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EL 1419

MANNUM – SEDAN AREA

DATA RELEASE AT PARTIAL SURRENDER : REPORT ON INVESTIGATIONS INTO THE PLATINOID POTENTIAL OF THE BLACK HILL NORITE

Submitted by
Placer Exploration Ltd
1988

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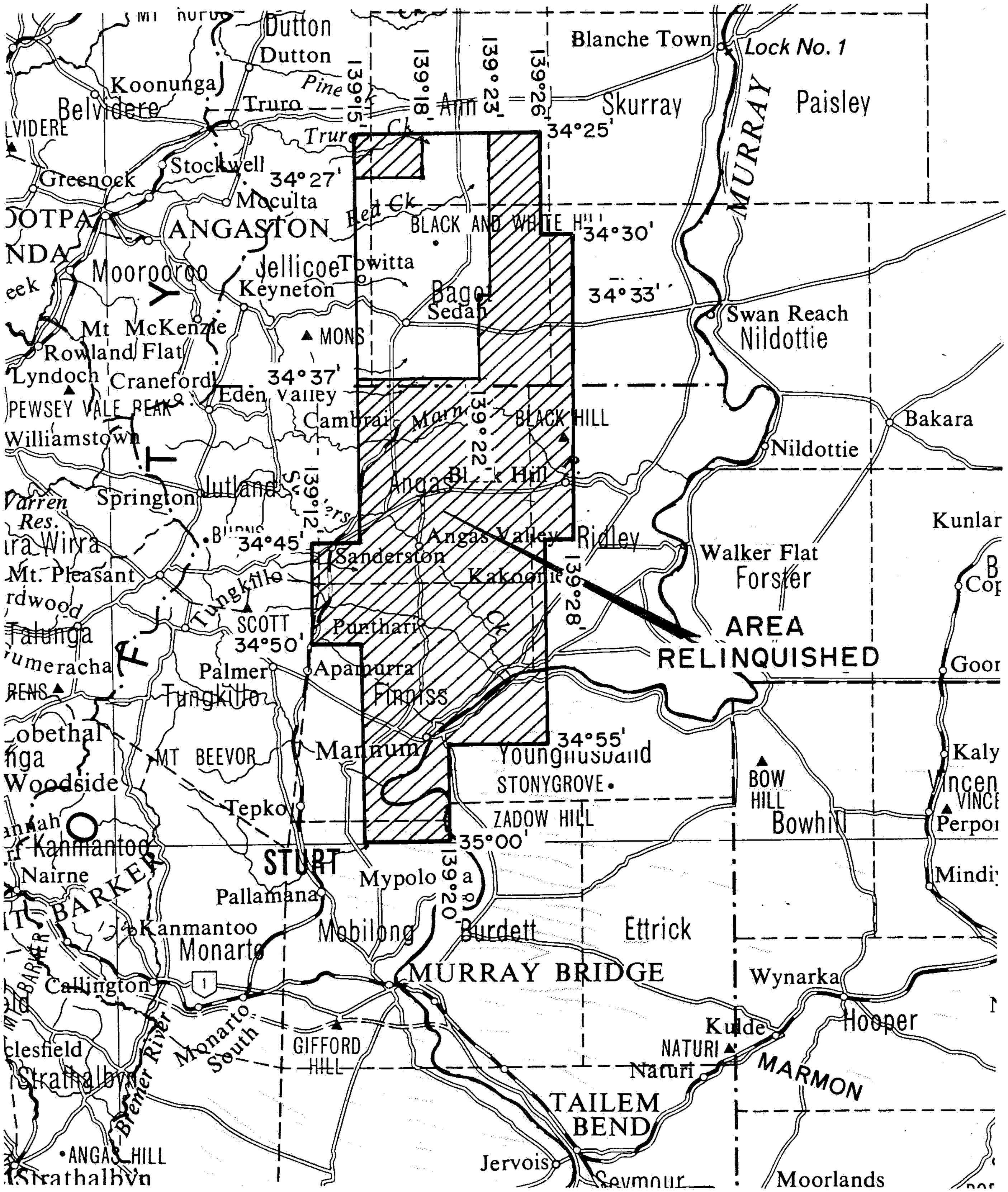
Government of South Australia
Primary Industries and Resources SA

SCHEDULE A



SCALE 1:500,000

KILOMETRES 10 0 10 20 30 40 50 KILOMETRES

PARTIAL SURRENDER NO. 14583.

APPLICANT: ~~CSR LIMITED~~ SHELL COMPANY OF AUSTRALIA, LIMITED

DM: 129/87

AREA: ~~1128~~ 243 square kilometres (approx.)

1:250 000 PLANS: ADELAIDE

LOCALITY: MANNUM AREA

EXPIRED

DATE GRANTED: 21-8-87

DATE EXPIRED: 20-8-~~89~~ ~~91~~ 92

EL No: 1419

CONTENTS ENVELOPE 8199

TENEMENT: E.L. 1419 - Mannum.

TENEMENT HOLDER: C.S.R. Ltd.

REPORT: Investigations into the Platinoid Potential of the Black Hill Norite E.L. 1419 Sedan, S.A. November 1988. Pgs. 3-33

Ref: 29.2/JLC/SR

INVESTIGATIONS INTO THE PLATINOID POTENTIAL OF THE BLACK HILL NORITE E.L. 1419 SEDAN SOUTH AUSTRALIA

Placer Exploration Ltd.
J.L. Curtis
November, 1988
Report No. SA3/88

Distribution

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KEYWORDS

SEDAN	GEOLOGY
ADELAIDE	GEOPHYSICS
EL 1419	GEOCHEMISTRY
DRILLING	GROUND MAGNETIC SURVEYS
PLATINOIDS	SIROTEM SURVEY

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1. INTRODUCTION

The "Imperial Black Granite" or "Black Hill Norite" of Sedan has been extensively quarried for use as a building facia stone, but its metalliferous economic potential has remained largely uninvestigated. A programme of work carried out by North Broken Hill Proprietary Ltd. seeking Sudbury type massive base metal sulphide deposits (Lynch, 1976) did however indicate potential in the area for base and/or precious metal mineralisation associated with the Black Hill intrusive.

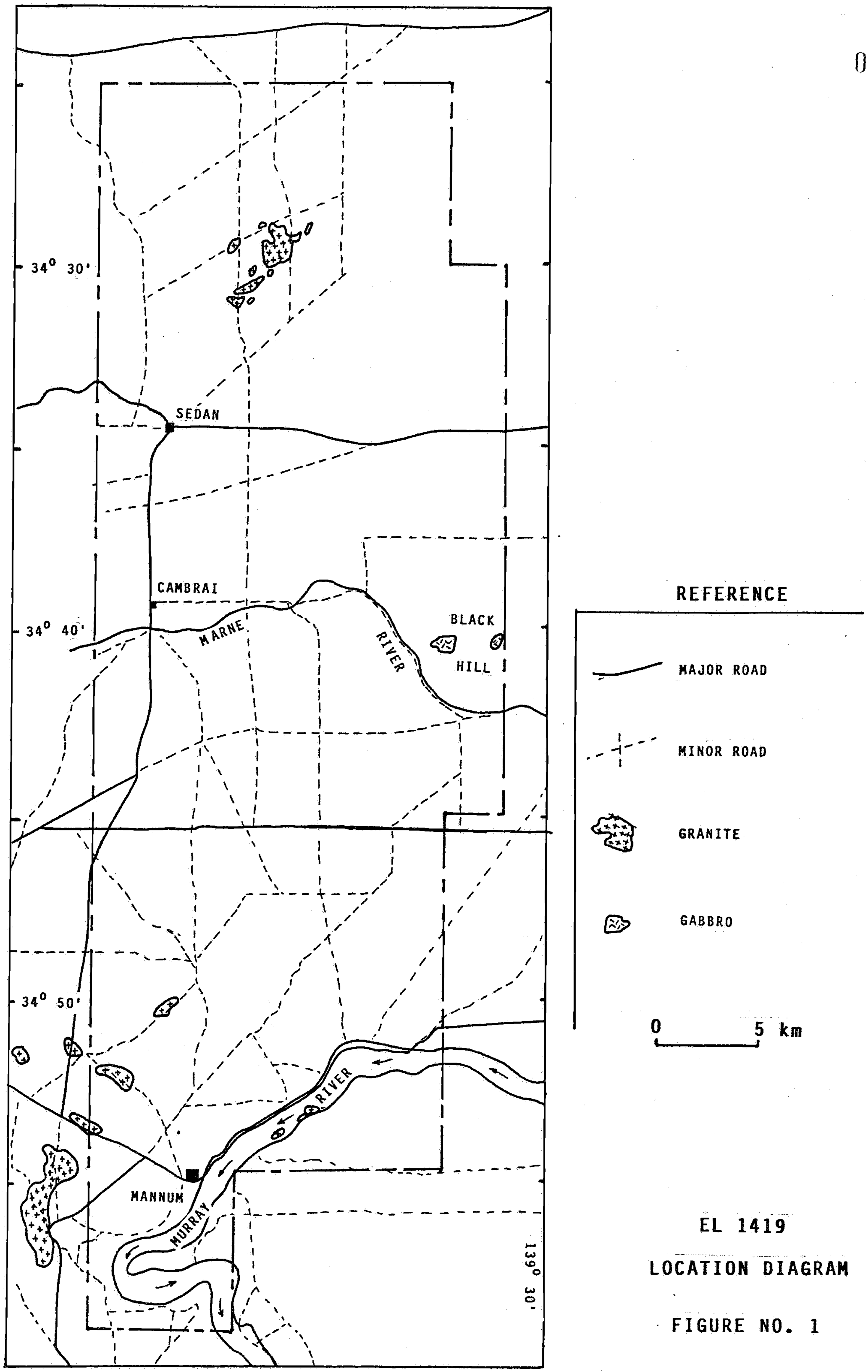
A petrological investigation on samples from the Black Hill exposure and drill cores (Farrand, 1986) also indicated that similarities exist between the Black Hill Norite and norite bodies known from platinoid bearing mafic complexes.

The evidence was considered sufficient for the CSR Minerals Exploration Development Group to initiate an assessment of the platinoid potential within the area of E.L. 1419, which covers the south-western portion of the inferred intrusive complex. The licence is held by CSR Limited through the company's Coal Division, securing tenement to the Tertiary lignite deposit at Sedan, in the northern portion of the licence.

2. LOCATION AND ACCESS

Exploration Licence No. 1419, is located approximately 80km east of Adelaide along the western extremity of the Murray Basin, between the Murray River and the Mt. Lofty Ranges. The title covers an area of 1128km^2 and includes the township of Sedan in the north.

The region is well served by a network of sealed and formed limestone roads established for agricultural use (Figure 1).



EL 1419

LOCATION DIAGRAM

FIGURE NO. 1

3. TOPOGRAPHY AND VEGETATION

The region consists of undulating hills and valleys of modest relief, formerly covered in Malley forest but now largely cleared for mixed cereal and sheep grazing.

The climate is tending arid due to the rain shadow cast by the Mt. Lofty Ranges. Fixed dune ridges attest to a drier time in the recent past.

4. REGIONAL GEOLOGY AND GEOPHYSICS

4.1 Pre-Tertiary Basement

The regional geology of the pre-Tertiary basement is not well known because outcrops are restricted to scattered granite exposures in the immediate vicinity of the Murray River, the Black Hill Norite in the centre east of the title and the Sedan Granite in the far north of the area.

The only other data available is from irregularly spaced drill holes and geophysical surveys. Some of the data from bore holes is not very useful because early water bore drillers referred to the Black Hill norite as 'granite' indistinguishable from true granite lithologies.

Compilation of the limited geological data on to aeromagnetic contour plans can be used to infer major lithological entities such as granite bodies, and tracts of probable sedimentary units.

A major core zone to the region has a distinctly different magnetic signature of broad, intense lows and highs that map around the south western limit of the magnetic signature of the Black Hill Norite. It is therefore possible that these features are related to the mafic body (See Figure 2).

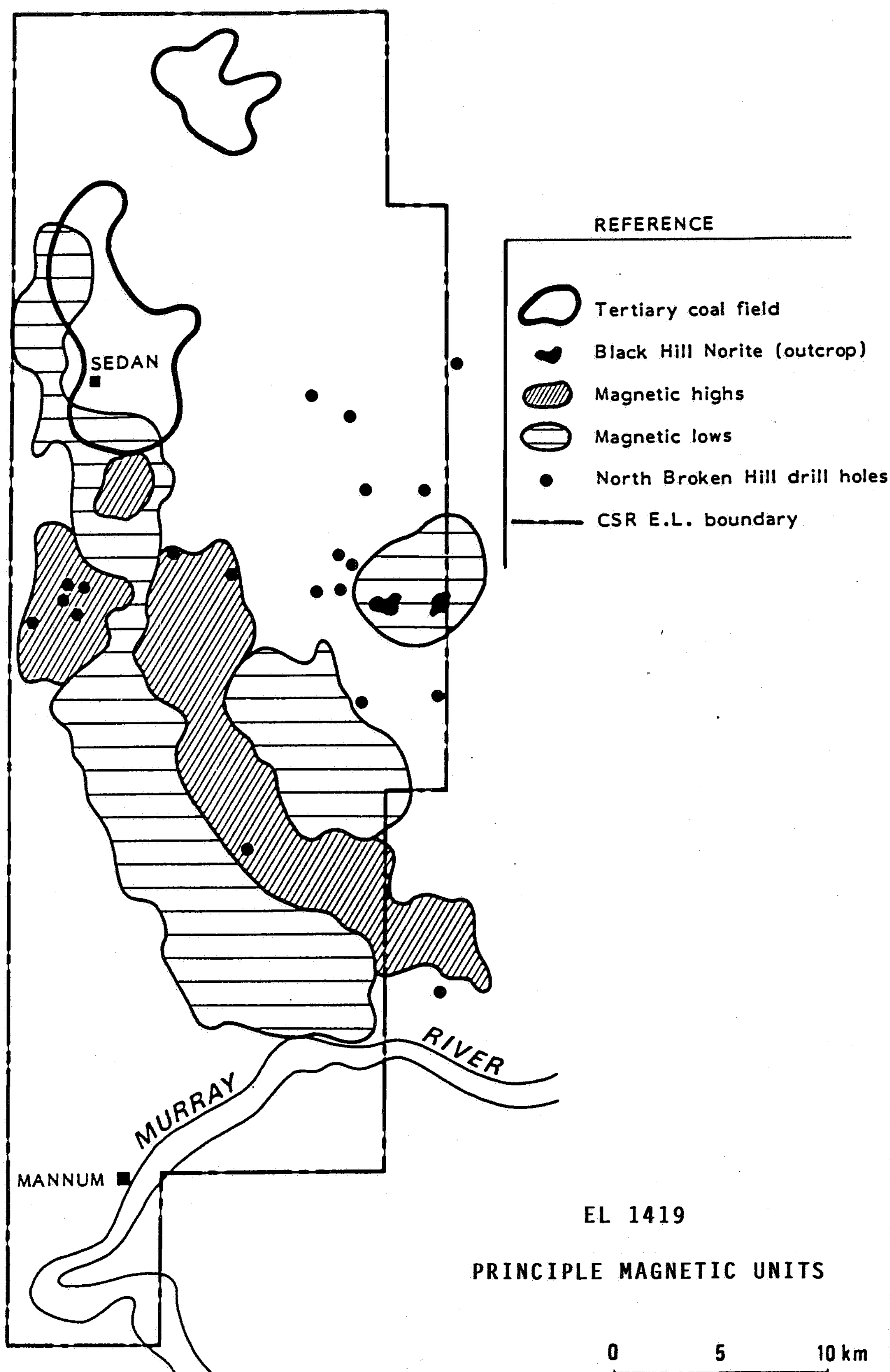
Evidence presented by Farrand (1986), suggests that the exposure at Black Hill is predominantly a gabbro with relatively abundant hypersthene (rarely to the level of being of a true norite composition) and minor olivine. The observable weak layering is possibly due to fluid dynamics rather than crystal settling. The low olivine level and absence of crystal settling suggests that the exposure constitutes part of the upper levels of a mafic complex in its original disposition with possible cumulate layering beneath and prospective zones at perhaps considerable depth.

Inspection of the regional gravity data shows that Black Hill is centred on a major Bouger Gravity high which is semi-coincident with a reversely polarised magnetic anomaly. This high density body lies on the north west side of a major gravity gradient which is part of the major trans-Australia G2 gravity corridor (O'Driscoll 1986). Since platinoid bearing mafic bodies frequently relate to major crustal fissures, (a necessary aspect to allow mantle tapping), the apparent association between the Black Hill area and an inferred continental-scale structure is encouraging. It would also be reasonable to propose that the zone of arcuate magnetic anomalies referred to earlier may represent an associated (layered sill?) intrusive body.

The age of the Black Hill Norite is somewhat conjectural since it has been affected by granitic veining and earlier fracturing and anealing alteration events. The plagioclase phenocrysts at Black Hill are strained but there is no clear suggestion of folding. The prevailing view is that this apparent deformation is related to viscous magma flow and observed fracturing and alteration are late stage cooling phenomena. Since the granites of the Nakara Arc are generally regarded as late Delamerian, and minor granitic veins are present at Black Hill, the Norite is likely to be of similar, but slightly older age. The lack of dynamic regional type deformation does not necessarily imply that the Norite is post-orogenic since it may have behaved as a coherent tectonic core with all the strain being taken up around its perimeter.

4.2 Tertiary

Compilation of depth to basement isopachs (Figure 3)



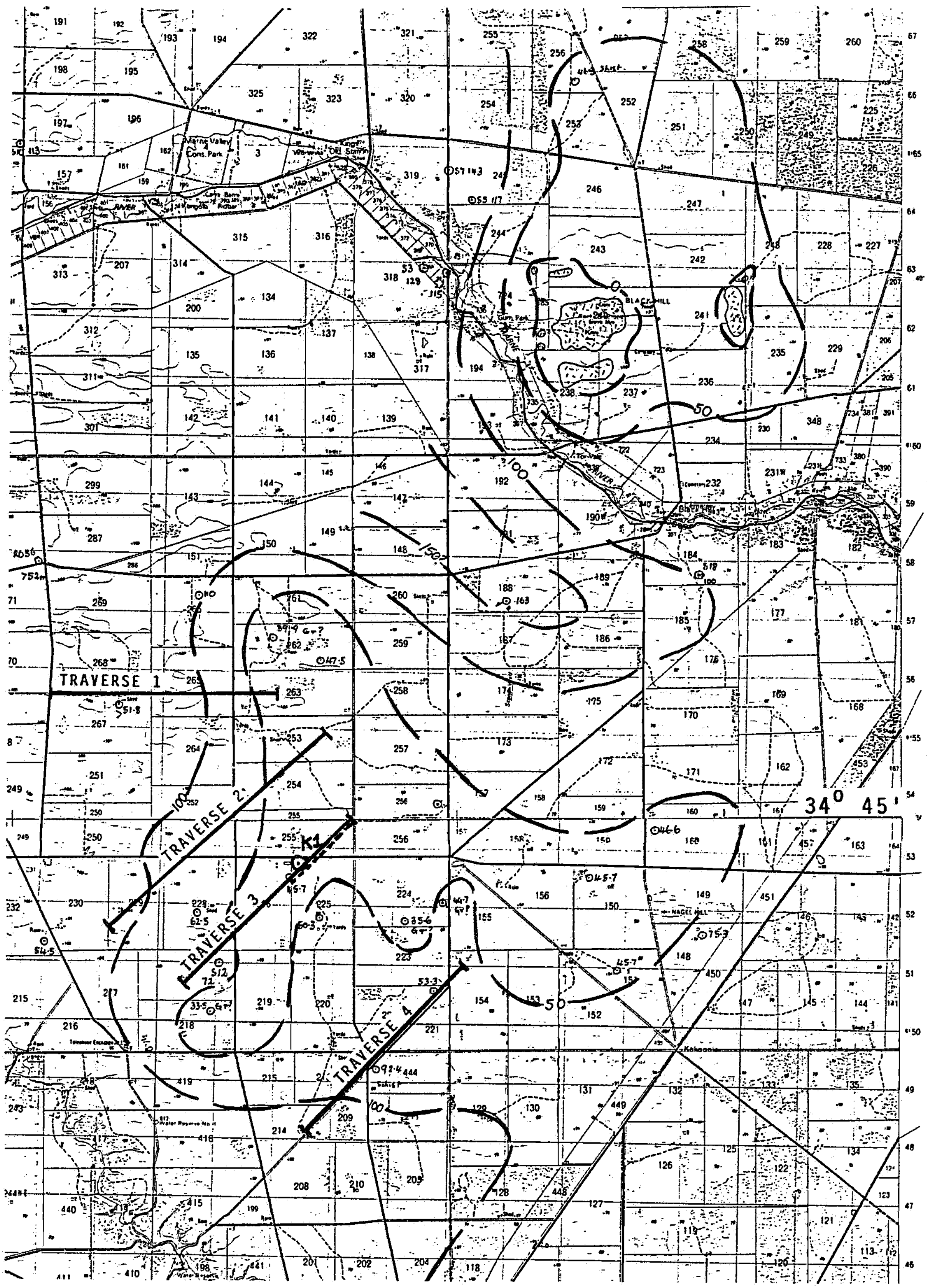
EL 1419

PRINCIPLE MAGNETIC UNITS

FIGURE NO. 2

shows a westward thickening Tertiary sequence that infills a palaeo-valley adjacent to the Mt. Lofty Ranges. A concealed, parallel palaeoridge also extends south from the region of Black Hill.

Tertiary coal measures are restricted to the western and deeper sections of the sequence, with the major basement zone of interest lying on the western flank of the latter palaeoridge.



REFERENCE

0 2 km

MAGNETIC SURVEY

SIROTEM SURVEY

⊙45·7 DRILL HOLE/WATER BORE

50 ISOPACH (m) TERTIARY SEDIMENTS

GEOPHYSICAL TRAVERSES AND TERTIARY ISOPACHS

FIGURE NO. 3

5. EXPLORATION PROGRAMME

The programme planned by CSR Limited was intended to achieve two primary objectives - firstly, to establish if the arcuate magnetic features described above represent intrusives associated with the Black Hill norite and secondly, to establish if any geochemical evidence for enrichment in platinoid and/or precious metals is present. Although the nature and location of the magnetic features strongly indicated that the former aim was highly achievable, the nature of mineralisation within layered mafic intrusives is such that exploration for the very minor portion of the overall complex which bears significant mineralisation is considerably more difficult.

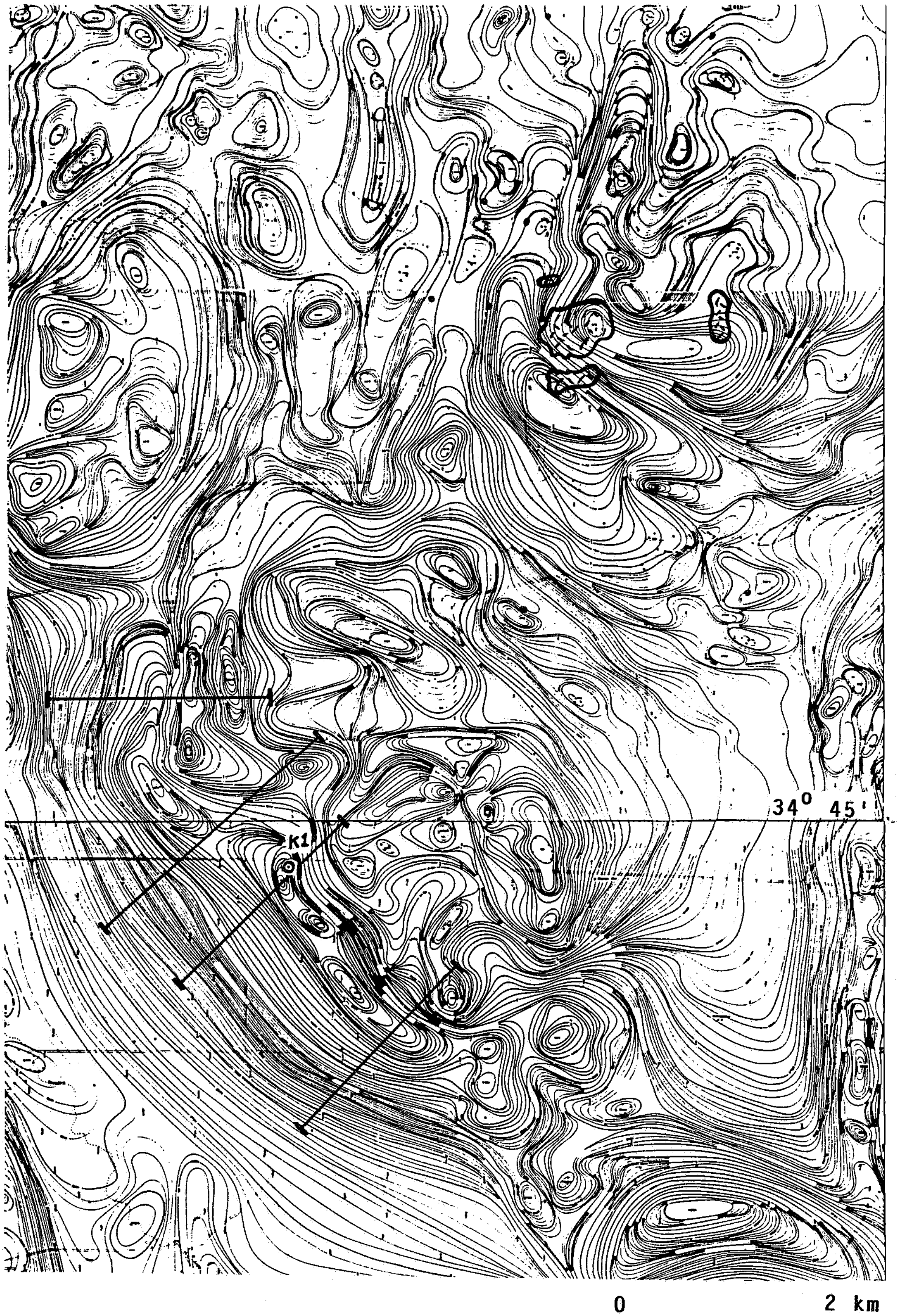
Metal concentrations generally occur at or near the base of cumulate layered sequences within the complex and the exploration programme consequently focussed on the southern margin of the arcuate magnetic zone. Ground magnetic and EM surveys were undertaken to attempt to locate conductive positions towards the inferred base of the magnetic sequence.

5.1 Ground Magnetic Survey

The magnetic trend was investigated with four regional magnetic profiles, totalling 12.79 line km, that were surveyed by Search Exploration Pty. Ltd. under contract.

Wooden stakes were used throughout the programme and where the profiles transected arable land the stakes were systematically removed. Traverse locations were marked semi-permanently by affixing punched metal tags to fences where possible.

Total field magnetic readings (see Figure 3 & 4, Plate 1, Appendix 1) were recorded using a Geometrics G856 proton precession magnetometer at a 10m spacing, with a second instrument automatically recording diurnal variations at a base station. All data were down-loaded



MAGNETIC SURVEY

GABBRO OUTCROP

AEROMAGNETIC CONTOUR PLAN
KAKOONIE AREA

FIGURE NO. 4

to a Toshiba T1100 portable computer for correction and field verification.

The magnetic profiles are plotted on Plate 1 and show a generally common form. A broad magnetic low in the west-south-west has a modest gradient towards the north-north-east to a distinct peak in intensity on the north side of which a very steep gradient descends into a low. Weaker magnetic features in the low may represent magnetic layers. The steep gradient is probably due to a sharp contrast in magnetic susceptibility or a reverse magnetic remanance polarity.

A subsidiary magnetic peak in the northerly gradient off the main magnetic ridge was readily modelled as a vertical or steeply south westerly tilted body, which suggests that it is not part of an in-situ sub-horizontal cumulate layer complex (Figure 5).

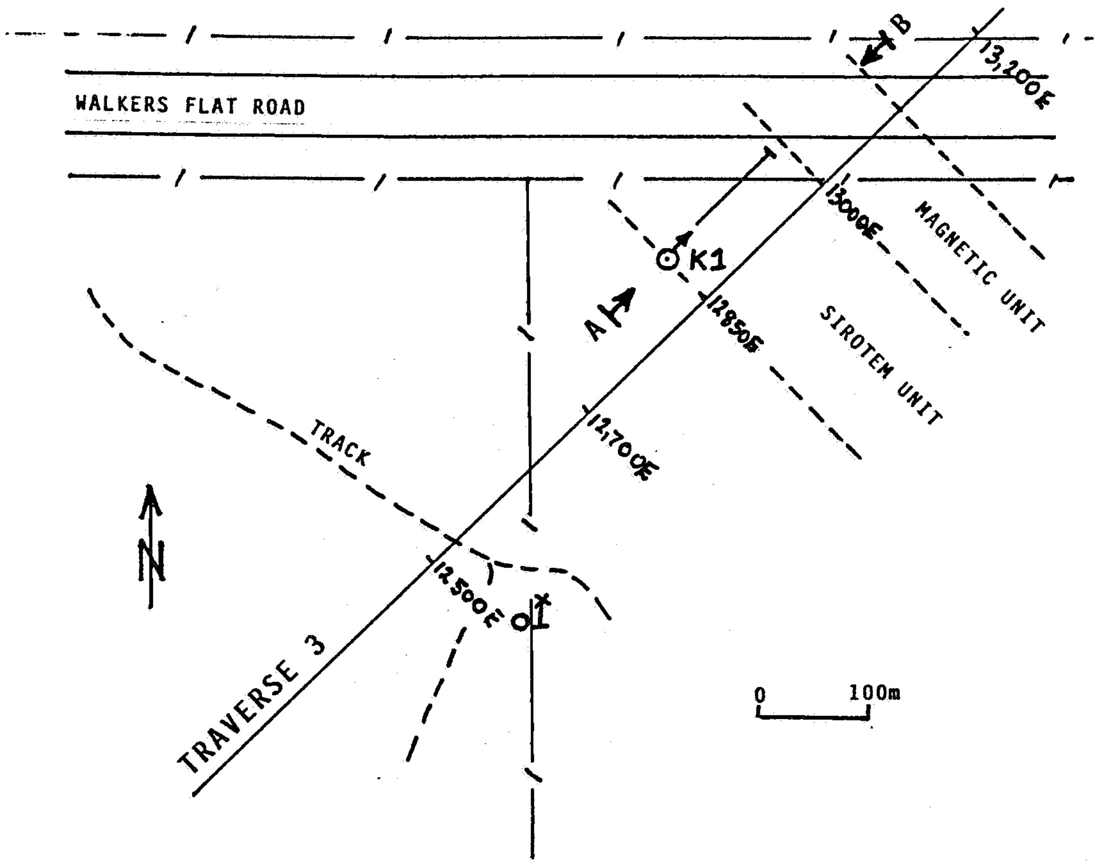
Good one

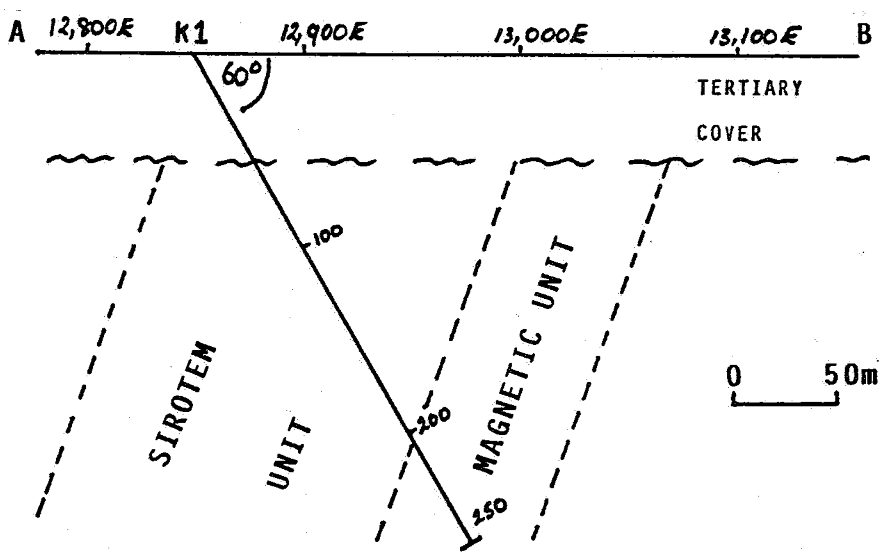
Since the Black Hill Nortie? has a reverse magnetic remanance polarity it is possible that the steep gradient is the edge of the Norite Complex, irrespective of whether or not the contact is intrusive or faulted.

5.2 Sirotem Survey

To investigate this magnetically defined boundary position, a Sirotem Survey was carried out under contract along magnetic traverse No. 3 from 12,500E to 14,000E by Solo Geophysics Co.

The survey used 100m square overlapped transmitter loops with a centrally located receiver coil. The stacked profiles of microvolts per Amp for different time delays clearly show a gradual decrease in early time response from south west to north east, which probably reflects a decrease in thickness of the Tertiary sequence. Imposed on this "half-space" response is a possible twin-shoulder anomaly due to a weakly conductive source at approximately 12950E (see Figure 5 & 6, and Appendix no. 2).





GEOPHYSICAL MODEL

KAKOONIE NO. 1

FIGURE NO. 5

5.3 Drilling Programme

5.3.1 Target Definition

Comparison of the Sirotem and Magnetic survey profiles on line 3 suggests that the weak transient EM response at 12,950E may be a unit of lower resistance and magnetic susceptibility adjacent to a unit of higher magnetic susceptibility and resistance.

As the programme budget permitted only one drill hole this conductive position on an inferred lithological contact was considered a valid target. Kakoonie No. 1 was consequently collared at 12,880E, oriented at 60^{0} towards the north east to intersect the boundary between the geophysical units at about 200m depth, assuming a south westerly dip (see Figure 5).

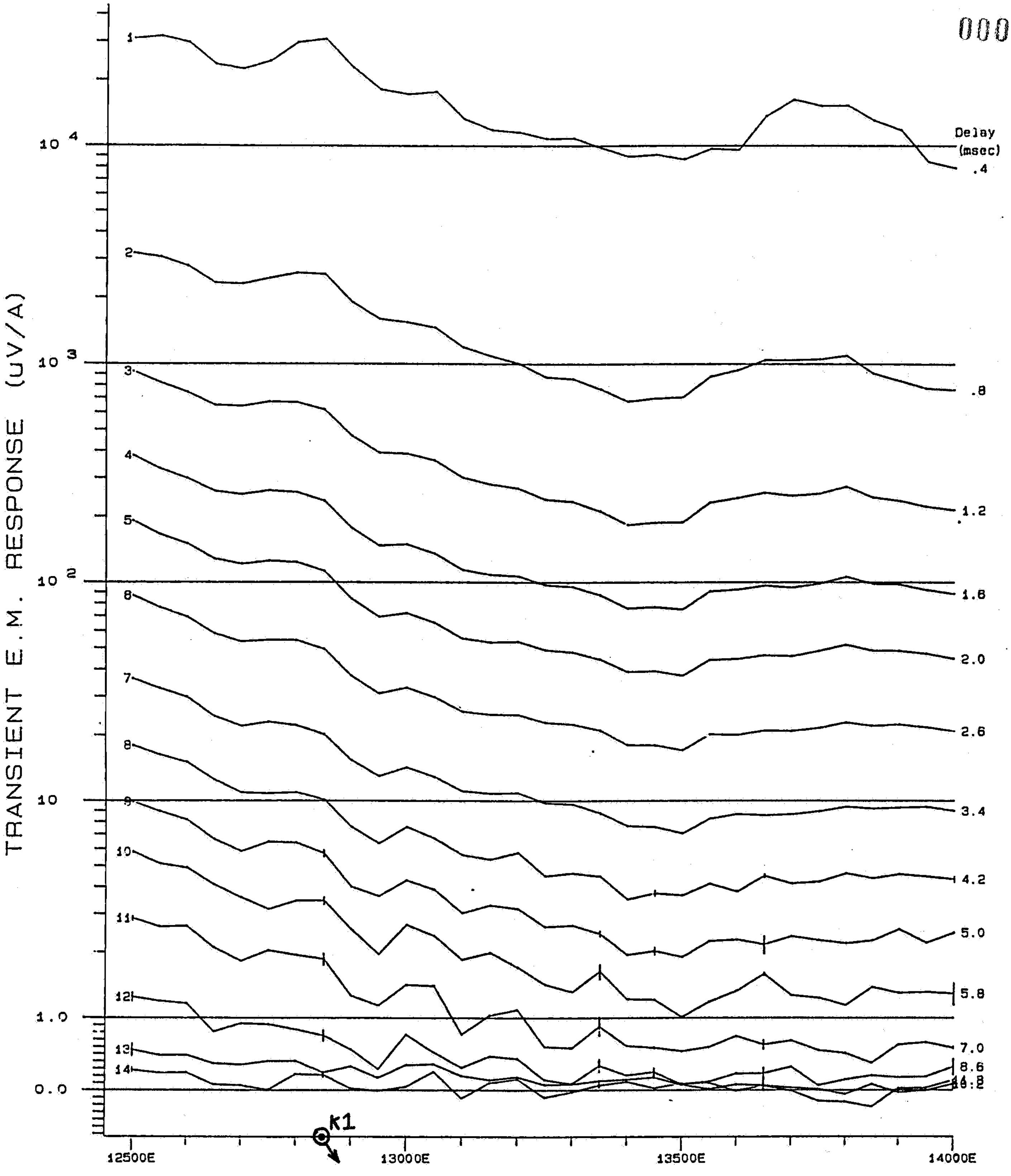
5.3.2 Results

Statistics

Kakoonie No. 1 was collared on April 21st, 1988 and completed two days later at a depth of 256m. The hole was drilled under contract by John Nitschke Drilling of Hahndorf and backfilled to surface on completion.

Geology

Kakoonie No. 1 intersected a typical interval of Tertiary Ettric Limestone down to 56m (48.5 vertical) below which a hard dark grey feldspathic igneous rock was present down to T.D. Field geology logs are included in Appendix no. 3.



CSR MEDG
AREA: SEDAN S. AUST.
GRID:
STANDARD TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 3 NORTH Reading interval 50.0 m
SCALE 1 : 10000 Loop size : 100 m
LOOP configuration : In-loop receiver
Plotted : 12:18 PM 6/ 4/88

SIROTEM PROFILES

KAKOONIE NO. 1

FIGURE NO. 6

Relatively thin zones of probable fine grained doleritic rock were intersected from 70 to 78m and 230 to 232m, within an otherwise relatively uniform composition of coarse to medium grained feldspar with minor mafic minerals such as biotite and amphibole-pyroxenes. The latter were generally harder to identify because of their finer grain size.

Veins of quartz occurred periodically, as well as probable veins of micrograite or aplite which occurred over the following intervals 136-138, 176-178, 216-218, and 226-230m.

The drilling penetration rate was relatively uniform within the basement interval, without evidence for any major zone of sheared and/or broken ground that may be attributed to faulting.

Cuttings of the mafic rock consist chiefly of light-medium grey feldspar cleavage fragments, up to several millimetres in size, accompanied by minor dark to black fragments, generally less than a millimetre in diameter. Pyrite and magnetite were commonly recognized in panned fine fractions.

To improve on the geological information gained from the field drill log, the cuttings were forwarded to M. Farrand of the SADME for further examination using a binocular microscope. Descriptions from this work recognize many subtle mineralogical changes that can be used to subdivide the intersected sequence into a main intrusive phase and a "hybrid" phase, believed to be the consequence of absorbtion of country rocks into the main melt (see Figure 7, Appendix 3).

The main intrusive phase appears to have been a hypersthene/anorthositic gabbro with

00024

diallage/augite pyroxene and/or green amphibole. The "hybrid" phase is more dioritic, with biotite, light micas and chlorite present, with the green hornblende being a transition mineral resulting from hydration. Olivine gabbro was also observed between 120 and 124m. Sulphide material from each of the major lithotypes also appear to be of slightly different character, supporting the lithological sub-divisions.

Interpretation of these observations suggests that the drillhole has penetrated a contact zone between a mafic gabbroic body and country rock. The contact can be diagramatically presented with a horizontal or vertical bias. The latter vertical bias is compatible with geophysical data and consistent with sillform invasion of steeply dipping sediments likely to be encountered in a post orogenic domain. Figure 7 has been adapted from an original figure by M. Farrand which was prepared with a horizontal bias.

? what steeply dipping sediments?

Total melting of country rock.

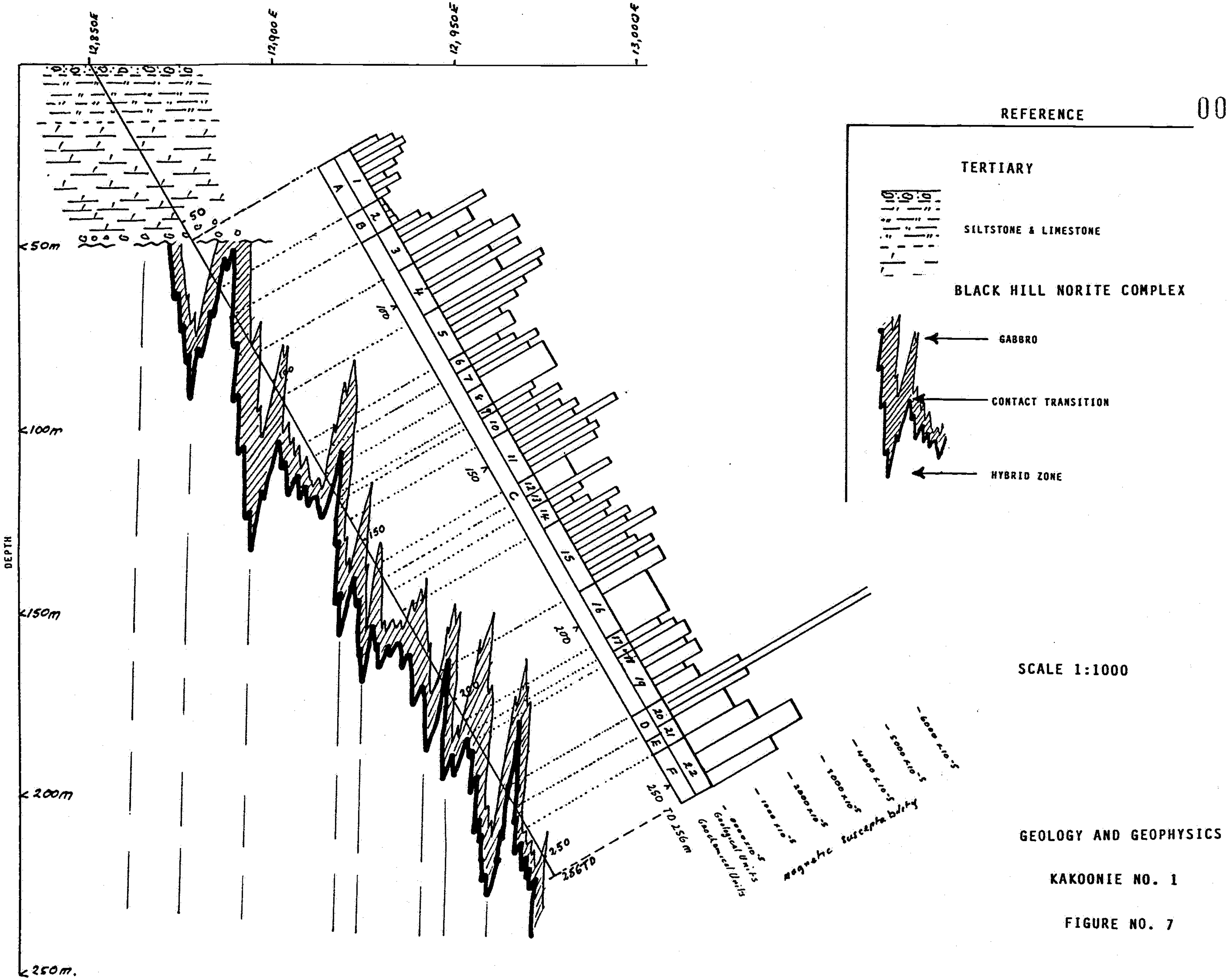
If not horizontal [illegible] bias [illegible] [illegible] Fluids [illegible] of lower pressure.

Mr. Farrand illustrates the contact and transition zone of pyroxene hydration to lie within ± 10m of the drill hole suggesting a relatively smooth igneous contact at ? smaller ? larger scales. However the likely mechanism of intrusion into sediments by a very hot fluid magma could result in thin sheeted bodies of melt penetrating extensively into the country rock resulting in a very spikey pattern to the contact surface when viewed in section. There is no way of determining if the main magmatic body lies below or above the contact zone encountered.

Geochemistry

Each 2m interval was routinely sampled and submitted for ICP analysis by AMDEL under the following scheme, to see if any geochemical subdivisions of significance could be detected (Appendix 4).

00025



GEOLOGY AND GEOPHYSICS

KAKOONIE NO. 1

FIGURE NO. 7

Cu, Co, Zn, Ni, Ag, and Cd to monitor base metal sulphide

Cr, V, P, Fe, Mn to monitor rock mineralogy

As, Sb to act as a gold pathfinder.

Antimony and arsenic were generally low suggesting little possibility for Au enrichment.

Of the base metal suite only copper showed any significant contrasts that may have been sulphide related, with values in the range 45 to 110 ppm from 58 to 120m, less than 45 ppm from 120 to 182m and in the range from 50 to 85 ppm below 182m. Nickel showed variations strongly correlated with the mineralogy suite.

The mineralogy element suite showed the most contrast with the elements listed in Table 1 suggestive of some degree of geochemical differentiation into the noted units that are also presented on Figure 7 for comparison. It is immediately apparent that geochemical units A,B,C,D,E and F correspond to geological units 1, 2, 3 - 19, 20, 21 and 22 respectively.

Since platinoid minerals and gold usually associate with the sulphide phases in mafic melts, the fine fraction material from the washed geological retention samples were retained in bulk and a rough sulphide concentrate prepared by initially separating a gravity concentate followed by a total sulphide flotation. The resultant 102gm sample from approximately 20kg of material was split into two portions of 50gm and a 1gm sample retained for microscope examination. Au, Pt, Pd, Ru, Rh, Ir & Os levels were determined by fire assay.

Geophysics

The magnetic susceptibility of the cuttings was determined using a Geoinstrument JH8 susceptibility meter. The readings were generally in the range 1000 to 3000 x 10^{-5} S.I. units with a mean value of about 1800 x 10^{-5} (Appendix 3).

A histogram plot of the values (Figure 7), shows some degree of correlation with the main lithological and geochemical subdivisions.

It is also apparent that the predicted discrete magnetic body below 200m was not intersected but the inferred conductive unit predicted to lie between 90 and 200m may correspond to geological units 3-15 inclusive, which seem to form a block of generally noisy magnetic susceptibility compared to the rest of the profile.

The drill hole was also geophysically logged with Natural Gamma, Neutron-Density, IP (Chargeability), IP (Resistivity) and Caliper tools, courtesy of the SADME. The profiles (Appendix 5) show some weak correlations with the lithological units suggested from the binocular microscope descriptions.

The gamma log has obvious features that seem to correspond with the appearance of K-Feldspar granitic/dioritic phases.

The unit sets, 1, 2, and 3, 4, 5 seem to correlate with increased neutron response, which is a measure of hydration. It is possible that these responses reflect a palaeoweathering aspect. Neutron response is lowered in the presence of the feldspathic granitic phases and possibly quartz veining.

The density and caliper profiles suggest that unit 1/2 may be of lower density rock and softer due to increased hole annulus and a few narrow washout zones.

The IP resistivity and chargeabilty logs are characterized by a major magnitude change at 192m that is likely to be instrumental in origin. Minor resistivity contrasts in units 8 and 15 may reflect sulphide content, however similar features in the chargeability profile for units 4 and 5 may be of similar cause but are unreflected in resistivity. The unit 1/2 density low is also reflected as a chargeability/resistivity, high/low feature which does not seem to be caused by sulphide content. Saline groundwater reacting with alteration clays may be responsible for this electrical behaviour.

5.4 Discussion

The similarity of the 'Black Hill Norite', and Kakoonie No. 1 gabbro compositions leave little doubt that the igneous rocks are of the same generic origin and it is therefore inferred that the Cambrai-Kakoonie arcuate magnetic zone is part of the 'Black Hill Norite Complex'.

If the interpreted contact nature of lithologies intersected by Kakoonie 1 is correct, then the magnetic ridge observed in the field profiles and on aeromagnetic plans, to the south of the drill-collar possibly represents an aureole effect of the Black Hill Norite Complex within country rock.

The geological units inferred from magnetic susceptibility, geochemistry and mineralogical assessment of the cuttings and their probable near vertical disposition from magnetic modelling suggests that these subdivisions are largely "shadows" of the

TABLE 1

GEOCHEMICAL UNITS KAKOONIE NO. 1

UNIT	INTERVAL (m)	Fe %	Mn ppm	Cr ppm	Ni ppm	V ppm	P ppm	Sb ppm
A	58- 70	>3.2	>430	< 20	>180	< 5	≤ 30	≤ 20
B	70- 80	>3.0	>460	< 20	≤150	≥ 15	>100	≤ 20
	80-202	<2.6	<350	> 45	< 90	< 15	< 60	< 25
C	202-220	<2.6	<350	> 45	< 90	≤ 15	≤ 60	≤ 25
	220-228	<2.6	<350	> 90	< 90	< 15	< 60	< 25
D	228-236	<2.6	<350	> 90	< 90	≥ 20	≥ 65	≤ 30
E	236-240	<2.6	<350	> 90	< 90	≤ 15	≤ 50	≤ 30
F	240-256	>2.8	>400	< 75	≥110	≤ 15	≤ 50	≥ 30

assimilated former country rock layering rather than the cumulate layering sought.

The close similarity in composition between the gabbro at Black Hill and Kakoonie suggests that the mafic rock may be relatively high in the intrusion at both sites. It would seem however, premature to put a great deal of weight on this veiw point without additional drilling, particularly to the NE of Kakoonie 1.

6. CONCLUSIONS AND RECOMMENDATIONS

- The Kakoonie programme has established that the gabbro at Black Hill and Cambrai is part of a much larger complex than previously demonstrated.

- The complex boundary probably follows the N-NW trending magnetic ridge just south west of the Kakoonie 1 drill collar, with the main intrusive to the north and north east.

- Geological, geochemical, and geophysical data patterns observed in Kakoonie 1 are not consistent with cumulate layering, but possibly relate to contact hybrid magmatic petrology.

- Drilling to the NE of Kakoonie 1 is warranted to ascertain the character of the complex in order to adequately test for cumulate layering away from possible hybrid contact petrological influence.

- Additional petrological and mineragraphic work coupled to selected additional geochemical work may prove useful.

7. ACKNOWLEDGEMENTS

CSR Limited acknowledges the useful contributions made to the programme by SADME staff, Messrs. DR M. Farrand, R. Gerdes, C. Gatehouse, R. Horn, W. McCallum and Drs. J. Parker and W. Preiss.

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LYNCH, J., 1986-77; Progress reports on exploration of Licence No. EL204, Kongolia, SADME Envelope No. 2631, North Broken Hill Pty. Ltd., Company Reports (unpub).

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APPENDIX 1

Magnetic Data Listings

X	Y	MAG	X	Y	MAG	X	Y	MAG
10000	100	59681.6	10600	100	60107.2	11200	100	60699.1
10010	100	59836.9	10610	100	60112.2	11210	100	60701.9
10020	100	59863.8	10620	100	60117.7	11220	100	60682.7
10030	100	59869.6	10630	100	60126.2	11230	100	60759.5
10040	100	59872.2	10640	100	60120.0	11240	100	60721.8
10050	100	59883.9	10650	100	60086.4	11250	100	60732.1
10060	100	59893.9	10660	100	60125.3	11260	100	60733.1
10070	100	59897.4	10670	100	60112.6	11270	100	60742.2
10080	100	59902.2	10680	100	60156.5	11280	100	60756.7
10090	100	59904.2	10690	100	60177.9	11290	100	60768.2
10100	100	59902.8	10700	100	60184.2	11300	100	60787.9
10110	100	59908.0	10710	100	60194.7	11310	100	60792.5
10120	100	59912.4	10720	100	60200.7	11320	100	60805.7
10130	100	59910.6	10730	100	60206.9	11330	100	60819.5
10140	100	59923.6	10740	100	60214.4	11340	100	60831.0
10150	100	59927.4	10750	100	60221.9	11350	100	60851.2
10160	100	59926.9	10760	100	60227.2	11360	100	60868.1
10170	100	59928.8	10770	100	60233.2	11370	100	60902.3
10180	100	59931.5	10780	100	60238.5	11380	100	60919.2
10190	100	59936.5	10790	100	60242.0	11390	100	60943.1
10200	100	59932.8	10800	100	60244.4	11400	100	60949.0
10210	100	59936.2	10810	100	60252.7	11410	100	60976.5
10220	100	59946.4	10820	100	60259.7	11420	100	60982.3
10230	100	59950.7	10830	100	60266.0	11430	100	60999.8
10240	100	59949.6	10840	100	60273.6	11440	100	61029.1
10250	100	59949.8	10850	100	60279.8	11450	100	61038.1
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10280	100	59951.5	10880	100	60302.5	11480	100	61096.2
10290	100	59957.2	10890	100	60309.2	11490	100	61114.4
10300	100	59955.0	10900	100	60315.4	11500	100	61131.2
10310	100	59959.2	10910	100	60309.3	11510	100	61152.7
10320	100	59968.8	10920	100	60313.4	11520	100	61175.5
10330	100	59972.0	10930	100	60320.0	11530	100	61197.1
10340	100	59979.2	10940	100	60348.3	11540	100	61220.1
10350	100	59986.0	10950	100	60368.3	11550	100	61246.6
10360	100	59993.7	10960	100	60389.0	11560	100	61279.0
10370	100	60002.2	10970	100	60401.8	11570	100	61305.6
10380	100	60009.2	10980	100	60411.8	11580	100	61329.9
10390	100	60008.6	10990	100	60425.6	11590	100	61350.0
10400	100	60011.8	11000	100	60437.7	11600	100	61402.4
10410	100	60016.5	11010	100	60449.4	11610	100	61405.8
10420	100	60019.4	11020	100	60461.6	11620	100	61844.0
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10440	100	60024.0	11040	100	60484.0	11640	100	61527.1
10450	100	60038.5	11050	100	60499.5	11650	100	61539.9
10460	100	60045.0	11060	100	60514.7	11660	100	61558.6
10470	100	60049.6	11070	100	60682.7	11670	100	61594.0
10480	100	60051.2	11080	100	60544.7	11680	100	61618.1
10490	100	60051.6	11090	100	60559.6	11690	100	61624.8
10500	100	60055.4	11100	100	60566.1	11700	100	61621.1
10510	100	60060.0	11110	100	60578.2	11710	100	61619.7
10520	100	60067.2	11120	100	60591.4	11720	100	61600.3
10530	100	60072.4	11130	100	60608.9	11730	100	61559.6
10540	100	60078.3	11140	100	60616.8	11740	100	61523.7
10550	100	60080.6	11150	100	60631.7	11750	100	61453.9
10560	100	60084.5	11160	100	60639.2	11760	100	61436.2
10570	100	60090.0	11170	100	60659.5	11770	100	61362.1
10580	100	60097.4	11180	100	60672.0	11780	100	61274.3
10590	100	60102.7	11190	100	60683.5	11790	100	61160.0

X	Y	MAG	X	Y	MAG	X	Y	MAG
11800	100	61057.2	12400	100	58614.7	13000	100	60047.6
11810	100	60933.2	12410	100	58599.9	13010	100	60075.1
11820	100	60804.4	12420	100	58587.1	13020	100	60101.3
11830	100	60663.6	12430	100	58574.8	13030	100	60131.8
11840	100	60525.5	12440	100	58572.7	13040	100	60160.4
11850	100	60368.5	12450	100	58580.6	13050	100	60198.0
11860	100	60230.3	12460	100	58594.3	13060	100	60233.0
11870	100	60068.6	12470	100	58619.8	13070	100	60266.5
11880	100	59906.9	12480	100	58658.2	13080	100	60302.5
11890	100	59708.1	12490	100	58688.8	13090	100	60341.5
11900	100	59443.1	12500	100	58732.4	13100	100	60375.4
11910	100	59249.6	12510	100	58775.1	13110	100	60408.5
11920	100	59033.8	12520	100	58818.8	13120	100	60443.2
11930	100	58849.4	12530	100	58868.1	13130	100	60473.6
11940	100	58659.4	12540	100	58912.9	13140	100	60496.2
11950	100	58456.8	12550	100	58959.2	13150	100	60516.0
11960	100	58279.9	12560	100	59004.3	13160	100	60531.0
11970	100	58093.9	12570	100	59043.1	13170	100	60539.5
11980	100	57944.3	12580	100	59084.1	13180	100	60552.7
11990	100	57811.2	12590	100	59122.2	13190	100	60557.6
12000	100	57686.4	12600	100	59160.5	13200	100	60558.8
12010	100	57589.9	12610	100	59194.8	13210	100	60556.4
12020	100	57538.9	12620	100	59224.5	13220	100	60555.7
12030	100	57503.8	12630	100	59253.8	13230	100	60560.2
12040	100	57497.7	12640	100	59283.5	13240	100	60560.2
12050	100	57523.0	12650	100	59314.2	13250	100	60554.3
12060	100	57572.9	12660	100	59341.5	13260	100	60541.9
12070	100	57633.9	12670	100	59375.4	13270	100	60530.7
12080	100	57707.6	12680	100	59414.6	13280	100	60515.8
12090	100	57793.7	12690	100	59442.2	13290	100	60494.4
12100	100	57872.2	12700	100	59480.3	13300	100	60465.6
12110	100	57956.5	12710	100	59516.3	13310	100	60439.7
12120	100	58040.9	12720	100	59551.7	13320	100	60402.7
12130	100	58118.7	12730	100	59591.0	13330	100	60352.9
12140	100	58194.5	12740	100	59625.9	13340	100	60302.2
12150	100	58260.2	12750	100	59658.2	13350	100	60247.4
12160	100	58346.2	12760	100	59687.2	13360	100	60184.2
12170	100	58426.0	12770	100	59711.1	13370	100	60121.8
12180	100	58501.4	12780	100	59732.2	13380	100	60043.9
12190	100	58581.7	12790	100	59753.7	13390	100	59959.7
12200	100	58659.0	12800	100	59772.9	13400	100	59869.6
12210	100	58718.4	12810	100	59783.2	13410	100	59776.1
12220	100	58763.2	12820	100	59789.2	13420	100	59681.5
12230	100	58795.7	12830	100	59792.1	13430	100	59587.0
12240	100	58813.7	12840	100	59793.3	13440	100	59510.5
12250	100	58808.9	12850	100	59793.5	13450	100	59422.6
12260	100	58802.1	12860	100	59794.9	13460	100	59333.5
12270	100	58802.3	12870	100	59795.8	13470	100	59239.5
12280	100	58788.4	12880	100	59801.0	13480	100	59135.8
12290	100	58773.6	12890	100	59808.0	13490	100	59035.6
12300	100	58741.7	12900	100	59819.7	13500	100	58930.2
12310	100	58727.4	12910	100	59831.9	13510	100	58823.1
12320	100	58720.3	12920	100	59848.5	13520	100	58704.9
12330	100	58709.2	12930	100	59869.8	13530	100	58579.1
12340	100	58701.7	12940	100	59892.7	13540	100	58461.7
12350	100	58693.7	12950	100	59917.4	13550	100	58344.5
12360	100	58681.3	12960	100	59941.5	13560	100	58228.7
12370	100	58669.2	12970	100	59965.2	13570	100	58109.4
12380	100	58656.3	12980	100	59997.9	13580	100	57971.3
12390	100	58635.9	12990	100	60018.6	13590	100	57838.0

X	Y	MAG	X	Y	MAG	X	Y	MAG
13600	100	57725.1						
13610	100	57624.8						
13620	100	57542.7						
13630	100	57481.7						
13640	100	57443.7						
13650	100	57434.9						
13660	100	57445.8						
13670	100	57484.7						
13680	100	57530.7						
13690	100	57580.5						
13700	100	57644.6						
13710	100	57697.1						
13720	100	57750.4						
13730	100	57793.1						
13740	100	57817.8						
13750	100	57827.8						
13760	100	57825.6						
13770	100	57817.0						
13780	100	57804.9						
13790	100	57790.0						
13800	100	57780.2						
13810	100	57775.6						
13820	100	57781.2						
13830	100	57796.9						
13840	100	57823.1						
13850	100	57859.5						
13860	100	57899.2						
13870	100	57936.4						
13880	100	57978.3						
13890	100	58013.7						
13900	100	58044.3						
13910	100	58074.1						
13920	100	58098.7						
13930	100	58112.8						
13940	100	58120.0						
13950	100	58120.4						
13960	100	58120.0						
13970	100	58118.9						
13980	100	58123.6						
13990	100	58138.0						
14000	100	58157.8						

X	Y	MAG	X	Y	MAG	X	Y	MAG
10200	200	59816.4	10800	200	60102.6	11400	200	60487.8
10210	200	59888.7	10810	200	60111.1	11410	200	60502.2
10220	200	59912.7	10820	200	60121.7	11420	200	60514.7
10230	200	59912.1	10830	200	60125.1	11430	200	60527.3
10240	200	59938.1	10840	200	60132.8	11440	200	60544.2
10250	200	59928.6	10850	200	60134.1	11450	200	60561.2
10260	200	59936.6	10860	200	60139.1	11460	200	60577.6
10270	200	59944.7	10870	200	60147.4	11470	200	60604.8
10280	200	59946.7	10880	200	60155.1	11480	200	60621.9
10290	200	59954.8	10890	200	60161.4	11490	200	60645.6
10300	200	59952.9	10900	200	60169.1	11500	200	60664.6
10310	200	59954.9	10910	200	60178.1	11510	200	60691.2
10320	200	59960.4	10920	200	60184.7	11520	200	60709.1
10330	200	59965.7	10930	200	60190.8	11530	200	60719.4
10340	200	59970.9	10940	200	60199.5	11540	200	60751.9
10350	200	59977.0	10950	200	60208.5	11550	200	60790.5
10360	200	59979.0	10960	200	60216.5	11560	200	60815.4
10370	200	59984.6	10970	200	60225.6	11570	200	60842.3
10380	200	59989.1	10980	200	60232.2	11580	200	60866.0
10390	200	59993.6	10990	200	60238.1	11590	200	60888.7
10400	200	59996.6	11000	200	60246.1	11600	200	60914.4
10410	200	60000.2	11010	200	60253.3	11610	200	60933.6
10420	200	60004.7	11020	200	60258.6	11620	200	60951.5
10430	200	60006.3	11030	200	60264.9	11630	200	60969.6
10440	200	60008.3	11040	200	60265.0	11640	200	60992.5
10450	200	60010.2	11050	200	60270.5	11650	200	61014.4
10460	200	60013.5	11060	200	60272.1	11660	200	61040.8
10470	200	60009.7	11070	200	60274.3	11670	200	61065.2
10480	200	60007.6	11080	200	60274.6	11680	200	61087.7
10490	200	60006.8	11090	200	60274.5	11690	200	61113.9
10500	200	60006.7	11100	200	60274.1	11700	200	61133.3
10510	200	60007.0	11110	200	60274.0	11710	200	61153.0
10520	200	60007.0	11120	200	60275.1	11720	200	61174.6
10530	200	60005.6	11130	200	60278.4	11730	200	61202.7
10540	200	60005.3	11140	200	60280.1	11740	200	61235.3
10550	200	60005.6	11150	200	60285.1	11750	200	61260.6
10560	200	60004.6	11160	200	60285.7	11760	200	61283.9
10570	200	60004.0	11170	200	60286.4	11770	200	61311.2
10580	200	60006.9	11180	200	60289.9	11780	200	61338.8
10590	200	60009.4	11190	200	60298.3	11790	200	61362.3
10600	200	60009.9	11200	200	60306.9	11800	200	61385.6
10610	200	60010.8	11210	200	60311.8	11810	200	61404.9
10620	200	60012.2	11220	200	60321.4	11820	200	61425.6
10630	200	60013.1	11230	200	60331.7	11830	200	61453.0
10640	200	60018.3	11240	200	60335.7	11840	200	61477.0
10650	200	60025.0	11250	200	60349.3	11850	200	61494.6
10660	200	60028.0	11260	200	60357.0	11860	200	61519.3
10670	200	60032.4	11270	200	60364.5	11870	200	61538.7
10680	200	60034.4	11280	200	60371.6	11880	200	61559.6
10690	200	60039.2	11290	200	60380.4	11890	200	61583.2
10700	200	60045.9	11300	200	60389.0	11900	200	61609.2
10710	200	60048.5	11310	200	60393.4	11910	200	61636.8
10720	200	60052.6	11320	200	60411.4	11920	200	61659.6
10730	200	60064.0	11330	200	60413.7	11930	200	61682.5
10740	200	60071.6	11340	200	60424.1	11940	200	61703.9
10750	200	60076.1	11350	200	60434.2	11950	200	61729.5
10760	200	60080.9	11360	200	60442.6	11960	200	61760.7
10770	200	60085.4	11370	200	60454.4	11970	200	61788.2
10780	200	60089.0	11380	200	60463.9	11980	200	61808.3
10790	200	60094.3	11390	200	60475.4	11990	200	61837.9

X	Y	MAG	X	Y	MAG	X	Y	MAG
12000	200	61872.1	12600	200	62447.5	13200	200	60126.3
12010	200	61912.3	12610	200	62434.6	13210	200	60108.8
12020	200	61943.2	12620	200	62407.6	13220	200	60079.5
12030	200	61970.1	12630	200	62369.3	13230	200	60052.7
12040	200	61996.5	12640	200	62327.5	13240	200	60014.2
12050	200	62014.1	12650	200	62282.4	13250	200	59976.2
12060	200	62039.1	12660	200	62233.5	13260	200	59939.5
12070	200	62064.7	12670	200	62178.0	13270	200	59902.1
12080	200	62086.8	12680	200	62123.9	13280	200	59865.9
12090	200	62110.4	12690	200	62068.7	13290	200	59833.5
12100	200	62133.6	12700	200	62008.3	13300	200	59809.6
12110	200	62150.3	12710	200	61969.2	13310	200	59789.8
12120	200	62172.4	12720	200	61922.6	13320	200	59764.9
12130	200	62196.9	12730	200	61868.9	13330	200	59752.8
12140	200	62219.3	12740	200	61818.6	13340	200	59718.0
12150	200	62240.8	12750	200	61771.6	13350	200	59685.9
12160	200	62269.0	12760	200	61728.5	13360	200	59653.9
12170	200	62291.2	12770	200	61683.3	13370	200	59626.8
12180	200	62322.2	12780	200	61643.1	13380	200	59607.4
12190	200	62339.3	12790	200	61601.0	13390	200	59598.3
12200	200	62365.0	12800	200	61559.7	13400	200	59577.3
12210	200	62381.9	12810	200	61527.5	13410	200	59556.2
12220	200	62398.7	12820	200	61494.6	13420	200	59532.3
12230	200	62415.6	12830	200	61462.9	13430	200	59494.6
12240	200	62434.5	12840	200	61426.0	13440	200	59447.9
12250	200	62449.5	12850	200	61392.2	13450	200	59394.7
12260	200	62463.7	12860	200	61359.1	13460	200	59352.6
12270	200	62477.7	12870	200	61330.2	13470	200	59329.6
12280	200	62488.6	12880	200	61299.8	13480	200	59310.1
12290	200	62501.4	12890	200	61261.7	13490	200	59300.1
12300	200	62514.2	12900	200	61221.7	13500	200	59300.1
12310	200	62521.0	12910	200	61186.7	13510	200	59311.0
12320	200	62526.2	12920	200	61141.4	13520	200	59319.6
12330	200	62535.4	12930	200	61097.9	13530	200	59319.7
12340	200	62535.6	12940	200	61056.2	13540	200	59317.6
12350	200	62531.5	12950	200	61011.2	13550	200	59304.2
12360	200	62532.4	12960	200	60951.9	13560	200	59283.3
12370	200	62529.9	12970	200	60932.7	13570	200	59261.9
12380	200	62529.8	12980	200	60891.4	13580	200	59237.7
12390	200	62532.3	12990	200	60859.1	13590	200	59216.2
12400	200	62536.0	13000	200	60835.8	13600	200	59209.7
12410	200	62541.1	13010	200	60802.1	13610	200	59212.3
12420	200	62546.2	13020	200	60766.4	13620	200	59221.7
12430	200	62552.7	13030	200	60728.5	13630	200	59237.5
12440	200	62560.2	13040	200	60693.1	13640	200	59253.3
12450	200	62569.0	13050	200	60658.3	13650	200	59270.0
12460	200	62574.0	13060	200	60624.5	13660	200	59275.1
12470	200	62578.9	13070	200	60590.0	13670	200	59289.6
12480	200	62577.3	13080	200	60551.1	13680	200	59295.5
12490	200	62574.4	13090	200	60513.9	13690	200	59309.9
12500	200	62566.1	13100	200	60473.7	13700	200	59323.5
12510	200	62564.4	13110	200	60437.3	13710	200	59339.3
12520	200	62558.7	13120	200	60396.7	13720	200	59356.1
12530	200	62547.8	13130	200	60357.1	13730	200	59376.0
12540	200	62542.5	13140	200	60312.8	13740	200	59388.2
12550	200	62521.2	13150	200	60268.0	13750	200	59399.6
12560	200	62507.7	13160	200	60232.7	13760	200	59410.3
12570	200	62493.5	13170	200	60196.8	13770	200	59418.1
12580	200	62482.6	13180	200	60167.3	13780	200	59420.2
12590	200	62465.6	13190	200	60144.5	13790	200	59420.3

X	Y	MAG	X	Y	MAG	X	Y	MAG
13800	200	59413.0	14400	200	60440.2	15000	200	58910.4
13810	200	59411.1	14410	200	60404.8			
13820	200	59404.0	14420	200	60361.7			
13830	200	59389.6	14430	200	60309.4			
13840	200	59390.7	14440	200	60241.8			
13850	200	59381.9	14450	200	60161.9			
13860	200	59374.4	14460	200	60077.3			
13870	200	59369.3	14470	200	59995.3			
13880	200	59372.1	14480	200	59911.9			
13890	200	59363.1	14490	200	59841.1			
13900	200	59366.5	14500	200	59742.3			
13910	200	59372.2	14510	200	59691.3			
13920	200	59374.8	14520	200	59642.2			
13930	200	59382.3	14530	200	59599.5			
13940	200	59393.8	14540	200	59553.5			
13950	200	59403.4	14550	200	59513.7			
13960	200	59415.4	14560	200	59479.3			
13970	200	59440.6	14570	200	59452.8			
13980	200	59469.2	14580	200	59424.6			
13990	200	59499.7	14590	200	59397.4			
14000	200	59528.4	14600	200	59372.2			
14010	200	59563.4	14610	200	59343.6			
14020	200	59590.1	14620	200	59331.0			
14030	200	59615.9	14630	200	59317.9			
14040	200	59630.6	14640	200	59303.1			
14050	200	59637.4	14650	200	59289.9			
14060	200	59641.4	14660	200	59272.8			
14070	200	59642.3	14670	200	59246.2			
14080	200	59636.8	14680	200	59181.6			
14090	200	59633.1	14690	200	59156.9			
14100	200	59624.2	14700	200	59168.7			
14110	200	59617.8	14710	200	59145.9			
14120	200	59614.2	14720	200	59112.4			
14130	200	59614.7	14730	200	59066.5			
14140	200	59623.3	14740	200	59025.2			
14150	200	59640.0	14750	200	58973.4			
14160	200	59669.0	14760	200	58934.6			
14170	200	59712.6	14770	200	58898.2			
14180	200	59757.4	14780	200	58864.2			
14190	200	59808.7	14790	200	58825.4			
14200	200	59867.5	14800	200	58788.0			
14210	200	59947.2	14810	200	58764.9			
14220	200	59991.8	14820	200	58730.1			
14230	200	60064.7	14830	200	58702.7			
14240	200	60126.5	14840	200	58685.8			
14250	200	60180.5	14850	200	58680.3			
14260	200	60234.1	14860	200	58686.5			
14270	200	60282.2	14870	200	58706.5			
14280	200	60324.4	14880	200	58734.2			
14290	200	60363.4	14890	200	58769.7			
14300	200	60399.4	14900	200	58812.7			
14310	200	60441.4	14910	200	58851.3			
14320	200	60469.8	14920	200	58896.8			
14330	200	60492.1	14930	200	58925.8			
14340	200	60507.0	14940	200	58944.4			
14350	200	60507.9	14950	200	58955.8			
14360	200	60438.8	14960	200	58948.6			
14370	200	60486.2	14970	200	58934.9			
14380	200	60470.5	14980	200	58930.8			
14390	200	60456.0	14990	200	58919.3			

X	Y	MAG	X	Y	MAG	X	Y	MAG
10000	300	59870.8	10600	300	60222.4	11200	300	60644.0
10010	300	59874.5	10610	300	60235.0	11210	300	60650.9
10020	300	59878.4	10620	300	60249.7	11220	300	60657.6
10030	300	59879.2	10630	300	60265.4	11230	300	60665.8
10040	300	59883.4	10640	300	60279.2	11240	300	60671.5
10050	300	59887.6	10650	300	60294.0	11250	300	60677.6
10060	300	59892.1	10660	300	60308.6	11260	300	60678.2
10070	300	59894.9	10670	300	60317.4	11270	300	60713.2
10080	300	59898.0	10680	300	60310.2	11280	300	60694.8
10090	300	59901.8	10690	300	60338.0	11290	300	60707.3
10100	300	59903.6	10700	300	60344.6	11300	300	60687.2
10110	300	59911.2	10710	300	60354.3	11310	300	60727.5
10120	300	59915.0	10720	300	60365.9	11320	300	60733.8
10130	300	59920.9	10730	300	60376.7	11330	300	60745.6
10140	300	59927.7	10740	300	60385.0	11340	300	60757.7
10150	300	59935.6	10750	300	60394.0	11350	300	60770.0
10160	300	59938.6	10760	300	60401.2	11360	300	60783.1
10170	300	59945.2	10770	300	60410.1	11370	300	60800.3
10180	300	59952.5	10780	300	60418.9	11380	300	60811.2
10190	300	59961.9	10790	300	60427.6	11390	300	60822.7
10200	300	59978.1	10800	300	60434.1	11400	300	60840.0
10210	300	59988.9	10810	300	60439.3	11410	300	60855.2
10220	300	59997.7	10820	300	60447.0	11420	300	60869.5
10230	300	60007.5	10830	300	60455.3	11430	300	60884.4
10240	300	60019.2	10840	300	60457.5	11440	300	60900.3
10250	300	60030.5	10850	300	60460.4	11450	300	60915.5
10260	300	60038.2	10860	300	60462.1	11460	300	60933.5
10270	300	60042.8	10870	300	60461.9	11470	300	60950.4
10280	300	60052.5	10880	300	60467.2	11480	300	60964.9
10290	300	60056.6	10890	300	60467.7	11490	300	60981.9
10300	300	60059.6	10900	300	60452.7	11500	300	60996.8
10310	300	60063.4	10910	300	60455.5	11510	300	61012.9
10320	300	60064.2	10920	300	60458.1	11520	300	61029.2
10330	300	60064.6	10930	300	60454.2	11530	300	61043.9
10340	300	60065.4	10940	300	60453.9	11540	300	61057.6
10350	300	60067.0	10950	300	60456.1	11550	300	61071.7
10360	300	60065.6	10960	300	60455.5	11560	300	61088.4
10370	300	60068.1	10970	300	60465.9	11570	300	61099.9
10380	300	60072.7	10980	300	60468.8	11580	300	61113.7
10390	300	60076.0	10990	300	60468.8	11590	300	61127.3
10400	300	60078.6	11000	300	60469.8	11600	300	61142.3
10410	300	60081.4	11010	300	60477.1	11610	300	61149.4
10420	300	60090.3	11020	300	60485.5	11620	300	61171.4
10430	300	60097.4	11030	300	60492.1	11630	300	61178.8
10440	300	60104.6	11040	300	60499.5	11640	300	61208.4
10450	300	60112.2	11050	300	60507.1	11650	300	61212.7
10460	300	60119.2	11060	300	60514.8	11660	300	61225.7
10470	300	60125.8	11070	300	60521.2	11670	300	61245.1
10480	300	60130.6	11080	300	60528.8	11680	300	61261.5
10490	300	60137.2	11090	300	60536.5	11690	300	61277.5
10500	300	60142.0	11100	300	60545.8	11700	300	61299.2
10510	300	60146.8	11110	300	60551.4	11710	300	61320.4
10520	300	60149.9	11120	300	60560.2	11720	300	61343.1
10530	300	60155.3	11130	300	60576.1	11730	300	61363.1
10540	300	60164.9	11140	300	60588.9	11740	300	61387.6
10550	300	60176.4	11150	300	60601.6	11750	300	61412.4
10560	300	60186.1	11160	300	60612.8	11760	300	61439.5
10570	300	60196.5	11170	300	60619.4	11770	300	61470.1
10580	300	60208.0	11180	300	60628.2	11780	300	61503.1
10590	300	60216.4	11190	300	60644.3	11790	300	61530.5

X	Y	MAG	X	Y	MAG	X	Y	MAG
11800	300	61561.1	12400	300	63493.4	13000	300	59813.0
11810	300	61595.0	12410	300	63537.7	13010	300	59824.6
11820	300	61620.8	12420	300	63578.2	13020	300	59834.8
11830	300	61643.6	12430	300	63621.1	13030	300	59857.3
11840	300	61673.8	12440	300	63655.5	13040	300	59890.8
11850	300	61699.6	12450	300	63685.5	13050	300	59915.3
11860	300	61729.2	12460	300	63709.1	13060	300	59937.2
11870	300	61751.4	12470	300	63722.7	13070	300	59942.9
11880	300	61781.5	12480	300	63726.4	13080	300	59923.7
11890	300	61817.9	12490	300	63723.2	13090	300	59883.3
11900	300	61850.2	12500	300	63719.3	13100	300	59794.6
11910	300	61885.4	12510	300	63706.9	13110	300	59655.9
11920	300	61917.1	12520	300	63692.7	13120	300	59474.8
11930	300	61951.7	12530	300	63673.3	13130	300	59238.1
11940	300	61985.2	12540	300	63653.8	13140	300	58966.2
11950	300	62019.2	12550	300	63639.3	13150	300	58730.3
11960	300	62050.1	12560	300	63622.9	13160	300	58537.5
11970	300	62082.5	12570	300	63597.7	13170	300	58416.4
11980	300	62113.6	12580	300	63566.8	13180	300	58360.0
11990	300	62136.8	12590	300	63532.0	13190	300	58355.5
12000	300	62154.2	12600	300	63492.8	13200	300	58368.9
12010	300	62176.9	12610	300	63424.7	13210	300	58409.8
12020	300	62201.2	12620	300	63338.0	13220	300	58461.4
12030	300	62232.6	12630	300	63214.2	13230	300	58507.5
12040	300	62260.6	12640	300	63089.6	13240	300	58546.8
12050	300	62289.6	12650	300	62969.9	13250	300	58592.6
12060	300	62317.7	12660	300	62826.2	13260	300	58616.0
12070	300	62347.7	12670	300	62664.8	13270	300	58634.0
12080	300	62376.6	12680	300	62498.8	13280	300	58637.2
12090	300	62405.8	12690	300	62292.1	13290	300	58633.4
12100	300	62435.0	12700	300	62122.6	13300	300	58659.6
12110	300	62466.1	12710	300	61920.1	13310	300	58723.8
12120	300	62493.0	12720	300	61715.2	13320	300	58815.9
12130	300	62523.2	12730	300	61535.5	13330	300	58926.9
12140	300	62549.8	12740	300	61365.4	13340	300	59042.0
12150	300	62580.6	12750	300	61211.0	13350	300	59120.3
12160	300	62610.5	12760	300	61076.9	13360	300	59159.7
12170	300	62643.4	12770	300	60952.7	13370	300	59163.7
12180	300	62672.2	12780	300	60840.8	13380	300	59122.0
12190	300	62694.7	12790	300	60745.1	13390	300	58975.8
12200	300	62711.6	12800	300	60659.9	13400	300	58717.5
12210	300	62734.3	12810	300	60571.7	13410	300	58404.3
12220	300	62766.4	12820	300	60494.2	13420	300	58206.1
12230	300	62795.2	12830	300	60429.2	13430	300	58060.8
12240	300	62820.2	12840	300	60367.4	13440	300	57824.3
12250	300	62856.1	12850	300	60314.7	13450	300	57569.4
12260	300	62889.3	12860	300	60270.8	13460	300	57276.9
12270	300	62921.7	12870	300	60229.7	13470	300	57023.9
12280	300	62955.8	12880	300	60197.4	13480	300	56869.6
12290	300	62998.1	12890	300	60153.4	13490	300	56767.8
12300	300	63033.4	12900	300	60113.8	13500	300	56766.0
12310	300	63074.6	12910	300	60068.8	13510	300	56855.2
12320	300	63117.6	12920	300	60022.4	13520	300	57024.0
12330	300	63162.7	12930	300	59970.5	13530	300	57188.3
12340	300	63212.9	12940	300	59910.8	13540	300	57379.1
12350	300	63252.5	12950	300	59863.4	13550	300	57540.7
12360	300	63305.2	12960	300	59835.3	13560	300	57721.5
12370	300	63350.6	12970	300	59815.6	13570	300	57874.9
12380	300	63412.3	12980	300	59802.4	13580	300	58030.3
12390	300	63468.8	12990	300	59825.2	13590	300	58154.9

X	Y	MAG	X	Y	MAG	X	Y	MAG
13600	300	58251.5						
13610	300	58323.5						
13620	300	58387.0						
13630	300	58434.1						
13640	300	58488.9						
13650	300	58531.3						
13660	300	58559.0						
13670	300	58584.9						
13680	300	58610.2						
13690	300	58646.7						
13700	300	58676.1						
13710	300	58717.3						
13720	300	58752.8						
13730	300	58784.9						
13740	300	58812.2						
13750	300	58838.2						
13760	300	58856.2						
13770	300	58858.5						
13780	300	58864.8						
13790	300	58867.7						
13800	300	58872.0						
13810	300	58880.8						
13820	300	58887.1						
13830	300	58892.3						
13840	300	58901.7						
13850	300	58917.3						
13860	300	58921.0						
13870	300	58919.7						
13880	300	58913.2						
13890	300	58901.1						
13900	300	58875.9						
13910	300	58844.9						
13920	300	58821.7						
13930	300	58795.6						
13940	300	58780.5						
13950	300	58771.4						
13960	300	58776.3						
13970	300	58781.5						
13980	300	58772.4						
13990	300	58778.0						
14000	300	58825.7						

X	Y	MAG	X	Y	MAG	X	Y	MAG
10000	400	59739.1	10600	400	60043.7	11200	400	60508.2
10010	400	59741.1	10610	400	60050.7	11210	400	60507.7
10020	400	59743.2	10620	400	60057.1	11220	400	60520.3
10030	400	59750.6	10630	400	60067.3	11230	400	60535.3
10040	400	59745.5	10640	400	60068.8	11240	400	60542.9
10050	400	59761.4	10650	400	60080.0	11250	400	60533.6
10060	400	59759.2	10660	400	60085.0	11260	400	60557.9
10070	400	59761.6	10670	400	60093.5	11270	400	60563.7
10080	400	59765.0	10680	400	60099.5	11280	400	60554.3
10090	400	59765.4	10690	400	60105.3	11290	400	60578.4
10100	400	59768.9	10700	400	60110.7	11300	400	60598.0
10110	400	59772.0	10710	400	60115.4	11310	400	60613.0
10120	400	59776.3	10720	400	60122.5	11320	400	60622.7
10130	400	59780.0	10730	400	60130.3	11330	400	60637.3
10140	400	59783.2	10740	400	60135.8	11340	400	60648.5
10150	400	59785.7	10750	400	60141.0	11350	400	60663.8
10160	400	59789.5	10760	400	60148.0	11360	400	60676.3
10170	400	59792.8	10770	400	60152.8	11370	400	60692.6
10180	400	59795.1	10780	400	60166.8	11380	400	60704.2
10190	400	59798.7	10790	400	60161.1	11390	400	60716.2
10200	400	59805.7	10800	400	60171.9	11400	400	60731.8
10210	400	59807.3	10810	400	60173.3	11410	400	60745.9
10220	400	59814.2	10820	400	60180.0	11420	400	60761.7
10230	400	59818.9	10830	400	60184.2	11430	400	60778.2
10240	400	59822.0	10840	400	60191.9	11440	400	60790.2
10250	400	59828.1	10850	400	60195.3	11450	400	60806.4
10260	400	59831.7	10860	400	60197.0	11460	400	60822.6
10270	400	59835.6	10870	400	60205.2	11470	400	60842.8
10280	400	59842.0	10880	400	60201.4	11480	400	60863.0
10290	400	59848.2	10890	400	60209.9	11490	400	60878.5
10300	400	59857.5	10900	400	60220.0	11500	400	60900.3
10310	400	59860.3	10910	400	60225.3	11510	400	60917.3
10320	400	59870.6	10920	400	60232.3	11520	400	60935.0
10330	400	59877.4	10930	400	60241.8	11530	400	60956.0
10340	400	59885.1	10940	400	60252.8	11540	400	60977.6
10350	400	59884.7	10950	400	60256.9	11550	400	60996.0
10360	400	59889.2	10960	400	60262.0	11560	400	61017.5
10370	400	59898.4	10970	400	60269.2	11570	400	61041.7
10380	400	59904.2	10980	400	60279.1	11580	400	61064.0
10390	400	59910.3	10990	400	60289.4	11590	400	61084.0
10400	400	59913.3	11000	400	60298.1	11600	400	61110.8
10410	400	59920.0	11010	400	60307.6	11610	400	61134.6
10420	400	59927.1	11020	400	60319.0	11620	400	61155.7
10430	400	59932.0	11030	400	60330.5	11630	400	61180.1
10440	400	59938.5	11040	400	60342.9	11640	400	61198.3
10450	400	59954.1	11050	400	60353.9	11650	400	61237.1
10460	400	59957.0	11060	400	60366.9	11660	400	61253.3
10470	400	59963.4	11070	400	60378.7	11670	400	61280.9
10480	400	59966.7	11080	400	60388.9	11680	400	61312.6
10490	400	59970.8	11090	400	60398.3	11690	400	61332.9
10500	400	59975.2	11100	400	60409.7	11700	400	61364.4
10510	400	59982.2	11110	400	60419.6	11710	400	61393.0
10520	400	59988.1	11120	400	60433.0	11720	400	61424.4
10530	400	59993.0	11130	400	60444.7	11730	400	61449.1
10540	400	60003.0	11140	400	60453.9	11740	400	61491.8
10550	400	60011.7	11150	400	60466.2	11750	400	61520.0
10560	400	60018.3	11160	400	60481.8	11760	400	61550.5
10570	400	60024.1	11170	400	60492.7	11770	400	61590.2
10580	400	60031.2	11180	400	60501.4	11780	400	61626.1
10590	400	60037.5	11190	400	60502.4	11790	400	61659.2

X	Y	MAG	X	Y	MAG	X	Y	MAG
11800	400	61703.9	12400	400	61594.1	13000	400	56903.6
11810	400	61746.2	12410	400	61497.1	13010	400	56886.0
11820	400	61787.9	12420	400	61402.1	13020	400	56873.5
11830	400	61837.4	12430	400	61314.5	13030	400	56878.1
11840	400	61886.3	12440	400	61234.8	13040	400	56904.6
11850	400	61932.6	12450	400	61161.0	13050	400	56953.5
11860	400	61977.7	12460	400	61096.1	13060	400	57010.9
11870	400	62023.2	12470	400	61040.4	13070	400	57082.6
11880	400	62069.6	12480	400	60987.9	13080	400	57158.1
11890	400	62114.3	12490	400	60940.2	13090	400	57213.3
11900	400	62157.4	12500	400	60880.2	13100	400	57260.6
11910	400	62197.3	12510	400	60825.6	13110	400	57339.9
11920	400	62237.3	12520	400	60767.4	13120	400	57431.1
11930	400	62274.2	12530	400	60699.7	13130	400	57509.5
11940	400	62305.7	12540	400	60616.2	13140	400	57590.8
11950	400	62340.2	12550	400	60524.4	13150	400	57669.1
11960	400	62370.9	12560	400	60421.5	13160	400	57757.7
11970	400	62392.4	12570	400	60321.6	13170	400	57841.0
11980	400	62414.0	12580	400	60223.1	13180	400	57911.1
11990	400	62432.8	12590	400	60132.6	13190	400	57982.1
12000	400	62454.4	12600	400	60027.6	13200	400	58078.6
12010	400	62467.8	12610	400	59929.3	13210	400	58147.6
12020	400	62479.2	12620	400	59828.1	13220	400	58202.3
12030	400	62493.8	12630	400	59741.2	13230	400	58264.1
12040	400	62508.3	12640	400	59663.4	13240	400	58315.4
12050	400	62526.6	12650	400	59592.2	13250	400	58353.2
12060	400	62555.4	12660	400	59536.1	13260	400	58409.3
12070	400	62579.1	12670	400	59498.5	13270	400	58493.1
12080	400	62610.5	12680	400	59474.7	13280	400	58531.8
12090	400	62647.6	12690	400	59452.5	13290	400	58582.7
12100	400	62704.8	12700	400	59290.6	13300	400	58632.2
12110	400	62754.6	12710	400	59460.8	13310	400	58690.2
12120	400	62809.4	12720	400	59506.3	13320	400	58738.9
12130	400	62864.4	12730	400	59520.9	13330	400	58788.9
12140	400	62915.7	12740	400	59521.9	13340	400	58837.5
12150	400	62965.5	12750	400	59507.1	13350	400	58886.8
12160	400	63010.6	12760	400	59472.0	13360	400	58932.7
12170	400	63042.2	12770	400	59428.3	13370	400	58972.3
12180	400	63062.0	12780	400	59365.2	13380	400	59005.0
12190	400	63068.8	12790	400	59301.2	13390	400	59037.0
12200	400	63057.9	12800	400	59229.1	13400	400	59064.6
12210	400	63036.4	12810	400	59133.3	13410	400	59091.4
12220	400	63008.2	12820	400	59020.7	13420	400	59119.2
12230	400	62967.8	12830	400	58903.3	13430	400	59139.7
12240	400	62922.4	12840	400	58767.2	13440	400	59160.0
12250	400	62872.4	12850	400	58623.4	13450	400	59176.7
12260	400	62812.7	12860	400	58500.6	13460	400	59191.1
12270	400	62747.0	12870	400	58368.4	13470	400	59200.8
12280	400	62674.5	12880	400	58231.8	13480	400	59212.3
12290	400	62595.3	12890	400	58113.0	13490	400	59221.2
12300	400	62511.6	12900	400	57983.9	13500	400	59224.4
12310	400	62424.1	12910	400	57843.9	13510	400	59229.6
12320	400	62329.9	12920	400	57708.2	13520	400	59232.3
12330	400	62235.1	12930	400	57562.4	13530	400	59235.6
12340	400	62138.7	12940	400	57428.0	13540	400	59236.1
12350	400	62041.4	12950	400	57304.2	13550	400	59240.1
12360	400	61952.6	12960	400	57194.9	13560	400	59242.7
12370	400	61864.0	12970	400	57100.4	13570	400	59244.1
12380	400	61761.0	12980	400	57020.5	13580	400	59244.4
12390	400	61673.4	12990	400	56964.3	13590	400	59243.6

X	Y	MAG	X	Y	MAG	X	Y	MAG
13600	400	59245.3						
13610	400	59247.7						
13620	400	59250.7						
13630	400	59257.1						
13640	400	59263.7						
13650	400	59274.2						
13660	400	59288.2						
13670	400	59304.0						
13680	400	59318.6						
13690	400	59333.3						
13700	400	59361.8						
13710	400	59380.2						
13720	400	59402.5						
13730	400	59423.5						
13740	400	59449.1						
13750	400	59472.6						
13760	400	59493.2						
13770	400	59517.8						
13780	400	59540.3						
13790	400	59555.1						
13800	400	59571.3						
13810	400	59586.0						
13820	400	59599.1						
13830	400	59605.8						
13840	400	59613.0						
13850	400	59618.6						
13860	400	59618.5						
13870	400	59618.4						
13880	400	59617.3						
13890	400	59617.0						
13900	400	59618.0						
13910	400	59615.3						
13920	400	59615.8						
13930	400	59615.8						
13940	400	59615.9						
13950	400	59616.8						
13960	400	59617.1						
13970	400	59614.8						
13980	400	59612.2						
13990	400	59591.5						
14000	400	59573.4						

APPENDIX 2

Sirotem Data Listing

Client : CSR MEDG
Area : SEDAN S. AUST.
Grid :

Line : 3 NORTH Survey type : In-loop receiver Loop size : 100
Instrumentation : SIROTEM MK-II Tx x Rx . Medium power option (?0 Amps), Program ID : 4.2
Records sequentially numbered from 1 to 7

Depth 0 m				Depth 0 m				Depth12500 m				Depth12500 m			
1	4691	4	0	1	4673	4	0	1	3112	4	0	1	3083	4	0
2	4122	4	0	2	4106	4	0	2	3208	3	0	2	3176	3	0
3	3622	4	0	3	3608	4	0	3	9274	2	0	3	9180	2	0
4	3183	4	0	4	3171	4	0	4	3833	2	0	4	3792	2	0
5	2797	4	0	5	2786	4	0	5	1918	2	0	5	1901	2	0
6	2309	4	0	6	2300	4	0	6	8724	1	0	6	8637	1	0
7	1783	4	0	7	1776	4	0	7	3637	1	0	7	3618	1	0
8	1377	4	0	8	1371	4	0	8	1811	1	1	8	1785	1	1
9	1063	4	0	9	1059	4	0	9	9929	0	3	9	9797	0	2
10	8217	3	0	10	8184	3	0	10	5843	0	6	10	5769	0	3
11	5626	3	0	11	5603	3	0	11	2788	0	8	11	2943	0	5
12	3360	3	0	12	3345	3	0	12	1310	0	17	12	1187	0	17
13	2007	3	0	13	1999	3	0	13	644	0	68	13	470	0	23
14	1200	3	0	14	1195	3	0	14	316	0	63	14	240	0	53
15	7167	2	0	15	7134	2	0	15	204	0	72	15	1	0	999
16	3424	2	0	16	3408	2	0	16	-163	0	999	16	41	0	***
17	1228	2	0	17	1222	2	0	17	-128	0	***	17	-153	0	***
18	4474	1	0	18	4449	1	0	18	-79	0	***	18	-147	0	34
19	1684	1	0	19	1675	1	0	19	-206	0	51	19	-94	0	63
20	6616	0	0	20	6608	0	1	20	-121	0	999	20	-191	0	34
# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 512			
Current : 4.1				Current : 4.1				Current : 5.7				Current : 5.8			
Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3			

Depth12550 m				Depth12600 m				Depth12650 m			
1	3178	4	0	1	2972	4	0	1	2359	4	0
2	3072	3	0	2	2789	3	0	2	2336	3	0
3	8218	2	0	3	7405	2	0	3	6473	2	0
4	3307	2	0	4	2988	2	0	4	2608	2	0
5	1655	2	0	5	1497	2	0	5	1277	2	0
6	7657	1	0	6	6934	1	0	6	5830	1	0
7	3270	1	0	7	2987	1	0	7	2441	1	1
8	1626	1	1	8	1504	1	1	8	1250	1	1
9	8918	0	3	9	8145	0	3	9	6624	0	3
10	5129	0	4	10	4902	0	5	10	4094	0	7
11	2622	0	9	11	2638	0	7	11	2099	0	10
12	1196	0	26	12	1166	0	12	12	807	0	24
13	481	0	47	13	483	0	999	13	369	0	26
14	237	0	999	14	242	0	***	14	80	0	999
15	-101	0	27	15	168	0	53	15	27	0	999
16	-113	0	66	16	25	0	37	16	-84	0	***
17	-80	0	66	17	-107	0	72	17	-67	0	35
18	-75	0	69	18	-158	0	76	18	-195	0	999
19	-177	0	66	19	-149	0	999	19	-136	0	***
20	-152	0	34	20	-156	0	25	20	-119	0	70
# of stacks 512				# of stacks 512				# of stacks 512			
Current : 5.5				Current : 5.7				Current : 5.5			
Standard time: 3				Standard time: 3				Standard time: 3			

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Processed by SOLO GEOPHYSICS & CO. on 12:32 PM WED., 6 APR., 1988

Client : CSR MEDG
Area : SEDAN S. AUST.
Grid :

Line : 3 NORTH Survey type : In-loop receiver Loop size : 100
Instrumentation : SIROTEM MK-II Tx x Rx , Medium power option (20 Amps), Program ID : 4.2
Records sequentially numbered from 8 to 14

Station 12700E(Z)				Station 12750E(Z)				Station 12800E(Z)				Station 12850E(Z)				Station 12850E(Z)				Station 12900E(Z)				Station 12950E(Z)			
1	2253	4	0	1	2454	4	0	1	3002	4	0	1	3124	4	0	1	3102	4	0	1	2300	4	0	1	1823	4	0
2	2308	3	0	2	2451	3	0	2	2592	3	0	2	2560	3	0	2	2546	3	0	2	1906	3	0	2	1599	3	0
3	6398	2	0	3	6698	2	2	3	6655	2	0	3	6185	2	0	3	6148	2	0	3	4684	2	0	3	3922	2	0
4	2520	2	0	4	2624	2	0	4	2577	2	0	4	2362	2	0	4	2342	2	0	4	1767	2	0	4	1471	2	0
5	1210	2	0	5	1251	2	7	5	1232	2	0	5	1128	2	0	5	1117	2	0	5	8385	1	0	5	6944	1	0
6	5350	1	0	6	5447	1	12	6	5426	1	0	6	4987	1	0	6	4925	1	0	6	3731	1	0	6	3106	1	1
7	2206	1	1	7	2304	1	15	7	2218	1	1	7	2028	1	1	7	2014	1	1	7	1537	1	2	7	1298	1	2
8	1091	1	3	8	1081	1	16	8	1092	1	2	8	1017	1	3	8	1010	1	3	8	7563	0	4	8	6354	0	6
9	5831	0	6	9	6456	0	16	9	6378	0	5	9	5938	0	6	9	5492	0	7	9	4005	0	10	9	3630	0	11
10	3564	0	11	10	3154	0	17	10	3449	0	10	10	3596	0	10	10	3321	0	10	10	2551	0	18	10	1964	0	13
11	1825	0	15	11	2041	0	18	11	1942	0	11	11	1982	0	13	11	1742	0	18	11	1266	0	17	11	1141	0	24
12	922	0	25	12	911	0	18	12	840	0	25	12	834	0	999	12	677	0	80	12	564	0	35	12	294	0	80
13	351	0	79	13	401	0	18	13	402	0	65	13	254	0	***	13	237	0	77	13	327	0	42	13	171	0	67
14	68	0	999	14	5	0	18	14	223	0	76	14	176	0	83	14	244	0	999	14	27	0	999	14	-6	0	73
15	-6	0	999	15	-2	0	18	15	-162	0	999	15	26	0	84	15	179	0	999	15	98	0	77	15	-143	0	36
16	-106	0	***	16	-118	0	18	16	-79	0	***	16	89	0	64	16	-1	0	***	16	-137	0	105	16	-139	0	98
17	-131	0	102	17	-22	0	18	17	-72	0	999	17	-2	0	47	17	-114	0	101	17	-149	0	98	17	-69	0	999
18	-100	0	57	18	1	0	18	18	12	0	***	18	-57	0	48	18	-179	0	100	18	-80	0	999	18	-121	0	***
19	-170	0	115	19	-112	0	18	19	-108	0	105	19	-171	0	63	19	-230	0	999	19	-154	0	***	19	-217	0	101
20	-97	0	54	20	-110	0	18	20	-204	0	105	20	-85	0	39	20	-173	0	27	20	-201	0	105	20	-17	0	106
# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 256			
Current : 5.7				Current : 5.5				Current : 5.7				Current : 5.6				Current : 5.7				Current : 5.6				Current : 5.6			
Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3			

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Processed by SOLO GEOPHYSICS & CO. on 12:32 PM WED., 6 APR., 1988

Client : CSR MEDG
Area : SEDAN S. AUST.
Grid :

Line : 3 NORTH Survey type : In-loop receiver Loop size : 100
Instrumentation : SIROTEM MK-II Tx x Rx , Medium power option (20 Amps), Program ID : 4.2
Records sequentially numbered from 15 to 21

Station 13000E(Z)				Station 13050E(Z)				Station 13100E(Z)				Station 13150E(Z)				Station 13200E(Z)				Station 13250E(Z)				Station 13300E(Z)			
1	1734	4	0	1	1779	4	0	1	1329	4	0	1	1183	4	0	1	1154	4	0	1	1079	4	0	1	1084	4	0
2	1546	3	0	2	1461	3	0	2	1192	3	0	2	1086	3	0	2	1006	3	0	2	8734	2	0	2	8554	2	0
3	3875	2	0	3	3612	2	0	3	3011	2	0	3	2805	2	0	3	2688	2	0	3	2390	2	0	3	2335	2	0
4	1488	2	0	4	1352	2	0	4	1139	2	0	4	1084	2	0	4	1068	2	0	4	9729	1	0	4	9548	1	0
5	7223	1	0	5	6524	1	0	5	5542	1	0	5	5324	1	1	5	5359	1	0	5	4912	1	1	5	4789	1	1
6	3302	1	0	6	2987	1	1	6	2569	1	1	6	2492	1	1	6	2481	1	1	6	2291	1	1	6	2246	1	1
7	1424	1	2	7	1287	1	3	7	1107	1	3	7	1080	1	3	7	1087	1	3	7	9756	0	4	7	9628	0	4
8	7568	0	5	8	6699	0	5	8	5631	0	6	8	5359	0	8	8	5762	0	6	8	4497	0	9	8	4625	0	8
9	4287	0	7	9	3888	0	11	9	3032	0	9	9	3290	0	14	9	3176	0	13	9	2623	0	22	9	2660	0	20
10	2677	0	12	10	2384	0	25	10	1853	0	26	10	1995	0	28	10	1709	0	19	10	1425	0	64	10	1317	0	61
11	1420	0	15	11	1402	0	27	11	773	0	38	11	1025	0	34	11	1089	0	38	11	600	0	35	11	582	0	29
12	769	0	35	12	525	0	65	12	313	0	999	12	468	0	33	12	437	0	61	12	145	0	78	12	89	0	80
13	347	0	999	13	360	0	999	13	198	0	***	13	141	0	999	13	183	0	77	13	76	0	999	13	82	0	999
14	48	0	***	14	255	0	***	14	-111	0	75	14	101	0	***	14	153	0	999	14	-99	0	***	14	-27	0	***
15	-22	0	999	15	47	0	999	15	-95	0	39	15	-99	0	999	15	123	0	29	15	-52	0	80	15	-54	0	76
16	-62	0	***	16	81	0	***	16	-68	0	37	16	-28	0	***	16	-73	0	48	16	-74	0	53	16	45	0	128
17	-72	0	999	17	-66	0	35	17	37	0	54	17	-92	0	***	17	17	0	28	17	-37	0	999	17	186	0	62
18	108	0	***	18	-31	0	999	18	-71	0	104	18	-77	0	40	18	54	0	52	18	-160	0	***	18	-21	0	124
19	-144	0	***	19	-45	0	***	19	-87	0	107	19	18	0	28	19	-135	0	999	19	-156	0	52	19	-115	0	127
20	-46	0	35	20	25	0	102	20	-130	0	110	20	-108	0	51	20	-59	0	106	20	31	0	53	20	-129	0	999
# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 256			
Current : 5.6				Current : 5.8				Current : 5.7				Current : 5.7				Current : 5.7				Current : 5.7				Current : 5.7			
Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3			

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Processed by SOLO GEOPHYSICS & CO. on 12:32 PM WED., 6 APR., 1988

Client : CSR MEDG
Area : SEDAN S. AUST.
Grid :

Line : 3 NORTH Survey type : In-loop receiver Loop size : 100
Instrumentation : SIROTEM MK-II Tx x Rx , Medium power option (20 Amps), Program ID : 4.2
Records sequentially numbered from 22 to 28

Station 13350E(Z)				Station 13350E(Z)				Station 13400E(Z)				Station 13450E(Z)			
1	9781	3	0	1	9728	3	0	1	8906	3	0	1	9119	3	0
2	7702	2	0	2	7656	2	0	2	6741	2	0	2	6982	2	0
3	2114	2	0	3	2103	2	0	3	1830	2	0	3	1877	2	0
4	8778	1	0	4	8710	1	0	4	7588	1	0	4	7721	1	0
5	4467	1	1	5	4426	1	1	5	3899	1	1	5	3935	1	1
6	2123	1	1	6	2088	1	1	6	1806	1	1	6	1792	1	1
7	8697	0	3	7	8830	0	3	7	7639	0	5	7	7513	0	5
8	4510	0	9	8	4442	0	9	8	3504	0	12	8	3860	0	7
9	2360	0	17	9	2513	0	18	9	1950	0	17	9	1940	0	23
10	1501	0	25	10	1767	0	54	10	1220	0	22	10	1217	0	49
11	1012	0	33	11	748	0	31	11	610	0	999	11	604	0	999
12	246	0	999	12	427	0	73	12	206	0	***	12	309	0	***
13	141	0	***	13	114	0	62	13	148	0	999	13	164	0	***
14	34	0	70	14	104	0	67	14	115	0	***	14	27	0	63
15	-179	0	63	15	-102	0	65	15	-87	0	69	15	-61	0	68
16	-39	0	101	16	-31	0	50	16	-86	0	27	16	35	0	999
17	-250	0	52	17	-135	0	999	17	-99	0	94	17	-25	0	***
18	-123	0	999	18	-192	0	***	18	-127	0	999	18	-159	0	***
19	-213	0	***	19	-33	0	44	19	44	0	***	19	-104	0	36
20	-146	0	91	20	-181	0	46	20	-200	0	96	20	-169	0	101
# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 256			
Current : 5.7				Current : 5.7				Current : 5.7				Current : 5.7			
Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3			

Station 13450E(Z)				Station 13500E(Z)				Station 13550E(Z)			
1	9052	3	0	1	8655	3	0	1	9662	3	0
2	6935	2	0	2	7049	2	0	2	8747	2	0
3	1864	2	0	3	1878	2	0	3	2311	2	0
4	7661	1	0	4	7508	1	0	4	9078	1	0
5	3911	1	1	5	3740	1	1	5	4413	1	1
6	1809	1	1	6	1707	1	1	6	2018	1	1
7	7579	0	4	7	7059	0	5	7	8251	0	4
8	3612	0	10	8	3657	0	9	8	4135	0	8
9	2116	0	25	9	1905	0	12	9	2255	0	11
10	1207	0	50	10	1008	0	48	10	1186	0	50
11	564	0	32	11	535	0	31	11	594	0	35
12	188	0	62	12	81	0	67	12	117	0	60
13	184	0	72	13	73	0	66	13	14	0	999
14	29	0	66	14	89	0	999	14	102	0	***
15	45	0	38	15	99	0	38	15	-15	0	999
16	-190	0	48	16	-60	0	93	16	-29	0	***
17	-80	0	86	17	-98	0	54	17	-41	0	52
18	-141	0	100	18	-115	0	36	18	-22	0	100
19	-18	0	28	19	-278	0	98	19	-109	0	39
20	-96	0	999	20	-191	0	999	20	-134	0	999
# of stacks 256				# of stacks 256				# of stacks 256			
Current : 5.7				Current : 5.8				Current : 5.7			
Standard time: 3				Standard time: 3				Standard time: 3			

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Processed by SOLO GEOPHYSICS & CO. on 12:32 PM WED., 6 APR., 1988

Area : SEDAN S. AUST.
Grid :

Line : 3 NORTH Survey type : In-loop receiver Loop size : 100
Instrumentation : SIROTEM MK-II Tx x Rx , Medium power option (20 Amps), Program ID : 4.2
Records sequentially numbered from 29 to 35

Station 13600E(Z)				Station 13650E(Z)				Station 13650E(Z)				Station 13700E(Z)				Station 13750E(Z)				Station 13800E(Z)				Station 13850E(Z)			
1	9545	3	0	1	1377	4	0	1	1363	4	0	1	1629	4	0	1	1523	4	0	1	1531	4	0	1	1305	4	0
2	9359	2	0	2	1048	3	0	2	1037	3	0	2	1040	3	0	2	1049	3	0	2	1092	3	0	2	9074	2	0
3	2420	2	0	3	2578	2	0	3	2548	2	0	3	2483	2	0	3	2544	2	0	3	2737	2	0	3	2439	2	0
4	9247	1	0	4	9668	1	0	4	9616	1	0	4	9460	1	0	4	9840	1	0	4	1058	2	0	4	9826	1	0
5	4458	1	1	5	4630	1	1	5	4633	1	1	5	4597	1	1	5	4857	1	1	5	5184	1	1	5	4865	1	0
6	2005	1	1	6	2101	1	1	6	2101	1	1	6	2095	1	1	6	2162	1	1	6	2291	1	1	6	2209	1	1
7	8660	0	4	7	8504	0	4	7	8601	0	3	7	8650	0	3	7	8924	0	4	7	9366	0	3	7	9175	0	3
8	3806	0	8	8	4397	0	9	8	4601	0	9	8	4151	0	7	8	4231	0	10	8	4620	0	8	8	4387	0	8
9	2289	0	15	9	1965	0	19	9	2381	0	28	9	2371	0	15	9	2273	0	18	9	2203	0	16	9	2266	0	16
10	1330	0	53	10	1564	0	24	10	1621	0	26	10	1273	0	17	10	1238	0	24	10	1146	0	48	10	1388	0	52
11	744	0	33	11	564	0	24	11	695	0	31	11	684	0	23	11	551	0	26	11	511	0	37	11	376	0	64
12	228	0	33	12	314	0	999	12	151	0	999	12	322	0	67	12	66	0	999	12	148	0	999	12	203	0	73
13	78	0	999	13	-11	0	***	13	145	0	***	13	34	0	60	13	14	0	***	13	-55	0	***	13	82	0	34
14	-11	0	***	14	128	0	***	0	0	0	***	14	-6	0	999	14	-147	0	62	14	-160	0	999	14	-228	0	75
15	99	0	68	15	-51	0	999	15	-71	0	999	15	-104	0	999	15	5	0	999	15	-94	0	64	15	-86	0	34
16	-3	0	999	16	-29	0	***	16	-27	0	***	16	-105	0	***	16	-69	0	***	16	-127	0	999	16	-206	0	94
17	-112	0	***	17	-140	0	49	17	-148	0	96	17	-93	0	***	17	-145	0	51	17	-148	0	***	17	-11	0	999
18	-76	0	***	18	-185	0	96	18	-139	0	46	18	-155	0	***	18	-108	0	999	18	-221	0	97	18	-166	0	***
19	-145	0	999	19	-134	0	27	19	-55	0	99	19	28	0	51	19	-181	0	***	19	-203	0	47	19	-110	0	93
20	-126	0	99	20	-86	0	53	20	-48	0	49	20	-115	0	104	20	-164	0	999	20	-97	0	37	20	-155	0	47
# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 256				# of stacks 256			
Current : 5.7				Current : 5.7				Current : 5.7				Current : 5.7				Current : 5.7				Current : 5.6				Current : 5.7			
Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3				Standard time: 3			

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Processed by SOLO GEOPHYSICS & CO. on 12:32 PM WED., 6 APR., 1988

Client : CSR MEDG
Area : SEDAN S. AUST.
Grid :

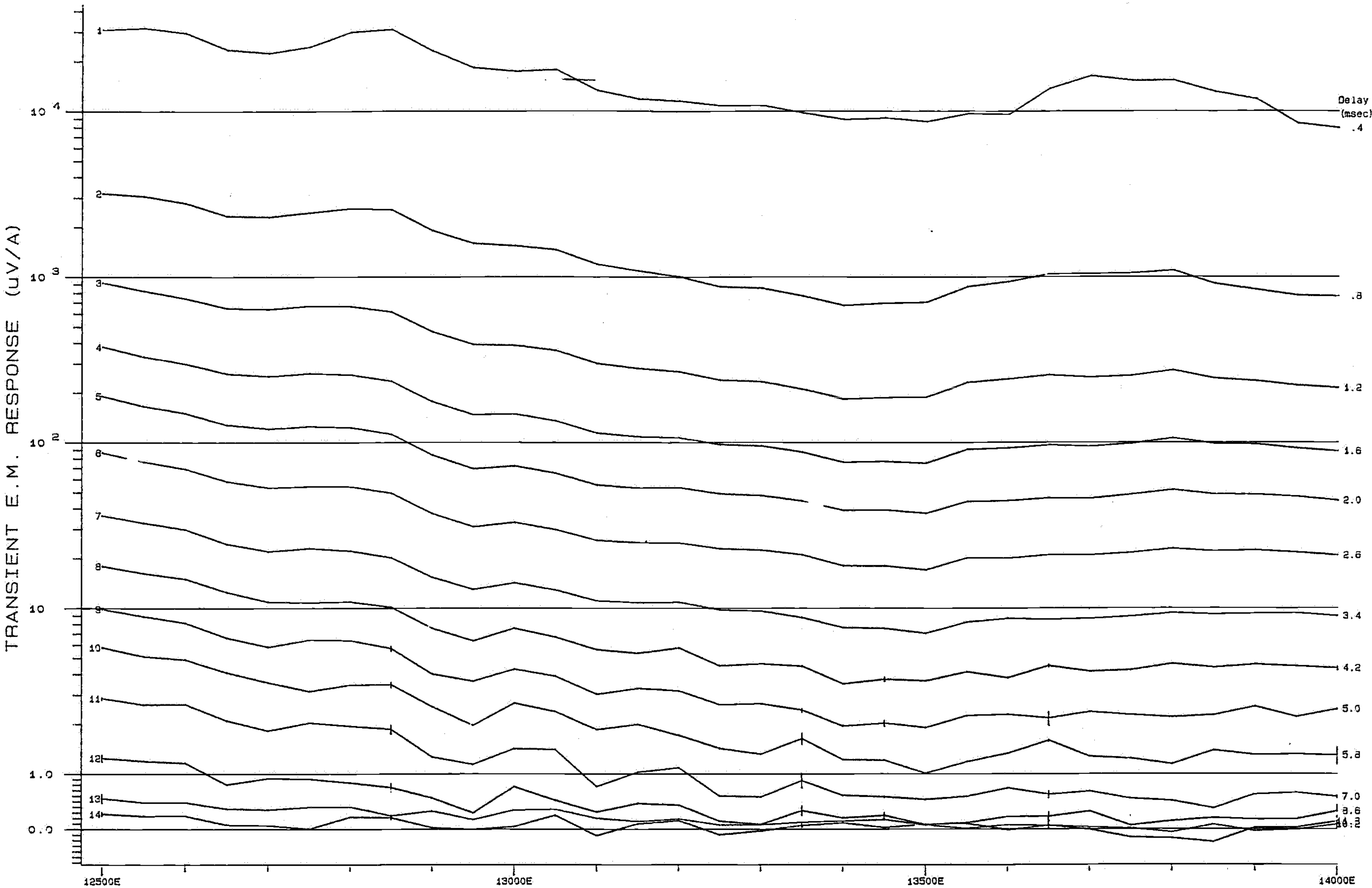
Line : 3 NORTH Survey type : In-loop receiver Loop size : 100
Instrumentation : SIROTEM MK-II Tx x Rx , Medium power option (20 Amps), Program ID : 4.2
Records sequentially numbered from 36 to 42

Station 13900E(Z)				Station 13950E(Z)				Station 14000E(Z)				Station 14000E(Z)				Station		0E(Z)		Station		0E(Z)		Station 13850W(Z)			
1	1179	4	0	1	8439	3	0	1	7930	3	0	1	7891	3	0	1	4603	4	0	1	4593	4	0	0	0	0	0
2	8381	2	0	2	7733	2	0	2	7657	2	0	2	7619	2	0	2	4045	4	0	2	4036	4	0	0	0	0	0
3	2357	2	0	3	2215	2	0	3	2145	2	0	3	2137	2	0	3	3555	4	0	3	3547	4	0	0	0	0	0
4	9764	1	0	4	9226	1	0	4	8864	1	0	4	8848	1	0	4	3124	4	0	4	3117	4	0	0	0	0	0
5	4858	1	0	5	4718	1	1	5	4462	1	1	5	4488	1	1	5	2745	4	0	5	2739	4	0	0	0	0	0
6	2239	1	1	6	2174	1	1	6	2098	1	1	6	2083	1	1	6	2266	4	0	6	2261	4	0	0	0	0	0
7	9285	0	3	7	9355	0	5	7	8982	0	3	7	8970	0	3	7	1750	4	0	7	1746	4	0	0	0	0	0
8	4583	0	6	8	4471	0	9	8	4483	0	6	8	4213	0	10	8	1352	4	0	8	1349	4	0	0	0	0	0
9	2555	0	17	9	2212	0	18	9	2448	0	16	9	2483	0	18	9	1044	4	0	9	1042	4	0	0	0	0	0
10	1304	0	23	10	1316	0	25	10	1451	0	52	10	1141	0	47	10	8069	3	0	10	8051	3	0	0	0	0	0
11	629	0	65	11	662	0	35	11	613	0	63	11	556	0	64	11	5526	3	0	11	5513	3	0	0	0	0	0
12	177	0	64	12	185	0	41	12	440	0	999	12	208	0	66	12	3300	3	0	12	3293	3	0	0	0	0	0
13	-33	0	999	13	-6	0	39	13	151	0	***	13	21	0	67	13	1972	3	0	13	1968	3	0	0	0	0	0
14	27	0	***	14	30	0	27	14	139	0	***	14	140	0	999	14	1180	3	0	14	1177	3	0	0	0	0	0
15	-101	0	999	15	-80	0	37	15	-27	0	63	15	123	0	68	15	7045	2	0	15	7028	2	0	0	0	0	0
16	-38	0	***	16	-89	0	33	16	-14	0	51	16	-182	0	48	16	3368	2	0	16	3360	2	0	0	0	0	0
17	-65	0	96	17	60	0	95	17	-123	0	46	17	-155	0	36	17	1208	2	0	17	1204	2	0	0	0	0	0
18	-265	0	106	18	-31	0	53	18	-62	0	98	18	-49	0	92	18	4406	1	0	18	4394	1	0	0	0	0	0
19	-200	0	49	19	-48	0	50	19	-170	0	96	19	-124	0	999	19	1661	1	0	19	1660	1	0	0	0	0	0
20	-194	0	45	20	-73	0	31	0	0	0	100	20	-221	0	47	20	6560	0	1	20	6530	0	1	0	0	0	0

# of stacks 256	# of stacks 256	# of stacks 256	# of stacks 256	# of stacks 256	# of stacks 256	# of stacks 0
Current : 5.6	Current : 5.7	Current : 5.6	Current : 5.7	Current : 4.1	Current : 4.1	Current : 0.0
Standard time: 3	Standard time: 3	Standard time: 3	Standard time: 3	Standard time: 3	Standard time: 3	Standard time: 3

* *

Processed by SOLO GEOPHYSICS & CO. on 12:32 PM WED., 6 APR., 1988



CSR MEDG
AREA: SEDAN S. AUST.
GRID:
STANDARD TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 3 NORTH Reading interval 50.0 m
SCALE 1 : 5000 Loop size : 100 m
LOOP configuration : In-loop receiver
Plotted : 12:29 PM 6/ 4/88

APPENDIX 3

Drill Hole Logs

HOLE No. KAMOONIE No1

PAGE 1 OF 12

PACMINEX PTY. LTD.—FIELD DRILL LOG

PROJECT: MANN. NM.
AREA: ANGAS VALLEY/KAMOONIE
LOCATION: WALTERS FLAT RD: T003
STARTED:
COMPLETED:

DATE STARTED: 21/4/88
23/4/88
COORDINATES: 12850 "N" (NE)
~~ELEVATION~~ ORIENTATION: 60° DIP, N.E.
DEPTH: 256 m.

TYPE OF DRILL: INGERSOLL RAND TR4
HOLE SIZE: 8"/6" 00056
CONTRACTOR: JOHN NITSCHKE DRILL
DRILLER: JOHN NITSCHKE
LOGGED BY: J. L. CURTIS

Metres	DESCRIPTION		SAMPLE No.	Assay Length	ASSAYS					
0	Greyish sands with chunks of off white limestone		A334							
2			001	2						
4	ditto but mixed with red brown silty clays.		002	2						
6	Red – yellowish brown silty clays.		003	2						
8	ditto		004	2						
10	ditto		005	2						
12	ditto		006	2						
14	ditto but more yellowish in colour.		007	2						
16	ditto as above.		008	2						
18	Silty clays mixed with a yellow brown fine limey powder.		009	2						
20	ditto.		010	2						

CSR/0035

PACMINEX PTY. LTD.—FIELD DRILL LOG

HOLE No. KAROONIE No1

PAGE 2 OF 12

00057

PROJECT: MANNUM.

Metres	DESCRIPTION		SAMPLE No.	Assay Length	ASSAYS
22	Yellow brown powder with chips of hard fine grained limestone.		A 334 011	2	
24	Buff - offwhite fine powder with chips of buff caritacdous limestone, possibly micropossil rich. fine to med grained, a few quartz grains, well rounded		012	2	
26	ditto		013	2	
28	ditto		014	2	
30	ditto		015	2	
32	ditto		016	2	
34	Off white powder derived from limestone as above.		017	2	
36	ditto		018	2	
38	ditto		019	2	
40	ditto		020	2	
42	ditto		021	2	

PACMINEX PTY. LTD.—FIELD DRILL LOG

PROJECT: MANNUM

00058

Metres	DESCRIPTION	SAMPLE No.	Assay Length	Ra	Re	MS	
44	ditto	A334 022	2				
46	ditto	023	2				
48	ditto	024	2				
* 56	NO SAMPLE RETURN. (presume ditto as above)	NS	8m				
58	Hard drilling in medium grained medium to dark grey, feldspathic igneous rock with <10% mafics, biotite ? and possibly other minerals. (fall back contamination from above 30%)	025	2	2	40	800	$\times 10^{-5}$
60	ditto	026	2	2	60	1200	$\times 10^{-5}$
62	ditto but with much less fall back – feldspars quite glassy, translucent appearance could be readily confused with smokey quartz. Minor limonite staining and chloritic green alteration.	027	2	2	70	1400	$\times 10^{-5}$
64	ditto	028	2	2	60	1200	$\times 10^{-5}$
66	ditto	029	2	2	47	940	$\times 10^{-5}$
68	ditto	030	2	2	25	500	$\times 10^{-5}$
70	ditto	031	2	2	40	800	$\times 10^{-5}$

PACMINEX PTY. LTD.—FIELD DRILL LOG

HOLE No. KANGOONIE No1

PAGE 4 OF 12

00059

PROJECT: MANNUM

Metres	DESCRIPTION		SAMPLE No.	Assay Length		Ra	Re	MS
72	Khaki green fines with chips of yellow-green altered fine grained dark green igneous rock. alteration affects 30% of rock – probably chlorite		A334 032	2	wet	2	20	400×10⁻⁵
74	ditto		033	2	wet	2	5	100×10-5
76	ditto		034	2	wet	2	6	120×10⁻⁵
78	ditto but with some chips of yellowish oxidized quartz, ≃10%, probably from a quartz vein.		035	2	wet	2	8	160×10⁻⁵
80	ditto as above but mixed with coarse cuttings of feldspar.		036	2	wet	2	10	200×10⁻⁵
82	ditto as above.		037	2		3	4	800×10⁻⁵
84	Dark grey medium to coarse grained feldspathic rock (similar to 56–70m). Feldspars dark grey glassy – translucent, mostly present as cleavage rhombs. – minor micas		038	2		3	5	1000×10⁻⁵
86	and other dark minerals. Chlorite green veinlet chips, minor magnetite. ditto		039	2		3	13	2600×10⁵
88	ditto		040	2		3	10	2000×10⁵
90	ditto		041	2		3	10	2000×10⁻⁵
92	ditto but with vesicle pyrite – trace.		042	2		3	7	1400×10⁻⁵

PACMINEX PTY. LTD.—FIELD DRILL LOG

PROJECT: MANNUM.

00060

Metres	DESCRIPTION		SAMPLE No.	Assay Length		Ra	Re	MS	
94	Dark grey feldspathic igneous rock as previously but with minor milky white quartz flakes - probable xenoliths. minor magnetite in mafic grains and a trace of visible pyrite.		A334 043	2		3	12	2,400	x10⁻⁵
96	ditto		044	2		3	15	3,000	x10⁻⁵
98	ditto		045	2		3	15	3,000	x10⁻⁵
100	ditto		046	2		3	10	2,000	x10⁻⁵
102	ditto		047	2		3	14	2,800	x10⁻⁵
104	ditto		048	2		3	10	2,000	x10⁻⁵
106	ditto		049	2		3	10	2,000	x10⁻⁵
108	ditto		050	2		3	16	3,200	x10⁻⁵
110	ditto		054	2		3	15	3,000	x10⁻⁵
112	ditto		055	2		3	12	2,400	x10⁻⁵
114	ditto but with yellow green-whitish moderately soft micaceous flakes, possibly relict material (not carbonate)		056	2		3	10	2,000	x10⁻⁵

PACMINEX PTY. LTD.—FIELD DRILL LOG

HOLE No. KAMOONIE No 1

PAGE 6 OF 12

PROJECT: MANNUM

00061

Metres	DESCRIPTION		SAMPLE No.	Assay Length		Ra	Re	MS	
			A 334						
116	ditto		057	2		3	7	1,400	$\times10^{-5}$
118	ditto		058	2		3	8	1,600	$\times10^{-5}$
120	ditto		059	2		3	8	1,600	$\times10^{-5}$
122	ditto		060	2		3	5	1,000	$\times10^{-5}$
124	ditto		061	2		3	7	1,400	$\times10^{-5}$
126	ditto		062	2		3	10	2,000	$\times10^{-5}$
128	ditto but with much less yellow-green veinlet material.		063	2		3	8	1,600	$\times10^{-5}$
130	ditto		064	2		3	10	2,000	$\times10^{-5}$
132	ditto		065	2		3	10	2,000	$\times10^{-5}$
134	ditto but with minor dark green chlorite		066	2		3	10	2,000	$\times10^{-5}$
136	ditto as above.		067.	2		3	10	2,000	$\times10^{-5}$

PACMINEX PTY. LTD.—FIELD DRILL LOG

PROJECT: MANNUM

Metres	DESCRIPTION		SAMPLE No.	Assay Length		Ra	Re	MS	
138	ditto but with 50% medium pink grained granite. (low quartz), probably a narrow intrusive vein		A334 068	2		3	6	1,200	$\times 10^{-5}$
140	ditto as above.		069	2		3	5	1,000	$\times 10^{-5}$
142	Coarse-medium grained feldspathic igneous rock as previously		070	2		3	9	1,800	$\times 10^{-5}$
144	ditto		071	2		3	5	1000	$\times 10^{-5}$
146	ditto		072	2		3	8	1,600	$\times 10^{-5}$
148	ditto but with a few yellowish-pale milky green translucent-waxy veinlet chips.		073	2		3	10	2000	$\times 10^{-5}$
150	ditto veinlet material more abundant.		074	2		3	9	1,800	$\times 10^{-5}$
152	ditto veinlet material less abundant.		075	2		3	15	3,000	$\times 10^{-5}$
154	ditto as previously		076	2		3	10	2000	$\times 10^{-5}$
156	ditto		077	2		3	11	2,200	$\times 10^{-5}$
158	ditto.		078	2		3	10	2000	$\times 10^{-5}$

PACMINEX PTY. LTD.—FIELD DRILL LOG

HOLE No. KAROONIE No1

PAGE 8 OF 12

00063

PROJECT: MANNUM.

Metres	DESCRIPTION		SAMPLE No.	Assay Length	ASSAYS	Ra	Re	MS	
160	Dark grey feldspathic igneous rock as previously. 10% white quartz veinlet flakes. Minor light green waxy veinlet chips. chlorite after biotite? minor magnetite (pyrite does not seem to be as abundant as previously).		A334 079	2		3	5	1,000 x10^{-5}	
162	ditto (less chlorite).		080	2		3	5	1,000 x10^{-5}	
164	ditto		081	2		3	5	1,000 x10^{-5}	
166	ditto		082	2		3	10	2,000 x10^{-5}	
168	ditto		083	2		3	5	1,000 x10^{-5}	
170	ditto but with increased abundance of quartz / chlorite veinlet material		084	2		3	3	600 x10^{-5}	
172	ditto as above.		085	2		3	5	1000 x10^{-5}	
174	ditto as above		086	2		3	9	1,800 x10^{-5}	
176	ditto as above.		087	2		3	7	1,400 x10^{-5}	
178	ditto as above but with chips of fine grained aplite or microgranite - probably a narrow vein.		088	2		3	6	1,200 x10^{-5}	
180	ditto as previously.		089	2		3	9	1,800 x10^{-5}	

PACMINEX PTY. LTD.—FIELD DRILL LOG

HOLE No. HAMOONIE No1

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PROJECT: MANNUM

00064

Metres	DESCRIPTION		SAMPLE No.	Assay Length		Ra	Re	MS	
182	ditto		A 334 090	2		3	8	1,600 x10^-5	
184	ditto but with a trace of hematitic alteration.		091	2		3	12	2,400 x10^-5	
186	ditto as previously		092	2		3	7	1,400 x10^-5	
188	ditto		093	2		3	8	1,600 x10^-5	
190	ditto		094	2		3	10	2,000 x10^-5	
192	ditto but with abundant milky white veinlet quartz.		095	2		3	7	1,400 x10^-5	
194	ditto as above		096	2		3	10	2000 x10^-5	
196	ditto as above		097	2		3	10	2000 x10^-5	
198	ditto		101	2		3	7	1,400 x10^-5	
200	ditto		102	2		3	7	1,400 x10^-5	
202	ditto		103	2		3	7	1,400 x10^-5	

PACMINEX PTY. LTD.—FIELD DRILL LOG

00065

PROJECT: MANNUM

Metres	DESCRIPTION		SAMPLE No.	Assay Length		Ra	Re	MS	
204	ditto		A334 104	2		3	7	1,400	x10^{-5}
206	ditto		105	2		3	7	1,400	x10^{-5}
208	ditto		106	2		3	7	1,400	x10^{-5}
210	ditto		107	2		3	5	1,000	x10^{-5}
212	ditto		108	2		3	7	1,400	x10^{-5}
214	ditto		109	2		3	8	1,600	x10^{-5}
216	ditto		110	2		3	8	1,600	x10^{-5}
218	ditto but with pale pink feldspathic grains from a vein? of aplite / microgranite.		111	2		3	7	1,400	x10^{-5}
220	ditto as previously		112	2		3	8	1,600	x10^{-5}
222	ditto		113	2		3	8	1,600	x10^{-5}
224	ditto		114	2		3	5	1,000	x10^{-5}

HOLE No. HAHOONIE No.1

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PACMINEX PTY. LTD.—FIELD DRILL LOG

PROJECT: MANNUM.

00066

Metres	DESCRIPTION		SAMPLE No.	Assay Length		Ra	Re	MS	
226	ditto but with a trace of red hematite staining ..		A334 115	2		3	6	1,200 x 10^-5	
228	ditto as above but with pale pink feldspars - possibly from a vein? of microgranite/aplite. Large fragment of red grained diorite -80% feldspar, ± 15% mafics.		116	2		3	6	1,200 x 10^-5	
230	ditto as above.		117	2		3	12	2,400 x 10^-5	
232	Dark green fine grained igneous rock - possibly a fine grained dolerite		118	2		3	35	7,000 x 10^-5	
234	Dark grey feldspar and biotite rock as previously with up to 15% pale pink feldspar and quartz from veins?		119	2		3	12	2,400 x 10^-5	
236	Dark grey feldspathic rock with 5% white quartz veinlet? chippings and sporadic dark green chlorite veinlet? minerals.		120	2		3	8	1,600 x 10^-5	
238	ditto		121	2		3	8	1,600 x 10^-5	
240	ditto		122	2		3	8	1,600 x 10^-5	
242	ditto		123	2		3	10	2,000 x 10^-5	
244	ditto		124	2		3	10	2,000 x 10^-5	
246	ditto		125	2		3	10	2,000 x 10^-5	

PACMINEX PTY. LTD.—FIELD DRILL LOG

PROJECT: MANNUM.

Metres	DESCRIPTION		SAMPLE No.	Assay Length		Ra	Re	MS	
			A334						
248	ditto		126	2		3	15	3,000	$\times 10^{-5}$
250	ditto		127	2		—	—	—	—
252	ditto		128	2		3	15	3000	$\times 10^{-5}$
254	ditto		129	2		3	10	2000	$\times 10^{-5}$
256	ditto		130	2		3	10	2000	$\times 10^{-5}$
	E of Hole.								

BINOCULAR MICROSCOPE EXAMINATION OF CUTTINGS FROM KAKOONIE NO. 1, SW OF BLACK HILL, SEDAN REGION

by M. Farrand, Petrologist, S.A.D.M.E.

SAMPLE	DEPTH (m)	UNIT NO.	DESCRIPTION
A334026	58- 60	1	Almost all cuttings are of a gabbroic rock with coarse grain size and consisting of glassy plagioclase, bronze diallage and opaque magnetic grains of magnetite. A green colouration is partly mineralic and partly a stain. A few grains are of decomposed rock and sediment.
A334027	60- 62	1	Hypersthene gabbro. Main pyroxene is still diallage but a few grains of hypersthene are present. Abundant chlorite and magnetite.
A334028	62- 64	1	Anorthositic gabbro. Plagioclase much more abundant than pyroxene. Green colouration is often a stain, not a mineral. Possibly associated with magnetite. Still a few grains of sediment.
A334029	64- 66	1	Gabbro, richer in pyroxene. Main pyroxene is closer to normal augite. Diallage is possibly an alteration product. Minor hypersthene. Magnetite and a trace of pyrite.
A334030	66- 68	1	Sample more finely divided. Plagioclase-rich. Rare sulphide, abundant magnetite. Blue-green staining. Green mica as well as chlorite.
A334031	68-70	1	Sample fine in grain size. Diallage more common. Much green staining. Blue-green amphibole. Abundant magnetite. Trace of sulphide. Some limonite material.

A334032	70- 72	2	Sample includes several rock types. A little coarse gabbro with diallage is mixed with a fine grained dioritic facies composed of plagioclase and biotite. Limonitic, oxidised material is common and appears to include sediment. Green mica and pink quartz and feldspar form another rock type. Magnetite is still present but sulphide is absent. The green mica may be chromium bearing. The lithologies appear to indicate that the hole has emergedfrom the intrusive contact into hybrid rocks and possibly into Tertiary sediments.
A334033	72- 74	2	Varied granitoids, probably remelted country rock. Quartz, biotite, muscovite, white feldspar, pink feldspar. Also green mica or chlorite.
A334034	74- 76	2	Contact rocks of siliceous and granitoid composition. Possibly hybridised as well as remelted.
A334035	76- 78	2	Diverse lithologies in contact rocks. Green amphibole, mica and chlorite.
A334036	78- 80	3	Marginal facies of plutonic gabbroid as well as contact rocks. Coarse grained green amphibole and brownish plagioclase. Some oxidised facies. Hole passing back into intrusion.
A334037	80- 82	3	Plutonic lithology predominant. Only a few chips of country rock. Ferromagnesium mineral still largely green amphibole but some brown to bronze pyroxene present.
A334039	84- 86	3	Few contact rocks but main ferromagnesium mineral still amphibole. Several grains of sulphide. A little magnetite.

A334040	86- 88	3	Both black pyroxene and green amphibole present. Sulphide clearly associated with green amphibole-probably derived from country rock. Little magnetite.
A334041	88- 90	3	Bronze and black pyroxene and green amphibole. Sulphide again with green amphibole. Probable olivine with black pyroxene. Abundant magnetite.
A334042	90- 92	3	Mainly gabbroic lithologies but wide range of lithologies, particulaly ferromagnesium minerals. Green amphibole, white plagioclase and sulphide. Black or bronze clinopyroxene sometimes intergrown with green amphibole (the latter is probably an alteration product of the former). Both hypersthene and? olivine present. Pinkish brown plagioclase. Some magnetite present.
A334043	92- 94	4	Plagioclase-rich facies with minor pyroxene and amphibole. A range of sulphide minerals occurs as inclusions in plagioclase. The minerals include pyrrhotite and chalcopyrite as well as pyrite and may be derived from the magma, not country rock. Some magnetite present.
A334044	94- 96	4	Mixed lithologies - green amphibole with white plagioclase and bronze pyroxene with abundant brown plagioclase. A little sulphide. Some magnetite.
A334045	96-98	4	Abundant brown plagioclase, less abundant bronze to black pyroxene. Rare green amphibole and white plagioclase. Occasional olivine, often with pyroxene rim. Scattered sulphide of both country rock and magmatic origin. Frequent magnetite.

A334046	90-100	4	Green amphibole facies more abundant than in A334045 but brown plagioclase facies still major paragenesis. Traces of pyrite and pyrrhotite. Little magnetite.
A334047	100-102	4	Finely divided grains. Brown plagioclase facies more abundant than green amphibole. Very little sulphide. Moderate magnetite.
A334048	102-104	4	Facies about equal. Sulphide more abundant than in A334047 but probably pyritic. Less magnetite. Green mica present.
A334049	104-106	4	Plagioclase-rich but abundant green amphibole. More abundant sulphide of both types. Particularly abundant pyrrhotite. Green mica, brown mica, colourless mica. Magnetite less abundant.
A334050	106-108	5	Brown plagioclase abundant but green amphibole frequent. Magnetite frequent and in large aggregates. Radial clusters of zeolite. Less sulphide but of magmatic type.
A334054	108-110	5	Both facies still present. More pyroxene - rich than preceding samples. Sulphides rare. ?Sphene surrounded by rim of magnetite.
A334055	110-112	5	Two facies amalgamated - green amphibole and brown plagioclase with dark pyroxene in same chip. Frequent fine grains of sulphide. White mineral possibly zeolite. Magnetite moderately abundant.
A334056	112-114	5	Brown plagioclase, white plagioclase, green amphibole, dark pyroxene, hypersthene all in same grains. Sulphide of all types relatively abundant. Magnetite often in large masses.

A334057	114-116	5	The same assemblage, including magnetite and sulphide is present in more finely ground sample.
A334058	116-118	5	The same mixed assemblage in coarser particles. The hole may be passing through marginal intrusion with the contact parallel to the hole.
A344059	118-120	5	The same assemblage.
A334060	120-122	6	Olivine gabbro predominant. Disseminated sulphide present. Magnetite rare.
A344061	122-124	6	Almost exclusively olivine gabbro with trace sulphide and magnetite.
A344062	124-126	7	Plagioclase-rich gabbro. Trace sulphide. Moderately abundant magnetite.
A334063	126-128	7	Gabbro with green amphibole. Sparse sulphide, moderate magnetite.
A334064	128-130	8	Return of substantial green amphibole. Finely ground sample. Abundant plagioclase.
A344065	130-132	8	Coarser grain size. Both 'brown' and 'green' parageneses present. Traces of sulphide and magnetite.
A334066	132-134	8	Coarse particles. Feldspathic. Rare sulphide and magnetite.
A334067	134-136	8	Green amphibole predominants. Sulphide more abundant. Magnetite sparse.
A334068	136-138	9	Pink and white feldspar, fine grained hybrid rocks. Plutonic grains with green amphibole. Magnetite rare. Sulphide absent.

A334069	138-140	10	Finely ground Plagioclase and green hornblende. Rare sulphide and magnetite? Back into pluton.
A334070	140-142	10	Coarse particle size and coarse crystals. Plutonic lithology again. Green amphibole. Sulphide more abundant. Magnetite rare.
A334071	142-144	10	Brown pyroxene as well as green hornblende. Disseminated magmatic sulphide and rare magnetite present.
A334072	144-146	11	Anorthositic differentiate. Brown and green ferromagnesians. Frequent fine sulphide grains.
A334073	146-148	11	Mainly brown plagioclase and dark pyroxene. Sulphide and magnetite rare.
A334074	148-150	11	Some green lithologies with oxidised iron present but otherwise similar to A334073.
A334075	150-152	11	Same lithologies but more sulphide and magnetite.
A334076	152-154	11	A little green amphibole but mainly feldspathic plutonic lithology. Sparse sulphide and magnetite.
A334077	154-156	11	Feldspathic plutonic lithology. Rare sulphide, magnetite more common.
A334078	156-158	11	Same lithology. Magnetite common, sulphide very rare. Highly feldspathic.
A334079	158-160	12	Abundant green amphibole. No brown pyroxene. Sulphide very rare but magnetite common.
A334080	160-162	12	Both 'green' and 'brown' parageneses. Sulphide extremely rare, magnetite relatively common.

A334081	162-164	13	Anorthositic facies with rare sulphide and more common magnetite.
A334082	164-166	13	Same assemblage. Sulphide slightly more common.
A334083	166-168	14	Assemblage richer in ferromagnesian minerals, both green amphibole and brown pyroxene. Poor in sulphide, richer in magnetite. White feldspar present.
A334084	168-170	14	Almost exclusively green amphibole with brown and white plagioclase. Sulphide rare, magnetite absent.
A334085	170-172	14	Green amphibole almost as abundant as pinkish brown plagioclase. Very little pyroxene. Sulphide rare, magnetite absent.
A334086	172-174	15	Green amphibole more abundant than brown pyroxene but brown plagioclase more abundant than white plagioclase. A few large patches of sulphide. Magnetite fairly abundant.
A334087	174-176	15	Very little brown pyroxene but abundant green amphibole. Brown plagioclase more common than white. Sulphide and magnetite moderate.
A334088	176-178	15	Same assemblage. Sulphide and magnetite relatively abundant.
A334089	178-180	15	Identical.
A334090	180-182	15	Same assemblage but with some oxidation. Magnetite more abundant than trace sulphide.
A334091	182-184	15	Same assemblage. Brilliant red oxidation on the surface of magnetite grains. A few patches of sulphide.

A334092	184-186	15	Same assemblage with a little biotite and mainly without oxidation. Rare sulphide, moderate magnetite.
A334093	186-188	15	More biotite. Ferromagnesian mineral still mainly green hornblende. Plagioclase pinkish brown. Scattered trace of sulphide. Magnetite rare.
A334094	188-190	15	As above. Fine, scattered sulphide. Rare magnetite.
A334095	190-192	15	More brown pyroxene but also white plagioclase or ?zeolites. Pale brown mica. Some oxidation. Sulphide and magnetite more abundant.
A334096	192-194	16	Very mixed lithology. Much white? plagioclase. Green staining? Hybrid fragments. Moderate sulphide and magnetite.
A334097	194-196	16	Blue green, yellow green, pink lithologies with brillian red oxidation on some grains. Definite hybrids. Trace sulphide and magnetite.
A334101	196-198	16	Still mixed but with 'brown lithology' predominant. Magnetite moderately abundant but sulphide rare.
A334102	198-200	16	Mixed but highly feldspathic (pink brown). Magnetite moderate but sulphide rare.
A334103	200-202	16	Dark ferromagnesian minerals more abundant. A little of 'green lithology' remains. Sulphide more abundant. Magnetite moderate.
A334104	202-204	16	Same lithology. Sulphide moderate, magnetite plentiful.

A334105	204-206	16	Almost none of the green lithology present. Sulphide and magnetite sparse. Ferromagnesian minerals abundant.
A334106	206-208	17	More green lithology. More sulphide. Magnetite rare.
A334107	208-210	17	Less green lithology. Less sulphide. Magnetite still rare.
A334108	210-212	18	Green hornblende and white feldspar common but bronze pyroxene and black biotite in brown plagioclase is main lithology. Fine grained, doleritic cuttings with abundant sulphide also present. Sulphide relatively abundant in plutonic rock, both 'brown' and 'green'. Magnetite moderate. Probably post-intrusion dyke? along contact? Origin sulphide.
A334109	212-214	19	Both brown and green plutonic lithologies, moderate sulphide and magnetite.
A334110	214-216	19	Same lithologies. Less abundant sulphide and magnetite.
A334111	216-218	19	Roughly equal amounts of brown and green lithologies. Frequent biotite. Sulphide more abundant. Moderate magnetite.
A334112	218-220	19	Almost identical. Possibly more white feldspar and magnetite.
A334113	220-222	19	More brown than green lithologies. Moderate sulphide and magnetite.
A334114	222-224	19	Green and white lithology more abundant but brown still dominant. Less sulphide and magnetite.

A334115	224-226	19	Same lithologies. Sulphide and magnetite moderate.
A334116	226-228	19	Same again.
A334117	228-230	20	Mainly medium grained hybrids of biotite and pink feldspar. May be more chilled gabbro than mobilised country rock. Pink, orange, white and green ?zeolites. Some plutonic chips of both green and brown lithologies. Sulphide and magnetite rare.
A334118	230-232	20	Mainly medium and fine grained hybrids. Sulphide content appears higher. Magnetite moderate.
A334119	232-234	20	Finer grains are coloured ?zeolites, coarser grains are of plutonic lithologies, mainly green type. Sulphide and magneite contents moderate. Pale brown mica.
A334120	234-236	21	White and green plutonic lithologies with dominant brown plagioclase. Moderate magnetite but low sulphide.
A334121	236-238	21	Mainly brown plagioclase with bronze and green ferromagnesian minerals. Some biotite. Magnetite fairly abundant. Sulphide in some patches.
A334122	238-240	21	Same lithology. Sulphide quite abundant. Magnetite rare.
A334123	240-242	21	Same again. Magnetite and sulphide (including barite) quite abundant.
A334124	242-244	22	Plutonic lithologies. Mainly brown plagioclase but with green hornblende, bronze pyroxene, hypersthene and olovine. Sulphide less abundant than in A334123 but still substantial as a trace. Magnetite low.

A334125	244-246	22	Same lithologies. Sulphides (including chalcopyrite) in large but rare patches. Magnetite sparse.
A334126	246-248	22	Mixed brown and green plutonic lithologies with hypersthene and olivine. Sulphides and magnetite somewhat less abundant.
A334127	248-250	22	Mixed plutonic lithologies with increased abundance of both sulphides and magnetite.
A334128	250-252	22	Similar lithologies but with higher proportion of white? feldspar. Sulphides moderate. Magnetite trace.
A334129	252-254	22	Similar in all respects except higher magnetite.
A334130	254-256	22	The hole ended in a plutonic lithology consisting of abundant pinkish brown plagioclase with both blue green amphibole and bronze pyroxene. In some chips hypersthene and in others white feldspar are present. Sulphides make an abundant trace component and magnetite is a moderately abundant trace. There is nothing to distinguish this from many other samples examined.

Comment

The drill hole appears to have passed through the contact zone of the intrusion. Because the contact is an irregular surface the hole has sampled country rock of melted and hybridised material, gabbro altered by formation water and relatively unaltered gabbro. The only evidence of a chilled margin is possibly between 228m and 232m.

Sulphides are present as trace minerals, probably under 1%, and are possibly of two types. Pyrite derived from country rock sulphur contrasts with an assemblage of mantle derivation containing pyrite, pyrrhotite and chalcopyrite. The most likely source of a weak EM anomaly is a dolerite at the contact with a substantial sulphide content.

APPENDIX 4

Analytical Results

amdel
technology and enterprise

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NATA CERTIFICATE

27 May 1988

Mr T. Francis
Classic Comlabs Ltd
305 South Road
MILE END SA 5031

REPORT AC 3369/88

YOUR REFERENCE:	8AD1649
REPORT COMPRISING:	Cover Sheet Pages I1 - I6
DATE RECEIVED:	19 May 1988
Approved Signatory:	Don Patterson

D. Patterson

Manager, Chemistry Services

for Dr William G. Spencer
General Manager
Applied Sciences Group

The report relates specifically to the sample tested and also to the entire batch in so far as the sample is truly representative of the sample source.

ij

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Geol Unit	Sample	From-To m	As	Bi	Cd	Co	Cr	Cu	Fe	Mn	Geochem Unit.
	A 334026	58-60	<5	15	<5	45	10	85	4.06	580	
	A 334027	60-62	<5	<10	<5	40	10	75	3.76	540	
1	A 334028	62-64	<5	<10	<5	35	15	65	3.36	490	A
	A 334029	64-66	<5	<10	<5	35	15	70	2.92	430	
	A 334030	66-68	<5	<10	<5	35	15	85	3.24	470	
	A 334031	68-70	<5	<10	<5	40	20	110	4.02	820	
	A 334032	70-72	<5	10	<5	35	10	85	3.76	720	
	A 334033	72-74	<5	10	<5	25	10	55	3.82	500	
2	A 334034	74-76	<5	10	<5	20	15	60	4.46	470	B
	A 334035	76-78	<5	10	<5	20	15	65	3.46	460	
	A 334036	78-80	<5	10	<5	30	15	70	3.02	490	
	A 334037	80-82	<5	10	<5	20	10	80	2.22	360	
	A 334038	82-84	<5	<10	<5	25	15	70	2.36	340	
	A 334039	84-86	<5	10	<5	25	15	55	2.40	340	
3	A 334040	86-88	<5	<10	<5	20	20	55	2.22	310	
	A 334041	88-90	<5	<10	<5	25	25	55	2.54	350	
	A 334042	90-92	<5	<10	<5	20	20	80	2.26	310	
	A 334043	92-94	<5	10	<5	15	15	60	1.53	220	
	A 334044	94-96	<5	<10	<5	20	35	120	1.96	240	C
	A 334045	96-98	<5	<10	<5	20	25	120	2.16	280	
	A 334046	98-100	<5	<10	<5	15	25	55	1.66	210	
4	A 334047	100-102	<5	10	<5	20	25	50	2.02	280	
	A 334048	102-104	<5	<10	<5	25	25	45	2.34	320	
	A 334049	104-106	<5	<10	<5	15	25	75	1.56	210	
5	A 334050	106-108	<5	<10	<5	20	25	85	2.28	290	
	A 334051		<5	<10	<5	160	10	10	0.020	<10	
X	A 334052	STD	10	15	<5	<5	45	55	2.08	80	X
	A 334053		<5	<10	<5	110	15	<5	0.020	<10	
	A 334054	108-110	<5	<10	<5	20	25	80	2.20	310	
	A 334055	110-112	<5	<10	<5	25	20	100	2.34	320	
5	A 334056	112-114	<5	<10	<5	25	20	85	2.30	310	
	A 334057	114-116	<5	10	<5	25	20	75	2.36	340	
	A 334058	116-118	<5	<10	<5	20	15	55	1.82	250	
	A 334059	118-120	<5	10	<5	25	15	50	2.24	310	
6	A 334060	120-122	<5	<10	<5	25	20	45	2.20	310	C
	A 334061	122-124	<5	<10	<5	20	20	45	1.97	280	
7	A 334062	124-126	<5	<10	<5	20	15	40	1.90	270	
	A 334063	126-128	<5	<10	<5	20	10	35	1.76	260	
	A 334064	128-130	<5	<10	<5	20	15	40	1.91	270	
8	A 334065	130-132	<5	<10	<5	20	10	35	1.87	260	
	Detn limit		(5)	(10)	(5)	(5)	(10)	(5)	(0.010)	(10)	
	Units		ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	

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Geol Unit	Sample	Depth (m)	Ni	P	Pb	Zn	Ag	Mo	Sb	V	
	A 334026	58	230	30	35	45	<5	<10	30	<5	
	A 334027		210	25	25	40	<5	<10	20	<5	
1	A 334028		200	25	25	35	<5	10	20	<5	A
	A 334029		180	20	25	30	<5	<10	20	<5	
	A 334030		200	25	25	30	<5	10	20	<5	
	A 334031	70	230	30	30	40	<5	<10	25	5	
	A 334032		160	190	20	40	<5	<10	20	15	
	A 334033		75	500	25	55	<5	<10	15	40	
2	A 334034		45	720	20	60	<5	10	20	60	B
	A 334035		85	350	20	45	<5	<10	15	35	
	A 334036	80	110	120	20	35	<5	<10	20	15	
	A 334037		85	60	30	30	<5	<10	20	5	
	A 334038		85	35	25	25	<5	<10	20	5	
	A 334039		80	25	25	20	<5	<10	20	5	
3	A 334040		70	25	20	20	<5	<10	20	5	
	A 334041		80	30	30	25	<5	<10	20	5	
	A 334042		75	20	25	20	<5	<10	20	5	
	A 334043		45	25	20	15	<5	<10	20	10	C
	A 334044	94	65	45	10	20	<5	10	10	15	
	A 334045		70	40	20	20	<5	<10	15	10	
4	A 334046		45	25	20	15	<5	10	15	10	
	A 334047		55	25	25	15	<5	<10	20	10	
	A 334048		65	25	15	20	<5	<10	10	10	
	A 334049	106	40	80	20	20	<5	<10	15	20	
5	A 334050		60	100	20	20	<5	10	15	15	
	A 334051		<5	<10	<10	10	<5	<10	<10	<5	
X	A 334052		45	150	15	25	<5	150	10	15	X
	A 334053		<5	<10	<10	<5	<5	<10	<10	<5	
	A 334054		70	60	25	40	<5	10	15	10	
	A 334055		70	35	20	20	<5	<10	15	10	
5	A 334056		70	30	30	30	<5	<10	15	10	
	A 334057		75	25	20	20	<5	<10	15	10	
	A 334058		60	25	20	20	<5	<10	15	5	
	A 334059	120	70	25	20	20	<5	<10	15	5	
6	A 334060		75	30	20	20	<5	15	15	5	C
	A 334061	124	65	20	15	15	<5	<10	10	5	
7	A 334062		60	20	15	15	<5	10	10	5	
	A 334063	128	55	20	20	15	<5	<10	15	5	
8	A 334064		60	25	25	25	<5	10	15	5	
	A 334065		60	25	20	15	<5	10	15	5	
	Detn limit		(5)	(10)	(10)	(5)	(5)	(10)	(10)	(5)	
	Units		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	

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Analysis code ICP 1 Report AC 3369/88

NATA Certificate Order No. 46123

Geol Unit	Sample	From-To m	As	Bi	Cd	Co	Cr	Cu	Fe	Mn
8	A 334066	132-134	<5	<10	<5	30	15	45	2.72	390
	A 334067	134-136	<5	10	<5	25	15	45	2.48	350
9	A 334068	136-138	<5	<10	<5	10	25	40	1.64	210
	A 334069	138-140	<5	<10	<5	10	20	35	1.04	130
10	A 334070	140-142	<5	<10	<5	10	20	40	1.11	150
	A 334071	142-144	<5	<10	<5	5	20	40	0.810	110
	A 334072	144-146	<5	<10	<5	10	15	45	1.38	200
	A 334073	146-148	<5	<10	<5	10	15	40	1.34	180
	A 334074	148-150	<5	<10	<5	15	15	35	1.38	190
11	A 334075	150-152	<5	<10	<5	20	15	35	1.83	250
	A 334076	152-154	<5	10	<5	20	15	35	2.20	290
	A 334077	154-156	<5	10	<5	20	20	40	2.34	320
	A 334078	156-158	<5	10	<5	15	15	35	1.73	240
12	A 334079	158-160	<5	<10	<5	15	15	30	1.61	230
	A 334080	160-162	<5	10	<5	15	20	30	1.63	230
13	A 334081	162-164	<5	10	<5	20	20	35	2.16	300
	A 334082	164-166	<5	<10	<5	25	15	40	2.72	390
14	A 334083	166-168	<5	15	<5	15	20	35	1.75	240 C
	A 334084	168-170	<5	15	<5	10	20	30	1.19	190
	A 334085	170-172	<5	15	<5	15	20	35	1.33	180
15	A 334086	172-174	<5	25	<5	15	25	40	1.57	200
	A 334087	174-176	<5	20	<5	15	20	40	1.50	190
	A 334088	176-178	<5	20	<5	15	25	40	1.51	190
	A 334089	178-180	<5	20	<5	10	40	40	1.15	160
	A 334090	180-182	<5	20	<5	10	40	40	1.03	160
	A 334091	182-184	<5	20	<5	15	30	55	1.76	260
	A 334092	184-186	<5	15	<5	20	40	60	2.04	320
	A 334093	186-188	<5	15	<5	20	40	50	1.96	300
	A 334094	188-190	<5	15	<5	20	35	50	2.04	310
	A 334095	190-192	<5	15	<5	15	35	50	1.70	250
16	A 334096	192-194	<5	20	<5	20	40	60	2.02	270
	A 334097	194-196	<5	15	<5	15	60	70	1.70	220
X	A 334098		<5	20	<5	170	10	<5	0.010	<10
	A 334099	STD	15	40	<5	5	50	70	2.68	100
	A 334100		<5	<10	<5	100	10	<5	0.020	<10
16	A 334101	196-198	<5	10	<5	20	35	80	2.06	280
	A 334102	198-200	<5	<10	<5	20	40	70	1.79	240
	A 334103	200-202	<5	<10	<5	20	40	75	2.14	300
	A 334104	202-204	<5	<10	<5	15	50	60	1.71	230
	A 334105	204-206	<5	<10	<5	15	45	60	1.56	230
	Detn limit		(5)	(10)	(5)	(5)	(10)	(5)	(0.010)	(10)
	Units		ppm	ppm	ppm	ppm	ppm	ppm	%	ppm

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Coal Unit	Sample	Depth (m)	Ni	P	Pb	Zn	Ag	Mo	Sb	V	
	A 334066		80	30	25	25	<5	<10	15	5	
8	A 334067	136	70	30	25	20	<5	10	20	5	
9	A 334068	138	30	100	20	30	<5	<10	10	25	
	A 334069		20	40	15	10	<5	10	10	10	
10	A 334070		25	25	20	10	<5	<10	15	10	
	A 334071	144	25	20	25	10	<5	10	15	5	
	A 334072		35	20	25	20	<5	<10	20	10	
	A 334073		35	20	20	10	<5	10	15	5	
	A 334074		40	15	20	10	<5	<10	15	10	
11	A 334075		50	20	20	15	<5	15	15	5	
	A 334076		55	55	40	65	<5	10	15	10	
	A 334077		65	25	35	35	<5	20	20	5	
	A 334078	158	50	20	25	20	<5	<10	15	5	
	A 334079		45	20	25	20	<5	10	15	5	
12	A 334080	162	45	25	35	20	<5	<10	20	5	
	A 334081		65	30	30	20	<5	10	20	5	
13	A 334082	166	80	30	25	25	<5	<10	25	5	
	A 334083		55	20	25	15	<5	15	20	5	
14	A 334084		30	25	30	25	<5	<10	20	10	
	A 334085	172	35	25	25	15	<5	10	20	10	
	A 334086		45	30	35	15	<5	<10	25	10	C
	A 334087		40	30	30	15	<5	10	25	10	
	A 334088		35	40	30	20	<5	<10	25	10	
	A 334089		35	25	20	10	<5	10	15	10	
	A 334090		30	30	20	10	<5	<10	15	10	
15	A 334091		50	30	30	20	<5	<10	25	10	
	A 334092		55	35	50	65	<5	<10	25	10	
	A 334093		55	25	40	20	<5	10	25	10	
	A 334094		55	25	35	20	<5	<10	25	10	
	A 334095	192	50	25	30	15	<5	10	25	10	
	A 334096		55	85	30	35	<5	<10	20	15	
16	A 334097		50	60	20	20	<5	10	15	15	
	A 334098		<5	<10	<10	<5	<5	<10	<10	<5	
X	A 334099		55	190	25	35	<5	180	20	20	X
	A 334100		<5	<10	<10	<5	<5	<10	<10	<5	
	A 334101		65	50	30	20	<5	<10	20	10	
	A 334102		60	30	30	15	<5	10	20	5	
16	A 334103		70	30	30	25	<5	<10	20	5	
	A 334104		60	20	30	15	<5	10	20	5	
	A 334105	206	55	20	25	15	<5	<10	20	10	
	Detn limit		(5)	(10)	(10)	(5)	(5)	(10)	(10)	(5)	
	Units		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	

amdel

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Geol Unit	Sample	From - To m	As	Bi	Cd	Co	Cr	Cu	Fe	Mn	
17	A 334106	206-208	<5	<10	<5	20	50	70	1.77	250	
	A 334107	208-210	<5	<10	<5	20	55	85	2.04	300	
18	A 334108	210-212	<5	<10	<5	20	40	70	1.83	260	
	A 334109	212-214	<5	10	<5	20	55	90	2.00	290	C
	A 334110	214-216	<5	<10	<5	20	60	80	1.91	270	
	A 334111	216-218	<5	<10	<5	15	65	60	1.59	230	
19	A 334112	218-220	<5	10	<5	20	90	70	2.02	280	
	A 334113	220-222	<5	10	<5	20	85	70	2.00	290	
	A 334114	222-224	<5	10	<5	20	95	80	2.26	330	
	A 334115	224-226	<5	10	<5	20	100	75	1.70	240	
	A 334116	226-228	<5	20	<5	15	110	80	1.72	240	
	A 334117	228-230	<5	10	5	20	100	85	2.46	290	
20	A 334118	230-232	<5	<10	<5	20	40	60	3.60	270	
	A 334119	232-234	<5	10	<5	20	95	65	2.36	300	D
21	A 334120	234-236	<5	10	<5	20	150	70	2.08	280	
	A 334121	236-238	<5	10	<5	20	120	65	2.00	280	
21	A 334122	238-240	<5	10	<5	20	95	80	2.36	330	E
21	A 334123	240-242	<5	10	<5	25	150	90	2.96	400	
	A 334124	242-244	<5	15	<5	25	75	85	2.84	400	
	A 334125	244-246	<5	10	<5	25	65	70	2.86	420	
	A 334126	246-248	<5	10	<5	30	55	85	3.28	470	
22	A 334127	248-250	<5	10	<5	30	70	85	3.20	450	F
	A 334128	250-252	<5	10	<5	30	60	85	3.06	450	
	A 334129	252-254	<5	10	<5	25	55	75	2.98	450	
	A 334130	254-256	<5	10	<5	30	65	75	3.34	490	
	Detn limit		(5)	(10)	(5)	(5)	(10)	(5)	(0.010)	(10)	
	Units		ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	

Analysis code ICP 1 | Report AC 3369/88 | Page 16

NATA Certificate | Order No. 46123

	Sample	Depth m	Ni	P	Pb	Zn	Ag	Mo	Sb	V	
	A 334106		70	20	25	15	<5	10	20	5	
17	A 334107	210	80	25	30	20	<5	<10	20	10	
18	A 334108	212	65	65	25	15	<5	10	15	10	
	A 334109		75	30	30	15	<5	<10	25	10	
	A 334110		70	25	30	15	<5	10	20	10	C
	A 334111		50	30	25	20	<5	<10	15	10	
	A 334112		70	30	35	20	<5	10	25	10	
19	A 334113		70	25	35	20	<5	<10	25	10	
	A 334114		75	30	40	25	<5	10	30	10	
	A 334115		65	25	35	20	<5	<10	25	10	
	A 334116	228	65	30	40	20	<5	<10	30	10	
	A 334117		65	210	30	35	<5	10	20	25	
20	A 334118		50	640	15	40	<5	<10	10	80	D
	A 334119	234	60	160	35	30	<5	<10	25	30	
21	A 334120	236	75	65	35	20	<5	10	25	20	
	A 334121		70	45	40	20	<5	<10	30	15	
21	A 334122	240	90	35	40	20	<5	10	30	10	E
21	A 334123	242	110	45	50	45	<5	<10	35	15	
	A 334124		110	45	45	30	<5	<10	35	10	
	A 334125		110	40	50	25	<5	<10	35	5	
	A 334126		120	50	50	25	<5	10	35	5	
22	A 334127		130	40	40	35	<5	<10	30	10	F
	A 334128		120	40	45	35	<5	10	35	5	
	A 334129		110	35	50	30	<5	<10	35	5	
	A 334130		120	35	50	30	<5	10	35	5	
	Detn limit		(5)	(10)	(10)	(5)	(5)	(10)	(10)	(5)	
	Units		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	

AMDEL REPORT NO. 06722

CSR Limited

Tabling and sulphide
Flotation

OD 3/8/1/0-06722 June 1988

amdel
technology and enterprise

Amdel
International Operations Group
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Osman Place,
Thebarton, S.A. 5031

Telephone: (08) 43 5733
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Australia

Telex: AA82725
Facsimile: (08) 352 8243

21 June 1988

OD 3/8/1/0-06722

CSR Limited
Minerals Exploration and Development Group
69 King William Street
KENT TOWN SA 5067

Attn. Mr. Lindsay Curtis

RE: REPORT NO. 06722/88

YOUR REFERENCE:	Purchase Order No. 46122
MATERIAL:	Crushed drill core
WORK REQUIRED:	Tabling and sulphide flotation

Investigation and Report by: J.M. Clayton

General Manager, International Operations Group: Peter M. Cameron

1. SUMMARY

A sample of crushed ore was stage ground to pass 500 µm, split at 250 µm and the -500 +250 µm and -250 µm fractions were each tabled to produce concentrate, middlings and tails. The concentrate was treated by flotation to recover a sulphide concentrate.

2. INTRODUCTION

Mr. Lindsay Curtis, of CSR Minerals Exploration and Development Group, requested Amdel Limited to carry out a short test programme to produce a sulphide concentrate from a sample of crushed drill core. The objective was to produce a table concentrate which was to be further treated by flotation to produce a sulphide concentrate.

3. PROCEDURE AND RESULTS

The material received was stage ground to pass 500 µm and wet screened at 250 µm. The -500 +250 µm and -250 µm fractions were tabled and concentrate, middlings and tailings were produced. The weight distributions are given in Table 1.

During tabling of the -500 +250 µm fraction no visible band of heavy mineral was observed, whereas the -250 µm fraction did have a visible band of heavy mineral.

Two flotation tests were carried out.

For the first test 500 g of -250 µm table concentrate was treated in a 1.5 litre flotation cell. Conditions were as shown in Table 2. Only 17.8 g of a sulphide concentrate was produced. - assay sample 1 ?

For the second test a composite of 180 g -500 +250 µm fraction and 320 g -250 µm fraction was ground in a stainless steel rod mill for 500 revs. The product was treated in a 1.5 litre flotation cell under the conditions shown in Table 2. 102.8 g of concentrate was produced. - assay sample ? 2

All concentrates, middlings and tailings were dried and returned to Mr. Curtis.

TABLE 1: WEIGHT DISTRIBUTION - TABLING

A. +250 μm Fraction

	Wt - g	Wt %
Table conc	796	9.0
Table middling	402	4.6
Table tails	7581	86.4
	8779	100.0

B. -250 μm Fraction

	Wt - g	Wt %
Table conc	1461	5.4
Table middling	4976	18.4
Table tails	20670	76.2
	27107	100.0

TABLE 2: FLOTATION TEST CONDITIONS

A. -250 μm Fraction Table Conc, Unground

500 g subsample, 1.5 litre cell

Conditions

Stage	Density %Solids	Time (min) Cond.	Time (min) Flot.	pH	Reagents - ml A238 (.5%)	Reagents - ml PAX (.5%)	Reagents - ml MIBC (.5%)	Remarks
Ro float 1	34	5	3	8.65	10	10	5	Small sulphide recovery Assay sample ①?
Ro float 2		5	3	8.98	-	20	-	Barren froth

B. Composite Table Cons, Ground - assay sample. ②?

180 g -500 +250 μm conc) ground 500 rev.
320 g -250 μm conc)

Conditions

Stage	Density %Solids	Time (min) Cond.	Time (min) Flot.	pH	Reagents A238 (.5%)	Reagents PAX (.5%)	Remarks
Ro float 1	34	2	4	8.96	10	10)	Combined to
Ro float 2		2	4	8.98	10	10)	form Ro Conc
Ro float 3		2	4	8.96	10	10	

Reference Number 39459

9 JUNE, 1988

Order Number 46123

C.S.R. Limited
****

69 King William Street

KENT TOWN SA 5067

Analysis of Mineral Samples
****

Analysed By :
ANALYTICAL SERVICES (WA) PTY LTD
19 Augusta St
WILLETTON WA 6155
Telephone 354 1888
Telex AA 94767
Facsimile 457 2569

T.K. Chan

Authorised By : T.K.Chan

REFERENCE NUMBER 39459 Order No 46123 Page 1

SAMPLE NUMBER	Au ppb	Pt ppb	Pd ppb	Ru ppb	Rh ppb	Ir ppb	Os ppb
SARM 7	200	3.2m	1.4m	400	210	86	55
TEST2 GR SULPHIDE CONC ①	200	18	23	5.0	2.0	1.0	< 2
TEST2 GR SULPHIDE CONDUP ②	170	19	25	4.0	1.0	<0.5	< 2

STANDARD

10%-15% SULPHIDE ONLY VISIBLE UNDER MICROSCOPE, ① BETTER THAN ②

REFERENCE NUMBER 39459   Order No 46123   PAGE 2
****

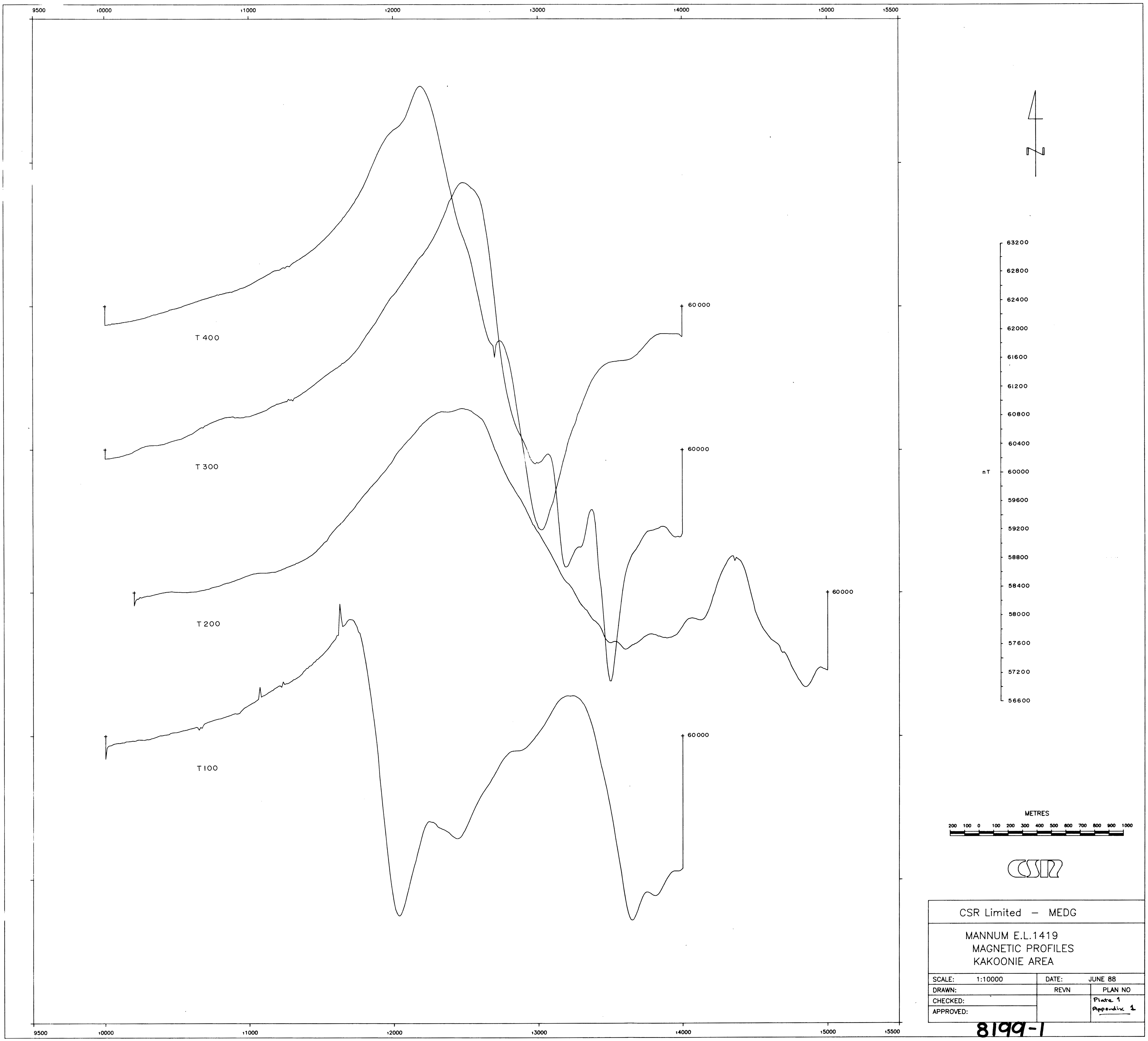
Sample Preparation
****
No sample preparation was required on these samples.

Sample Analysis
****
An 'm' Suffix after a result implies results are expressed in ppm for this sample

Au   Pt   Pd   Ru   Rh   Ir   Os
have been determined by Fire Assay of the sample (in NEW pots) using Nickel Sulphide as the collection media. The Platinoids have been recovered from the Nickel Sulphide and analysed by ICP-Mass Spectrometry. Recovery of Gold is not quantitative at levels below 500 ppb.

APPENDIX 5

Down Hole Logging Profiles



CSR Limited – MEDG

MANNUM E.L.1419
MAGNETIC PROFILES
KAKOONIE AREA

SCALE:	1:10000	DATE:	JUNE 88
DRAWN:		REVN	PLAN NO
CHECKED:			Plate 1 Appendix 1
APPROVED:			

8199-1

8199-2

S.A.D.M.E
COMPUTERISED BOREHOLE LOGGING

BOREHOLE PROJECT NO. KAKOONIE

VERTICAL SCALE 1: 200

DEPTH LOGGED 213.36 M.

DATE LOGGED 21/ 4/88

DATE PROCESSED 27/ 4/88

C.S.R. MINERALS

BLACK HILL AREA

AUST. MAP GRID REF.

1:100,000 REF. SHEET NO.

OPERATOR: N.F.DUNSTAN

DATUM ABOVE GROUND LEVEL . 0.60 M.

LINEAR DENSITY EQUATION: COUNTS= A * DENS * EXP(B*DENS)

LOGGING SPEEDS AND TIMEBASES.

DENSITY PROBE NO. 101 , 6 M/MIN 200 MSEC

CALIPER (CM.)
FIL= 5 SKIP= 2
5.0 25

LONG DENSITY (GM/CC)
FIL= 15 SKIP= 4 A= 1482.75 B= -2.0458
2.0 3.0

SHORT DENSITY (GM/CC)
FIL= 15 SKIP= 4 A= 418.79 B= -0.5410
2.0 3.0

SHORT DENSITY (GM/CC)
FIL= 15 SKIP= 4 A= 418.79 B= -0.5410
2.0 3.0

CALIPER (CM.)
FIL= 5 SKIP= 2
0 25

LONG DENSITY (GM/CC)
FIL= 15 SKIP= 4 A= 1482.75 B= -2.0458
2.0 3.0

8199-3

S.A.D.M.E
COMPUTERISED BOREHOLE LOGGING

BOREHOLE PROJECT NO. KAKOONIE #1

VERTICAL SCALE 1. 200
DEPTH LOGGED 252.39 M.
DATE LOGGED 21/ 4/88
DATE PROCESSED 27/ 4/88

C.S.R. MINERALS

BLACK HILL AREA

AUST. MAP GRID REF.

1.100,000 REF. SHEET NO.

OPERATOR. N.E.DUNSTAN
DATUM ABOVE GROUND LEVEL . 0.00 M.
CASING DEPTH 60.0 M.

IP PROBE DETAILS :
SCHLUMBERGER CHLUM 25
TX ON TIME 2000 MSECS
DECAY READING TIMES AFTER TX OFF (MSECS) :
500 650 800 950 1100 1250 1400 1550 1700 1850

LOGGING SPEEDS AND TIMEBASES.
IP PROBE NO. 101 , 3 M/MIN 2000 MSEC

S.A.D.M.E
COMPUTERISED BOREHOLE LOGGING

BOREHOLE PROJECT NO. KAKOONIE

VERTICAL SCALE 1: 200
DEPTH LOGGED 252.53 M.
DATE LOGGED 21/ 4/88
DATE PROCESSED 27/ 4/88

C.S.R. MINERALS

BLACK HILL AREA

AUST. MAP GRID REF.

1:100,000 REF. SHEET NO.

OPERATOR: N.E.DUNSTAN
DATUM ABOVE GROUND LEVEL : 0.60 M.
CASING DEPTH 120.0 M.

LOGGING SPEEDS AND TIMEBASES:
NEUTRON PROBE NO. 101 , 6 M/MIN 200 MSEC

NEUTRON (DASHED)
4000 8000

NATURAL GAMMA (CPS)
FIL= 25 SKIP= 4
0.0 200
200 API

LONG DENSITY (GM/CC)
FIL= 15 SKIP= 4 A= 1482.75 B= -2.0458
2.4 2.9

NEUTRON (CPS)
FIL= 16 SKIP= 4
0.0 4000

CHARGEABILITY MV/V
FIL= 3 SKIP= 0
0.0 1000

NEUTRON (CPS)
FIL= 15 SKIP= 4
0.0 4000
CAL #1 #2 #3

NATURAL GAMMA (CPS)
FIL= 25 SKIP= 4
0.0 200
CAL 0 API

8199-4

APPENDIX 6

Consultant Report (K.J. Maiden)

00097

CSR LIMITED

MINERALS EXPLORATION AND DEVELOPMENT GROUP

SOME EXPLORATION POSSIBILITIES IN SOUTH AUSTRALIA

EMR 69/87

CANBERRA

MAY 1987

K.J. MAIDEN

CONTENTS

LIST OF ILLUSTRATIONS

2. SUMMARY

(vi) Black Hill Basic Intrusive : A basic complex intrusive into Kanmantoo rocks has potential for platinum deposits. An exploration programme is recommended.

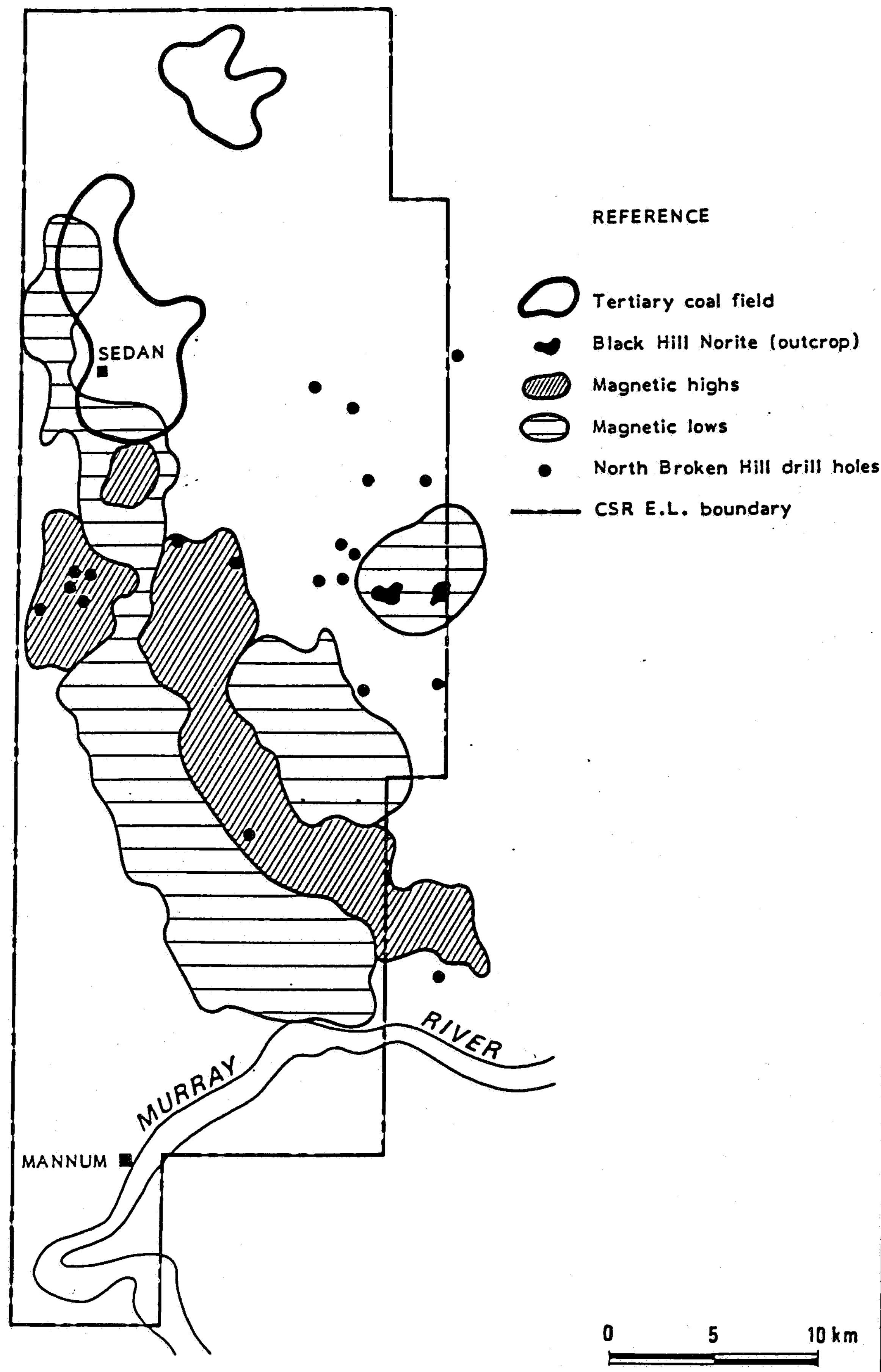


FIG. 11 SEDAN AREA SOUTH AUSTRALIA

8. BLACK HILL BASIC INTRUSIVE

Mr. Lindsay Curtis, of CSR's Adelaide exploration office, has drawn my attention to the Sedan area, east of Adelaide, where there are small outcrops of the Black Hill Norite within CSR's coal exploration licence area. The norite is apparently intrusive into the Kanmantoo Group, although most of the Paleozoic rocks are covered by a thin veneer of Murray Basin sediments.

Some years ago, North Broken Hill Ltd. drilled 20 vertical diamond holes into the area around the norite outcrops and into two zones of magnetic highs a few kilometres west of the outcrops (Figure 11). The purpose of the drilling was to test for magmatic nickel-copper concentrations. The drill cores are currently the subject of a University of Adelaide post-graduate research project.

Together with Mr. Curtis, I examined several of the cores at the SADME core library in Adelaide. The rocks intersected are gabbro and norite, not distinctly layered but with a mineral foliation. There is minor metamorphism to form chlorite-?amphibole. Minor pyrrhotite is disseminated through the rocks, but there is no major sulphide concentration. Some of the core has recently been sampled by Billiton, apparently in a search for platinum group metals.

The Black Hill Norite outcrop is actually associated with a magnetic low. Mr. Curtis raised the interesting possibility that a linear north-trending magnetic low, approximately 30 km in length (Figure 11), could represent reversely magnetised basic or ultrabasic rock. This suggestion is supported by the reported occurrence of basic igneous rock beneath Tertiary coal in CSR (Coal Group) drill holes near Sedan. If an ultrabasic part of the igneous complex can be found, this would provide a better target for platinum exploration than the gabbro and norite.

The basic igneous body is largely within the boundary of an existing CSR exploration licence area. It would make sense to investigate the platinum potential before relinquishment. The initial approach should be to confirm the magnetic response by a ground magnetometer survey, to check the drill logs from the CSR Coal Group and to re-log the North Broken Hill drill cores (perhaps the Adelaide University study could be employed on this task). A few carefully placed diamond drill holes would soon confirm the presence of basic or ultrabasic igneous rock causing the magnetic low.

One additional item of interest : North Broken Hill's drill hole number 1 intersected no basic igneous rock, only metasediments and metavolcanics, presumably of the Kanmantoo Group. The hole bottomed in a fine-grained siliceous rock, probably felsic tuff or lava initially, but now strongly silicified. The rock has pronounced brittle fracturing throughout, and pyrite along the fracture surfaces. It may be a long shot, but it could be worth analysing the core for gold, as a possible epithermal gold target.

I assume that Mr. Curtis will be submitting a separate memo/report outlining his ideas on the area.