$



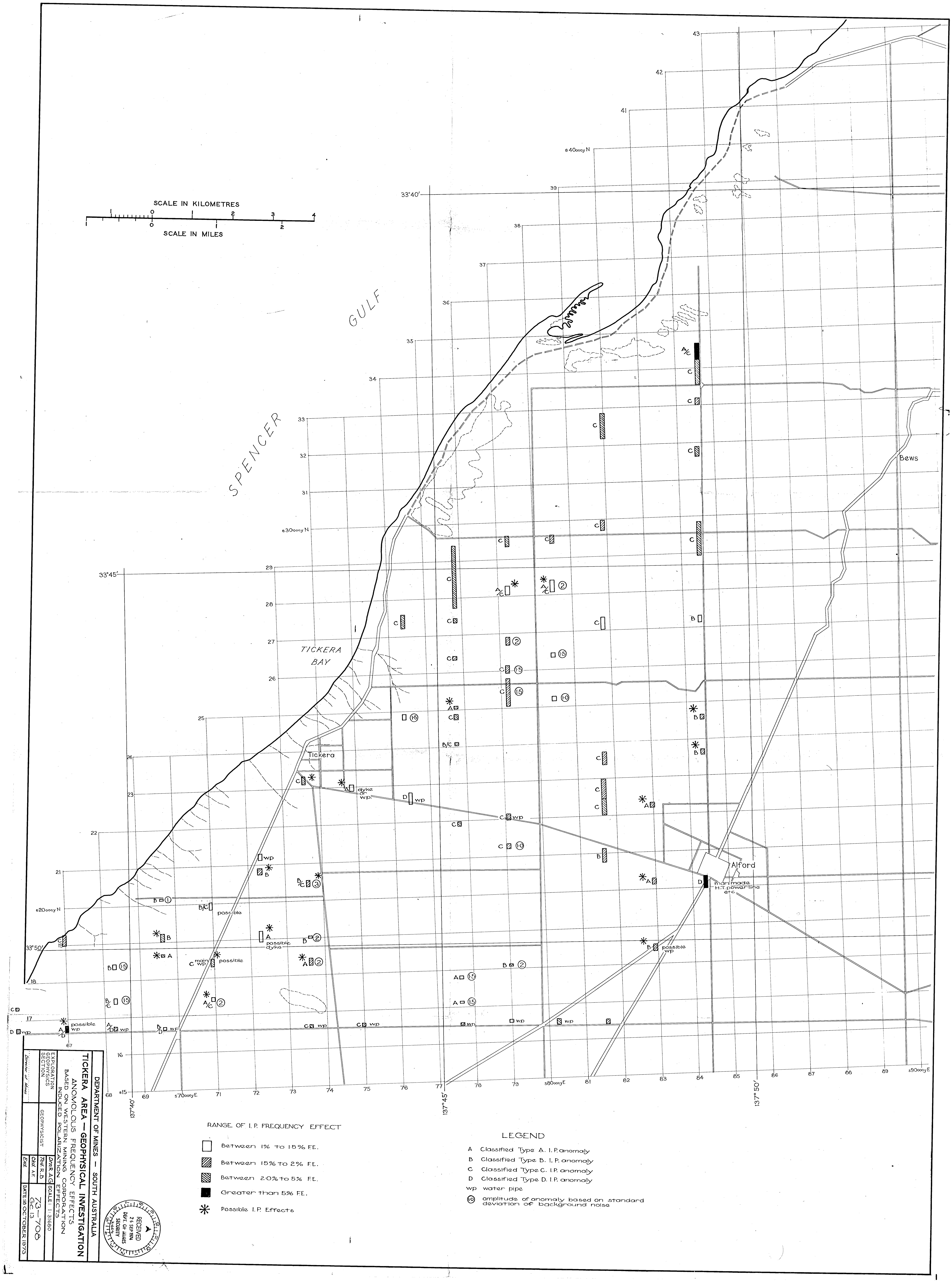
Equatorial case:

$$\theta = 90^\circ$$

$$\rho_a = \frac{\pi}{\ell} \frac{\Delta V}{I} \frac{(X^2 + L^2)^{3/2}}{L}$$

	DEPARTMENT OF MINES — SOUTH AUSTRALIA	Scale:
Compiled: R. G. N.	ELECTRODE ARRAYS.	Date: 26 - 7 - 71.
Drn. | Ckd.		Drg. No. S9364 Fd+1

1M-2,70 A1810


SCALE IN KILOMETRES
SCALE IN MILES
SPENCER GULF
TICKERA BAY
Tickera
Alford
Bews
33°40'
33°45'
33°50'
137°40'
137°45'
137°50'
main made H.T. power line etc.
dyke or wp.
possible dyke
possible
RANGE OF I.P. FREQUENCY EFFECT
Between 1% to 1.5% F.E.
Between 1.5% to 2% F.E.
Between 2.0% to 5% F.E.
Greater than 5% F.E.
Possible I.P. Effects
LEGEND
A Classified Type A. I.P. anomaly
B Classified Type B. I.P. anomaly
C Classified Type C. I.P. anomaly
D Classified Type D. I.P. anomaly
wp water pipe
amplitude of anomaly based on standard deviation of background noise
DEPARTMENT OF MINES — SOUTH AUSTRALIA
TICKERA AREA — GEOPHYSICAL INVESTIGATION
ANOMOLOUS FREQUENCY EFFECTS
BASED ON WESTERN MINING CORPORATION
INDUCED POLARIZATION EFFECTS
EXPLORATION GEOPHYSICS SECTION
GEOPHYSICIST
SCALE: 1:31680
DATE: 16 OCTOBER 1970
73-708
S.G. 13
RECEIVED 25 SEP 1974 DEPT OF MINES SECURITY

DEPARTMENT OF MINES — SOUTH AUSTRALIA

TICKERA AREA — GEOPHYSICAL INVESTIGATION

LOCATION OF V.E.S. SCHLUMBERGER PROBE POSITIONS INDUCED POLARIZATION TRAVERSES AND SURFACE GEOLOGY

EXPLORATION GEOPHYSICS SECTION

Director of Mines

GEOPHYSICIST

Drn. R.A.G. SCALE: 1:31680

Trcd. R.B.

Chd. A.F.

Exd.

73-709

Gc 13

DATE: 16 OCTOBER 1973

RECEIVED 26 SEP 1974 DEPT. OF MINES SECURITY

LEGEND

V.E.S. Schlumberger Probe Positions

T29 Tickera Survey (Orientation indicated by arrows)

PB17 Port Broughton Survey (Sheard & Taylor; Jan'73)

Road

Track

Saltpan or claypan

Creek

LINE 500E 60000N .... I.P. Survey Lines after Western Mining Corporation Ltd. (Plan No. 1010-214)

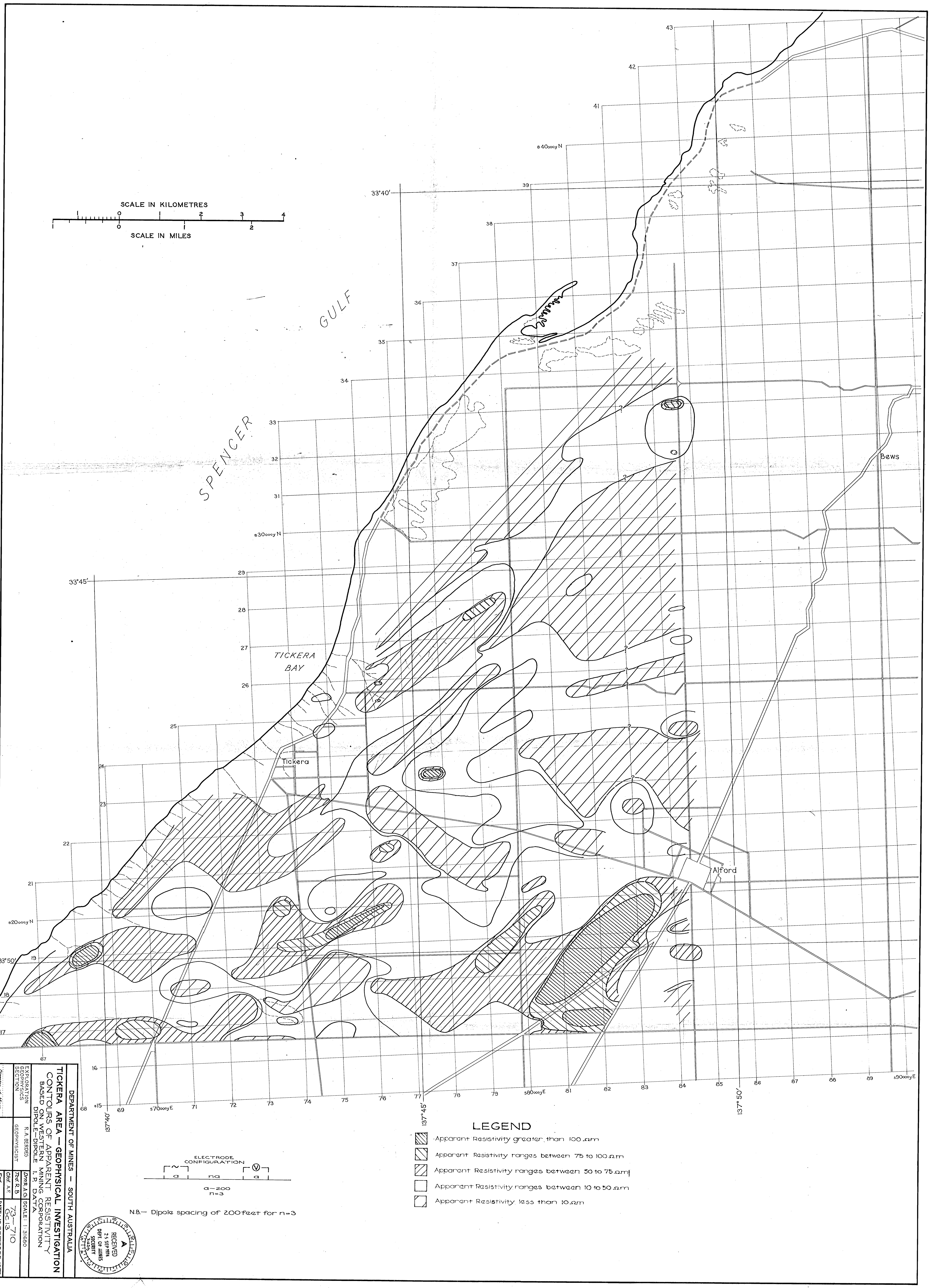
...... Outcrop } Basement Granites McCallum (1973)

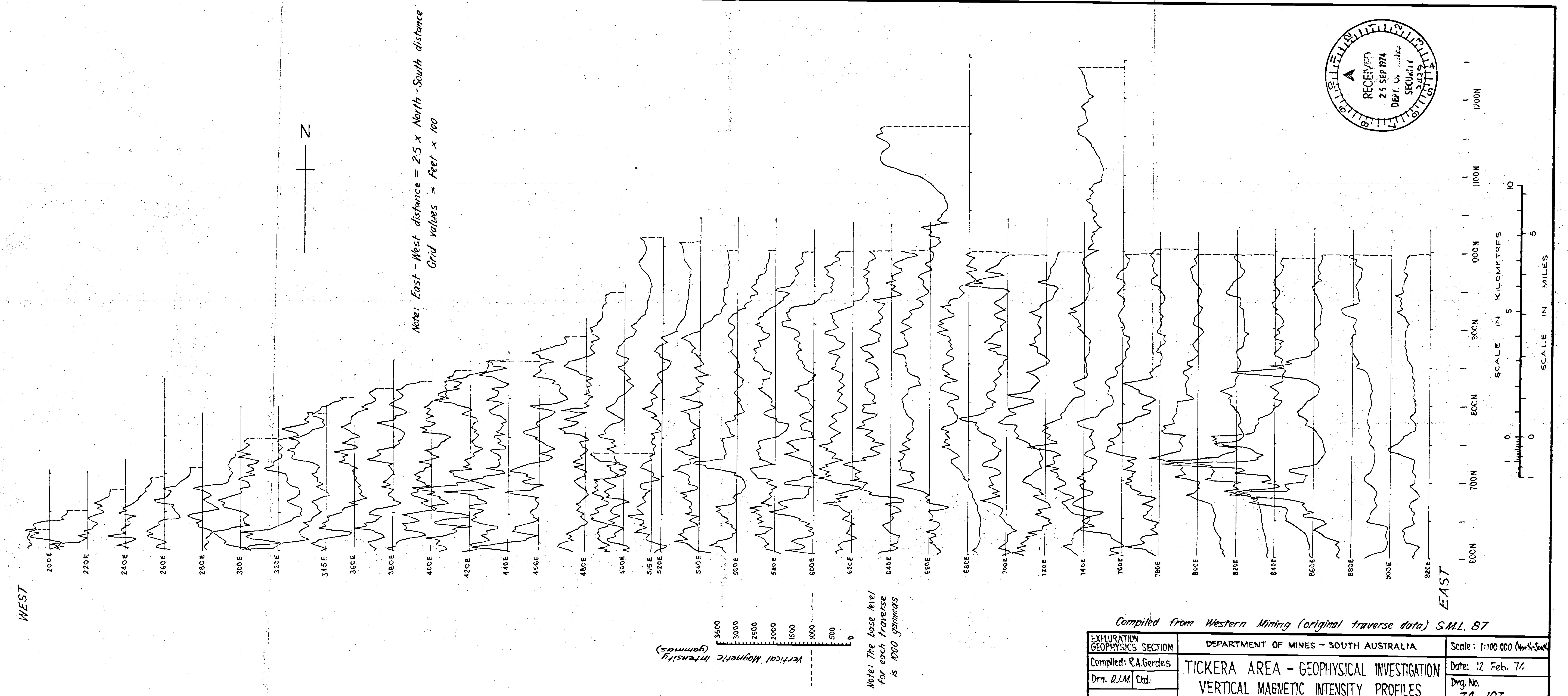
g ...... Float

b ...... Basement metasediments

...... Probable basement, Crawford (1960)

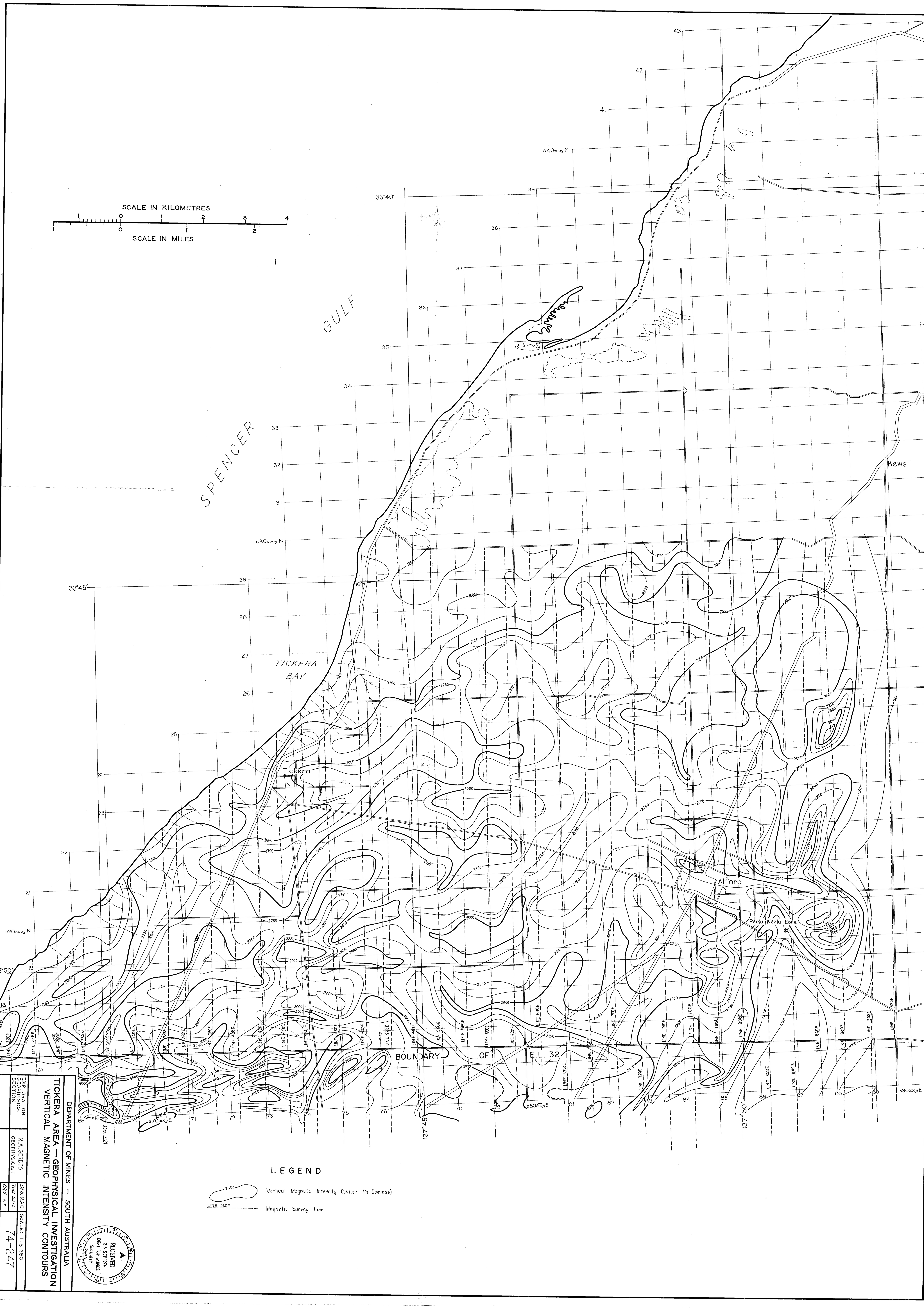
• AH4 Location of Gemco holes (X BS.IBENALER (D.M 135/74 unpublished)

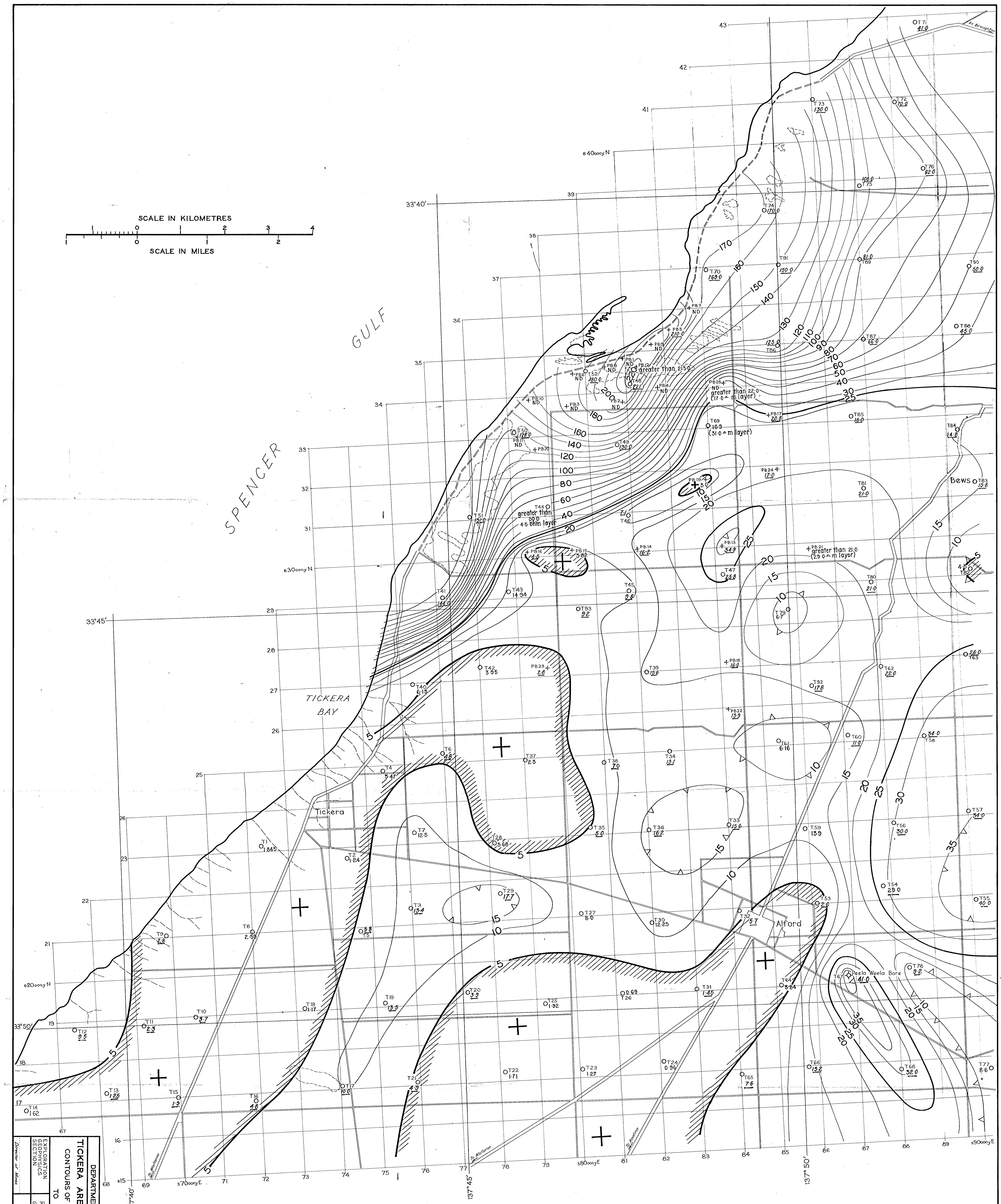

SCALE IN KILOMETRES
SCALE IN MILES
SPENCER GULF
TICKERA BAY
Tickera
Alford
Bews
33°40'
33°45'
33°50'
137°40'
137°45'
137°50'
6 40000 y N
6 30000 y N
6 20000 y N
6 15
5 70000 E
5 80000 E
5 90000 E
LEGEND
Apparent Resistivity greater than 100 Ω.m
Apparent Resistivity ranges between 75 to 100 Ω.m
Apparent Resistivity ranges between 50 to 75 Ω.m
Apparent Resistivity ranges between 10 to 50 Ω.m
Apparent Resistivity less than 10 Ω.m
ELECTRODE CONFIGURATION
a na a
a=200
n=3
N.B.— Dipole spacing of 200 feet for n=3
DEPARTMENT OF MINES — SOUTH AUSTRALIA
TICKERA AREA — GEOPHYSICAL INVESTIGATION
CONTOURS OF APPARENT RESISTIVITY
BASED ON WESTERN MINING CORPORATION
DIPOLE—DIPOLE I.P. DATA
EXPLORATION GEOPHYSICS SECTION
Director of Mines
R.A. GERDES
GEOPHYSICIST
Drn. R.A.G.
Tcd. R.B.
Ckd. A.F.
Exd.
SCALE: 1:31680
73—710
Gc 13
DATE: 18 OCTOBER 1973
RECEIVED
25 SEP 1974
DEPT. OF MINES
SECURITY



Compiled from Western Mining (original traverse data) S.M.L. 87

EXPLORATION GEOPHYSICS SECTION	DEPARTMENT OF MINES - SOUTH AUSTRALIA	Scale: 1:100 000 (North-South)
Compiled: R.A.Gerdes	TICKERA AREA - GEOPHYSICAL INVESTIGATION	Date: 12 Feb. 74
Drn. D.J.M. Ckd.	VERTICAL MAGNETIC INTENSITY PROFILES	Drg. No. 74-107 Gc13


SCALE IN KILOMETRES
SCALE IN MILES
SPENCER GULF
TICKERA BAY
Tickera
Alford
Bews
Peela Weela Bore
BOUNDARY OF E.L. 32
33°40'
33°45'
33°50'
137°40'
137°45'
137°50'
6 40000 N
6 30000 N
6 20000 N
570000 E
580000 E
590000 E
LEGEND
Vertical Magnetic Intensity Contour (In Gammas)
Magnetic Survey Line
DEPARTMENT OF MINES — SOUTH AUSTRALIA
TICKERA AREA — GEOPHYSICAL INVESTIGATION
VERTICAL MAGNETIC INTENSITY CONTOURS
EXPLORATION GEOPHYSICS SECTION
R.A. GERDES GEOPHYSICIST
SCALE 1:31680
74-247
DATE: 12 JUNE 1973



LEGEND

V.E.S. Schlumberger Probe Positions

- O T29 Tickera Survey
- + PB 17 Port Broughton Survey (Sheard & Taylor; Jan'73)

- Road
- Track
- Saltpan or claypan
- Creek

10·0 — TOTAL CONDUCTANCE FOR ACTUAL 45 DEGREE ASYMTOPE

2·59 — INTERPRETED TOTAL CONDUCTANCE TO FINITE RESISTIVITY BASEMENT

N.D. — No data due to 3 Hz being used and the current electrode distance AB/2 not being over highly conductive near surface layers which caused incorrect results due to skin effect and not large enough to penetrate the high resistivity basement.

+ — Shallow basement areas

Contour interval 5 metres/ohm metre

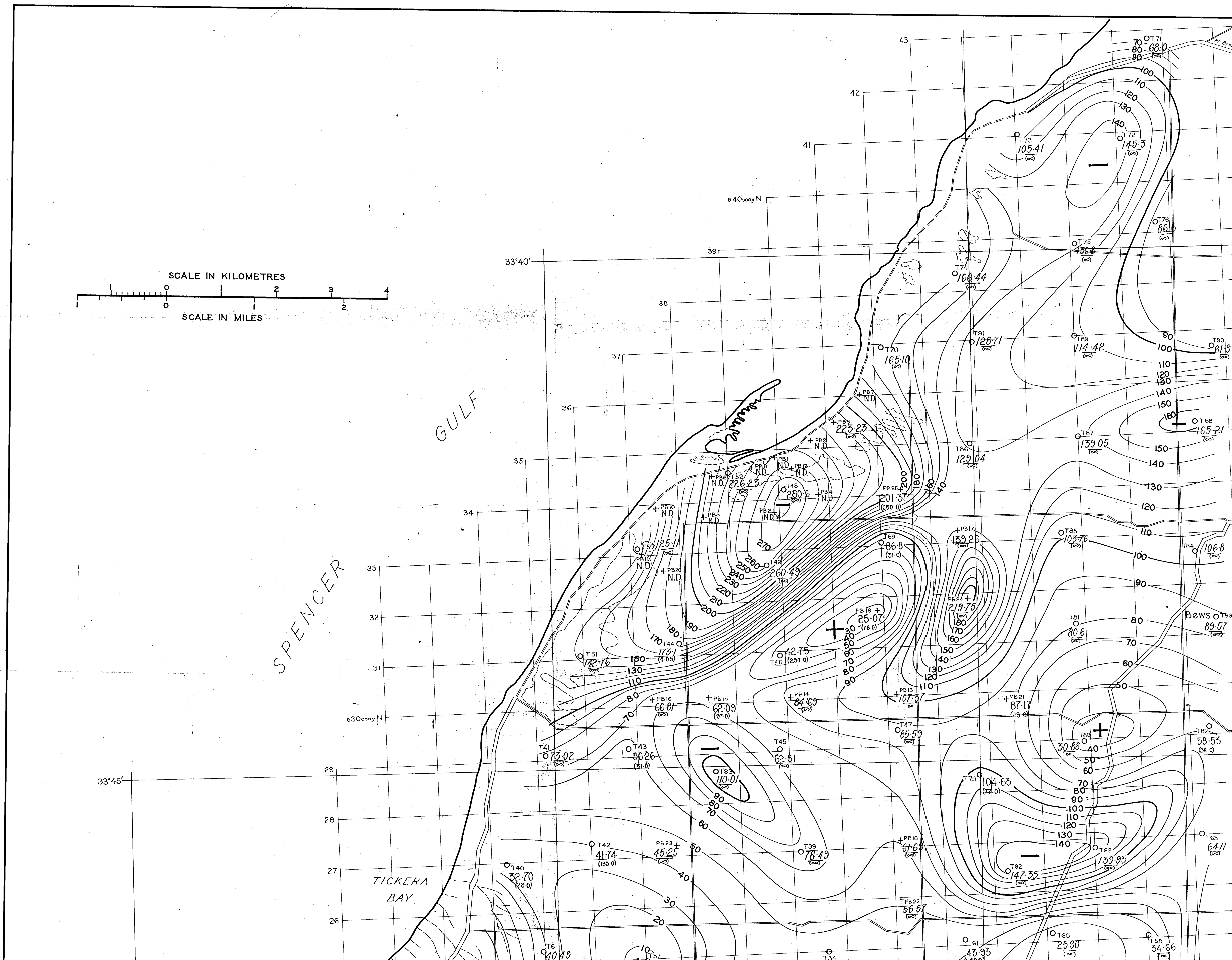
DEPARTMENT OF MINES — SOUTH AUSTRALIA

TICKERA AREA — GEOPHYSICAL INVESTIGATION

CONTOURS OF TOTAL LONGITUDINAL CONDUCTANCE TO HIGH RESISTIVE BASEMENT

EXPLORATION GEOPHYSICS SECTION	R.A. GERDES GEOPHYSICIST	Drn. RAG.	SCALE: 1:31680
Director of Mines		Tcd. B.D.W.	74-248 6C 13
		Ckd.	
		Exd.	DATE: 14 MARCH 1974

RECEIVED 26 SEP 1974 DEPT. OF MINES SECURITY



LEGEND

V.E.S. Schlumberger Probe Positions

○ T29 Tickera Survey

+ PB 17 Port Broughton Survey (Sheard & Taylor; Jan '73)

Road

Track

Saltpan or claypan

Creek

Depth to infinite resistivity basement

eg. T16 35·48 — depth in metres below ground level
(∞) — infinite resistivity

T18 7·71 — depth in metres below ground level
(190) — basement has resistivity of 190 ohm metres.

Contour interval 10 metres below ground surface.

+ Basement high

— Basement low

DEPARTMENT OF MINES — SOUTH AUSTRALIA

TICKERA AREA — GEOPHYSICAL INVESTIGATION

INTERPRETED DEPTH CONTOURS TO HIGH RESISTIVITY BASEMENT

EXPLORATION GEOPHYSICS SECTION

R.A. GERDES GEOPHYSICIST

Director of Mines

Drn. R.A.G. SCALE: 1:31680

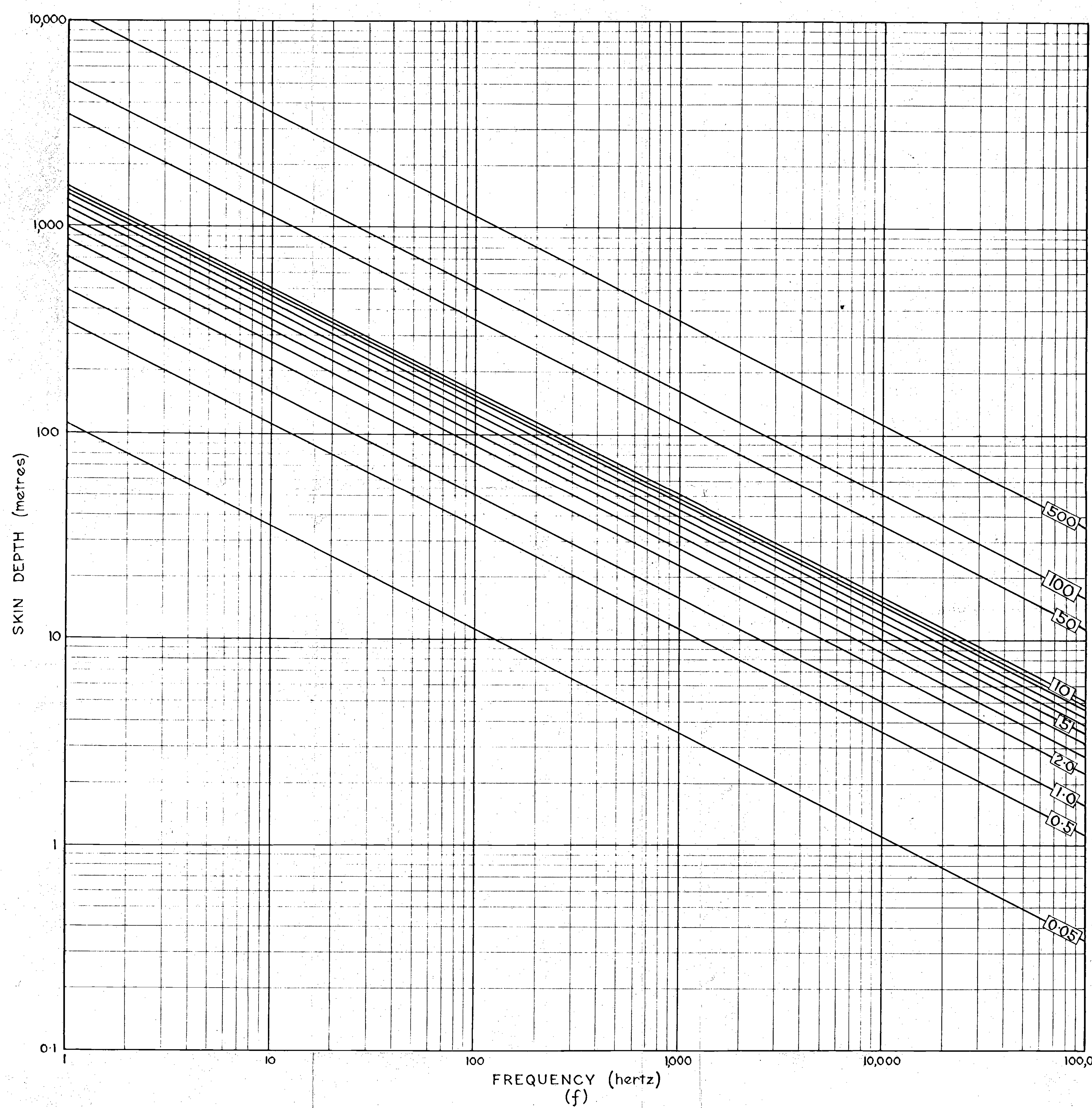
Trd. B.D.W.

Ckd. A.F. 74-268

Exd. Gb. 15

DATE: 1 April 1974

RECEIVED 25 SEP 1974 DEPT. OF MINES



Based on the formula SKIN DEPTH $\simeq 503{\cdot}8\sqrt{\frac{\rho}{f}}$

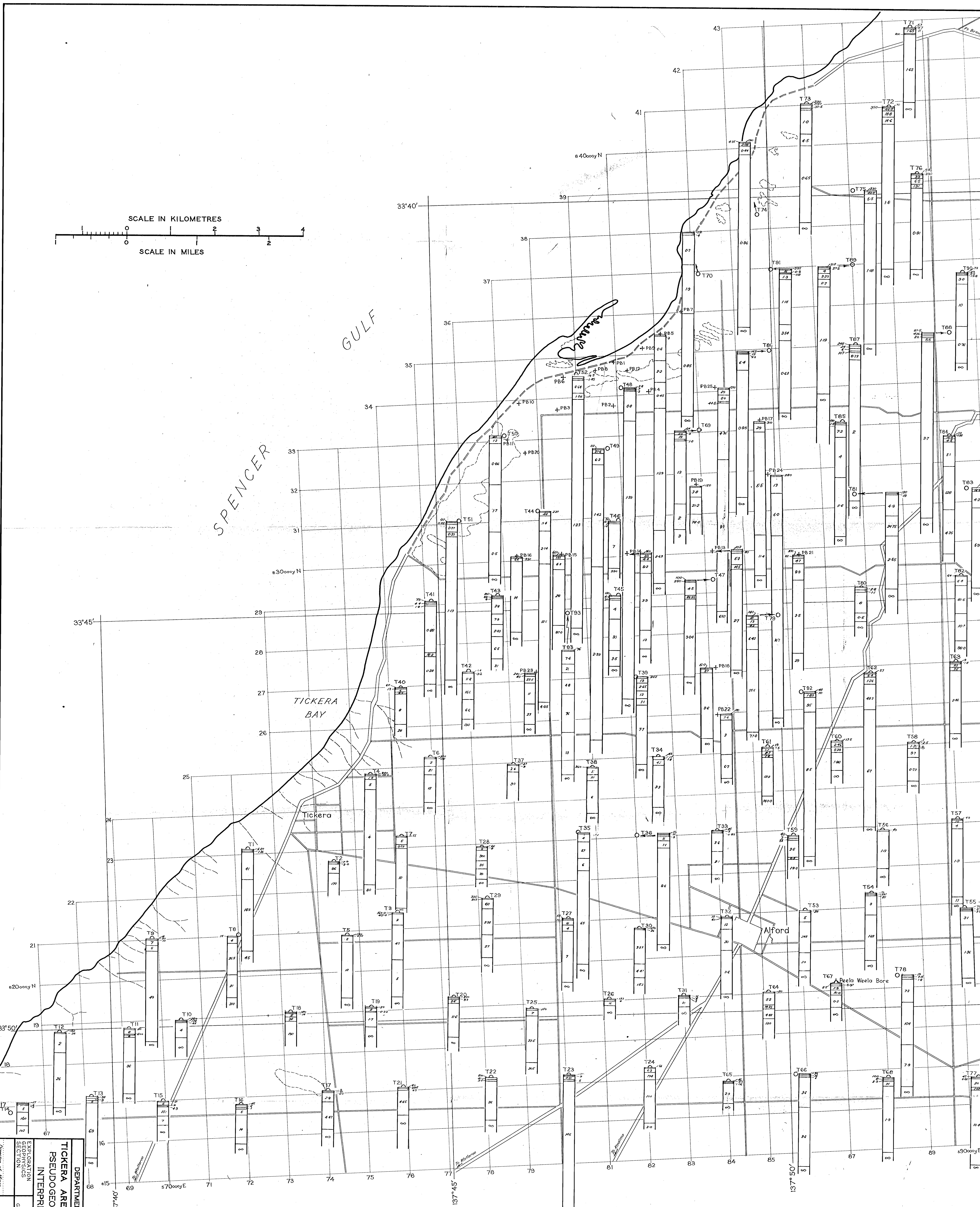
Values of ρ in ohm-metres shown —[10]—

DEPARTMENT OF MINES — SOUTH AUSTRALIA

NOMOGRAPH OF SKIN DEPTH VERSUS FREQUENCY

EXPLORATION GEOPHYSICS SECTION		Compiled R.A. Gerdes	Scale:
			Date: 2 MAY 1974
		Drn. A.F.	Drg. No 74-328 MG1
Director of Mines		Ckd.	

200-4,70 A2432



LEGEND

V.E.S. Schlumberger Probe Positions

- O T29 Tickera Survey
- + PB17 Port Broughton Survey (Sheard & Taylor; Jan '73)

Road

Track

Saltpan or claypan

Creek

Pseudogeological Section

horizontal resistivity layer with value 50 ohm-metres

DEPTH IN METRES

Vertical scale 1:1250

DEPARTMENT OF MINES — SOUTH AUSTRALIA

TICKERA AREA — GEOPHYSICAL INVESTIGATION

PSEUDOGEOLOGICAL SECTIONS BASED ON INTERPRETATION OF V.E.S. PROBES

EXPLORATION GEOPHYSICS SECTION

R.A. GERDES GEOPHYSICIST

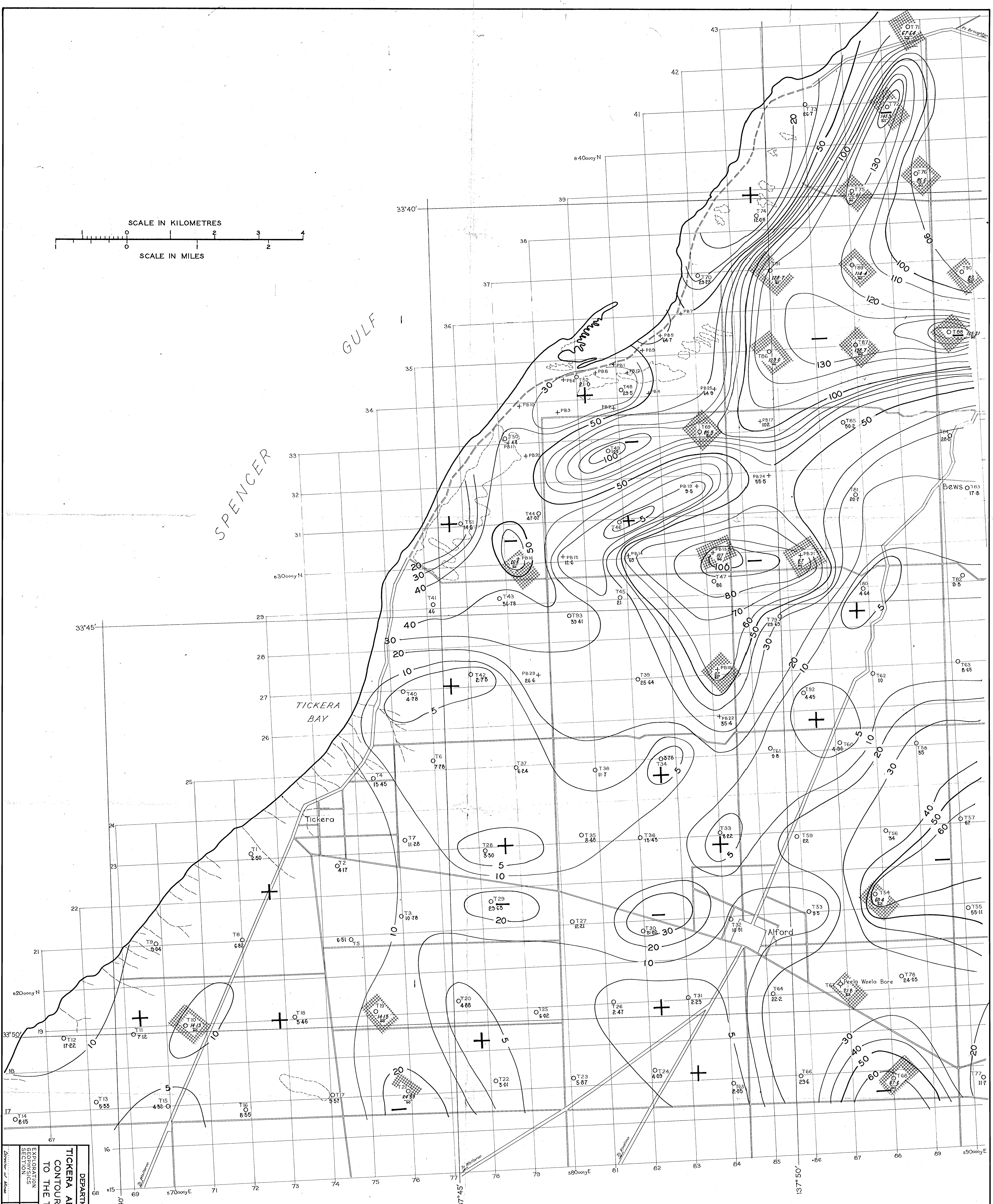
Director of Mines

Drn RAG | Trcd A.F. | Ckd A.F. | Exd.

SCALE 1:31680

74-451 Gc 15

DATE: 14 JUNE 1974



DEPARTMENT OF MINES — SOUTH AUSTRALIA

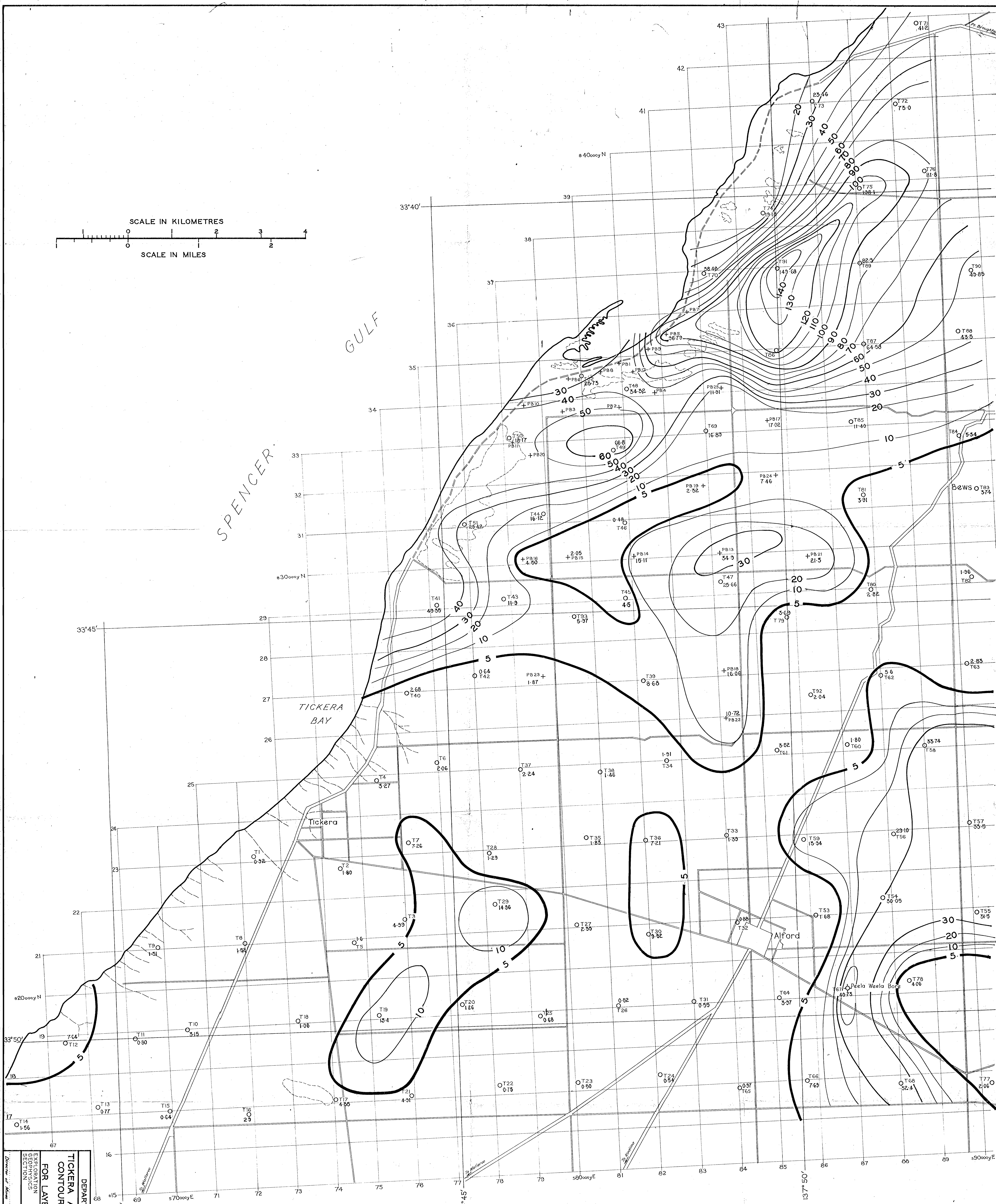
TICKERA AREA — GEOPHYSICAL INVESTIGATION
CONTOURS OF THE INTERPRETED DEPTH TO THE TOP OF WEATHERED BASEMENT

EXPLORATION GEOPHYSICS SECTION	R.A. GERDES GEOPHYSICIST	Drn. R.A.G
		Tcd. B.D.W
		Ckd. A.F.
Director of Mines		Exd.
SCALE: 1:31680	74-452 GC 13	DATE: 14 JUNE 1974

LEGEND

V.E.S. Schlumberger Probe Positions

- O T29 Tickera Survey
- + PB 17 Port Broughton Survey (Sheard & Taylor; Jan '73)
- Road
- Track
- Saltpan or claypan
- Creek
- O T17 9.57 Depth to top of interpreted weathered basement
- T21 24.59 Areas where weathered basement could not be resolved.
- + Shallow areas
- — Deep areas



DEPARTMENT OF MINES — SOUTH AUSTRALIA

TICKERA AREA — GEOPHYSICAL INVESTIGATION CONTOURS OF INTERPRETED LONGITUDINAL CONDUCTANCE FOR LAYERS ABOVE WEATHERED BASEMENT

EXPLORATION GEOPHYSICS SECTION	R.A. GERDES GEOPHYSICIST	Drn. R.A.G. SCALE: 1:31680
Director of Mines		Tcd. B.D.W.
		Ckd. A.F. 74-453 Gc.13
		Exd. DATE: 13 JUNE 1974

LEGEND

V.E.S. Schlumberger Probe Positions

○ T29 Tickera Survey

+ PB 17 Port Broughton Survey (Sheard & Taylor; Jan '73)

Road

Track

Saltpan or claypan

Creek

10 ohm metres — Contour interval

⊙ T23 0·50 Sum of conductances of layers above first major break in resistivity curves.

—10— Longitudinal conductance contour value in ohm-metres

LEGEND

V.E.S. Schlumberger Probe Positions

○ T29 Tickera Survey

+ PB17 Port Broughton Survey (Sheard & Taylor; Jan '73)

Road

Track

Saltpan or claypan

Creek

Magnetic Zone Type 6

Magnetic trend

DEPARTMENT OF MINES — SOUTH AUSTRALIA

TICKERA AREA — GEOPHYSICAL INVESTIGATION
INTERPRETED MAGNETIC ZONES
BASED ON TRAVERSE DATA

EXPLORATION GEOPHYSICS SECTION

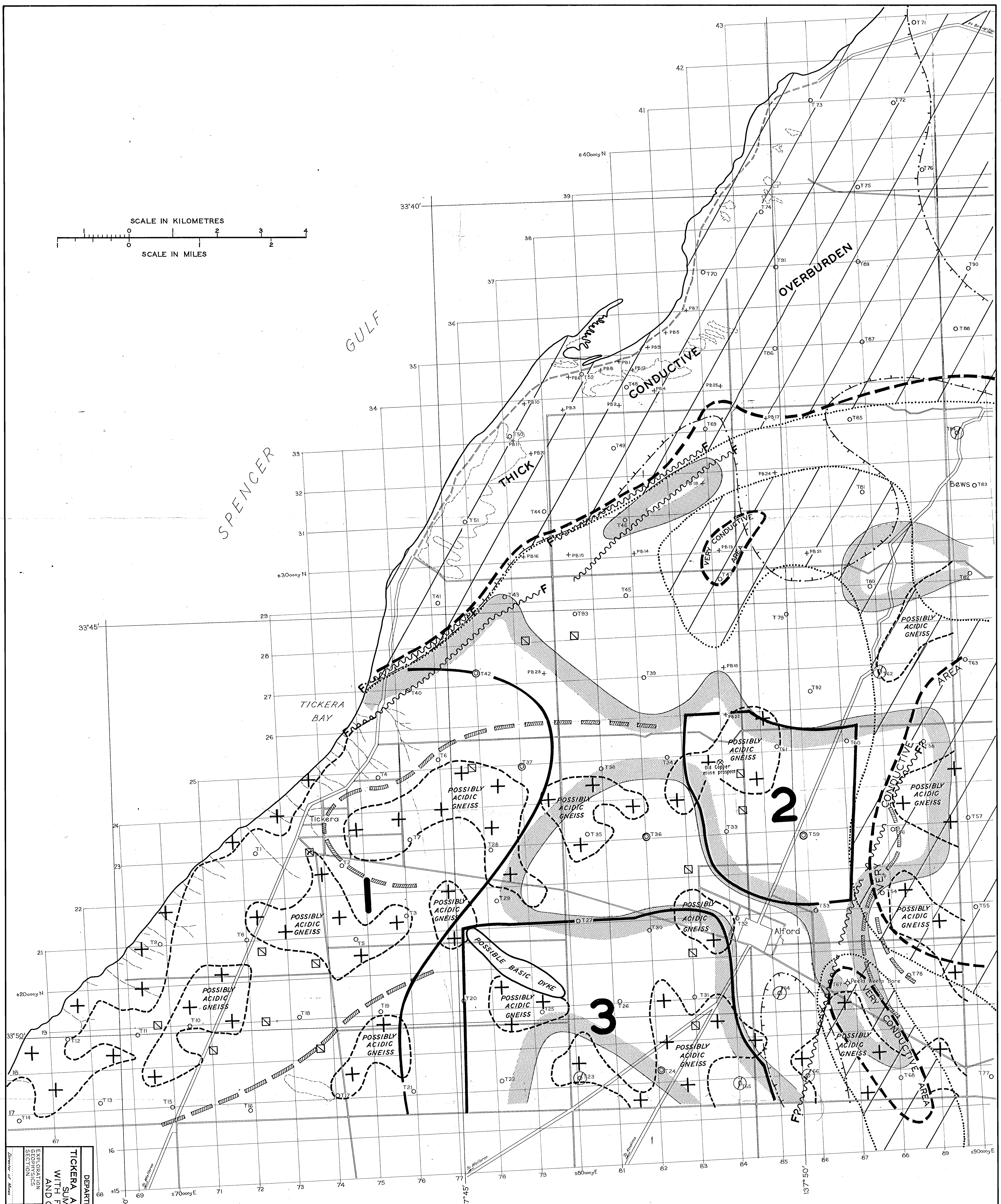
R.A. GERDES
GEOPHYSICIST

Drn R.A.G. | Trd B.D.W. | Ckd A.F. | Exd

SCALE: 1:31680

74-454
S6013

DATE: 11 JUNE 1974



LEGEND

V.E.S. Schlumberger Probe Positions

- ○ T29 Tickera Survey
- + PB17 Port Broughton Survey (Sheard & Taylor; Jan '73)

- Road
- Track
- Saltpan or claypan
- Creek

- Priority area 1 for future geophysical surveys
- Areas of large inductive coupling before interpreted basement is reached. I.P. not recommended.
- Areas where Tudam EM method may not be applied.

- Area with basement < 60 metres
- I.P. Anomaly after W.M.C.
- T65 Areas of positive frequency effect based on V.E.S
- T24 Areas of positive frequency effect based on V.E.S (Tentative)
- Magnetic trend lines.

DEPARTMENT OF MINES — SOUTH AUSTRALIA

TICKERA AREA — GEOPHYSICAL INVESTIGATION
SUMMARY OF FEASIBILITY STUDY
WITH FUTURE AREAS FOR GEOPHYSICAL
AND GEOCHEMICAL INVESTIGATIONS

EXPLORATION GEOPHYSICS SECTION	R.A. GERDES GEOPHYSICIST	Drn. R.A.G.	SCALE: 1:31680
Director of Mines		Tcd. B.D.W.	74-455 GC13
		Ckd. A.F.	
		Exd.	DATE: 11 JUNE 1974

DEPARTMENT OF MINES — SOUTH AUSTRALIA

TICKERA AREA — GEOPHYSICAL INVESTIGATION CONTOURS OF INTERPRETED TOTAL TRANSVERSE RESISTANCE OF WEATHERED BASEMENT LAYERS

EXPLORATION GEOPHYSICS SECTION

Director of Mines

R.A. GERDES GEOPHYSICIST

Drn R.A.G. SCALE: 1:31680
Trcd B.D.W.
Ckd A.F.
Exd
DATE: 14 JUNE 1974

74-456
64-13

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LEGEND

V.E.S. Schlumberger Probe Positions

O T29 Tickera Survey

+ PB17 Port Broughton Survey (Sheard & Taylor; Jan '73)

Road

Track

Saltpan or claypan

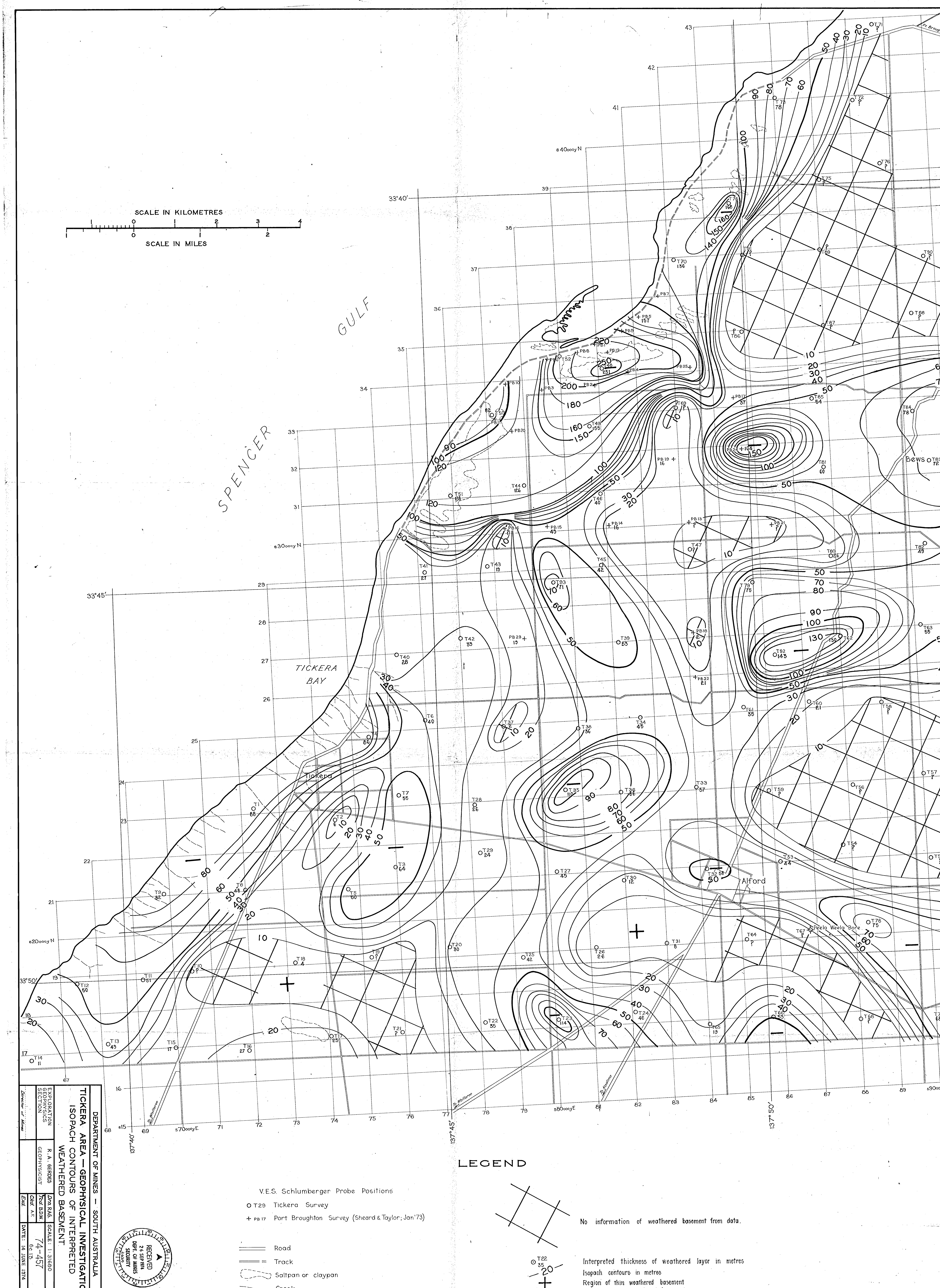
Creek

R — Resistive weathered basement areas. Transverse resistance greater than 1000 ohm metre².

F — Fresh basement (infinite resistivity)

O T22 1234 — Interpreted value of transverse resistance in ohm (metre)²

250 — Transverse resistance contour value in ohm (metres)²



SCALE IN KILOMETRES
SCALE IN MILES
SPENCER GULF
TICKERA BAY
Tickera
Alford
Bews
Peela Weela Bore
Pt Broughton
33°40'
33°45'
33°50'
137°40'
137°45'
137°50'
6840000 N
6830000 N
6820000 N
570000 E
580000 E
590000 E
LEGEND
V.E.S. Schlumberger Probe Positions
T29 Tickera Survey
PB17 Port Broughton Survey (Sheard & Taylor; Jan '73)
Road
Track
Saltpan or claypan
Creek
No information of weathered basement from data.
Interpreted thickness of weathered layer in metres
Isopach contours in metres
Region of thin weathered basement
Region of thick weathered basement
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DEPARTMENT OF MINES — SOUTH AUSTRALIA
TICKERA AREA — GEOPHYSICAL INVESTIGATION
ISOPACH CONTOURS OF INTERPRETED WEATHERED BASEMENT
EXPLORATION GEOPHYSICS SECTION
R.A. GERDES GEOPHYSICIST
Drn. RAG.
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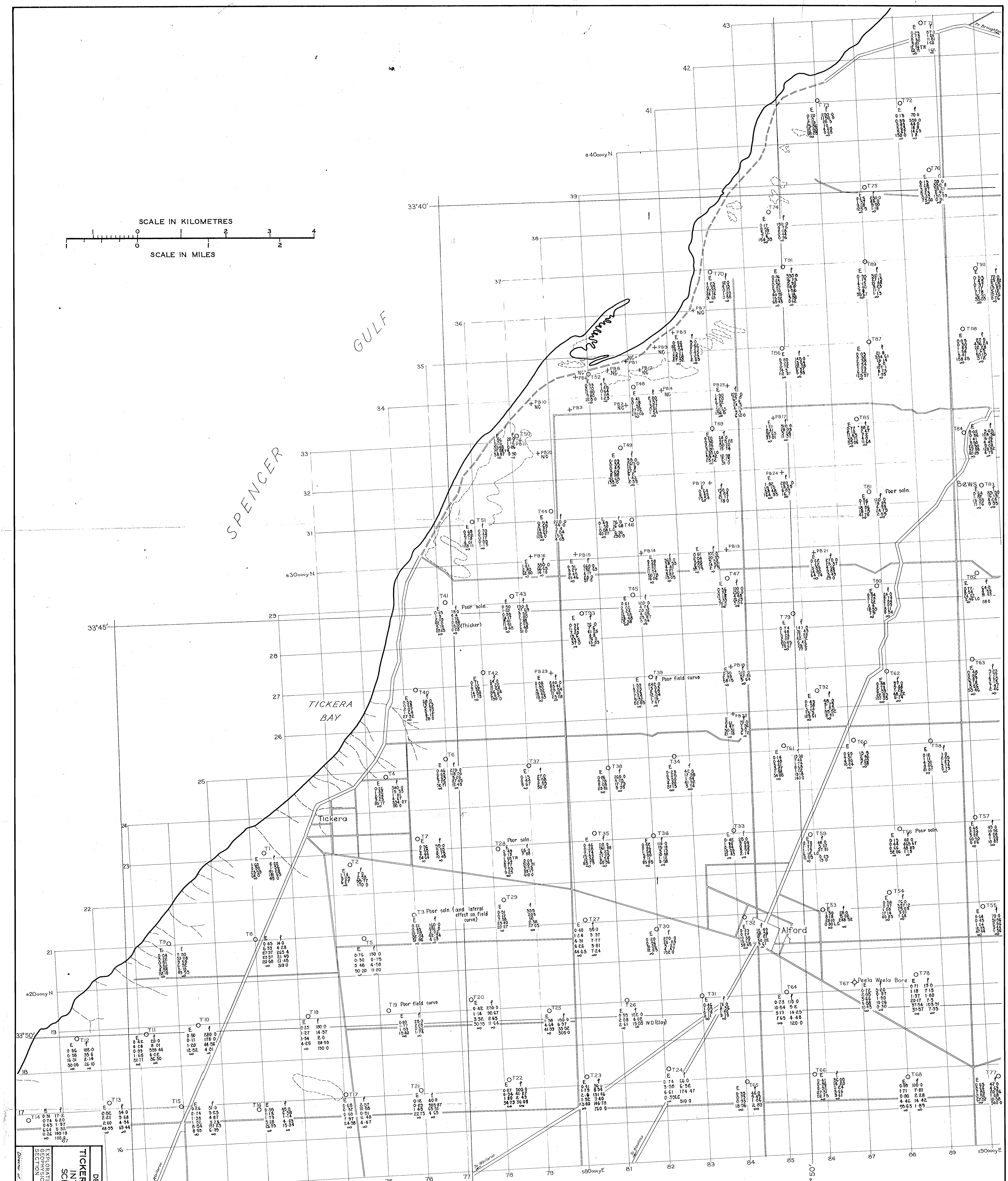

LEGEND

V.E.S. Schlumberger Probe Positions

○ T29 Tickera Survey

+ PB 17 Port Broughton Survey (Sheard & Taylor; Jan '73)

Road

Track

Saltpan or claypan

Creek

INTERPRETED HORIZONTAL LAYERS OF VERTICAL ELECTRICAL SOUNDING

E Thickness in metres.

ƒ True interpreted resistivity in ohm metres.

∞ Infinite (in thickness) and resistivity

eg. ○T1 E ƒ
1·60 9·62
0·80 41·62
0·90 181·60
∞ 45·0

N.C. Not completely satisfactory probe for interpretation.

L.C. Longitudinal conductance of layer.

T.R. Transverse resistance of layer.

DEPARTMENT OF MINES — SOUTH AUSTRALIA

TICKERA AREA — GEOPHYSICAL INVESTIGATION
INTERPRETED HORIZONTAL LAYERS OF SCHLUMBERGER VERTICAL ELECTRICAL SOUNDINGS

EXPLORATION GEOPHYSICS SECTION

Director of Mines

R.A. GERDES GEOPHYSICIST

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74-458

66-15

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