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ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED

West Coast Mines

EXPLORATION LICENCE NO. 12/72 - BULGOBAC

Progress Report on Activity 5th May to 24th August, 1982

OPEN FILE

Geology Department
Report No. 153 MD

R.A. Sainty,
I.R. McDonald,
August, 1982.

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BOCO

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Geochemistry	1: 5,000	AO-521-0077; -0084	Zn	
		AO-521-0076; -0083	Pb	
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		AO-521-0078; -0095	Fe	
		AO-521-0080; -0087	As	VOL 2
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1. INTRODUCTION

This report covers work on Exploration Licence No. 12/72 by Electrolytic Zinc Company of Australasia Limited between 5th May, and 24th August, 1982.

The work was carried out on behalf of a Joint Venture between E.Z. and Getty Oil Development Co. Ltd., which was initiated in April, 1976. A description of the Licence can be found in E.Z. Report No. 128 - "Exploration Undertaken in E.L. 12/72 during 1976-77".

2. PREVIOUS EXPLORATION

Details of all previous work on E.L. 12/72 have been reported in E.Z. Geology Department Reports No's 128 (1977), 129 (1978), 130 (1979), 132 (1980), 137 (1981), 145 (1982) and 149 (1982).

3. ABBREVIATIONS

Standard symbols and terminology used on geological plans and sections are detailed on Plate 1 of E.Z. Report No. 137 - "E.L. 12/72 Progress Report on Activity July, 1980 to June, 1981".

4. EXPLORATION UNDERTAKEN 5.5.'82 - 24.8.'82

4.1. Boco Area

4.1.1. Work Completed

This progress report covers an assessment of the field data collected furing the 1981-82 summer and documented previously in E.Z. Report No. 149 - "E.L. 12/72 Progress Report on Activity 15.12.'81 - 4.5.'82".

This data was derived from a programme of geological mapping, soil geochemical sampling, magnetometry and a 60m dipole-dipole array E.I.P. survey by Scintrex (using their new micro-processor-based IPR-11 receiver) on a 35.76km on 18 lines extension into the southeastern and southwestern corners of the Boco area and infilling of some widely spaced lines from the original 1976-77 and 1977-78 gridding programmes.

Additionally, all previous work in the Boco area has been reviewed during preparation of this report, particularly in order to properly integrate the different sets of geological and E.I.P. data.

4.1.2. Geology (Refer to 1:5,000 scale geology plans: AO-521- 0093 and AO-521- 0094 Thin section petrographic descriptions: Appendix 1 and revised outline DDH Logs Appendix 2.)

The Boco area is typified by poor outcrop exposure due to glacial cover. Outcrop is restricted to the steep ravines and adjacent hills of Boco and Farm Creeks in the southwestern and southeastern corners of the grid, to two small isolated hills in the central buttongrass plain area and to scattered exposure along logging tracks to the northwest.

Western Sediment Sequence:
('Animal Creek Greywacke' of Collins, 1981)
Line 14,680N of the 1982 gridding extended westwards over outcrop and suboutcrop of interbedded micaceous sandstone, siltstone and fine-grained acid tuffs. These sediments are exposed along the old logging tracks in this vicinity, where moderate dips of 40-50° to the northwest have been recorded.

Along strike equivalents of these rocks are exposed along the Murchison Highway northeast of the Boco Grid. Here inter-bedded well laminated shale, black shale and tuffaceous silt-stones dip and face northwest.

No contact with the acid volcanic sequence is exposed, but a discordant or faulted contact may be reasonably inferred (see later discussion).

Central Acid Volcanic Sequence:
In the southeastern infill corner (lines 14,520N to 13,580N) a sequence of NE-trending rhyodacitic pyroclastics and lavas and pelitic/psammopelitic ash sediment units has been well defined.

Adjacent to the Murchison Highway a coarse-grained crystal-vitric-lithic tuff of ash flow origin (specimen 48389, Appendix 1) contains fragments of the underlying porphyritic rhyodacitic lavas and vitric tuff and at 11,630E on 13,580N large fragments of silicified laminated black shale were recorded. On a highway cutting (383,960E; 5,385,300N) a 1.5m long slab of black shale is exposed within this unit. A basal coarser unit of lapilli to breccia size is distinguishable on lines 13,580N to 14,200N and the unit contains several pods of porphyritic rhyodacitic lava and a pod of bedded grey pelitic ash. It appears to interfinger to the north (lines 14,840N - 15,160N) with bedded siliceous reworked volcaniclastic sediments and lavas. In BBP 208 (collar 11,240E on 13,720N) 49.5m (true width 25m) of fine grained weakly pyritic bedded pelitic ash (specimen 48388, Appendix 1) and minor siltstone are intercalated with this unit, clearly indicating a subaqueous environment for this ash flow unit.

To the southeast, and underlying this unit are thick units of porphyritic 'dacitic' lava and bedded pelitic ash (one of the two pelitic ash units lies outside the E.L.), with smaller units of coarse agglomerate (14,360N to 14,520N) and crystal-vitric-lithic tuff. Correlation of rock types between lines was made directly on rock specimens collected from most mapped outcrop locations.

The lavas (e.g. specimens 48381, -85, -86, -87 Appendix 1) are feldsparphyric, contain minor quartz phenocrysts and are characterised by a paucity of mafic minerals. C.M.S. regard them as quartz trachyandesites because their albitized plagioclase phenocrysts are believed to have initially been of andesine composition and the groundmass gives a positive reaction to K-feldspar staining tests (D. Cowan, pers. comm.). Their hand specimen features, and general silicic appearance imply an acid composition. (Indeed Collins et al, (1981) supply similar petrographic descriptions and also whole rock chemical analyses for 5 lavas and ash flow crystal-vitric tuffs from the Farrell tramway section north of the Pieman River: SiO_2 ranges 70.6% to 78.0% for 4, with a single 61.2%; implying a general acid composition.) The current E.Z. Exploration Legend infers an (acid) 'rhyodacite' name for these rocks rather than (intermediate) 'latite', henceforth 'rhyodacite' will be used in this discussion and on the geological plans as denoting a (minor) quartz and K-feldspar bearing, mafic poor, felsic lava.

The pelitic to psammopelitic ash unit (specimens 48379, 48380 Appendi 1) that outcrops on all lines 14,520N to 13,580N is 130-220m wide and varies in hand specimen appearance from a siliceous, very fine grained, dark grey massive rock with sharp splintery fracture to a vaguely bedded fine grained tuffaceous sediment. In thin section these are bedded shard or lithic shard rocks with variable sericite-chlorite alteration. The rocks typically contain finely disseminated pyrrhotite, and pyrrhotite partly replaces and haloes lithic fragments within occasional coarse psammitic lithic bands. A minor basal phyllitic argillaceous orthoquartzite (specimen 48376, Appendix 1) was mapped (at 12,325E on 14,040N) from loose boulders. A small pod of porphyritic dacite was also mapped from float rock within this pelitic ash unit on line 14,040N.

In the southwestern infill corner (lines 11,000 to 11,500N

and 11,780N) the dominant, outcropping rock is massive rhyodacitic lava similar to that in the southeastern infill corner but with a characteristic widespread sporadic brown to pinkish colouration imparted by fine grained primary magnetite/haematite (e.g. specimen 48386, Appendix 1). BBP 208 (collar 11,240E on 13,720N) intersected 40m of both green (weakly chloritic) and pinkish-brown lava types (specimens 48387 and 48386 respectively, Appendix 1) above the bedded pelitic ash intercalation referred to earlier. BBP 209 (collar 9440E on 13,720N) intersected 162m (i.e. entire length of hole) of this massive to autobrecciated lava (cut with narrow basic dykes) with sometimes intense pink to red pigmentation.

One specimen submitted for thin-sectioning (specimen 48385, Appendix 1) has been described as lava-like, but interpreted as an ash flow crystal vitric tuff on the basis of patchy relict shards. This specimen displays a pale pink-orange, diffuse spotty ?alteration and so resembles a coarse lithic fragmental rock (see below). Similar rocks have also now been renamed ash flow crystal-vitric tuffs, but conceivably some other lava-like rocks may also be ash flow tuffs.

Only relatively minor coarse pyroclastics outcrop in this area. Lapilli-size lithic-crystal and crystal-lithic rhyodacitic tuffs are defined in a unit east of the E.B.R. and outcrop only sporadically elsewhere. The tuffs are characterised by pink-orange colouration of the lava fragments. An isolated massive outcrop was mapped (at 10,310E on 11,300N) of another cherty pelitic ash (specimen 48384, Appendix 1), this rock may have remained unmapped on adjacent lines due to lack of exposure.

Outcrop of massive porphyritic rhyodacitic lavas is repeated along strike in the far northeastern corner of the grid (lines 15,960N to 16,920N) forming a steep, densely-timbered hill east of the Murchison Highway - Boco Siding road intersection.

Fine grained tuffaceous sediments, in addition to the cherty pelitic ash (at 10,310E on 11,300N) referred to above, have been mapped on the steep ravine slope and hilltop along and west of the E.B.R. from 12,280N to 12,920N in association with pyroclastics and lavas. Northwards, this zone dissappears beneath glacial cover of the central Boco buttongrass plain. There is also an occurrance of cherty laminated tuffaceous sediment at 11,375E on 15,160N to the east. These sediments and the bedded pelitic ash units mapped in the southeastern infill corner and that intersected in BBP 208 demonstrate the acid volcanic sequence at Boco as representing a suitable environment for Rosebery - Que River style mineralisation.

Furthermore, 1km along strike to the northeast of the Boco Creek Ravine, BBP 207 (Collar 10,150E on 13,880N) intersected 159.5m (i.e. total depth of hole) of intensely silicified and seritized, incipiently sheared tuff containing abundant disseminated and minor stringer pyrite (specimens 48390 and 48391, Appendix 1). In thin section this is quartz-sericite rock with abundant disseminated pyrite, and in hand specimen resembles Rosebery host rock with lesser shearing. A thin section comparison (D. Cowan, per. comm.) shows that the Boco rock has been silicified more and sericitised somewhat less than a typical Rosebery sericite host rock (largely due to the differing original compositions of the two samples); the severity of alteration is comparable. Very minor remobilised sphalerite and galena occur in association with quartz veins throughout the length of the hole, and one 6.0m chip sample length assayed 1.55% Zn, 3500 ppm Pb, 1700 ppm Cu. Similar rock is found outcropping both to the southwest and north from BBP 207 as two small hills rising sharply out of the glacial cover over a length of 800m and across-strike width of 500m. These exposures are the only bedrock indications within an otherwise glacial-covered 'blank' area of 3km strike length and across strike width of 1-1.5km in the central buttongrass plain area.

Additionally, two wide lanes of glacial cover (including moraine-covered hills) either side of Boco Creek extend 1-2km southward from line 12,920N to the E.L. boundary.

It must be concluded that encouraging quartz-sericite-pyrite alteration exists beneath at least part of the central button-grass-covered plain area and that fine-grained volcanogenic sediment, indicative of an environment suitable for exhalative sulphide accumulation, is known from sporadic outcrop or diamond drill core over most of the area of the Boco Grid.

An additional favourable indication may be that strong haematitic colouration of massive volcanics as is present in BBP 209 (above the zone of strongest alteration) is known in the hanging-wall rocks from Rosebery, Hercules and Que River deposits.

Along-strike lateral facies variation from massive dacitic lavas in the southwestern and northeastern corners to a central area of interbedded lavas, tuffs and volcanogenic silty sediments may indicate a paleo-geographic basin environment especially favourable for the formation of a Rosebery - Que River type deposit. In this Kuroko-style model, the basin may have received sulphide sediment exhaled from hydrothermal vents located within the adjacent acid lava (?dome) areas (see interpretation on geology plans).

The intense silicification and sericitisation with pyritisation of the pyroclastics as encountered in BBP 207 and exposed on two hills 800m apart along strike and 500m across strike was previously interpreted as due to a northwards extension of a fault zone proposed along Boco Creek - E.B.R., but it is considered improbable for a silicified fault zone to have the width of continuous intensity, the degree of sericitisation and the good core recovery which is present here (only a 20cm pug zone was encountered within BBP 207). Thin section petrographic examination (specimens 48390 and 48391, Appendix 1) supports this conclusion: the incipient shearing in both

specimens is described as post quartz-sericite-pyrite alteration and veining.

Structure:

Previously (E.Z. Report 128 pg 18, 20) it has been considered that the acid volcanic sequence in Boco dips and faces east. Evidence for this was taken from graded bedding within the fine grained sediments interbedded with ash flow tuff in BBP 208 ("clearly displayed" in the discussion text but "possible" in the original log). Re-examination of the core shows this evidence to be doubtful - a few instances of possible graded bedding can be found but these offer conflicting evidence. Elsewhere within the sediment unit, slumping contortion is visible, as was noted in the original log. Even if the grading upwards evidence is correct, either an easterly or a (shallow) westerly dip conclusion can be constructed from the hole attitude and sediment bedding to core axis angle data.

South of the E.L. boundary (now Farm Creek Grid of E.L. 1/62) Cominco reported graded bedding in a crystal tuff outcropping in Tramway Creek (at 383,350E; 5,383,500N) with variable dip but around 20°W. Further up Tramway Creek (at 383,400E 5,384,000N) a very thinly bedded ash tuff was found to dip 45-50°W. Dips of about 40-50°W are also recorded from the exposures of western sediment sequence on the old logging tracks west of Boco and on the Murchison Highway cuttings north of the Animal Creek bridge.

This situation suggests that the entire Boco sequence has a westerly dip and facing. The Que River and Chester deposits also dip and face west, implying that this may be a regional trend.

A shallower westerly dip in the Boco area would account for the broad surface width of mapped lithological units, and imply that the three diamond drill holes have been drilled in the dip direction and have traversed relatively little rock

type. Both BBP 207 and 209 remained in a single rock unit for their entire depths.

The contact between the acid volcanic and western sediment sequences was previously required to be faulted in order to reconcile the opposing dip directions. While this constraint is no longer felt to be valid a discordant or faulted contact is still reasonably inferred between these two major units of different lithology because of their inferred structural setting (Corbett's central cordera vs western sequences) and an observed faulted or sheared nature elsewhere (Pieman River; west of Que River).

A large scale ENE-trending linear that passes through the Boco area has been recognised for some time on Landsat imagery. This lineament truncates and offsets previously recognised NE-trending air photo lineaments in the area of massive rhyodacitic lavas to the south. It also appears to coincide with the northern limit of outcrop of the lavas and their associated magnetic response, suggesting a genetic relationship with the basin proposed previously. The 'block' formed by this Landsat linear and a less persistent one subparallel to it to the south appears to have undergone a clockwise rotation. The linear would therefore appear deep seated and able to conduct volcanic magma (eruption conduit) or have contributed to seawater circulation through the basin floor and consequent transport of metals in solution.

Magnetics: (refer to 1:50,000 scale ground magnetic plans AO-521-0091 and AO-521-0092)
The 1982 ground magnetics data has been incorporated into the total field contour map of the 1976/77 surveys and extends the trends already present into the infill areas.

Despite the location inaccuracies apparent in the original Boco Grid, the ground magnetics plans show the same pattern as the previous 1973 Scintrex and 1975 Geoterrex 1:10,000 scale

aeromagnetic maps i.e. A magnetically responsive area in the southwestern to southcentral area of the Boco Grid as far north as 13,580N has a convex northwards arcuate pattern hinged in the vicinity of Boco Creek - E.B.R. and contrasts with the remainder of the grid which is magnetically quiet.

(The 1:10,000 scale aeromagnetic maps also show another magnetically strong area to lie east of the northern limit of Boco, outside the E.L.)

The strong magnetic zone broadly coincides with the southwestern infill corner exposures of brown magnetite-bearing rhyodacitic lavas. Some similar brown lavas apparently outcrop in the northeastern corner with no accompanying magnetic expression. This presumably indicates that these lavas belong to a different flow set, or eruptive centre, and supports the paleogeographic reconstruction proposed earlier.

The causes of some discrete magnetic sources are identified with surface geology: The high-intensity 63,200+nT (i.e. 1200 contour) anomaly on line 12,920N west of the E.B.R. is directly correlated with a doleritic intrusive. It may be reasonably assumed that the several other intense anomaly centres elsewhere have a similar cause (although exposure of fresh pyroxene rich dolerite at 11,940E on 13,880N had no such centre). This invites the question of how much these small random anomalies and perhaps other less intense (deeper) responses influence the overall contour pattern. The 63,000+nT (1000) contour response west of the E.B.R. on 12,280N appears to be due to a haematitic fine lithic sandstone mapped from float in 1976. The magnetically noisy areas on the eastern end of 11,780N and approximately 150m west of the E.B.R. on 11,000 and 11,100N coincide with outcrop of brown, magnetite-bearing rhyodacitic lava.

The overall pattern of response may be explained in the following ways:

a) That the arcuate pattern represents the trace of a tight north plunging antiform or south plunging synform.

b) That the pattern could be produced by a single unit repeated due to faulting along Boco Creek, although there does appear to be a real angular convergance of the two lobes.

As stated previously, there is no geological evidence (based on limited outcrop and diamond drill core) for structural complexity in the Boco area except for shattered volcanics occurring near Boco Creek - E.B.R. in the vicinity of 12,920N supporting some degree of faulting along this linear zone.

c) The arcuate pattern could also be produced by the distribution of lava about an (dome shaped) eruptive centre. On the 1:10,000 aeromagnetic maps the western lobe of the magnetic response has a sharp eastern boundary and gradual western boundary, characteristic of a west dipping source. If an eruptive centre existed in the southwestern corner of the Boco area then the lava would appear to be limited to the west, north and east about this centre, perhaps because of the original geometry of eruption (e.g. sideways venting). The existance of this area of magnetically uneven response in the southwest (and east of the northern end of the Boco Grid) may in itself support the location of eruptive centres in an otherwise quiet magnetic area (refer to 1981 1:50,000 scale Geoex aeromagnetic survey map) this is in agreement with the geological model proposed previously.

Geochemistry: (Refer to the following 1:5,000 scale plans and Appendix 3 AO-521-0077, -0084 Zn; AO-521-0076, -0083 Pb; AO-521-0075, -0082 Cu; AO-521-0078, 0085 Fe; AO-521-0080, 0087 As; AO-521-0079, 0086 Mn; AO-521-0081, -0088 Sn)
The results of the 20m spaced hand auger soil sampling are disappointing, with the highest values from immediately outside the E.L's southern boundary. A clustering of 85-110 ppm

Zn values occurs over outcrop on the western slope of the Boco Creek ravine on lines 11,100N to 11,300N and another of 100-400 ppm Zn values over 100m on 11,780N 400m east of Boco Creek in an isolated area of outcrop (this area was also marked by a coincident E.I.P. chargeability anomaly). However previous soil sampling on adjacent lines 11,960N and 12,120N gave values of only 20-60 ppm along strike (on non-outcrop) within E.L. 12/72.

In the southeastern infill corner the linear zone of anomalous 80-120 ppm Zn values correlate with the pelitic ash sediment unit within the rhyodacitic lavas and ash flow tuffs. The values would therefore appear to be lithological response and not related to potential sulphide mineralisation.

On the western end of line 13,580N a clustering of 7 coincident Zn and Pb values of 80-155 ppm occur over a width of 220m (8,230E-8,450E)(with 30% thin glacial cover). Scattered anomalous values occur on 14,040N and 14,680N over the (same) western sediment sequence.

The observation may be made, then, that the geochemical anomalies are confined to areas of outcrop or only patchy thin glacial cover, inferring that many of these values may be more or less typical of the bedrock, rather than being truely anomalous.

The data for Zn, Pb, Cu and Fe has been statistically analysed to calculate population distribution and contouring intervals. The data was divided into two sets - analyses from areas of outcrop where soils are expected to be residual and all other analyses. The (interpreted) outcrop limits are shown on each 1:5,000 scale plan. Frequency histograms and cumulative per cent frequency plots (the latter on 1 cycle log probability paper) appear as Appendix 3. These figures show a strong skewness toward the low abundances (note the long tail for Fe and the short tail for Cu) and no distinct break points from which threshold and anomalous values can be determined.

Instead these values were determined from (mean + standard deviation) and (mean + 2 standard deviations) respectively. The results are summarised as follows:

Element	No.	Sum	Mean	SD	Mean + SD	Mean + 2 SD	
Cu Insitu	492	5390	10.95	3.67	15	20	x Cu
Transported	749	8390	11.2	6.0	17	23	
Pb Insitu	492	9400	19.1	14.2	35	50	x Pb
Transported	749	13260	17.7	17.9	35	50	
Zn Insitu	492	14060	28.6	25.3	55	80	x Zn
Transported	749	17400	23.2	24.0	50	75	
Fe Insitu	402	382	0.95	1.1	2%	3%	x Fe
Transported	570	455.6	0.8	1.0	2	3	

No significant anomaly trends have been defined, however one should keep in mind the limited geographic area and limited across-strike width that has been effectively sampled. Much of the data relates to the outcrop of massive rhyodacitic lava and ash flow tuff in the Boco ravine. Follow-up of potentially anomalous zones (e.g. on 11,780N at the E.L's southern boundary) may be possible but glacial cover will probably mask any continuation.

E.I.P.: (Refer to 1:5,000 scale A0-521-0089; -0090)
The infilling of the southeastern and southwestern corners produced no significant anomalous zones.

In the southeastern infill corner (lines 14,520-13,580N) the pelitic ash unit containing fine disseminated pyrite produced an along-strike linear I.P. response south of 14,200N, but which shifted up to 150m stepwise to the west north of 14,200N, due to the presence of fine disseminated pyrrhotite in the adjacent lava and pyroclastic units. (This suggests that the pyrrhotite and I.P. response is not purely a lithological response.)

In the southwestern infill corner a number of low-order chargeability anomalies were defined on lines 11,200; 11,400; 11,500 and 11,780N east of the E.B.R. on or south of the E.L. boundary. These have been described by Dr. J. Bishop in the previous progress report. On 11,780N, 400m east of the E.B.R. a response was coincident with soil geochemical anomalism (refer previous section).

As was noted in the previous progress report, comparison of the I.P. profiles with the geological mapping shows a very strong correlation between I.P. response and outcrop. Those sections of the I.P. profiles which show "normal" I.P. character correspond exactly with areas of outcrop. As soon as outcrop disappears beneath glacial cover the I.P. profiles become very flat and featureless, and very low chargeabilities (4-10 mV/V) occur uniformly over large areas. The 1976 gradient array and 1978 50m dipole-dipole array surveys were unsuccessful in penetrating the glacial cover. The 1982 60m dipole-dipole array survey appears to have been similarly unsuccessful. All three surveys produced unusually low chargeability values for these typical Mt. Read Volcanics rocks.

In his review of the geophysics over the Boco Grid Bishop (1981) examined the three gradient array anomalies drilled by DDH's BBP 207, 208 and 209 and later resurveyed by 50m-spaced dipole-dipole array I.P. in 1978 (in order to check their validity and exact location). He states that "the gradient anomaly was located by each dipole-dipole survey, the latter usually giving better definition to the causative body(s)". Howland-Rose (1978) in the original Scintrex report accompanying the dipole-dipole survey pseudo-sections (TAS-051), also confirmed that the dipole-dipole array "in general confirms the anomalies located during the gradient array reconnaissance survey". He and Bishop (1981) noted the very low resistivities (<100-400 ohm-m) produced over the chargeability anomaly on line 13,880N in contrast to the average values of over 2000 ohm-m produced by the gradient array. Howland-Rose's explanation

was "that the dipole-dipole resistivity is characteristic of the overburden and is in fact comparable to sounding SX#3 at 13,880N/10,040E, which shows resistivity within the overburden of 500 ohm-m. However he also believed that the dipole-dipole data did not demonstrate the "grossly inhomogeneous" overburden resistivities that would be required to mask bedrock penetration.

Each of the three anomalies drilled (plus the proposed target on 16,440N to the north) display double peak chargeability anomalies starting at n=1. Those drilled by BBP 208 and 209 on 13,720N and that on 16,440N show very well-defined double peak ('trouser-leg') form, that drilled by BBP 207 on 13,880N is broader at n=1, but confirmed by a subsequent Geoex frequency domain dipole-dipole survey (refer Fig. 6 in Bishop, 1981). All were interpreted by both Howland-Rose (1978) and Bishop (1981) as indicating a shallow flat lying body. Howland-Rose adds "at considerably less (depth) than the dipole spacing of 50m", while Bishop supplies comparable type 'curves' for 15m and 37.5m ($\frac{3}{4}$ dipole spacing) -thick bodies 'of limited extent" (50m - 1 dipole spacing).

These constraints can be satisfied by discrete sources within the glacial cover, which also explains the (virtually) complete lack of mineralisation intersected by BBP 208 and 209. The anomalies drilled by these two holes have previously remained unexplained (although it is recognised in hindsight that BBP 208 could have been better sited). It is argued that the source of the anomaly drilled by BBP 207 was also the glacial cover (44m of which was intersected) i.e. that the disseminated and minor stringer pyrite found over the entire length of the hole (159.5m) did not cause the observed anomaly - neither does it conform to the geophysical interpretation detailed above. This mineralisation was 'accidentally' intersected - although the hole was sited in the vicinity of observed alteration and

weak pyrite (and favoured because of this).

Because no down-hole I.P. was able to be done on BBP 207 this point will probably remain disputable.

The recurring incidence of well developed 'double-peak' anomalies starting at n=1 within an area of glacial blanketing is most striking. Bishop (1981) concluded that the gradient array anomalies were due to variations in the thickness of the overburden, but had previously commented (op. cit. p 10) that the 50m dipole-dipole array surveys had both located the gradient array anomalies and had "usually given better definition to the causative body(s)". This obviously suggests that the dipole-dipole array survey had responded to the same discrete sources within the glacials as the gradient array survey, perhaps even better.

Mitre Geophysics has examined the spectral information from the 1982 coverage from type sections over glacial cover and sub-outcrop to see if any other E.I.P. parameter can assist in answering the question of penetration. Dr. J. Bishop's report appears as Appendix 4. His conclusion was that the geology (glacial overburden, tuffs, lava, etc) cannot be differentiated by the decay shape and this decay shape cannot be used to determine whether the survey adequately tested the bedrock. The study also showed that much of the data was noisy, with some (perhaps ten percent of the total) of too poor a quality to be usable.

It is felt that the vague isolated and irregular areas of higher chargeability (15mV/V) on n=5 and 6 spacings on a few of the pseudo-sections over glacial areas may represent some degree of shallow bedrock penetration. However the degree of penetration and the depth estimate of that overburden-bedrock interface cannot be obtained from the pseudo-sections. On line 14,680N two readings on n=6 (14,18 mV/V on background of 4-8 mV/V) almost certainly indicates some shallow bedrock response because one of the two small hills of altered volcanics is adjacent to the grid line.

Regional Alteration:

C. Eastoe (1981) in part presented a Rosebery-Que River 'host horizon' based on regional mapping of contrasting alteration styles.

His 'attempt'at classification of alteration styles in the Central Sequence' sketch map (his Fig. 10) shows the host horizon intersecting the Murchison Highway immediately south of E.L. 12/72. It may correlate with the weakly altered pelitic ash sediment unit mapped in the southeastern infill corner of Boco.

However, examination of his sample point 'Distribution of alteration assemblages sample by sample' sheet (his Fig. 2A) shows that the above host horizon position is highly subjective, and based on a single non-calcic data point on the Murchison Highway. Instead, a wide corridor of non-calcic alteration exists within Boco (and westwards towards Burns Peak) coincident with the quartz-sericite-pyrite alteration and the massive lava in the north and south (indeed, most of Boco).

Eastoe's interpretation is designed to draw a straight line horizon from Que River, through Mt. Charter and Mt. Black (both small Ba deposits) to his mapped non-calcic alteration zone on the Pieman Road to the south of Boco (see his progress report, May, 1981). A more objective interpretation, more consistent with the known trend of the geology: from Que River southwestwards through Boco, the Chester syngenetic pyrite deposit and arcing southwards to Rosebery.

Eastoe's most westerly data point on the Pieman Road was a non-calcic assemblage - this is perhaps the detection of the above trend.

This equally valid interpretation of the alteration data places Boco in a very favourable light.

4.2. Northern and Western Areas

4.2.1. Work Completed

No field work was done in this period. Activities involved the compilation and assessment of the data resulting from the stream sediment sampling and geological mapping programme reported in E.Z. Report No. 147.

4.2.2. Results Received

Geology (refer to Plans A0-525-0010; 0012 and to Appendix 5)
In the Western area the mapping largely confirmed the interpreted geology through the area, which comprised a sequence of volcaniclastic and fine grained sediments lying west of an intrusive quartz feldspar porphyry. The present mapping suggests that tuff units are more common than previously interpreted and that the porphyry may be less extensive than previously thought. Around 5,391,100N 381,200E some outcrops previously mapped as ?iAqf (i.e. possibly porphyry), were remapped as quartz and feldspar crystal tuffs. A similar situation occurs around 5,388,000N 382,100E. Both cases are near the old margins of the porphyry and both pass westward into sequences of interbedded tuffs and volcaniclastic sandstones. The interpretation of these outcrops as tuffs is favoured. The sequence as a whole appears consistant with the "Western Sequence" as described and defined by K. Corbett.

In the Northern Area around the Hatfield River the sequence is dominated by fine grained sediments. The sequence dips and faces to the north-west. A lowermost unit of quartzites and siltstones contains a prominant conglomerate horizon which is largely siliceous, but in places is calcareous. This is overlain by a unit of siltstones and sandstones which are occasionally calcareous. This in turn is overlain by a unit of siltstones and tuffaceous greywackes which in its turn gives way to a unit of micaceous sandstone and siltstones. The entire sequence is folded round a north-east plunging anticline

which has a closure in the vicinity of 5,399,000N 384,000E. The sequence is variably obscured by Tertiary basalt flows.

Geochemistry (refer to plan no's AO-525-0177, 0178, 0181, 0182 and to Appendix 6).

In the Western Area three samples taken from creek junctions around 5,390,900N 380,700E are weakly anomalous in Cu, Pb and Zn with values of 35, 110, 90 ppm Cu; 110, 65, 100 ppm Pb and 110, 140, 210 ppm Zn respectively. These samples also contain high Mn with values of 1600, 950, 650 ppm Mn respectively. Manganese oxide scavenging may therefore be a factor in the elevated values. The area, however, contains close spaced sampling by Comstaff which also analysed for Cu, Pb and Zn. These limit the anomaly to Zn and Pb only in one small tributary. Comstaff did not analyse for Mn.

Every sample reported Ag below the detection limit of 0.5 ppm Ag. Only 6 of the 44 samples reported As above the detection limit of 5 ppm As. The highest value of 20 ppm As is associated with 1600 ppm Mn so scavenging may be indicated.

Sn values are almost universally low. Only 3 samples reported above the detection limit of 10 ppm Sn. Two of these samples were 10 ppm Sn. The third was 65 ppm Sn, and as such represents the only anomalous Sn value in the entire survey. It comes from a small tributary stream about 100m downstream from the access road to the Silver Falls Grid. The possibility of contamination in this situation cannot be ruled out.

In the Northern Area a zone of anomalous Pb values (80-170 ppm Pb) is situated around 5,398,200N 382,650E. These samples also contain some of the highest Mn values (up to 2700 ppm Mn) so scavenging may be indicated although the Cu and Zn values are not noticeably enriched.

Zn values appear to form a continuous population from 30 ppm Zn to about 200 ppm Zn, with no distinguishable anomalous population. The highest Zn value is associated with the highest Mn value; 240 ppm Zn with 6400 ppm Mn. The sample comes from a very small creek so the result is most probably due to scavenging.

Cu values are higher than usual but almost all the values above 70 ppm Cu can be explained by drainage off Tertiary basalts. The highest value of 140 ppm Cu cannot be explained in this way. The sample, however, lies just outside the E.L. 12/72 boundary and drains a catchment area outside the E.L.

Like the western area, Ag values are all below detection limit. Ten of the 46 samples contain above detection limit of As and 6 of these are only 10 ppm As. Two others appear to be due to Mn scavenging leaving only a 30 ppm As and a 100 ppm As as possibly anomalous. Neither sample is associated with any other anomalous element values.

Sn values are again very low. Only 5 of the 46 samples are above the 10 ppm detection limit. Three of these are 10 ppm Sn and the remaining two are 15 ppm and 25 ppm Sn respectively. Comstaff sampling in the Northern area included sampling for Sn. The analytical technique and laboratory used are unknown. The technique however reported Sn only as even numbers between 10 ppm and 30 ppm Sn. The values reported are evenly spread across this range. There are some locations with near coincident sample collections by Comstaff and E.Z. In these locations there is no correlation between the two samples as the E.Z. value is invariably <10 ppm Sn. The results of the coincident E.Z. sampling together with the even spread of the Comstaff Sn results suggests that 10-30 ppm Sn is a background noise level for whatever analytical technique was used by Comstaff.

In both the Western and Northern Areas the reported W values are highly anomalous. Values range very evenly up to 115 ppm W. The Western Area contains slightly more values in the lower end of the range and the Northern Area contains slightly more of the higher values, but distribution is remarkably evenly spread across the range encountered. Of the 90 samples analysed only 10 lie below the detection limit of 10 ppm W. This is in complete contrast with the Sn distribution which is almost all below detection limit. In the geological environment exposed in the Northern and Western Bulgobac areas it seems very unlikely that widespread anomalous W values should occur. It seems even less likely that they should occur without some associated Sn geochemistry.

Routine W analyses in stream sediments have only been undertaken by E.Z. in recent times. Only two other areas have stream sediment W values for comparison. One area lies between Queenstown and Strahan and the other is west-north-west of Mt. Dundas. In both these areas the same pattern emerges. In the first area W was the only element to show anomalism in an otherwise very low value population, with values up to 90 ppm W. Rock chip samples from this area, analysed at a different laboratory, contained no detectable W. In the second area 44 stream sediment samples ranged evenly up to 100 ppm W with 4 samples <10 ppm W. The same 44 samples returned 42 analyses of <10 ppm Sn. Soil samples from a grid area immediately north of these stream sediment samples, which were again analysed by a different laboratory, returned no detectable W.

The inference from the above discussion is that there is a laboratory error in the stream sediment W analyses. A.C.S. Laboratory, who performed the analyses, have advised that they do not use any tungsten steel pulverising equipment which might have introduced W to the samples. It is still believed that these W values do not belong to a natural geological population but are the result of some sampling and/or

laboratory induced error. If contamination can be ruled out then possibly X.R.F. matrix effects might be the source of the anomalous W.

Geophysics

The Mines Department sponsored regional aeromagnetic survey of the Tasmanian West Coast has recently become available. This survey covers the areas under discussion. E.L. 12/72 contains 4 main magnetic domains. In the north and north east of the E.L. responses are typical of the Tertiary basalt terrain with a noisy character of over 300nT amplitude. A prominant linear belt running south-west from the Hatfield River area to the Silver Falls area outlines the sedimentary lithologies exposed there. This belt is characterised by a noisy response of up to 200nT amplitude, but generally less than 100nT amplitude. To the north it disappears under basalt. To the south it is truncated fairly sharply along a west-north-west trend which passes through the old Silver Falls workings and extends across through the Boco Grid area. The central Bulgobac area displays a broad domal magnetic high of about 120nT amplitude. This feature shows on earlier aeromag coverages of the area and was postulated as the response from a possible buried granite cupola. It can now be seen from comparison with the magnetic response over outcropping granites (e.g. Meredith), and areas of known shallow granite (e.g. margins of the Heemskirk Granite), that the Bulgobac magnetic feature does not have a similar character and is probably not due to granite. The most favoured interpretation of the zone is of a sub unit, possibly structurally bounded, within the Mt. Read acid volcanic belt (pers comm D Leaman, Consultant Geophysicist). The last magnetic domain covers the Boco Grid area in the south-east of the E.L. and is typified by a zone of low amplitude highs. These lie in a north-east trending belt along the regional gradient coming off the magnetic feature in the central area. These highs attain a maximum of 50nT amplitude.

The 1975 Barringer Input survey, flown by Geoterrex (refer to E.Z. Report No. 129) was re-examined for any anomalous conductor responses within the present area of discussion.
A six-channel anomalous zone occurred on the western end of line L-246E which places it in the Hatfield River area. This forms the north-western bulge on an anomaly zone identified by Geoterrex as CS-27. This zone covers an area of over 8 sq.km. The line anomaly in question relates directly to the capping of Tertiary basalt on the ridge which lies south of the Hatfield River at about 5,396,500N 382,500E.

702028

APPENDIX 1. Thin section petrographic descriptions
C.M.S. Report 82/7/20.

REPORT CMS 82/7/20

Fourteen rock and drill core samples were received for petrological examination, and results are compiled in the attached tables. Individual descriptions incorporate data from K-feldspar staining tests and microscopic (stereobinocular, petrological) examination of representative thin-sections and offcuts, and include interpretative comments.

Summary

Apart from a single argillaceous orthoquartzite (48376), this suite consists entirely of intermediate to felsic intermediate and minor intermediate-acid volcanics. Primary compositional detail is obscured by alteration effects, but the volcanics are characterised by a paucity of primary ferromagnesian silicates or their altered equivalents. The broad compositional ranges reflected are leuco-andesitic to trachyandesitic and dacitic.

Texturally, the suite includes lavas (and, conceivably, minor intrusives) and various fragmental types including ignimbrites and psammopelitic ashes. Pyroclastics tend to be defined mesoscopically (hand specimen) by streaky or mottled appearances (e.g. 48389, 48385 respectively), but may be masked by marked and pervasive alteration, particularly where this is homogeneous (48390, 48391).

The rocks exhibit low-greenschist facies tectonic fabrics, but these are decidedly non-penetrative. Alteration features comprise mainly development of quartz-albite-sericite-chlorite(-epidote) assemblages consistent with volcano-hydrothermal alteration, but no doubt enhanced by the incipient regional metamorphism. Fe-sulphides are disseminated throughout a few samples and tend to be associated with relatively marked quartz-sericite or sericite-chlorite alteration. Observed base metal sulphides are restricted to isolated very fine pretectonic quartz-vein-related blebs of sphalerite in 48390.

Notes accompanying the samples refer to a major cherty unit represented in part by samples 48379 and 48380. These can be classified as pelitic ashes, a lithology often confused with cherts, but generally readily distinguished by an "angular" (as distinct from truly conchoidal) fracture. These particular ashes are potassic types and use of K-feldspar staining tests may render them a useful marker horizon.

D. Cowan, B. Sc.

Central Mineralogical Services

ample o.	Classification - Composition	Fabric	Accessories	Comments
8378 T.S. 2816)	Metaquartzite. Extensively recrystallized silt- to medium-sand-sized detrital (framework) quartz, similarly recrystallized quartz/ fine to semi-sericitic muscovite matrix.	Mildly restressed, phyllitic. Relict slightly medium sandy, silty fine sandy clastic (angular to rounded).	Thinly disseminated relict detrital zircons, traces detrital/ authigenic schorl.	Low-greenschist facies regionally metamorphosed/mildly restressed argillaceous orthoquartzite.
48379	Psammopelitic Ash. Alteranting bands of poorly sorted psammitic ash (with felsic intermediate lava tuff clasts, feldspar crystals/fragments, shardy matrix) and pelitic (vitric) ash with sparse opaques.	Massive to finely laminated pelitic ash with planar to segmented (slumped) sandy interbeds (to 1.5 cm).	Pervasive sericite-chlorite-cloudy micro-crystalline epidote alteration. Films, clots of pyrrhotite.	"Trachytic", bedded, subaqueous, psammitic to pelitic tuff with marked sericite-chlorite-epidote alteration. Pyrrhotite is partly bedded, elsewhere corrodes/replaces
48380	Pelitic Ash. Devitrified/variably sericite-stained fine silt-sized shards, minor splintery to angular alkali feldspar, sparse quartz grains with a weakly cloudy epidote-stained sericitic matrix.	Massive to faintly laminated, homogeneous, strongly vitroclastic. Incipiently sheared.	Clastic opaques, traces leucoxenic semi-opaques, rare apatite. Minor trace pyrrhotite.	Close similarities with the clasts pelitic units in 48379; relatively weakly sericitised. Pyrrhotite is extremely fine-grained, weakly bedded.
48381	Altered "Trachyandesite". Disseminated thoroughly saussuritised (sericite-zoisite-pseudomorphed) plagioclase phenocrysts, sparse K-spar, rare quartz microphenocrysts; kaolin-sericite-stained felsitic groundmass.	Andesitic with a weakly perlitic (devitrified) groundmass.	Leucoxenised opaques, trace magnetite, very rare ultrafine Fe-sulphide particles.	Devitrified, moderately altered "leuco-trachyandesite". Lava-like, but conceivably a chilled minor intrusive. Alteration essentially similar to that in 48379, 48380.
48382	Flow Breccia. Interspersed bands, irregular clasts of weakly sericitised, albite-porphyritic, felsitic, quartz-amygdaloidal and chlorite-epidote-stained, weakly porphyritic/amygdaloidal subvitric lava.	Variable; massive to banded, generally tuff lava-like.	Leucoxenised opaques and traces of (primary) magnetite, rare apatite.	Compositional affinities with 48381 Strongly flow-banded, flow-brecciated, felsic intermediate lav. Clastic fabric enhanced by differential alteration (chlorite distrib
48383	"Leuco-andesite". Frequent sericitised plagioclase, sparse chloritised ?amphibole phenocrysts in a strongly epidote-chlorite-sericite-stained/partly silicified microcrystalline groundmass.	Andesitic, weakly quartz-amygdaloidal, faintly flow-structured.	Leucoxenised opaques.	ution). Extensively altered, ferro- mag silicate-poor, intermediate phase, broadly andesitic and conceivably minor intrusive; dependent on field evidence.
48384	Pelitic Ash. Abundant devitrified/albitised microshards, minor splintery to angular alkali feldspar, sparse quartz grains with a sericitic cherty matrix.	Massive to incipiently laminated. Similar to 48380, slightly coarser shards.	Weak, pervasive epidote stainings, traces leucoxenised clastic opaques.	Close affinities with 48380, 48379, felsic intermediate affinities.
48385	Sericitic "Dacite". Albitised/epidote-stained phenocrysts, clusters of plagioclase in a weakly chlorite-stained, sericitic, crypto- to microcrystalline quartzofeldspathic matrix.	Lava-like, with contorted to brecciated microscale flow-banding, patchy relict shards.	Leucoxenised opaques. RAre ultrafine pyrite, (oxidised).	Leucoandesitic-dacitic "flow breccia", lava-like, but interpreted as a flow-brecciated ignimbritic vitric-crystal tuff on basis of microtextural features.

702030

Sample No.	Classification - Composition	Fabric	Accessories	Comments
48386	"Trachyandesite". Albitised/variably sericite-siderite-chlorite-stained plagioclase, minor quartz phenocrysts in a weakly/pervasively chlorite-stained, semi-felsitic quartzo-feldspathic groundmass.	Weakly glomero-porphyritic, incipiently flow-structured, faintly perlitic.	Conspicuous fine to ultrafine primary magnetite, ?hematite. Rare ultrafine pyrite, trace epidote.	Moderately altered felsic intermediate lava. Bulk colouration reflects primary Fe-oxide pigmentation and weak chloritisation of groundmass.
48387	Trachyandesite. Albitised/weakly sericite-stained plagioclase, minor quartz phenocrysts, weakly sericite-chlorite-stained felsitic groundmass. Sporadic quartz-albite veinlets (+ chlorite, sericite).	Closely analogous to 48386, slightly finer groundmass.	Leucoxenised opaques.	Close affinities with 48386. Alteration is relatively sericitic. Main contrast is presence of accessory titan-opaques, rather than ultrafin hematitic pigmentation.
48388	Psammopelitic Ash. Weakly, pervasively sericite-chlorite-stained, microcrystalline quartzo-feldspathic material with sparse to conspicuous sericitic alkali feldspar grains, vague lithic fragments.	Massive to laminated, silty vitroclastic to silty fine sandy clastic.	Clastic leucoxenised opaques. Traces cloudy epidote, carbonate. Minor traces pyrrhotite, pyrite.	Affinities with 48379, 48390 and similarly altered. Lithic clasts are devitrified, albitised/silicifi ill-defined ?vitric tuff.
48389	Ignimbrite. Sporadic variously sericitised, chloritised, carbonated and prehnitised lava, vitric tuff clasts, sericitic feldspar crystals/fragments, sericite-epidote-stained shardy matrix.	Flow-structured to flow-brecciated, cutaxitic.	Patchy calcite impregnations. Leucoxenised opaques. Rare quartz crystals. Traces pyrite, pyrrhotite.	Flow- (or auto-) brecciated, ignimbritic lithic-vitric-crystal tuff. Dark "wispy" features are relatively chloritised lithic clasts. Compositional affinities wit
48390	Felsite. Quartz and sericite with conspicuous quartz amygdales, disseminated sericitised feldspar crystals/fragments. Conspicuous very fine pyrite. Minor quartz-muscovite and late quartz veins.	Ill-defined. Essentially a strongly quartz-amygdaloidal, weakly porphyritic, felsitic, vaguely fragmental.	Leucoxenised opaques. Extremely rare very fine sphalerite (quartz vein).	Primary fabric largely 48386, 48387 obscured by devitrification, intense silicification/sericitisation. Conceivably a welded vitric tuff. Incipiently sheared (post alteration veining)
48391 (T.S. 2829)	Felsite. Quartz and sericite with disseminated fine to ultrafine pyrite. Frequent quartz amygdales, sparse pyritic sericite pseudomorphs of feldspar crystals/fragments; sparse quartz-sericite veinlets.	Analogous to 48390, but distinctly flow-breccia-like.	Leucoxenised opaques, rare quartz "phenocrysts".	Close affinities with 48390, but relatively distinctly fragmental (flow-brecciated ?welded tuff). Pyrite introduced with quart sericite alteration (sim. 48390).

APPENDIX 2. Revised outline DDH Logs.

APPENDIX 2. - REVISED OUTLINE DDH LOGS

BBP 207 (Collar 13,880N, 10,150E) 383890 E 5386110N

0 - 44.3	Glacial cover.
44.3 - 48	Clay "probably deeply weathered rock".
48 -159.5	Sheared, fine to lapilli-sized tuff, intensely silicified
EOH	and sericitised, abundant disseminated and minor stringer pyrite. Minor remobilised quartz-galena-sphalerite veinlets.

BBP 208 (Collar 13,720N, 11,240E) 3838605 5385205N

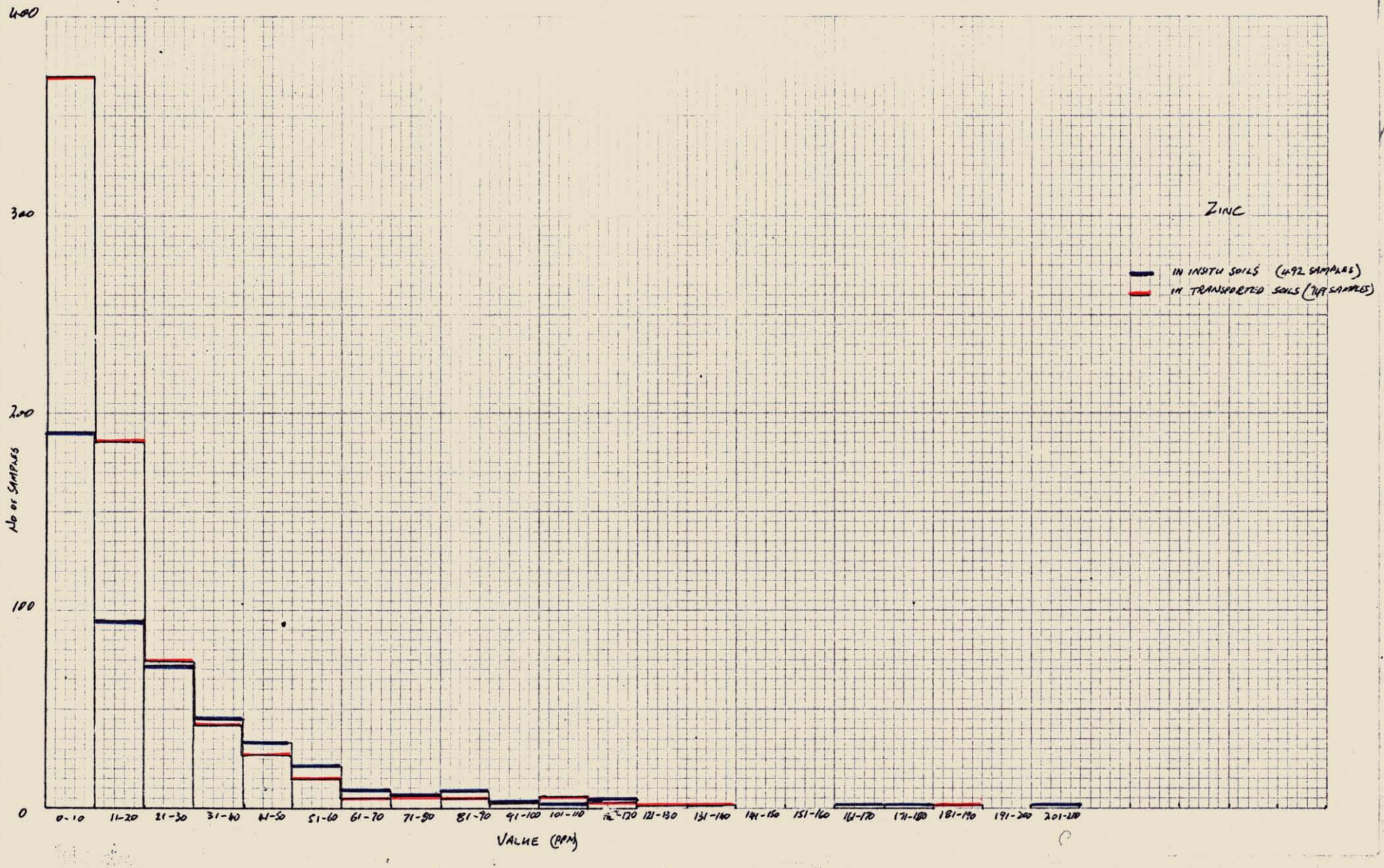
0 - 9	Glacial cover.
9 - 26.9	Ash flow crystal lithic vitric tuff (rhyodacitic), locally lapilli/agglomeritic.
26.9 - 67.0	Massive feldsparphyric rhyodacitic lava. Brown colouration 39.5-41.3, 44.8-49.3 and 63-63.8.
	Basic intrusives: 48.3-49.3, 56.7-62.2 and 63.8-65.2.
67.0 -116.5	Interbedded laminated siliceous pelitic ash volcanogenic sediment and ash flow crystal lithic vitric tuff.
	Vesicular basic intrusive 92.1-95.8.
116.5 -121.5	Basic intrusive.
121.5 -149.61	Ash flow crystal lithic vitric tuff (rhyodacitic).
149.61-154	Andesite intrusive or lava, pyroxene-and feldsparphyric.
EOH	

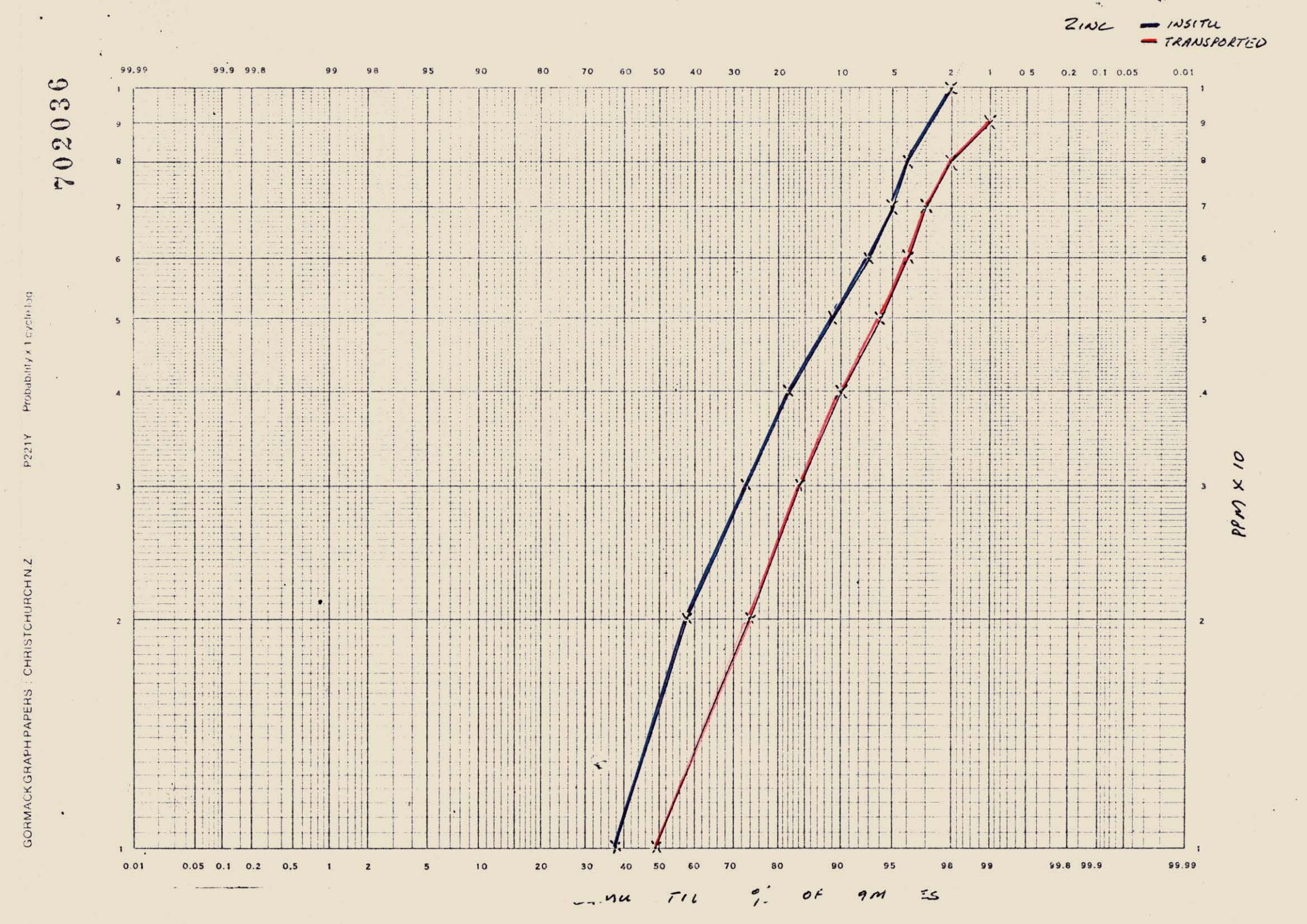
BBP 209 (Collar 13,720N, 9,440E) 382715E 5386520N

0 - 17	Glacial cover.
17 -162	Feldspar phyric rhyodacitic lava (and/or ash flow crystal tuff)
EOH	locally strong pink/red pigmentation.

APPENDIX 3. Soil sample geochemistry: frequency histograms and cumulative per cent frequency plots.

702035

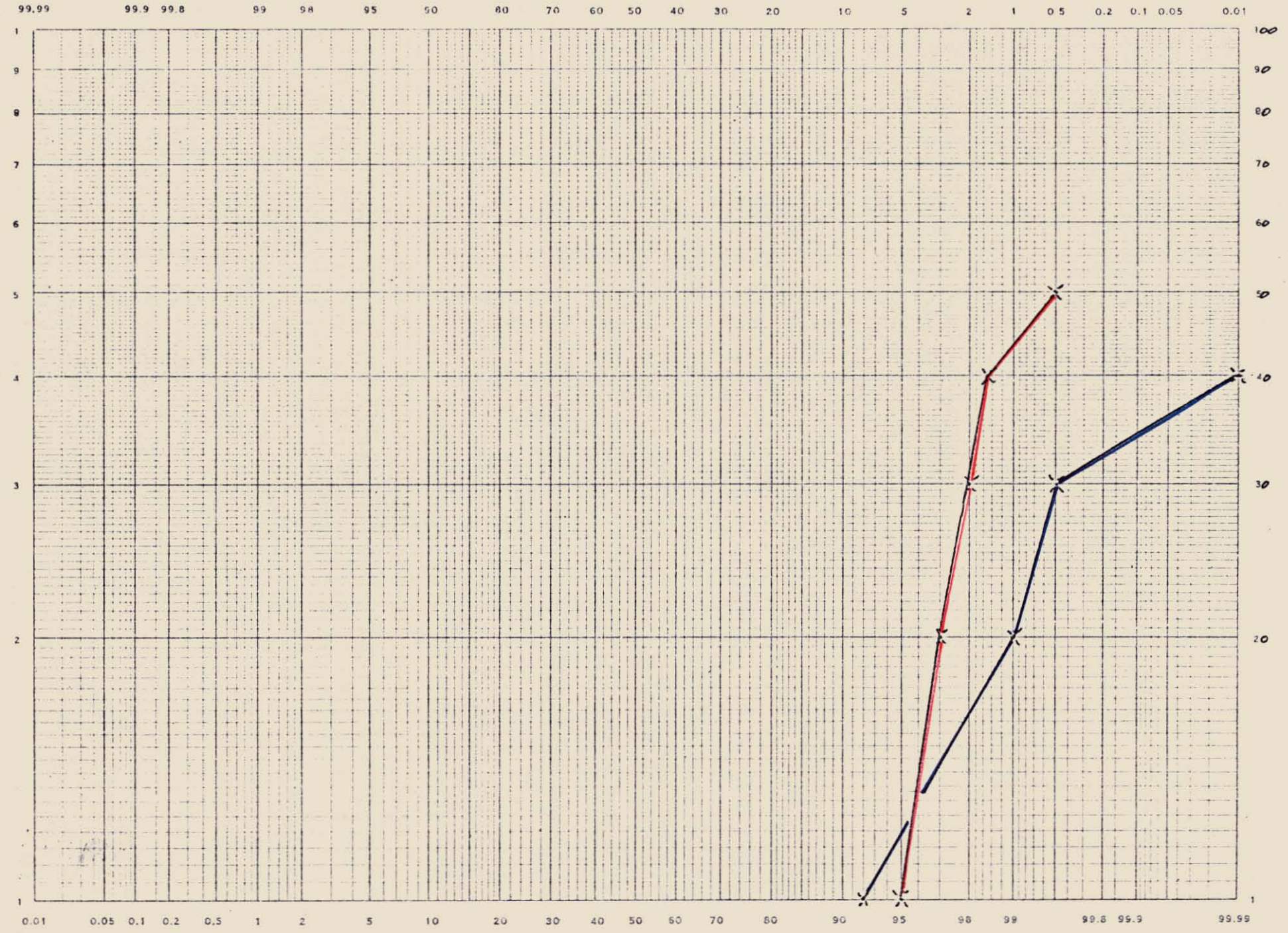

ZINC
IN INSITU SOILS (492 SAMPLES)
IN TRANSPORTED SOILS (74 SAMPLES)
No OF SAMPLES
400
300
200
100
0
0-10
11-20
21-30
31-40
41-50
51-60
61-70
71-80
81-90
91-100
101-110
111-120
121-130
131-140
141-150
151-160
161-170
171-180
181-190
191-200
201-210
VALUE (PPM)


ZINC
INSITU
TRANSPORTED
702036
GORMACK GRAPH PAPERS : CHRISTCHURCH N.Z.
P221Y Probability x 1 cycle log
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99
PPM X 10
% OF SAMPLES

702037


COPPER
IN INSITU SOILS (492 SAMPLES)
IN TRANSPORTED SOILS (749 SAMPLES)
NO. OF SAMPLES
400
300
200
100
0
0-10
11-20
21-30
31-40
41-50
51-60
61-70
71-80
81-90
91-100
101-110
111-120
121-130
131-140
141-150
151-160
161-170
171-180
VALUE (PPM)

COPPER — IN SITU — TRANSPORTED



PPM

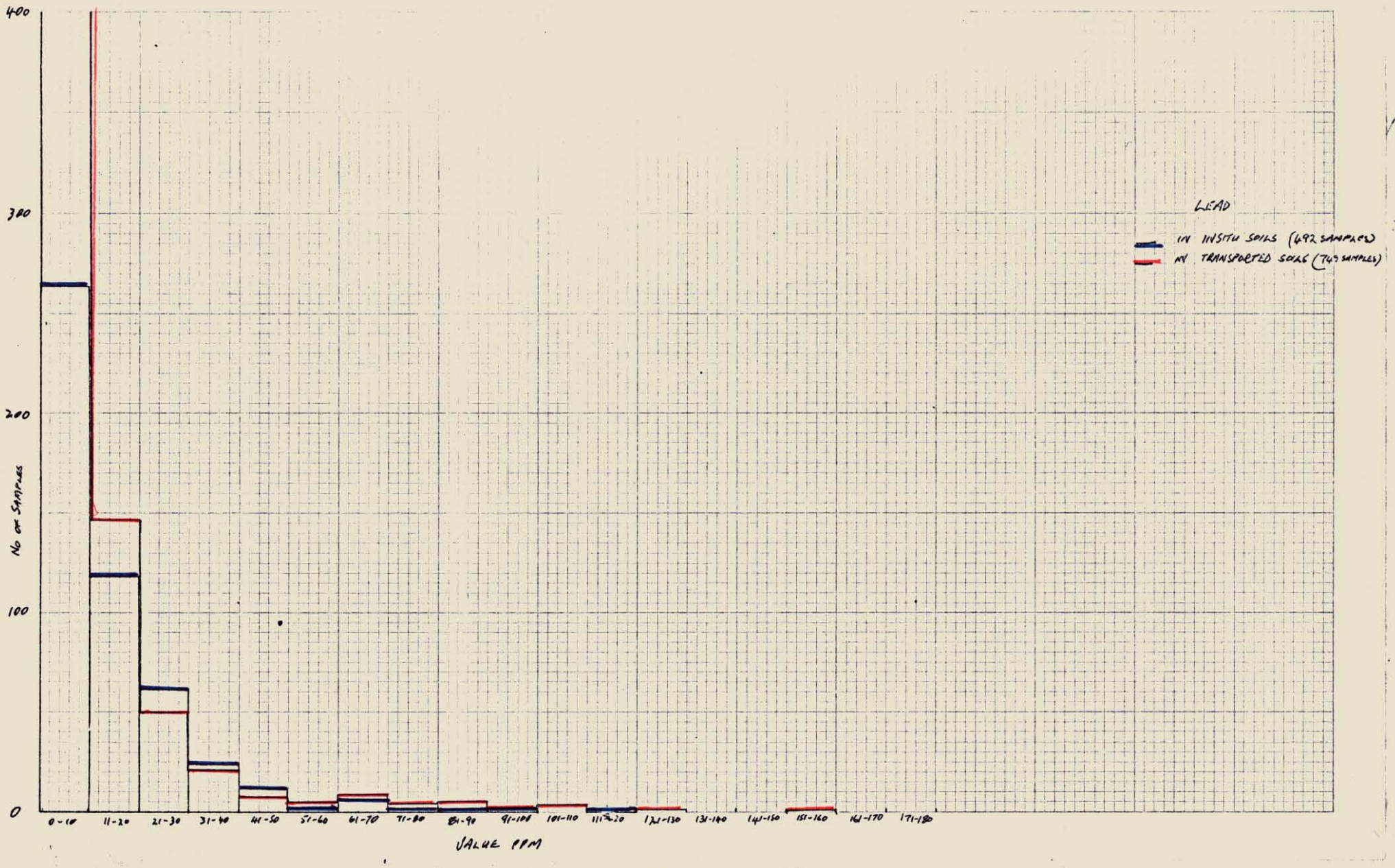
_ IM AT _ OF SAMPLES

702038

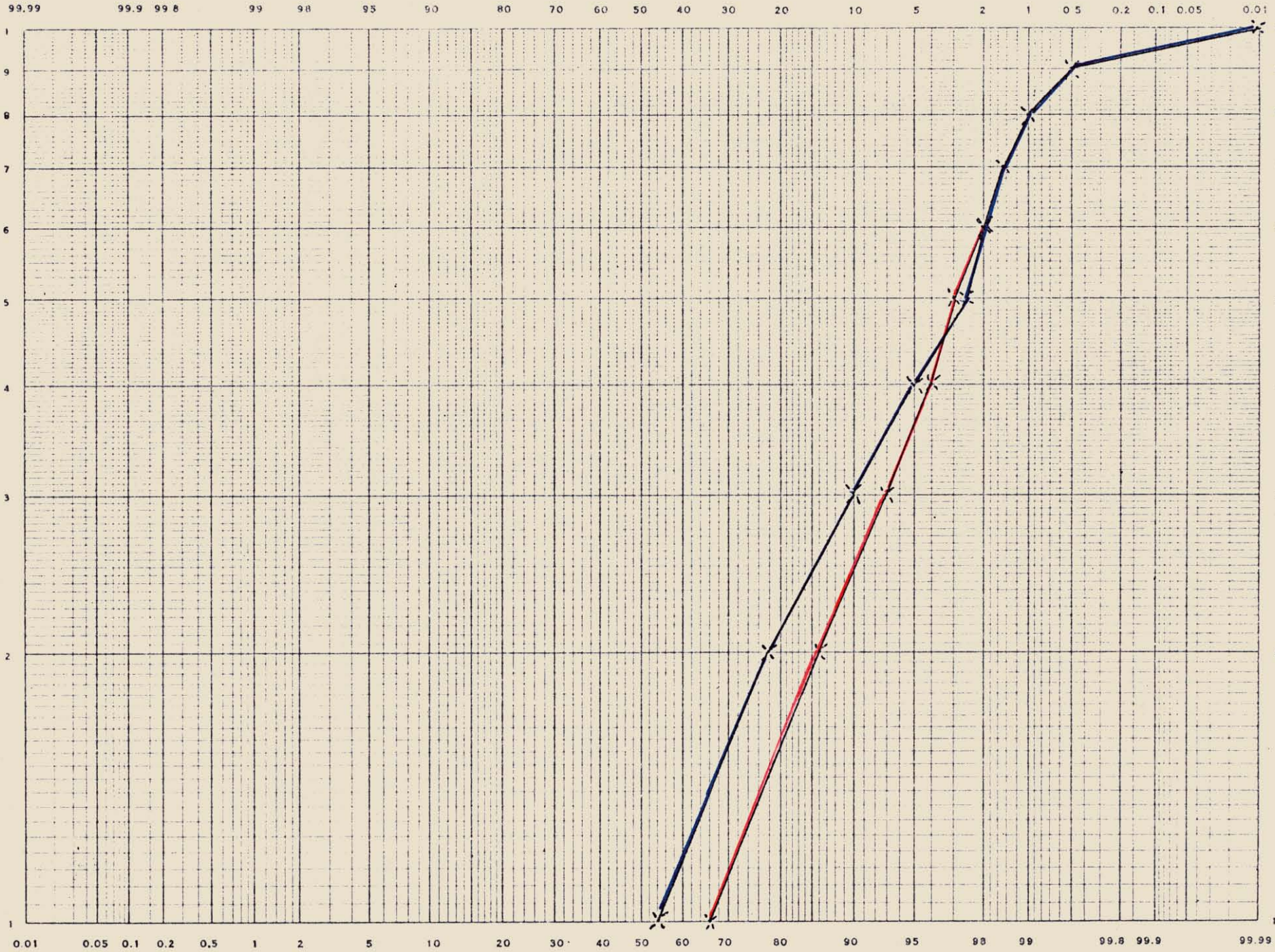
P221Y Probability x 1 cycle log

GORMACK GRAPH PAPERS CHRISTCHURCH N Z

702039

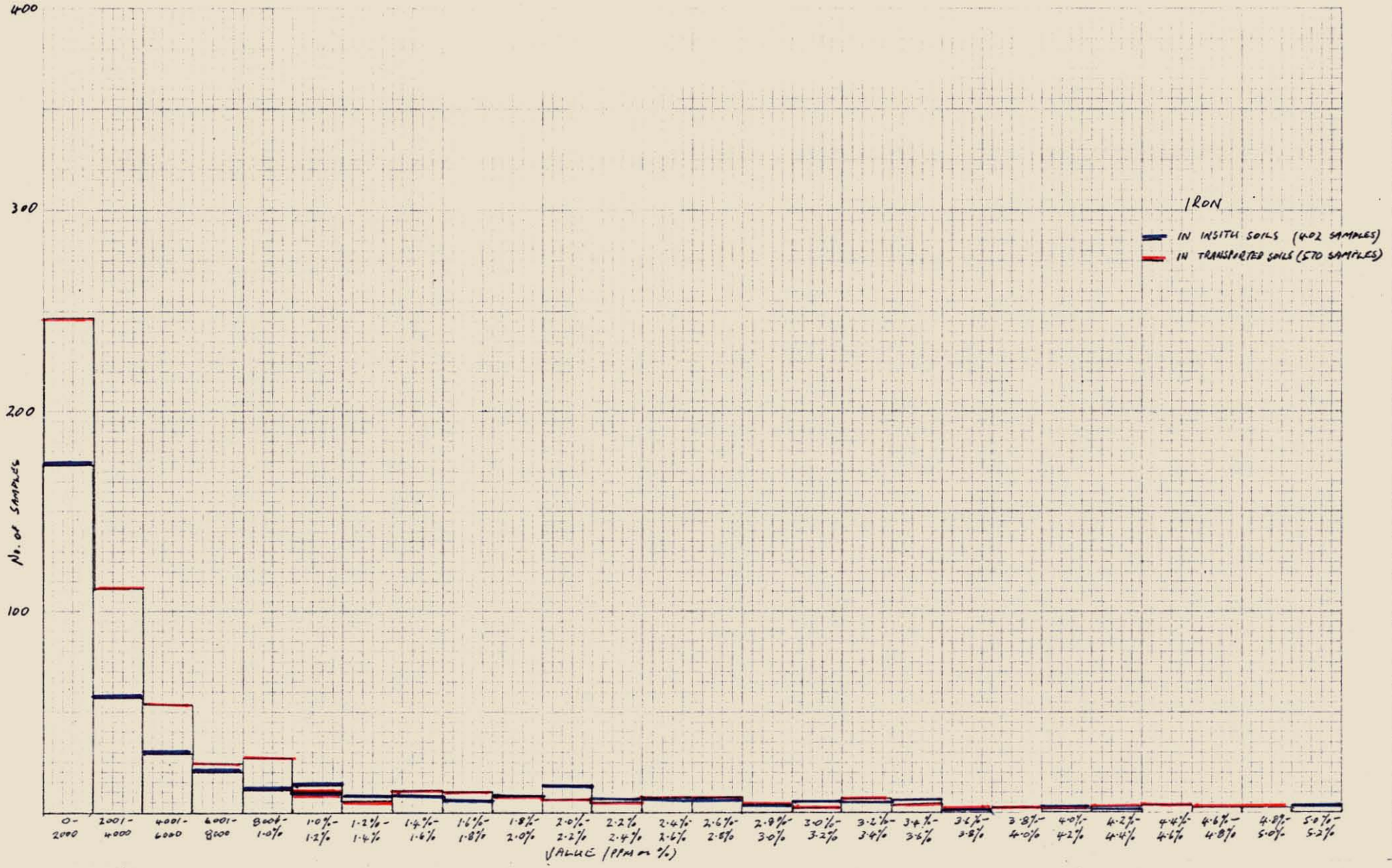

LEAD
IN INSITU SOILS (692 SAMPLES)
IN TRANSPORTED SOILS (749 SAMPLES)
400
300
200
100
0
NO OF SAMPLES
0-10
11-20
21-30
31-40
41-50
51-60
61-70
71-80
81-90
91-100
101-110
111-120
121-130
131-140
141-150
151-160
161-170
171-180
VALUE PPM

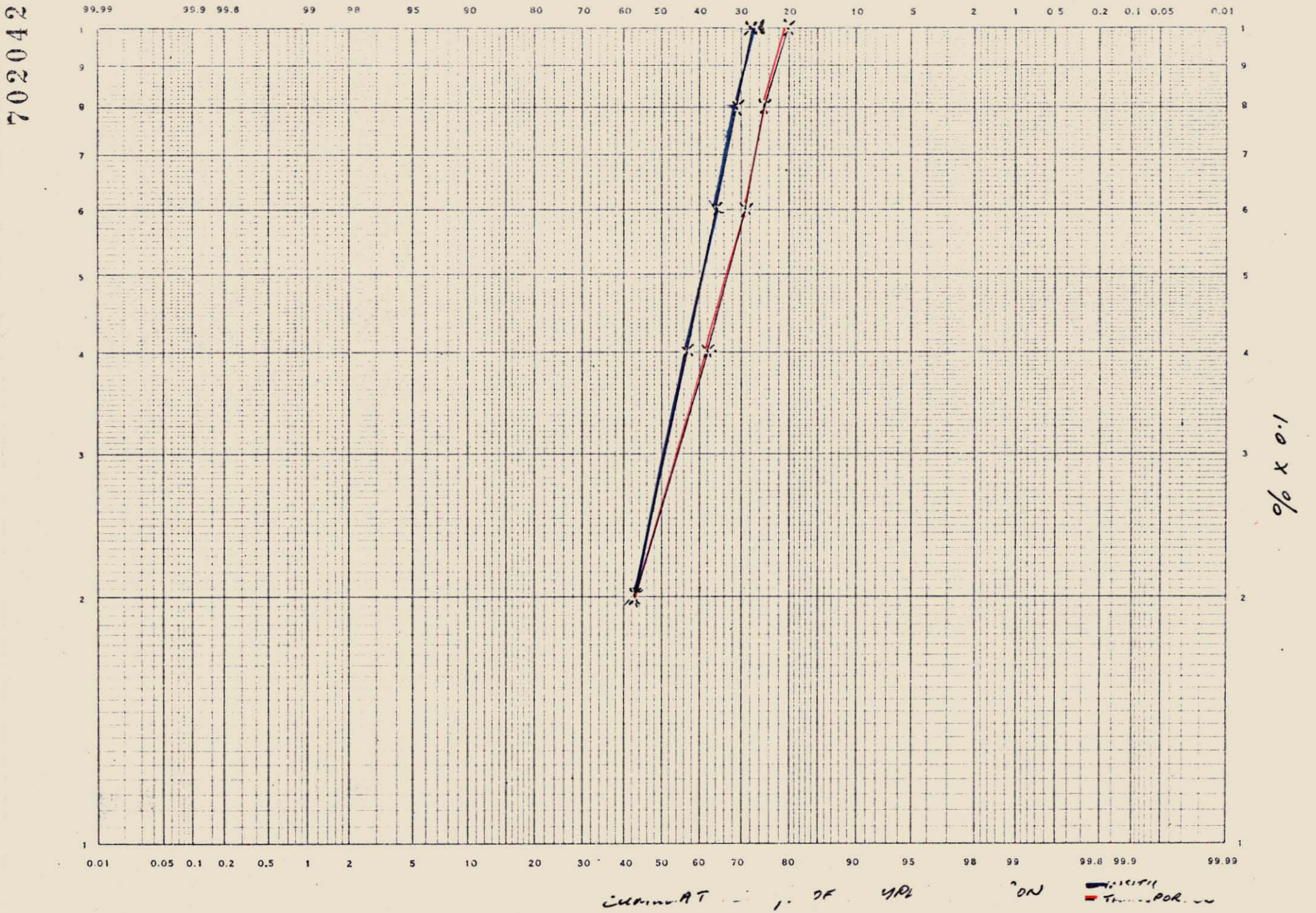
702040



GORMACK GRAPH PAPERS . CHRISTCHURCH N.Z. P221Y Probability x 1 cycle log

702041


IRON
IN INSITU SOILS (402 SAMPLES)
IN TRANSPORTED SOILS (570 SAMPLES)
No. of SAMPLES
400
300
200
100
0-2000
2001-4000
4001-6000
6001-8000
8001-1·0%
1·0%-1·2%
1·2%-1·4%
1·4%-1·6%
1·6%-1·8%
1·8%-2·0%
2·0%-2·2%
2·2%-2·4%
2·4%-2·6%
2·6%-2·8%
2·8%-3·0%
3·0%-3·2%
3·2%-3·4%
3·4%-3·6%
3·6%-3·8%
3·8%-4·0%
4·0%-4·2%
4·2%-4·4%
4·4%-4·6%
4·6%-4·8%
4·8%-5·0%
5·0%-5·2%
VALUE (PPM or %)


99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99
1 2 3 4 5 6 7 8 9
1.0 x %
GORMACK GRAPH PAPERS CHRISTCHURCH N.Z.
P221Y Probability (Normal)

702042

APPENDIX 4. Spectral I.P. measurements on the Boco Grid, E.L. 12/72, by Dr. J.R. Bishop, Mitre Geophysics, 1982.

702044

MITRE GEOPHYSICS PTY LTD
MINERAL EXPLORATION AND ENGINEERING CONSULTANTS
BUGGS LANE ELLIOTT TASMANIA 7325 PHONE 004-363143

SPECTRAL I.P. MEASUREMENTS

ON THE BOCO GRID, E.L. 12/72

for

WEST COAST MINES

by

J.R. BISHOP

EZ/MG82/12

AUGUST, 1982

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ABSTRACT

Following earlier unsuccessful I.P. surveys on the largely glacially covered Boco Grid, a dipole-dipole I.P. survey was undertaken on several lines using an IPR-11 receiver: this instrument is capable of defining the I.P. decay curve by upto forty data points. Again the results were disappointing and the low and uniform chargeability pseudo-sections suggested that the overburden had not been penetrated.

An examination of a representative sample of the spectral I.P. measurements madé by this survey, shows that the geology (glacial overburden, tuffs, lava, etc) cannot be differentiated by the decay shape and this decay shape cannot be used to determine whether the survey adequately tested the bedrock. The study also showed that much of the data was noisy, with some (perhaps ten percent of the total) of too poor a quality to be usable.

If the various I.P. surveys were considered worth doing, then it must be established whether they have done the job and found nothing (within rocks of an atypically low chargeability) or whether, as is suspected, the glacial overburden has masked the bedrock. This latter will have occurred if the glacials are too thick and/or too conductive. It is recommended that some electrical soundings be carried out (extended out sufficiently far to properly measure bedrock): these will provide information about the resistivities and thickness of the glacial layers. If significant sequences of conductive material are defined, it is recommended that a Sirotem E.M. survey be tried since this system was designed to detect conductors beneath thick, conductive overburden.

INTRODUCTION

A dipole-dipole I.P. survey was carried out over several lines of the Boco Grid in March-April, 1982. An IPR-11 time domain receiver was used: this measures the decay curve in ten slices (for any one of four receiver times) for six dipoles simultaneously. Unlike earlier Scintrex I.P. receivers, IPR-11 data is not normalised by a 'standard' decay curve, and the results directly portray the true decay shape (with the usual restraints of instrumental noise, etc.).

Much of the Boco Grid is covered by glacials and it was hoped that a dipole-dipole I.P. survey using 60m dipoles with readings to n=6 would penetrate this overburden (shown by drill holes to be at least 40m thick in places). The results were generally disappointing, with some poorly defined anomalies detected in the south-eastern and south-western corners of the grid. Otherwise, the chargeability pseudo-sections showed little variation with background values of around 5mV/V. Resistivity lows were in the low hundreds of ohm-ms, with background values in the high hundreds to thousands of ohm-ms. Thus although the resistivities were apparently not low enough to cause masking of the bedrock, the chargeability results did not suggest that the glacial cover had been penetrated. It was therefore decided to see if there was any difference between decay curves from readings over bedrock and from readings over (thick) glacial material. If any difference was discernable, decay shape might then be a useful diagnostic for determining whether the glacials had been penetrated.

The results from a "small sample of data" from the Boco Grid are given in this report.

RESULTS

Chargeabilities were picked from the pseudo-sections over areas of known geology (from recent mapping by R. Sainty) and from areas of glacial overburden (see Figure 1). The data were plotted on semi-log paper as Vs/Vp% (i.e. chargeability ÷ 10) against time. Whilst a more complete (and more accurate) shape of the decay curve can be obtained by reading ten slices for different values of the receiver time, to (i.e. the Window width), a quite adequate representation of the

late-time or I.P. section of the curve* is obtained from the one set of ten values for to=30msecs: this defines the curve between 90 and 1950 msecs.

A total of fifty data points were plotted (Figure 2); a casual inspection of the data shows that much of it is noisy (i.e. not a smooth curve), and that some of it (about 10% of this sample) is of very poor quality (further discussed below). A visual comparison of the data shows that the underlying geology can not be distinguished by the decay shape, although data collected from adjacent points apparently have closer similarities (including 'noise' features) than the (sample) population as a whole.

To quantify this lack of discrimination, the late-time section of the curve (780ms to 1950 msecs) was fitted to an exponent of the form $Ce^{-\gamma t}$ where C is constant (the apparent chargeability at zero time) and γ the inverse of the decay constant. (The fitting of decay curves to a number of exponential functions has been tried by various workers (e.g. Tyne, 1981) and is compared with other models such as the Cole-Cole representation in Bishop, 1982.) The procedure adopted here was an arbitrary curve fitting exercise to the last five points defining the curve, and hence it may not be a true and accurate representation of the I.P. decay phenomenon, however the results are quite adequate for comparisons of curve shape. For the less noisy decay curves a good fit was obtained with r^2 values of .98 to 1.00 (r^2 is unity for an exact fit). A plot of these values, although small in number, shows no discernible grouping according to rock type (Figure 3).

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* The I.P. decay curve has been explained as consisting of three sections: the early time due to E.M. coupling, the late time due to the I.P. effect and the middle time as an interaction between these two. The actual proportions will depend upon the geologic conditions, for example in very conductive environments, E.M. coupling may effect most of the decay curve.

In Tyne's (1981) study of decay shape over the Woodlawn orebody he noted that about 10% of the data was too noisy to factor into exponential functions. I have suggested above, that a similar proportion of the Boco data may be too noisy to be meaningful. An example of such data is given in Figure 2b which shows the decays for data points defining a strong chargeability anomaly below 14,040N/11,440E (Figure 1b). Though 'strong', this anomaly is poorly defined, with only three points having markedly higher values than adjacent points. Also, such abrupt changes are unusual (and unlikely), particularly at depth where adjacent readings share a large proportion of the sampled volume of ground. Figure 2b shows that (at least) one of the adjacent data points should have a similarly high value, and another plotted value (9.5 mV/V) is meaningless. Other adjacent points, not plotted, have similarly unusable decay curves (note that unless the value is negative or grossly different from the norm, noisy or unusable data are not readily picked from the pseudo-sections). It is likely that this proportion of poor data was due to the operators' lack of familiarity with a new instrument and possibly to machine malfunction (apparently there were several initial problems with all three IPR-11s owned by Scintrex Australia).

DISCUSSION

Tyne (1981) in a similar study of the Woodlawn orebody showed that there was no relationship between relaxation time (i.e. the decay constant) and chargeability, he therefore concluded that different phenomena were being measured. He notes that the relaxation time was longer over mineralised zones and suggested values of 1.0s to 1.1s for unmineralised hanging wall rocks, 1.2s to 1.35-1.4s for the massive sulphides and greater than 1.35-1.4s for the disseminated pyrite in the footwall rocks.

In this study, a larger range was encountered with relaxation times varying between 0.7s and 1.37s. Again there was no relationship with chargeability, but neither could any groupings be made according to rock type. However these rocks did not run the gamut from unmineralised to massive sulphide. (A more promising avenue for spectral I.P. is the separation of response between graphitic shales and base metal sulphides. Pelton et al (1978) fitted frequency domain data to a Cole-Cole relaxation model (see below) and suggested that graphitic shales have positive time constants in contrast to negative constants for massive sulphides. A similar

(negative) property was claimed for magnetite, thus enabling the discrimination of pyrrhotite.)

There are several ways of presenting spectral I.P.: some of these consist of fitting a model (i.e., a mathematical function) to the data. The decay (or frequency response) is then specified in terms of certain parameters. A model which is common to both time and frequency domain is the Cole-Cole model: this is defined as

$$Z(w) = Ro \{1 - m (1 - \frac{1}{1+(iw\tau)^c})$$

where Z is the impedance of the earth; $W = 2\pi f$, f being the frequency of the current waveform; Ro is the DC resistivity; m is the chargeability; τ is the time constant in seconds and c is the 'frequency dependant exponent'. This representation is used by several companies (including Scintrex and Geoex), however it is emphasised that all information is contained in the plot of the decay curve and no model will produce differences which do not occur as differences in the decay shapes.

CONCLUSIONS AND RECOMMENDATIONS

An examination of decay curves from an I.P. survey over lavas, tuffs, chert and glacial moraine has shown no significant differences in shape. However the data was noisy, with perhaps 10% unusable and it is possible that (subtle) differences could be detected from a larger sample of smoother data.

Earlier I.P. surveys also produced unsatisfactory results (Bishop, 1981) and thus geophysics has been most unsuccessful on the Boco Grid. Nevertheless, the area is considered to be quite prospective, both regionally and locally. It lies on strike between the old Chester pyrite mine and the Que River base metal mine. From drill core and inliers of Mt. Read Volcanics within the glacials, the project geologist, R. Sainty, has recognised silic and sericite alteration: one drill hole intersected 6m of 1.5% zinc. The fact that the area is buried further enhances its potential, though leading to difficulties as exemplified by this report.

As stated previously, the resistivity results do not indicate any conductive layer capable of significantly reducing the penetration of an I.P. survey, yet the

low and uniform chargeability calues suggest that bedrock has not been reached. Glacial thicknesses greater than 50m are considered unlikely by E.Z. geologists, thus leaving the problem as to why the method has (apparently) not worked. A knowledge of the depths and electrical properties of the glacial cover might solve this problem and would permit better planning of any future exploration. Resistivities and thicknesses of the glacials (both as a whole and for any layering within them) may be determined by electrical soundings. Three such soundings have already been carried out on the Boco Grid, but as admitted by the contractor these did not extend far enough to enable a confident interpretation of depth to bedrock, perhaps indicating a greater than expected thickness of glacials. In the interpretation that was done, a depth to bedrock of "no more than 70 to 100m" was expected (Howland-Rose, 1976). Thus it is possible that the glacials are indeed sufficiently thick to mask the bedrock from I.P. surveys.

Whilst electrical soundings will give the depth to bedrock for one point (below the centre of the sounding), continuous profiles of the bedrock topography may be obtained from seismic refraction surveys. A good velocity contrast should exist betwee the glacial overburden and the volcanics, however one possible problem might be the attenuation of seismic energy through thick sequences of unconsolidated material.

Finally, if the I.P. surveys have been negated by sequences of conductive material within the glacials, a Sirotem (time domain E.M.) survey is recommended since this system was designed to detect conductors beneath thick, conductive overburden. Although some type-deposits for Boco (the Rosebery and Que River mines) are considered to be non-conductive, the mineralisation is still many time more conductive than the host rocks and may confidently be expected to respond to a properly focussed E.M. survey.

J.R. BISHOP,
AUGUST, 1982

JRB/amd

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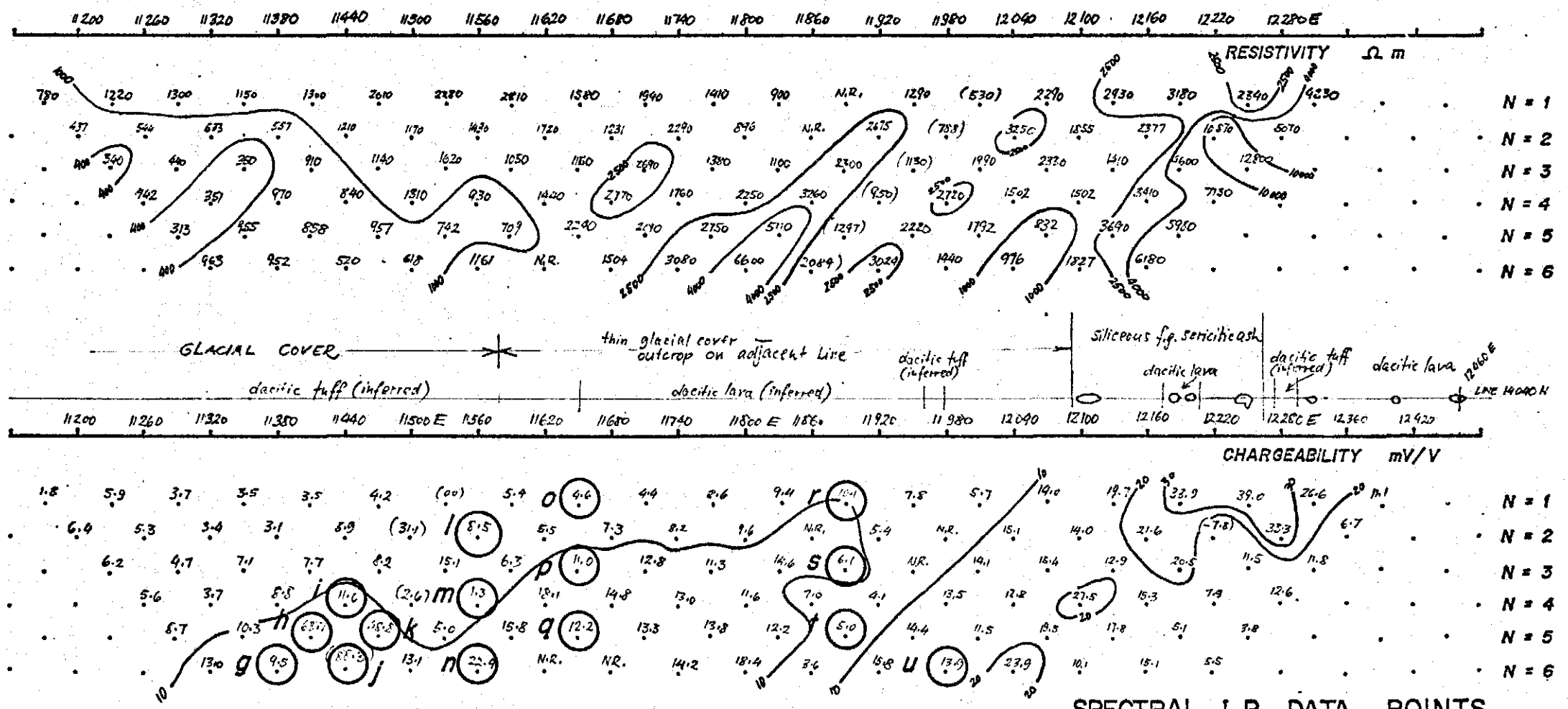
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INDUCED POLARIZATION AND RESISTIVITY SURVEY

SURVEY BY	: SCINTREX	PROSPECT	: BOCO GRID	DATE	: (23-24)-1-82
PLOTTED BY	: J. DICKINSON	LINE Nº	: 14 040 N	RECEIVER	: IPR 11 80 11103
CREW LEADER	: J. DICKINSON	REF. Nº	: TAS 094	PULSE	: 2 SECOND

DIPOLE - DIPOLE SPACING = 60 METRES

SCALE = 1:5000



SPECTRAL I.P. DATA POINTS
BOCO GRID LINE 14 040 N

DATE : July 1982

[redacted] REF. [redacted] / M[redacted] 12 [redacted] Fig. 1 [redacted]

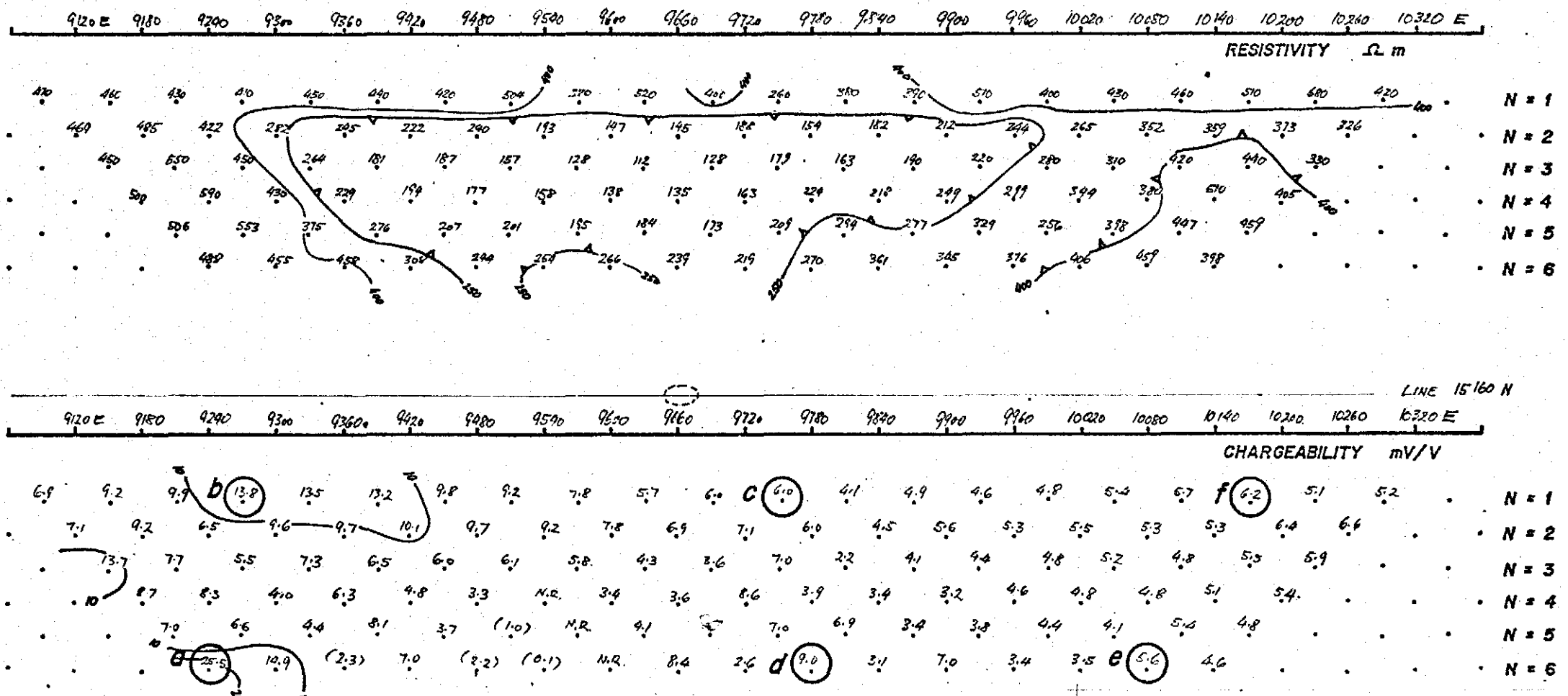
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INDUCED POLARIZATION AND RESISTIVITY SURVEY

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PLOTTED BY	: P. LIST	LINE Nº	: 15160N	RECEIVER	: 810708
CREW LEADER	: J. DICKINSON	REF. Nº	: TAS094	PULSE	: 2 SEC.

DIPOLE - DIPOLE SPACING = 60 METRES SCALE = 1:5000



SPECTRAL I.P. DATA POINTS
BOCO GRID LINE 15160N
DATE : July 1982
F. [redacted]Z/[redacted]2/12[redacted] Fig. 1[redacted]

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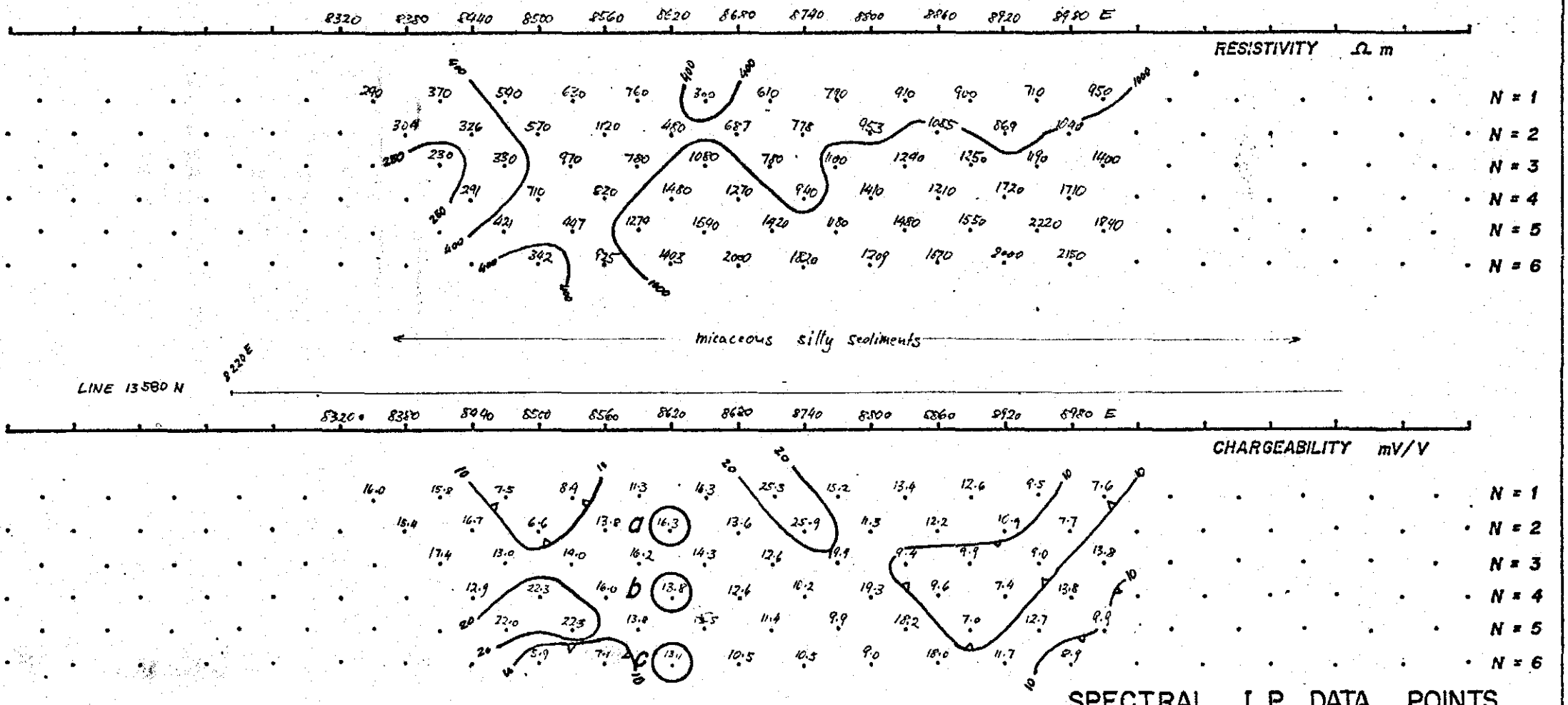
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INDUCED POLARIZATION AND RESISTIVITY SURVEY

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PLOTTED BY	: J.DICKINSON	LINE Nº	: 13580 N	RECEIVER	:
CREW LEADER	: J. DICKINSON	REF. Nº	: TAS 094	PULSE	: 2 SECOND

DIPOLE - DIPOLE SPACING = 60 METRES

SCALE = 1:5000



SPECTRAL I.P. DATA POINTS
BOCO GRID LINE 13580 N

DATE : July 1982

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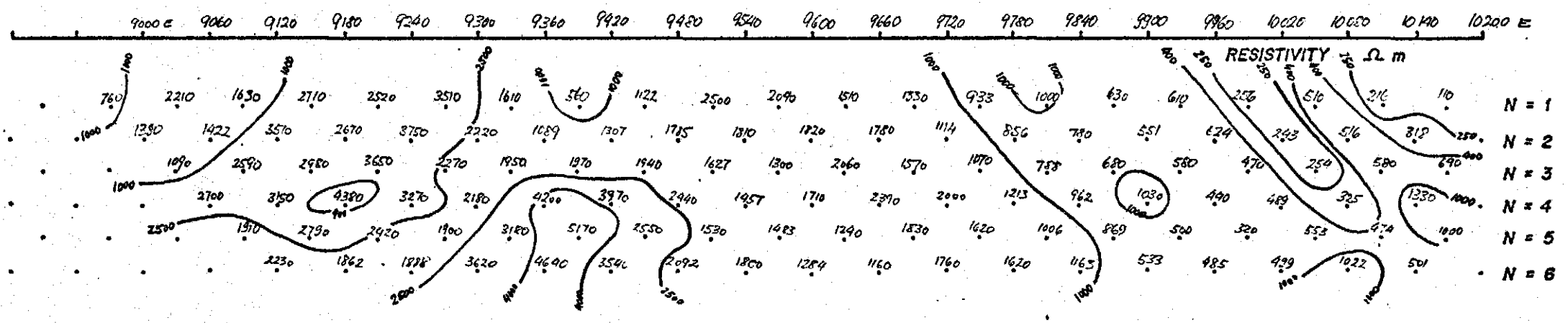
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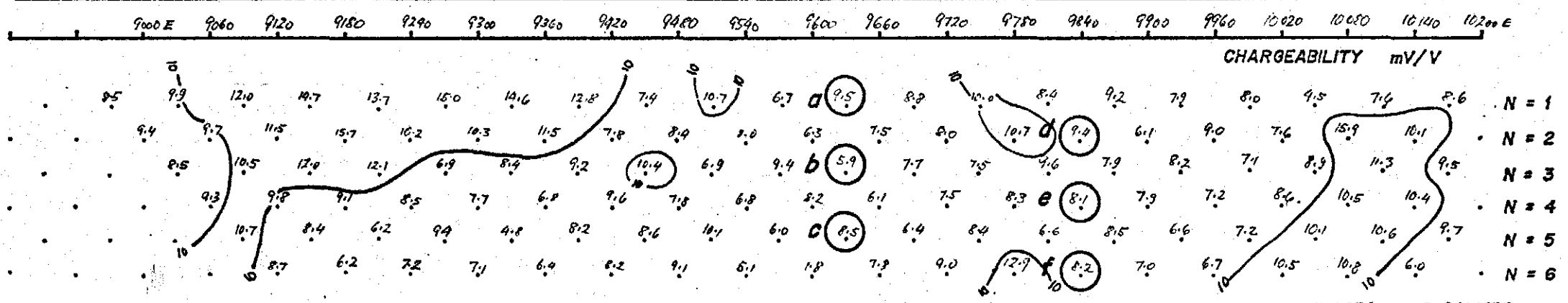
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CREW LEADER	: J. DICKINSON	REF. Nº	: TAS 094	PULSE	: 2 SECOND

DIPOLE – DIPOLE SPACING = 60 METRES MA SLICE G SCALE = 1:5000



LINE 14040N



SPECTRAL I.P. DATA POINTS
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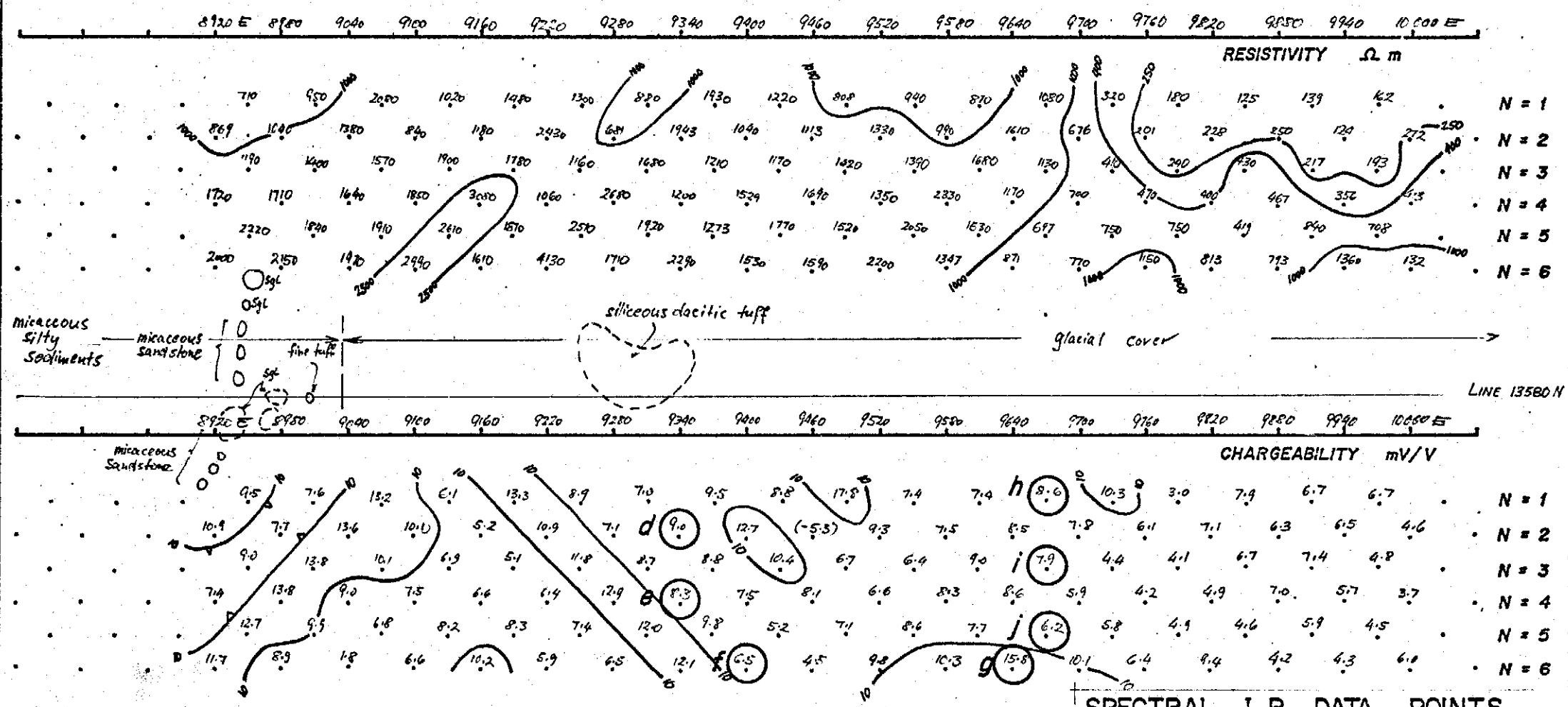
INDUCED POLARIZATION AND RESISTIVITY SURVEY

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PLOTTED BY : J. DICKINSON	LINE Nº : 13 580 N	RECEIVER :
CREW LEADER : J. DICKINSON	REF. Nº : TAS 094	PULSE :

DIPOLE - DIPOLE SPACING = 60 METRES

SCALE = 1 : 5000



SPECTRAL I. P. DATA POINTS

BOCO GRID LINE 13 580 N

DATE : July 1982

REF. : E·Z / MG 82/12

Fig. 1 d

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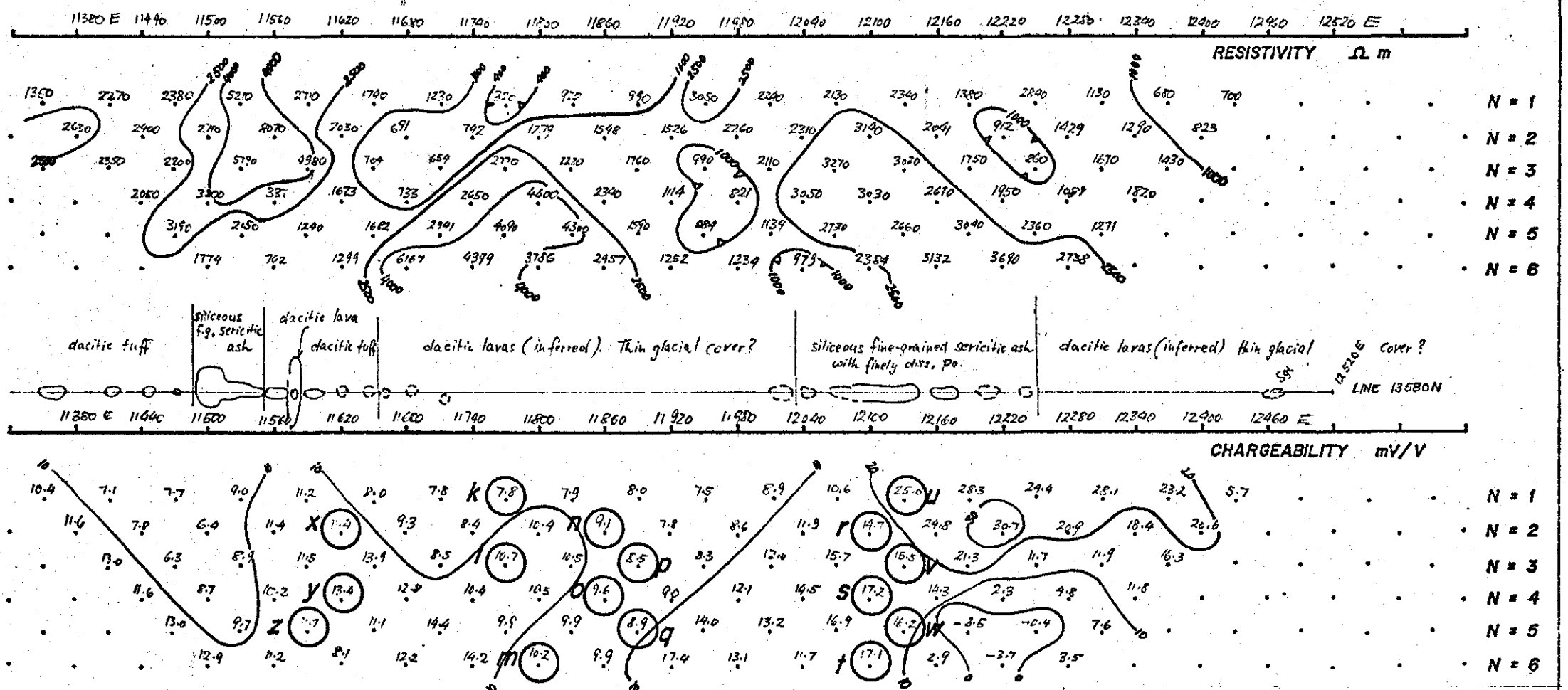
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DIPOLE - DIPOLE SPACING = 60 METRES

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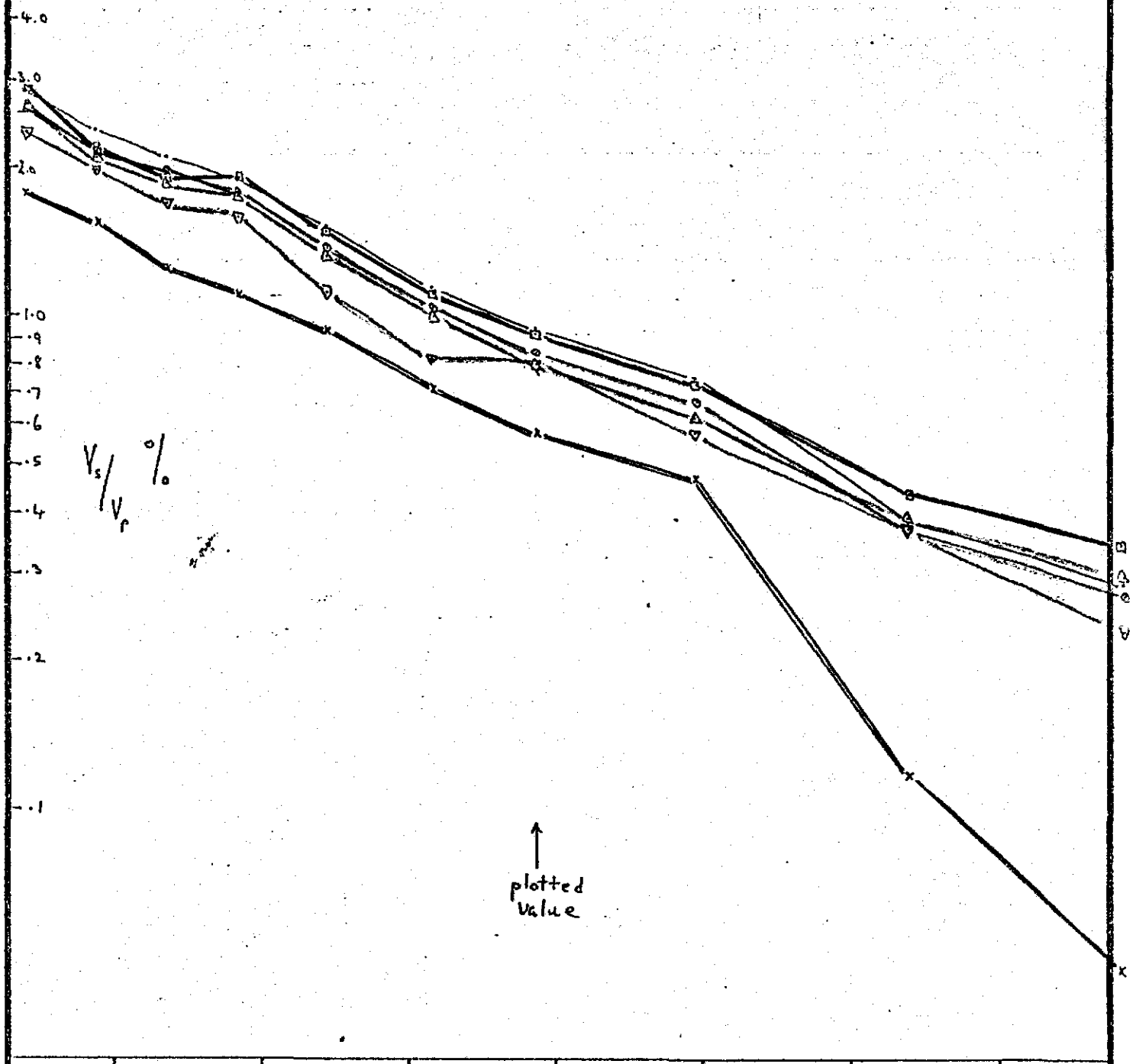


SPECTRAL I.P. DATA POINTS
BOCO GRID LINE 13580 N

DATE : July 1982

REF. [redacted]

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·—· a : n=1 : $3.11\,e^{-1/.81t}$ (r^2=.98)

x—x b : n=3 : $5.89\,e^{-1/.42t}$ (r^2=.95)

o—o c : n=5 : $2.64\,e^{-1/.85t}$ (r^2=.99)

□—□ d : n=2 : $2.50\,e^{-1/.98t}$ (r^2=.99)

△—△ e : n=4 : $2.21\,e^{-1/.97t}$ (r^2=.99)

▽—▽ f : n=6 : $2.20\,e^{-1/.90t}$ (r^2=.98)

Geology : Glacials

ref : EZ/MG82/12

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BOCO GRID

IP DECAY CURVES

line 14040N (a-f)

Drawn by JR | Scale:

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FIG 2a

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△ △ g* : n = 6 : —

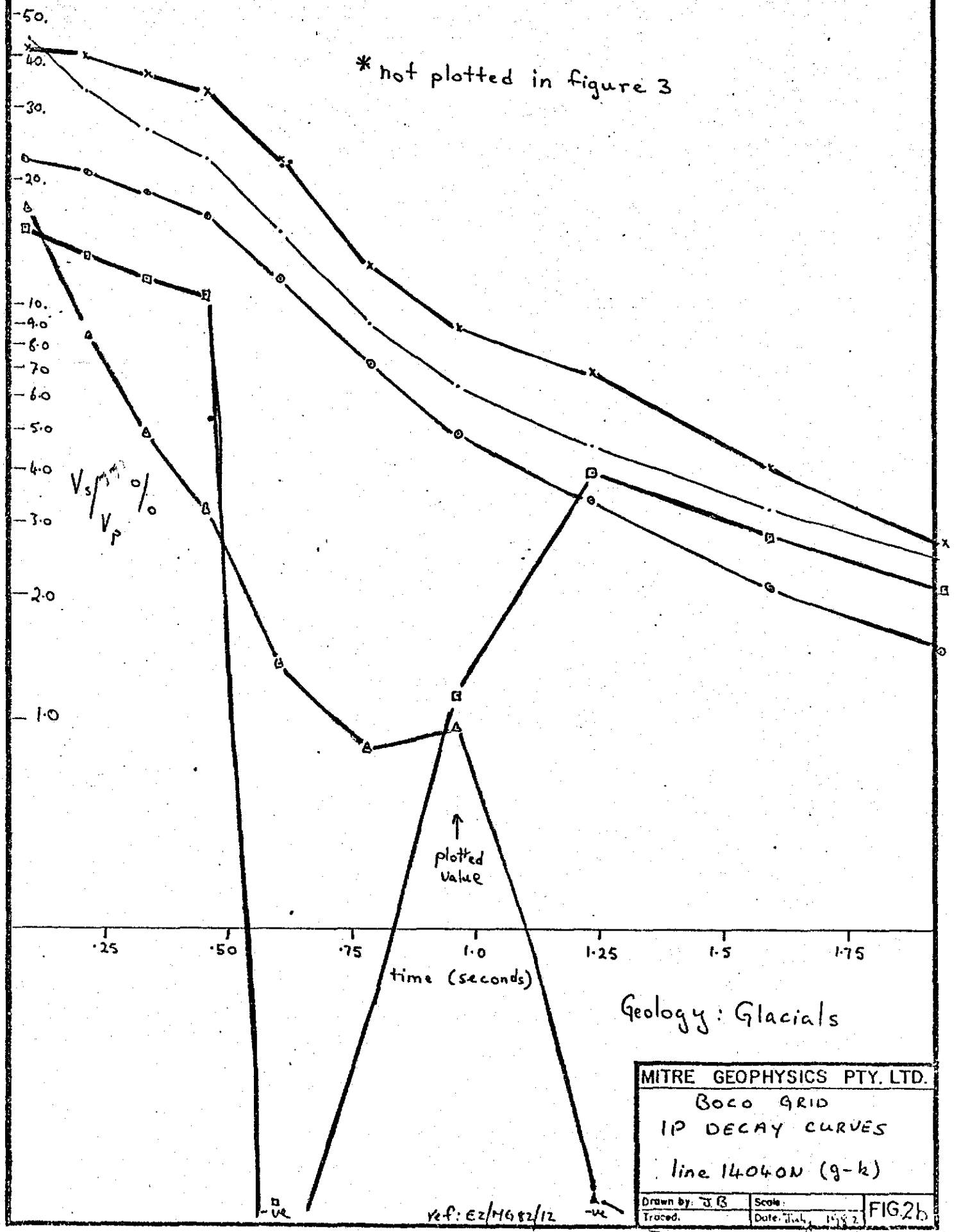
·—· h : n = 5 : $18.92\ e^{-1/.93t}$ ($r^2 = .98$)

□—□ i* : n = 4 : —

x—x j : n = 6 : $32.3\ e^{-1/.78t}$ ($r^2 = .99$)

⊙---⊙ k : n = 5 : $18.51\ e^{-1/.75t}$ ($r^2 = .98$)

* not plotted in figure 3



Geology : Glacials

MITRE GEOPHYSICS PTY. LTD.

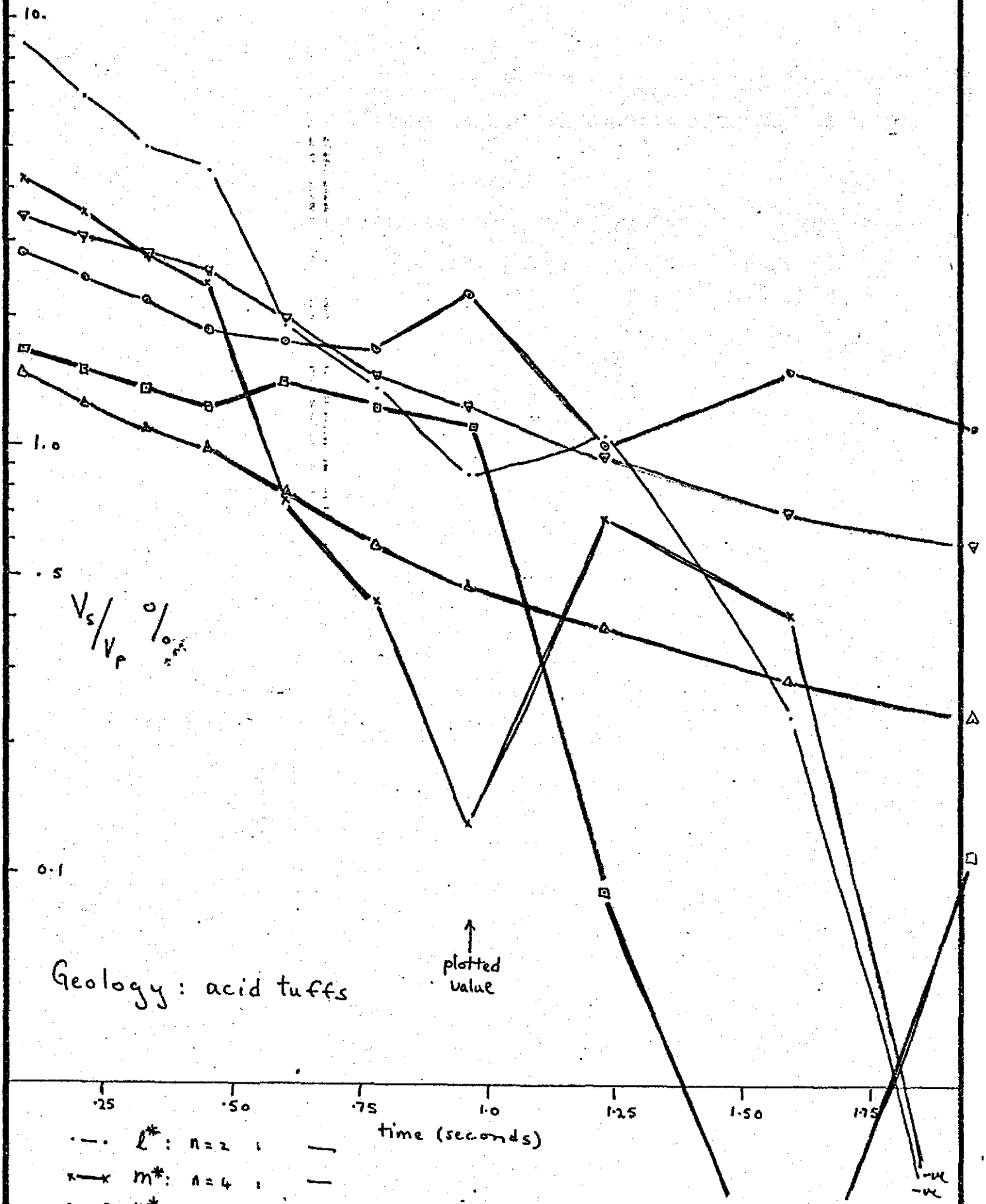
Boco GRID

IP DECAY CURVES

line 14040N (g-k)

Drawn by: J B | Scale: | Traced. | Date: July 1982 | FIG 2b

ref: EZ/MG82/12



·—· ℓ^*: n = 2 : —

×—× m^*: n = 4 : —

⊙—⊙ η^*: n = 6 : —

△—△ 0 : n = 1 : $1.00\, e^{-t/1.28}$ ($r^2 = .98$)

□—□ ρ^*: n = 3 : —

▽—▽ q : n = .5 : $2.66\, e^{-t/1.22}$ ($r^2 = .99$)

*not plotted in figure 3

ref: E2/HGR/12

MITRE GEOPHYSICS PTY. LTD.

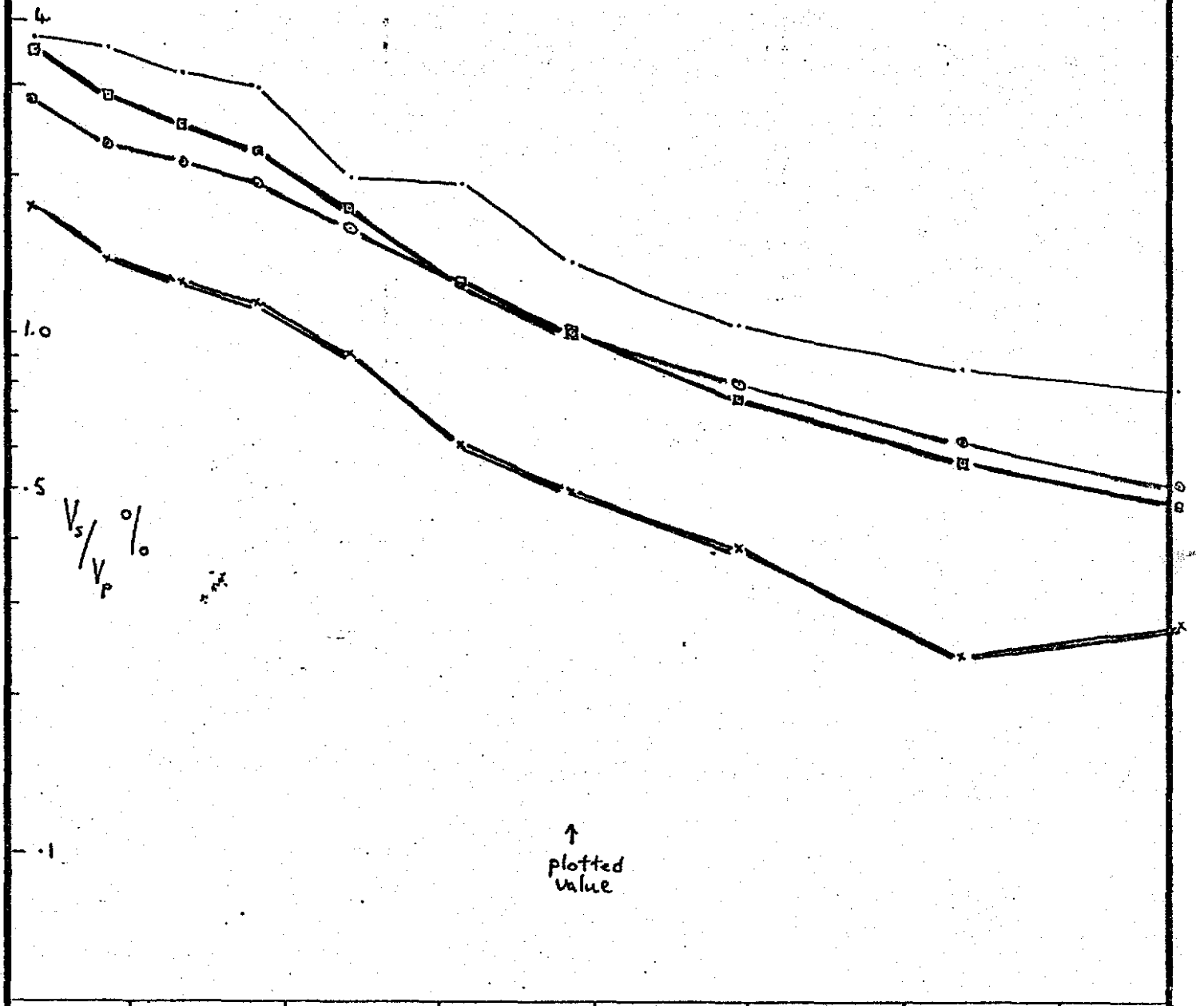
BOCO GRID

IP DECAY CURVES

line 14040N (ℓ-q)

Drawn by: JFB	Scale:	FIG.2c
Traced:	Date: July 1982	

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□—□ r : n=1 : $2.25\,e^{-1/1.20\,t}$ (r^2=.97)

⊙—⊙ s : n=3 : $2.08\,e^{-1/1.37\,t}$ (r^2=.98)

x—x t*: n=5 : $1.01\,e^{-1/1.33\,t}$ (r^2=.84)

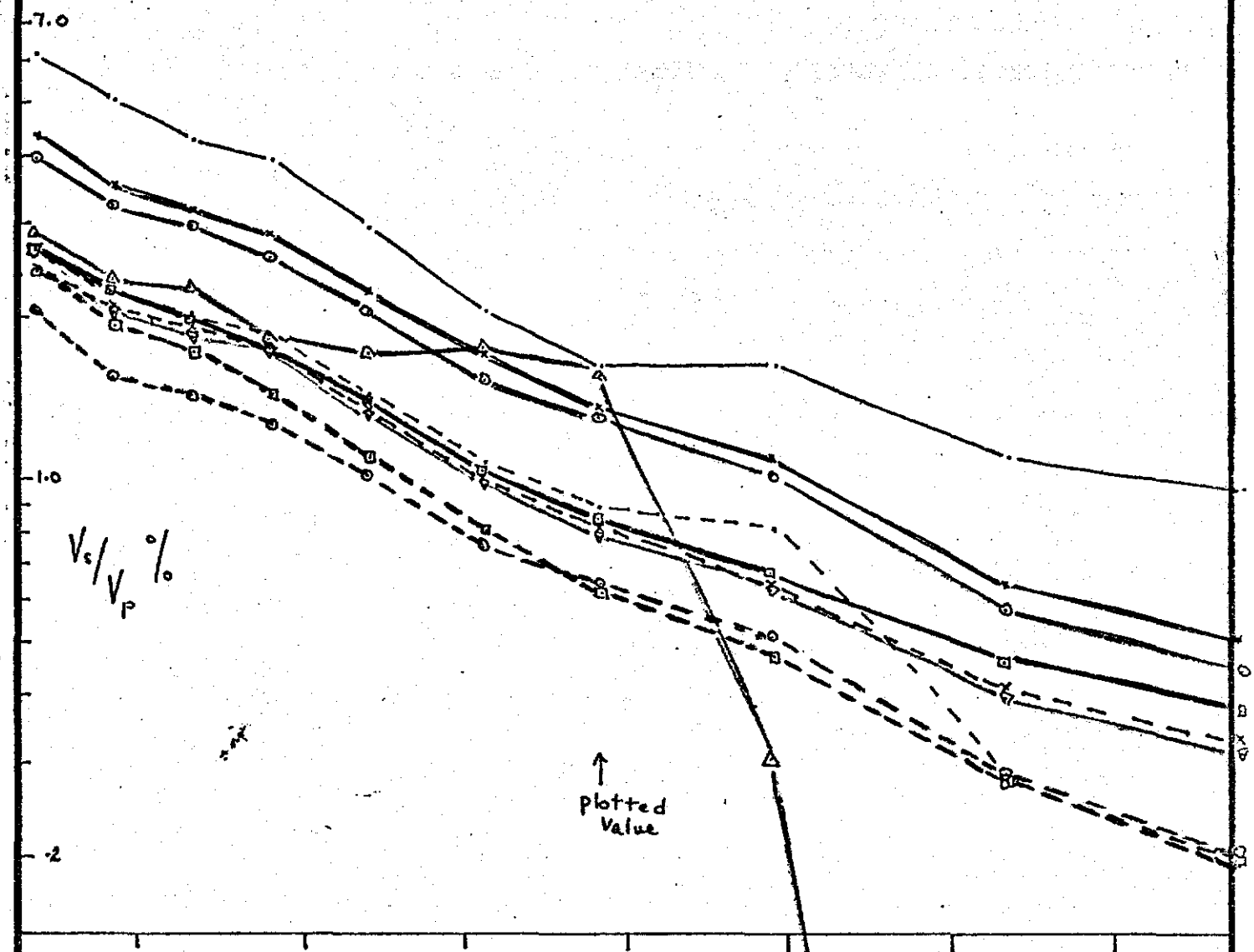
.—. u*: n=6 : $2.95\,e^{-1/1.37\,t}$ (r^2=.86)

Geology : acid lavas

* not plotted in figure 3

ref. EZ/MG82/12

MITRE GEOPHYSICS PTY. LTD.		
Boco GRID IP DECAY CURVES line 14040N (r-u)		
Drawn by: B.S.	Scale:	FIG.2d
Traced:	Date: July 1982	



a* : n = 2 : $3.27\ e^{-1/1.16t}$ ($r^2 = .94$)

b : n = 4 : $3.7\ e^{-1/.99t}$ ($r^2 = .97$)

c : n = 6 : $3.64\ e^{-1/.93t}$ ($r^2 = .99$)

d : n = 2 : $3.93\ e^{-1/.65t}$ ($r^2 = .97$)

e : n = 4 : $2.09\ e^{-1/1.04t}$ ($r^2 = .99$)

f : n = 6 : $1.94\ e^{-1/.87t}$ ($r^2 = .99$)

g* : n = 6 : —

h : n = 1 : $2.02\ e^{-1/1.14t}$ ($r^2 = .99$)

i : n = 3 : $2.09\ e^{-1/1.01t}$ ($r^2 = .99$)

j : n = 5 : $1.95\ e^{-1/.85t}$ ($r^2 = .99$)

Geology: Glacials

* not plotted in figure 3

ref: EZ/MG82/12

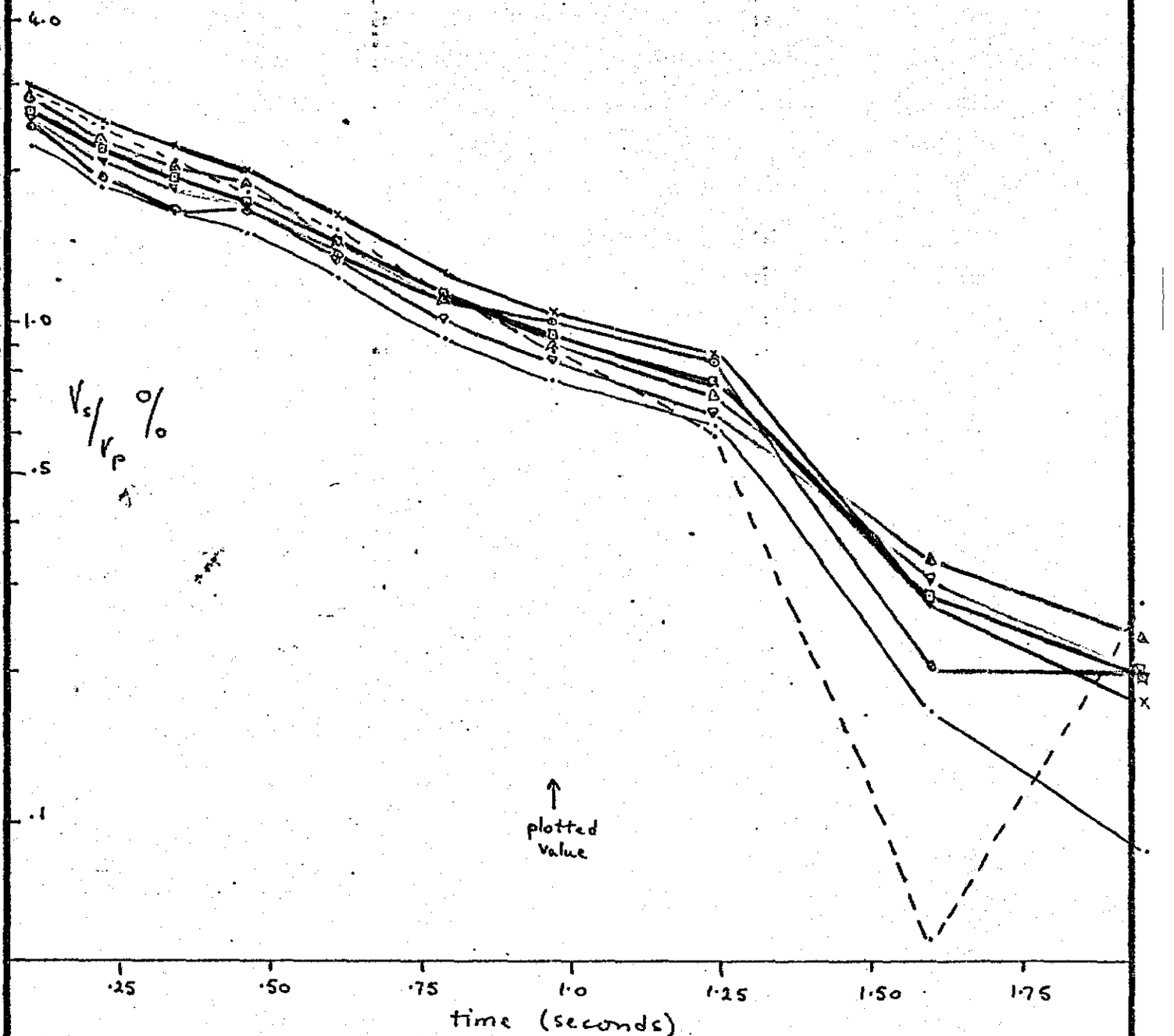
MITRE GEOPHYSICS PTY. LTD.

Boco Grid

IP DECAY CURVES

line 13580N (a-j)

Drawn by: JR | Scale: | Traced | Date: | FIG.2e



·—· k*: n=1 : $6.02\ e^{-1/47t}$ (r^2=·95)
x—x l : n=3 : $5.95\ e^{-1/56t}$ (r^2=·95)
⊙—⊙ m*: n=6 : $4.93\ e^{-1/58t}$ (r^2=·88)
△—△ n : n=2 : $3.41\ e^{-1/72t}$ (r^2=·98)
□—□ o : n=4 : $4.40\ e^{-1/63t}$ (r^2=·96)
▽—▽ p : n=3 : $3.30\ e^{-1/71t}$ (r^2=·98)
·---· q*: n=5 : —

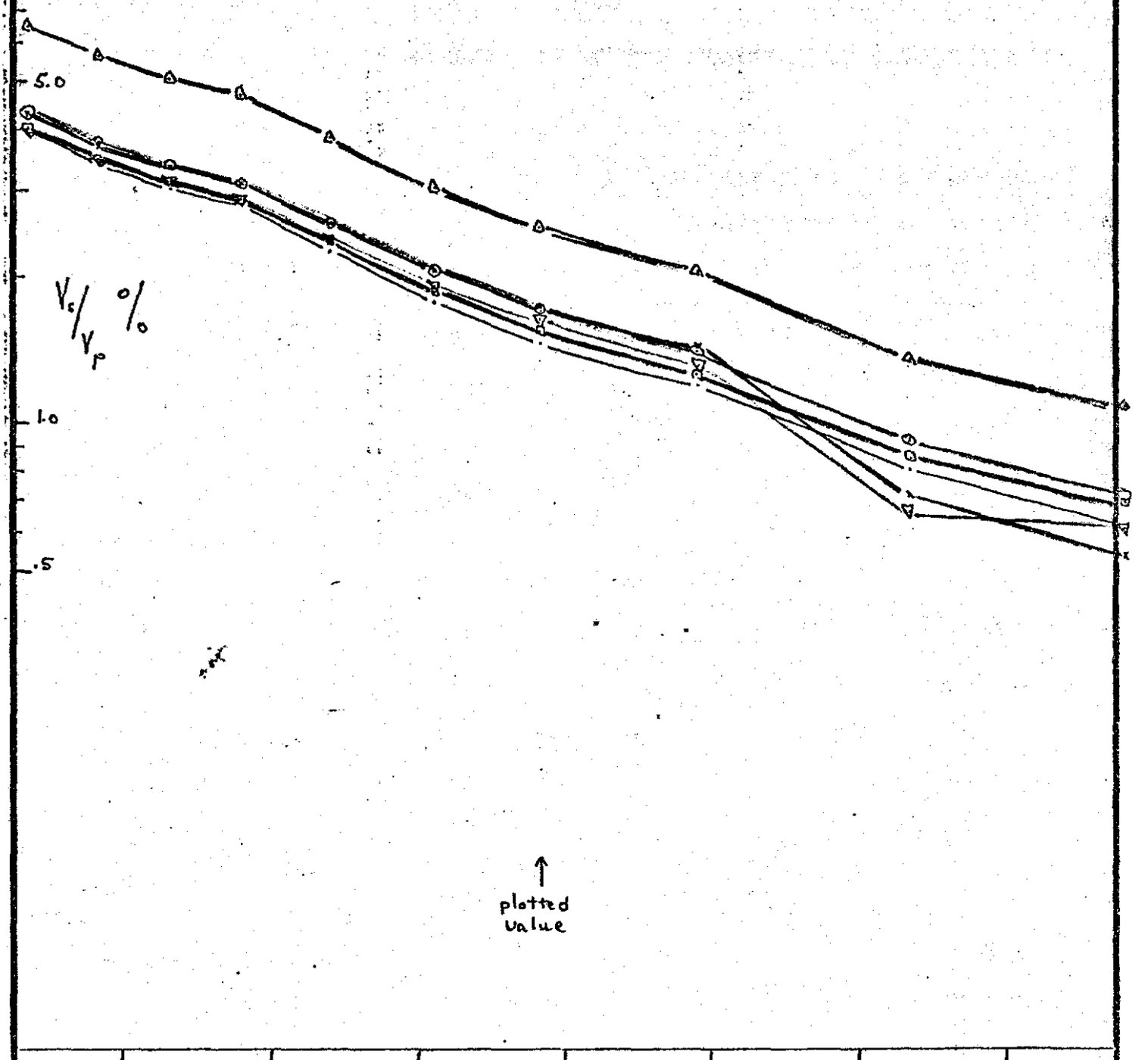
Geology : acid lavas

* not plotted in figure 3

ref. G2/MG82/12

MITRE GEOPHYSICS PTY. LTD.		
BOCO GRID		
IP DECAY CURVES		
line 13580N (k-q)		
Drawn by: J.B.	Scale	FIG.2.f
Traced	Date July 1982	

702066



r : n=2 : $3.42e^{-1/115t}$ (r^2=.99)

s : n=4 : $5.38e^{-1/84t}$ (r^2=.97)

t : n=6 : $4.07e^{-1/112t}$ (r^2=.99)

u : n=1 : $5.94e^{-1/1.12t}$ (r^2=.99)

v : n=3 : $3.49e^{-1/119t}$ (r^2=.99)

w : n=5 : $4.35e^{-1/96t}$ (r^2=.93)

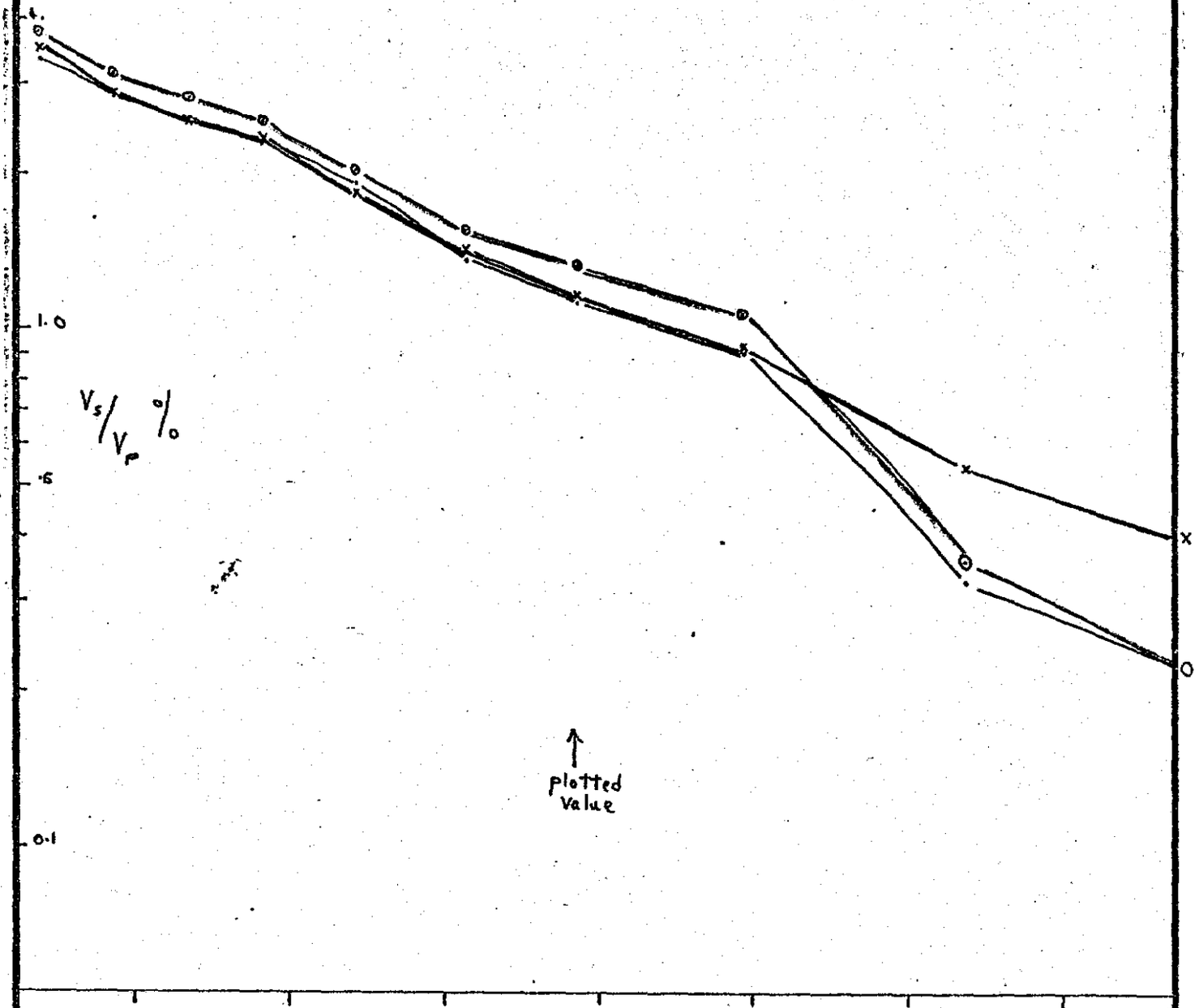
Geology : Chert

MITRE GEOPHYSICS PTY. LTD.	
BOCO GRID	
IP DECAY CURVES	
line 13580N (r-w)	
Drawn by: J.R.	Scale:
Traced:	Date: July, 1982

FIG. 24

ref: E2/MG82/12

702067



X : n = 2 : $5.49\, e^{-1/.61\, t}$ (r^2 = .96)

Y : n = 4 : $7.18\, e^{-1/.97\, t}$ (r^2 = .95)

Z : n = 5 : $3.42\, e^{-1/.91\, t}$ (r^2 = .99)

Geology: acid tuffs

MITRE GEOPHYSICS PTY. LTD.

BOCO GRID

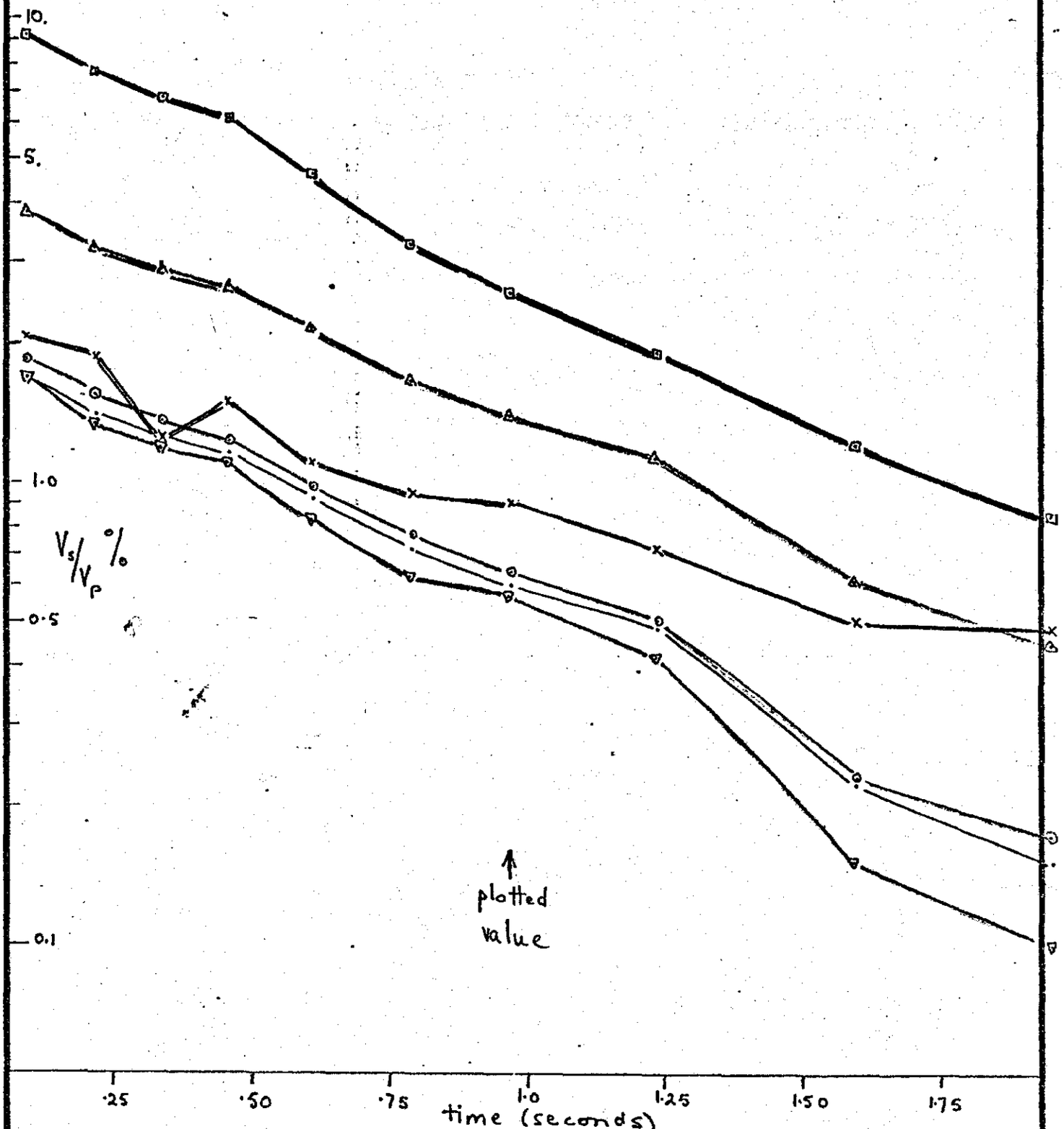
IP DECAY CURVES

line 13580N (X-Z)

Drawn by: J.R.	Scale:	FIG. 2h
Traced.	Date: July 1982	

Ref. EZ/MG82/12

702068



a : n=6 : $7.82\,e^{-t/.87}$ (r^2=1.0)

b : n=1 : $4.21\,e^{-t/.86}$ (r^2=.98)

c : n=1 : $2.29\,e^{-t/.71}$ (r^2=.98)

d* : n=6 : $1.60\,e^{-t/1.52}$ (r^2=.94)

e : n=6 : $2.7\,e^{-t/.59}$ (r^2=.96)

f : n=1 : $2.25\,e^{-t/.74}$ (r^2=.97)

Geology : Glacials

* not plotted in figure 3

Ref : EZ/MG82/12

MITRE GEOPHYSICS PTY. LTD.

BOCO GRID

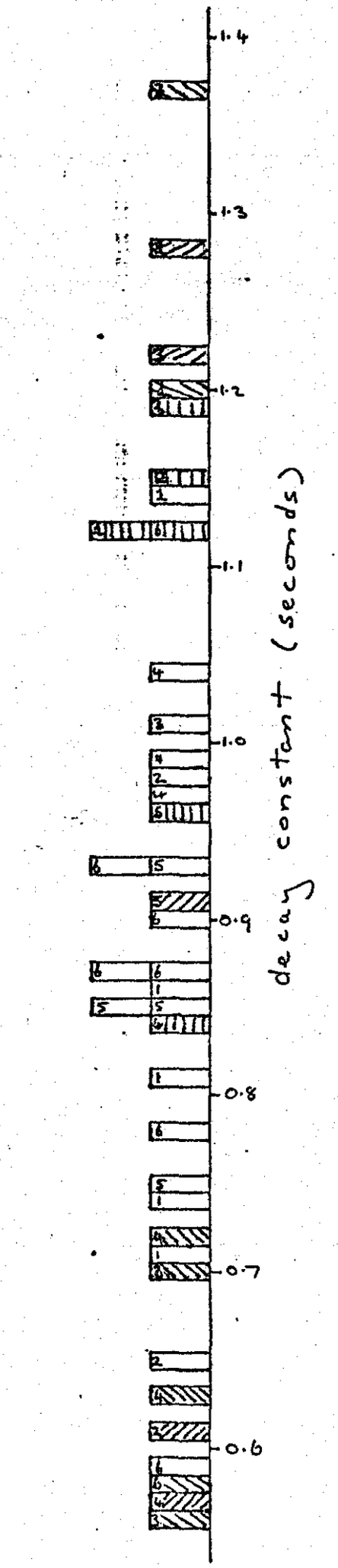
IP DECAY CURVES

line 1516ON (a-f)

Drawn by: A.E. | Scale:

Traced: | Date: July 1982

FIG. 2i



Legend

'n' reading → glacials

cherts

tuffs

lavas

MITRE GEOPHYSICS PTY. LTD.

BOCO GRID

DISTRIBUTION PLOT

OF DECAY CONSTANTS

Drawn by: J.B. | Scale: | Date: July 1982 | FIG. 3

ref: EZ/M682/12

APPENDIX 5. Rock sample descriptions from the Northern and Western Areas.

Electrolytic Zinc Co. of A'asia Ltd.
Rosebery, Tas.

ROCK SAMPLE LEDGER

PROJECT: Bulgobac. J.V. E.L.N/72 LOCALITY: Hatfield River
COLLECTED BY: Roger Pollock DATE: APRIL 1982.

Sample Number	A.M.G. Co-ordinates N	E	Sample Type	Geological Description	Rock-type (Macroscopic)	Thin or Polished Section: T or P	By	Reference	Rock-type (Microscopic)	Metal Content (p.p.m. unless specified)
				Most of the following samples contain several pieces being a representative sample from up to 200m of creek.						
47201	5,396,520	381960	Rock	Conglomerate :- poorly sorted (variety of rock frags) ; all rounded ; to 40mm. Conglomerate :- fine grained, pebble, well sorted, all fine siliceous material ; rounded to angular - may be Tertiary ? greybully ? (not outcropping)						
47202	5,396500	381900	"	Conglomerate :- fine - quartzose grit. Sandstone :- fine silty ; dark grey.						
47203	5,396,450	381850	"	Grit :- fine quartzose Conglomerate :- subrounded, quartz-quartzite pebbles. matrix minor. Some pebbles weathered - may have been calcareous						
47204	5,396,800	381550	"	Sandstone :- fine, dark grey Quartzite :- fine, pale grey.						
47205	5,397,000	381550	"	Grit/Greywacke :- slightly tuffaceous Siltstone :- brown weathered.						
47206	5,397,080	381520	"	Calcareous Siltstone :- dark grey ? band of grey limestone Siltstone :- laminated dark grey ? calcite veinlet.						

Smith Print Ph., 441622

702071

Electrolytic Zinc Co. of A'asia Ltd.
Rosebery, Tas.

ROCK SAMPLE LEDGER

PROJECT: BULGOBAC J.V. EL.12/72 LOCALITY: HATFIELD RIVER
COLLECTED BY: Roger Pollock DATE: April 1982.

Sample Number	A.M.G. Co-ordinates N	A.M.G. Co-ordinates E	Sample Type	Geological Description	Rock-type (Macroscopic)	Thin or Polished Section: T or P	By	Reference	Rock-type (Microscopic)	Metal Content (p.p.m. unless specified)
47207	5,397,040	381,470	Rock	Sandstone :- slightly tuffaceous, fine grained, brown Tuffaceous Grit :- fine						
47208	5,398,000	382 050	"	Grit :- quartzose, tuffaceous, brown.						
47209	5,398,100	381,700	"	Siltstone :- fine, brown, slightly micaceous Greywacke/Sandstone :- fine, brown						
47210	5,398,300	381 500	"	Siltstone/Sandstone :- black, fine, with calcite vein & speck of ? galena. Sandstone :- micaceous, dark grey.						
47211	5,398,420	381 430	"	Siltstone :- dark grey						
47212	5,399 250	383 400	"	Siltstone :- laminated, black. Grit/Wacke :- fine - coarse grained & calcareous matrix and calcite vein						
47213	5,399 250	393 530	"	Quartzite :- grey & quartz-pyrite vein.						
47214	5,399 100	394 550		Quartzite :- fine, minor fine grit						

Smith Print Ph.. 447822

702072

Electrolytic Zinc Co. of A'asia Ltd.
Rosebery, Tas.

ROCK SAMPLE LEDGER

PROJECT: Bulgobac J.V. EL 12/72. LOCALITY: N. Pinnacles — W. Boco
COLLECTED BY: Roger Pollock DATE: April ; 1992.

Sample Number	A.M.G. Co-ordinates N	A.M.G. Co-ordinates E	Sample Type	Geological Description	Rock-type (Macroscopic)	Thin or Polished Section: T or P	By	Reference	Rock-type (Microscopic)	Metal Content (p.p.m. unless specified)
47215	5,387,150	381100	Rock	Siltstone :- dark grey laminated Tuff :- lithic/brecciated, siliceous, fragments < 20mm. Fine Tuffaceous Sediment :- possibly tuffaceous Sandstone ± vitric tuff lenses.						
47216	5,386,870	381,000		Crystal Tuff :- feldspar > quartz, groundmass minor. Vitric - Crystal Tuff :- with scattered fine siliceous rock frags. < 1cm. Vitric - Crystal Tuff :- dark grey ± qtz vein						
47217	5,387,000	381330		Lithic Tuff :- crystal and groundmass minor. Liths :- black chloritic (fiamme?) to 10mm, - sub rounded siliceous to 2mm. Crystal Tuff :- Feldspar ± minor quartz some chloritic liths (? fiamme)						
47218	5,388,000	382150		Crystal Tuff :- quartz > feldspar, groundmass grey-green ~50%. Vitric Tuff :- crystals minor < 1mm. This could be fine siliceous siltstone?						
47219	5,388,050	381830		Crystal Tuff :- feldspar dominant < 2mm in dark grey g'mass 50%. Vitric Tuff or Fine Tuffaceous Quartzite :- quartz vein. Crystal lithic Tuff :- feldspars dominant, liths scattered < 10mm, weathered.						

Smith Print Pn., 441822

702073

Electrolytic Zinc Co. of A'asia Ltd.
Rosebery, Tas.

ROCK SAMPLE LEDGER

PROJECT: Bulgobac. J.V. EL12/72 LOCALITY: N. Pinnacles – W. Boco.
COLLECTED BY: R. Pollock. DATE: April 1982.

Sample Number	A.M.G. Co-ordinates N	A.M.G. Co-ordinates E.	Sample Type	Geological Description	Rock-type (Macroscopic)	Thin or Polished Section: T or P	By	Reference	Rock-type (Microscopic)	Metal Content (p.p.m. unless specified)
47220	5,388,130	381620	Rock.	Tuffaceous Sandstone/Wacke' :- banded with fine siliceous tuff Tuffaceous Sandstone						
47221	5,387,850	381,200	"	Crystal lithic tuff :- quartz crystal to 2mm ; abundant liths to 2mm. Uniform size & type - may be altered feldspar						
47222	5,387,850	381,520	"	Tuffaceous Sandstone/Wacke' :- dark grey, fine to medium Crystal lithic tuff :- components equal proportion. <2mm, feldspar >quartz, liths sub-rounded.						
47223	5,387,750	381700	"	Vitric tuff - minor crystal :- pale grey crackled texture.						
47224	5,387,500	381850	"	Vitric crystal tuff :- quartz dominant 1-3mm in pale yellow-brown vitric groundmass						
47225	5,390,420	380,380	"	Tuffaceous Wacke' :- medium grained Siltstone :- grey Tuffaceous Sandstone, fine, dark grey						
47226	5,390,890	380700		Siltstone :- dark grey Tuffaceous Wacke :- quartzose & scattered black siltstone fragments						

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702074

Electrolytic Zinc Co. of A'asia Ltd.
Rosebery, Tas.

ROCK SAMPLE LEDGER

PROJECT: Bulgobac. J.V. EL 12/72 LOCALITY: N. Pinnacles — W. Boco.
COLLECTED BY: R. Pelloch DATE: April 1972.

Sample Number	A.M.G. Co-ordinates N	A.M.G. Co-ordinates E	Sample Type	Geological Description	Rock-type (Macroscopic)	Thin or Polished Section: T or P	By	Reference	Rock-type (Microscopic)	Metal Content (p.p.m. unless specified)
47227	5,390,970	380 920	Rock	Crystal Tuff:- Quartz dominant 1-3mm groundmass minor - may be reworked. Siltstone - thin bedded dark grey. Crystal Tuff :- quartz - feldspar, may be reworked.						
47228	5,391 170	381 180	"	Crystal Tuff:- Feldspar & quartz, <3mm groundmass 50-60% chloritic.						
47229	5,391,480	381 360	"	Crystal tuff:- quartz dominant in pale grey-green vitric g'mass.						
47230	5,390,800	380,350	"	Vitric Tuff:- with fine crystal fragments minor pyrite. Tuffaceous Wacke:- quartzose, fine grained Crystal lithic tuff:- fine & dark vitric g'mass.						
47231	5390,470	379 980	"	Crystal lithic tuff:- feldspar dominant <1mm & scattered black chloritic lithic <3mm. Tuffaceous Wacke- fine-medium grained.						
47232	5,390,330	379800	"	Siltstone:- fine dark grey tuffaceous Greywacke/Grit:- fragments angular subrounded 2mm. Crystal Tuff:- feldspar quartz, g'mass minor						
47233	5,390,280	379 700	"	Conglomerate:- Fragments predominantly of acid volcanic, rounded-angular:						

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702075

Electrolytic Zinc Co. of A'asia Ltd.
Rosebery, Tas.

ROCK SAMPLE LEDGER

PROJECT: Bulyobac. J.V. E.L.1/82 LOCALITY: N. Pinnacles – W. Boco
COLLECTED BY: Roger Pollock DATE: April 1982.

Sample Number	A.M.G.Co-ordinates N	A.M.G.Co-ordinates E	Sample Type	Geological Description	Rock-type (Macroscopic)	Thin or Polished Section T or P	Thin or Polished Section By	Thin or Polished Section Reference	Thin or Polished Section Rock-type (Microscopic)	Metal Content (p.p.m. unless specified)
47233	(cont)			< 10mm in cryst'al tuff groundmass						
47234	5,389980	379470	Rock.	Conglomerate :- Fragments subrounded -angular. < 10mm.						

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702076

APPENDIX 6. Stream sediment sample data sheets, Northern and Western Areas.

702078

EZ Co of A'Asia Ltd
Rosebery Tas

GEOCHEMICAL SAMPLE DATA SHEET

Project : Bulgobac J.V. EL12/72
Locality : N. Pinnacles – W. Boco
Grid Name :
Nominal Grid Azimuth :

Material : Stream Sediments
Sample Method : Grab of total load
Sampled By : R.E.N. Pollock
Date : April 1982

Size Fraction Analysed : -80#
Analysed By : A.C.S.
Method : AAS. : Sn, W by XRF

SAMPLE NUMBER	Sample Location Data: Grid Line No	Grid Easting	AMG CO-ORDINATES: NORTHING	EASTING	Stream Data: Stream Order	Direction of Flow	Width	Active Stream Load	Composition Data: Clay	Sand	Rock Frags.	Organic	Contam.	Geology
42217			5387735	391320			3·0	W	✓	✓				
218			5387235	381210			0·5	W–M		✓	✓			
219			5387140	381080			1·0	M		✓	✓			
220			5387140	381100			1·0							
221			5387025	381020			1·0	W–M		✓	✓			
222			5386825	381015	1	2	0							
223			5386800	381145										
224			5386850	381250										
225			5387000	381350										
226			5387880	382130			1·0	W–M	✓	✓	✓			
227			5388000	382140			0·7	W–M						
228			5387980	381920			0·5	W–M		✓	✓		Sgl	
229			5388100	381745			0·8	M		✓	✓		Sand	
230			5388170	381430			1·0	M		✓	✓			
231			5387875	381420			1·0	M	✓	✓	✓			
232			5387560	381180			0·8	M		✓	✓			
233			5387770	381600			1·3	M		✓	✓			
234			5387650	381700			1·3	M		✓	✓			
235			5387480	381840			0·2			✓	✓			
236			5387500	381670			1·4	M		✓	✓			
237			5390390	380390			3·0	M		✓	✓			
238			5390710	380390			3·0	M	✓	✓	✓			
239			5390750	380400			4·0	M		✓	✓			
240			5390890	380680			4·0			✓	✓			
241			5390865	380680			1·2	M	✓	✓	✓			
242			5390920	380710			4·0	M–G		✓	✓			
243			5390940	380770			0·8	M	✓	✓	✓			
244			5391070	381025			4·0	M		✓	✓			
245			5391180	381345			1·0	M	✓	✓	✓			
42256			5391200	381325			4·5	M		✓	✓			

SAMPLE NUMBER	METAL CONTENT (ppm. unless specified): Cu	Pb	Zn	Ag	Co	Fe %	Mn	As	Sn	W
42217	<5	<5	10	<0·5	<5	0·18	20	<5	<10	25
218	10	10	55		10	0·85	110		<10	<10
219	30	50	100		30	2·20	780		<10	40
220	30	25	50		10	1·10	130		10	25
221	35	10	80		15	1·80	330		<10	25
222	15	30	60		15	1·30	290		<10	<10
223	35	10	30		<5	0·75	70		<10	35
224	40	30	70		20	2·70	200		<10	<10
225	15	30	20		<5	0·48	35		<10	55
226	20	50	50		10	1·30	290		10	45
227	30	40	50		10	0·69	460	<5	<10	25
228	35	50	80		10	2·00	340	10		<10
229	60	50	90		20	2·90	680	10		70
230	30	40	60		15	1·50	420	<5		<10
231	45	65	75		30	3·40	950	<5		35
232	20	56	150		30	3·10	710	<5		30
233	25	80	130		40	3·20	1800	<5		55
234	20	65	95		25	2·30	950	10		15
235	30	30	45		<5	0·43	70	<5		40
236	75	40	130		25	3·00	550	<5		35
237	35	90	95		30	3·20	1700	<5		65
238	15	80	80		25	2·00	1600	<5		<10
239	25	40	60		10	0·88	270	<5		80
240	35	60	60		15	1·10	610	<5		30
241	35	110	110		50	4·90	1600	20		55
242	110	65	140		20	3·70	950	10		<10
243	90	100	210		20	3·60	650	<5		70
244	40	60	80		15	1·30	470	<5		50
245	45	60	95		10	1·30	730	<5		95
42256	40	70	90	<0·5	20	2·00	1600	<5	<10	20

EZ Co of A'Asia Ltd
Rosebery Tas

GEOCHEMICAL SAMPLE DATA SHEET

702079

Project : Bulgobac T.V. EL12/79
Locality : NNE end of W. Beach
Grid Name :
Nominal Grid Azimuth :

Material : Stream Sediments
Sample Method : Grab of total load
Sampled By : R.E.N. Pollock
Date : April 1982

Size Fraction Analysed : -80#
Analysed By : A.C.S.
Method : AAS, Sn, W by XRF

SAMPLE NUMBER	Sample Location Data: Grid Line No / Grid Easting	Sample Location Data: AMG CO-ORDINATES NORTHING	Sample Location Data: AMG CO-ORDINATES EASTING	Stream Data: Stream Order	Stream Data: Direction of Flow	Stream Data: Width	Stream Data: Active Stream Load	Composition Data: Clay	Composition Data: Sand	Composition Data: Rock Frags.	Composition Data: Organic	Composition Data: Contam.	Geology	METAL CONTENT (ppm unless specified): Cu	Pb	Zn	Ag	Co	Fe %	Mn	As	Sn	W
42257		5390825	3790350			1.0	M	✓	✓	✓				40	120	220	<0.5	30	3.80	1600	10	<10	90
58		5390731	3790260			0.8	W-M	✓	✓	✓				25	70	120		15	1.60	660	<5	<10	20
59		5390650	3790220			1.0	M		✓	✓				60	50	90		10	1.60	270		<10	65
60		5390480	3790050			0.7	M	✓	✓	✓				70	150	70		25	3.10	960		65	50
61		5390350	3790590			1.0	M		✓	✓				60	30	60		10	1.90	260		<10	100
62		5390340	3790320			0.8	W-M	✓	✓	✓				40	60	85		20	1.70	320			40
63		5390210	3790720			0.5	W-M	✓	✓	✓				25	30	25		<5	0.33	80			55
64		5390090	3790550			1.0	W-M	✓	✓	✓				20	25	25		<5	0.38	90			40
65		5390065	3790550			3.5	M		✓	✓				40	30	60		10	1.20	160			90
66		5389966	3790460			4.0	M		✓	✓				55	50	80		<5	1.40	200			50
67		5389590	3790325			0.8	M-S		✓	✓				35	35	40		<5	0.75	140			110
69		5389600	3790310			3.0	M	✓	✓	✓				70	35	70		10	1.60	200			55
69		5389306	3790165			0.8	M	✓	✓	✓				35	60	80		10	2.70	250			95
42270		5389280	3790180			2.5	M		✓	✓				80	60	70	<0.5	10	2.90	400	<5	<10	60
		53	3																				
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EZ Co of A'Asia Ltd
Rosebery Tas.

GEOCHEMICAL SAMPLE DATA SHEET

702080

Project : BULGOBAC EL 12/72
Locality : HATFIELD RIVER
Grid Name :
Nominal Grid Azimuth :

Material : Stream Sediments
Sample Method : Grab of total load
Sampled By : R.E.N. POLTOCK
Date : April 1982

Size Fraction Analysed : -80#
Analysed By : A.C.S.
Method : AAS ; Sn, W by XRF

SAMPLE NUMBER	Sample Location Data: Grid Line No.	Grid Easting	AMG CO-ORDINATES: NORTHING	EASTING	Stream Data: Stream Order	Direction of Flow	Width	Active Stream Load	Composition Data: Clay	Sand	Rock Frags.	Organic	Contam.	Geology	METAL CONTENT (ppm. unless specified): Cu	Pb	Zn	Ag	Co	Fe %	Mn	As	Sn	W
42271			539648	038204			1.0	M	✓	✓	✓				35	50	110	<0.5	35	4.30	420	<5	<10	70
72			539647	038203			1.5	M	✓	✓	✓				30	30	60		30	1.80	960			50
73			539647	038188			2.0	M	✓	✓	✓				40	40	80		25	2.70	700			110
74			539644	038188			1.0	M	✓	✓	✓				20	20	30		<5	0.64	100			20
75			539663	038164			3.0	M	✓	✓	✓				20	35	50		15	1.20	550			95
76			539695	038157			1.0	M		✓	✓				20	40	60		10	1.40	320			40
77			539694	038155			4.0	M-S	✓	✓	✓				30	50	50		10	1.10	300			85
78			538711	038134			3.5	M		✓	✓				25	50	100		25	1.30	480			55
79			538724	038123											55	40	170		40	4.30	500			85
80			539737	038120			1.5	W-M	✓	✓	✓				140	45	170		30	4.80	620			20
81			539796	038184			2.0	M		✓	✓				80	40	150		30	4.40	530			95
82			539795	038188			7.0								75	50	190		50	5.60	910			30
83			539806	038215			7.0		✓	✓	✓				30	20	110		35	3.40	390			105
84			539821	038161			2.0	M	4	16	80				60	40	140		35	4.00	1200	<5		55
85			539822	038164			2.5			15	85				40	40	130		30	3.70	790	100		80
86			539843	038142			1.0			40	60				25	20	90		20	1.60	850	<5		60
87			539844	038140			1.5			20	80				90	80	180		45	5.60	1400	<5		75
88			539855	038164			0.7		5	10	85				65	30	130		30	4.40	950	<5	<10	55
89			539855	038167			1.5		5	20	75				70	60	160		40	5.20	640	<5	15	85
90			539834	038240			7.0								50	50	170		45	5.70	670	<5	<10	55
91			539827	038246			0.8		20	20	60				20	100	40		10	0.55	230	10	<10	85
92			559815	038258			0.8			10	90				55	170	80		25	5.60	1600	40	<10	35
93			539827	038272			0.5			15	85				85	130	95		45	5.30	2700	20	10	105
94			539830	038262			0.7			15	85				30	80	50		20	2.00	900	10	<10	65
95			539852	038273			1.0			20	80				70	110	100		30	4.00	1300	<5		110
42296			539857	038274			7.0								50	40	170		40	5.20	730	<5		30
44608			539840	038293			1.0			20	80				80	50	70		15	3.70	540	10		100
09			539831	038316			0.5			5	95				30	60	40		10	1.40	370	10		55
10			538827	038315			1.0		5	15	80				30	25	40		<5	1.10	90	<5		115
44611			539905	038310			8.0			10	90				85	80	210		50	7.30	950	10	<10	75

EZ Co of A'Asia Ltd
Rosebery Tas.

GEOCHEMICAL SAMPLE DATA SHEET

702081

Project : BULGOB AC. JV EL13/72
Locality : HATFIELD RIVER
Grid Name :
Nominal Grid Azimuth :

Material : Stream Sediments
Sample Method : Grab of total load
Sampled By : R.P.N. Pollock
Date : April 1982

Size Fraction Analysed : -80#
Analysed By : A.C.S.
Method : AAS. : Sn, W by XRF

SAMPLE NUMBER	Sample Location Data: Grid Line No.	Grid Easting	AMG CO-ORDINATES: NORTHING	EASTING	Stream Data: Stream Order	Direction of Flow	Width	Active Stream Load	Composition Data: Clay	Sand	Rock Frags.	Organic	Contam	Geology
44612			5398840	383000			8·0			5	95			
13			5399270	383260			5·0		10	90				
14			5399240	383310			9·0			5	95			
15			5399270	383605			0·6		20	80				
16			5399245	383625			7·0			5	95			
17			5399170	383790			0·3		20	80				
18			5399250	383875			6·0							
19			5399400	383970			1·5		20	80				
20			5399500	384000			0·8		25	75				
21			5399480	384120			1·0		30	70				
22			5399340	384290										
23			5399170	384380			0·5		20	60	20			
24			5399180	384420			7·0							
25			5399080	384940			0·8		20	80				
26			5398970	384560			1·0		25	75				
44627			5398980	384590			7·0		10	90				
			53	3										
			53	3										
			53	3										
			53	3										
			53	3										
			53	3										
			53	3										
			53	3										
			53	3										
			53	3										
			53	3										
			53	3										
			53	3										
			53	3										
			53	3										
			53	3										

METAL CONTENT (ppm unless specified)

Cu	Pb	Zn	As	Co	Fe %	Mn	As	Sn	W
55	70	190	<0·5	50	6·00	940	10	<10	50
50	40	150		45	6·10	660	<5	<10	45
30	40	130		40	4·90	650		<10	60
70	60	160		40	5·40	600		<10	45
55	40	160		45	5·40	730		<10	105
40	40	200		25	1·60	4600		<10	80
65	30	170		40	5·00	740		10	60
55	25	150		30	3·40	440		<10	15
40	20	100		30	3·80	630		<10	<10
35	50	140		40	5·20	520		<10	<10
60	40	170		45	4·60	710		<10	60
45	60	240		100	1·90	6400		<10	40
50	25	150		40	4·70	810		10	65
50	35	110		15	1·40	330		<10	40
95	25	80		15	1·30	230	<5	25	85
50	60	180	<0·5	50	5·70	910	30	<10	<10

5 387 000 N
5 386 000 N
5 385 000 N
5 384 000 N
5 383 000 N
381 000 E
382 000 E
383 000 E
384 000 E
385 000 E
EMU BAY RAILWAY
MURCHISON HIGHWAY
Area of known silica - sericite (pyrite) alteration
E.L. 12/72
E.L. 1/62
rhyodacitic porphyritic lava
sericitic pelitic ash sediment
rhyolitic porphyritic lava
Murchison Highway
EMU BAY RAILWAY

NOTE :

This map presents **1982 mapping** with revised " probable rocktypes " re-interpreted by R.A.S. after N.K.H. on 1976-77 grid lines.

E.L.12/72

E.L.12/72

BOCO SOUTH SHEET (SPECIAL)
COMPILED FROM SHEETS AO-521-0002/0004

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.	
PROJECT: BULGOBAC EL12/72	TAS.
CORRECTED BOCO GRID SHOWING	
GEOLOGY	
702082	82-1343 Vol 2/3
SCALE: 1 : 5 000	REF. NO. AO-521-0093
DATE: 24.8.1982 DRAWN BY Nik	SURVEY BY R.S.

5 cm

1063

382 000E

383 000E

384 000E

385 000E

5 390 000 N

5 389 000 N

5 388 000 N

EMU BAY RAILWAY

MURCHISON HIGHWAY

Inferred Fault

Volcanic porphyritic lava

Interbedded rhyolitic lava flows and volcanogenic sediment

NOTE :

This map presents 1982 mapping with revised "probable rocktypes" re-interpreted by R.A.S. after N.H.H. on 1976-78 grid lines .

E.L.12/72

E.L.12/72

BOCO NORTH SHEET

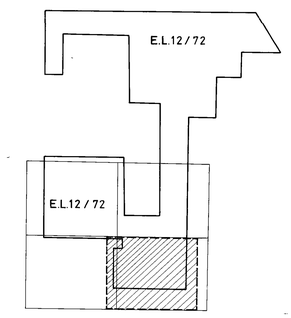
ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.	
PROJECT: BULGOBAC E.L.12/72	TAS.
CORRECTED BOCO GRID SHOWING	
GEOLOGY 702083	
82-1843 2/3	
SCALE: 1: 5 000	REF. NO.
REFERENCE:	AO-521-0094
DATE: 24.8.982 DRAWN: Nik. GEOLOGY: R.S.	

5 cm

1064

NOTE

1. Contour interval 25 nT ; add 62 000 to all values .
2. This map is a compilation of the 1976 - 77 Contour maps (AO - 521 - 0007, - 8 - 9) and the 1982 infill data (shown as thicker gridlines)
3. In several areas the infill data did not agree with the earlier surveys (probably due to the numerous surveying errors associated with this grid) - in all cases the later data has been used.
4. Because of the location problems (and because profiles were not available to aid the contouring) trends should not be given too much credence - rather the map shows magnetically responsive areas and magnetically quiet areas



BOCO SOUTH SHEET (SPECIAL)
COMPILED FROM SHEETS AO-521-0002/0004

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.		
PROJECT: BULGOBAC EL12/72		TAS.
CORRECTED BOCO GRID SHOWING		
702084		
GROUND MAGNETICS		
SCALE: 1 : 5 000		REF. NO. AO - 521 - 0091
DATE : 13. 9. 1982	DRAWN BY Nik	SURVEY BY J. Bis.

82-1845 V2/5

1065

382 000E

383 000E

384 000E

385 000E

5 390 000 N

5 389 000 N

5 388 000 N

EMU BAY RAILWAY

MURCHISON HIGHWAY

NOTE

1. Contour interval 25 nT., add 62 000 to all values

2. This map is a completion of the 1976 - 77 Contour maps (BO - 521 - 0002_1 - 9) and the 1982 infill data (shown as thicker gridlines)

3. In several areas the infill data did not agree with the earlier surveys (probably due to the numerous surveying errors associated with this grid) - in all cases the later data has been used

4. Because of the location problems (and because profiles were not realistic for dip fine contouring) trends should not be given too much credence - rather this map shows magnetically responsive areas and magnetically quiet areas

E.L.12/72

E.L.12/72

BOCO NORTH SHEET

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.	
PROJECT: BULGOBAC E.L.12/72	TAS.
CORRECTED BOCO GRID SHOWING	
702085	
GROUND MAGNETICS	
SCALE: 1: 5 000	REF. NO.
REFERENCE:	AO-521-0092
DATE: 13.8.1982 DRAWN: Nik SURVEY: J Bis	

82-1943 V213

5 cm

1066

5 387 000 N

5 386 000 N

5 385 000 N

5 384 000 N

5 383 000 N

382 000 E

383 000 E

384 000 E

385 000 E

RAILWAY

EMU BAY

HIGHWAY

MURCHISON

B.M.P. 209

E.L. 12/72

E.L. 1/62

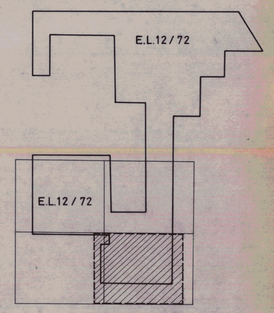
Highway

Murchison

NOTE :

Values shown on right of line are results from 1981/82 field season.

Values shown on left of line are older results taken from plans No : AO - 504 - 0026
AO - 504 - 0032



BOCO SOUTH SHEET (SPECIAL)
COMPILED FROM SHEETS AO-521-0002/0004

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT: BULGOBAC EL12/72 | TAS.

CORRECTED BOCO GRID SHOWING

SOIL GEOCHEMISTRY

- Zn -

702086

82-1343 V2/3

SCALE: 1 : 5 000

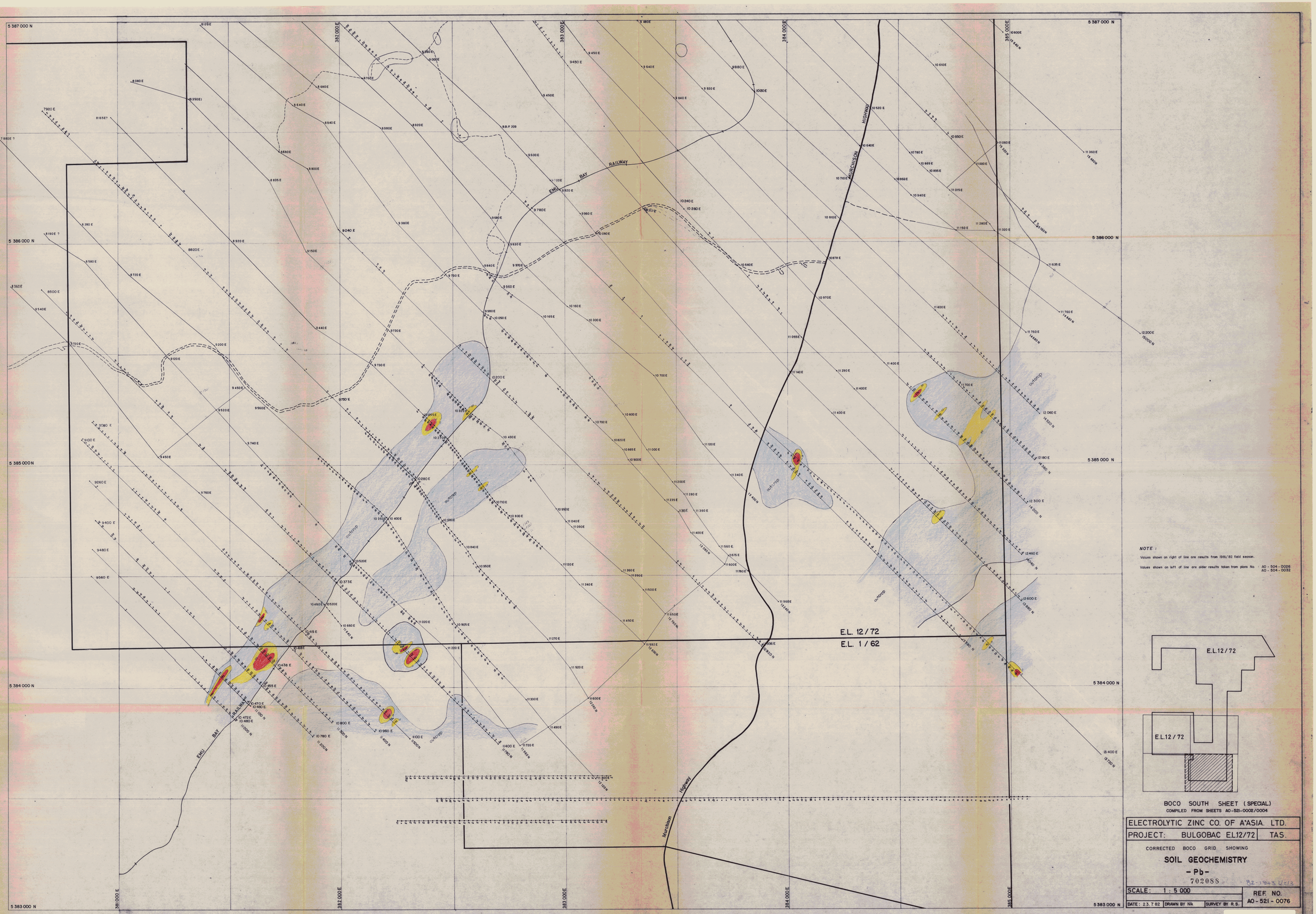
REF. NO. AO - 521 - 0077

DATE : 23. 7. 82 | DRAWN BY Nik | SURVEY BY R.S.

5 cm

1067

382 000E
383 000E
384 000E
385 000E
5 390 000 N
5 389 000 N
5 388 000 N
EMU BAY RAILWAY
MURCHISON HIGHWAY
HIGHWAY
5 390 000N
5 389 000N
5 388 000N
8510 E
8770E
9060E
9220E
9360N
8860 E
8880 E
9000 E
9060 E
9240 E
9400E
9760 E
15 820N
9800E
14 600N
9810E
9835E
9920E
9900 E
10 160E
16 280N
10 320E
15 440N
10 460E
16 180N
10 100E
15 800N
10 230E
10 370E
10 520E
15 960N
9730E
9710E
9748E
9530E
9480 E
9680 E
9600 E
9350E
9120E
9280 E
9080 E
9000E
15 600N
9000 E
9120 E
9280 E
9000E
15 200N
9440 E
9730E
9450E
9480E
9693 E
9800 E
10100 E
10280 E
7980 E
8750E
14 480N
14 320N
8240E
15 320N
9000E
14 480N
14 700N
8400E
8720E
13 880N
8240E
13 240N
7880E
13 720N
8200 E
13 880N
8220 E
13 400N
8320 E
14040N
8840E
9000 E
8945 E
8840E ?
8150 E
9450E
9480E
362 000E
363000E
364 000E
385 000 E
OUTCROP
E.L.12/72
E.L.12/72
BOCO NORTH SHEET
ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.
PROJECT: BULGOBAC E.L.12/72 | TAS.
CORRECTED BOCO GRID SHOWING
SOIL GEOCHEMISTRY
—Zn—
702087
82-1843 V2f3
SCALE: 1: 5 000
REFERENCE:
REF. NO. AO-521-0084
DATE: 23.7.82 | DRAWN: Nik | GEOLOGY: R.S.
5 cm
1068


5 387 000 N
5 386 000 N
5 385 000 N
5 384 000 N
5 383 000 N
382 000 E
383 000 E
384 000 E
385 000 E
RAILWAY
EMU BAY
HIGHWAY
Murchison highway
E.L. 12 / 72
E.L. 1 / 62
E.L.12/72
E.L.12/72
outcrop
NOTE :
Values shown on right of line are results from 1981/82 field season.
Values shown on left of line are older results taken from plans No. AO - 504 - 0026
AO - 504 - 0032
BOCO SOUTH SHEET (SPECIAL)
COMPILED FROM SHEETS AO-521-0002/0004
ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.
PROJECT: BULGOBAC EL12/72 TAS.
CORRECTED BOCO GRID SHOWING
SOIL GEOCHEMISTRY
- Pb -
702088
82-1943 Uc13
SCALE: 1 : 5 000
REF. NO.
AO - 521 - 0076
DATE: 23.7.82
DRAWN BY Nik
SURVEY BY R.S.
5 cm
1069

382 000E

383 000E

384 000E

385 000E

5 390 000 N

5 389 000 N

5 388 000 N

EMU BAY RAILWAY

MURCHISON HIGHWAY

E.L.12/72

E.L.12/72

BOCO NORTH SHEET

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT: BULGOBAC E.L.12/72 TAS.

CORRECTED BOCO GRID SHOWING

SOIL GEOCHEMISTRY

— Pb —

SCALE: 1: 5 000

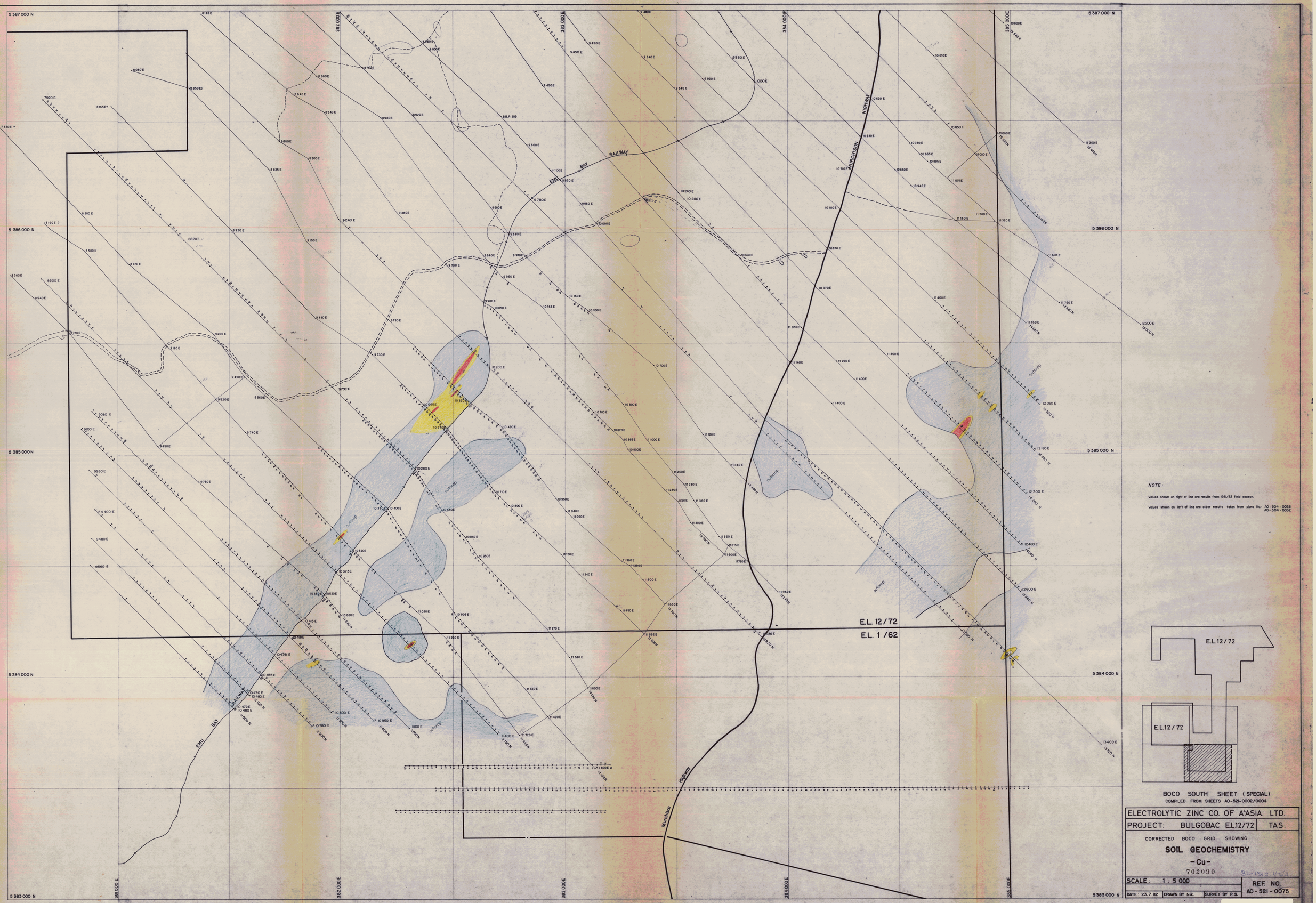
REFERENCE:

DATE: 23.7.82 DRAWN: Nik GEOLOGY: RS

REF. NO. AO-521-0083

5 cm

702089



NOTE :

Values shown on right of line are results from 1981/82 field season.

Values shown on left of line are older results taken from plans No : AO - 504 - 0026
AO - 504 - 0032

BOCO SOUTH SHEET (SPECIAL)
COMPILED FROM SHEETS AO-521-0002/0004

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.	
PROJECT: BULGOBAC EL12/72	TAS.
CORRECTED BOCO GRID SHOWING	
SOIL GEOCHEMISTRY	
-Cu-	
702090	
SCALE: 1 : 5 000	REF. NO. AO - 521 - 0075
DATE : 23.7.82 DRAWN BY N.K. SURVEY BY R.S.	

5 cm

382 000E
383 000E
384 000E
385 000E
5 390 000 N
5 389 000 N
5 388 000 N
EMU BAY RAILWAY
MURCHISON HIGHWAY
E.L.12/72
E.L.12/72
BOCO NORTH SHEET
ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.
PROJECT: BULGOBAC E.L.12/72 TAS.
CORRECTED BOCO GRID SHOWING
SOIL GEOCHEMISTRY
— Cu —
702091
82-1843 W2/3
SCALE: 1: 5 000
REF. NO.
DATE: 23.7.82 DRAWN: NK GEOLOGY: R.S.
AO-521-0082
5 cm
1072

5 387 000 N
5 386 000 N
5 385 000 N
5 384 000 N
5 383 000 N
382 000 E
383 000 E
384 000 E
385 000 E
EMU BAY RAILWAY
HIGHWAY
MURCHISON
Murchison Highway
EMU BAY
outcrop
E.L. 12/72
E.L. 1/62
NOTE :
Values shown on right of line are results from 1981/82 field season.
Values shown on left of line are older results taken from plans No. AO - 504 - 0026 AO - 504 - 0032
E.L.12/72
E.L.12/72
BOCO SOUTH SHEET (SPECIAL)
COMPILED FROM SHEETS AO-521-0002/0004
ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.
PROJECT: BULGOBAC EL12/72 TAS.
CORRECTED BOCO GRID SHOWING
SOIL GEOCHEMISTRY
-Fe-
702092
82-1842 Vol 3
SCALE: 1 : 5 000
REF. NO. AO - 521 - 0078
DATE: 23.7.82 DRAWN BY Nik. SURVEY BY R.S.
5 cm
1073

382 000E

383 000E

384 000E

385 000E

5 390 000 N

5 389 000 N

5 388 000 N

EMU BAY RAILWAY

HIGHWAY

MURCHISON

5 390 000N

5 389 000N

5 388 000N

MURCHISON HIGHWAY

EMU BAY RAILWAY

E.L.12/72

E.L.12/72

BOCO NORTH SHEET

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT: BULGOBAC E.L.12/72 | TAS.

CORRECTED BOCO GRID SHOWING

SOIL GEOCHEMISTRY

—Fe—

702093

82-1843 U2/3

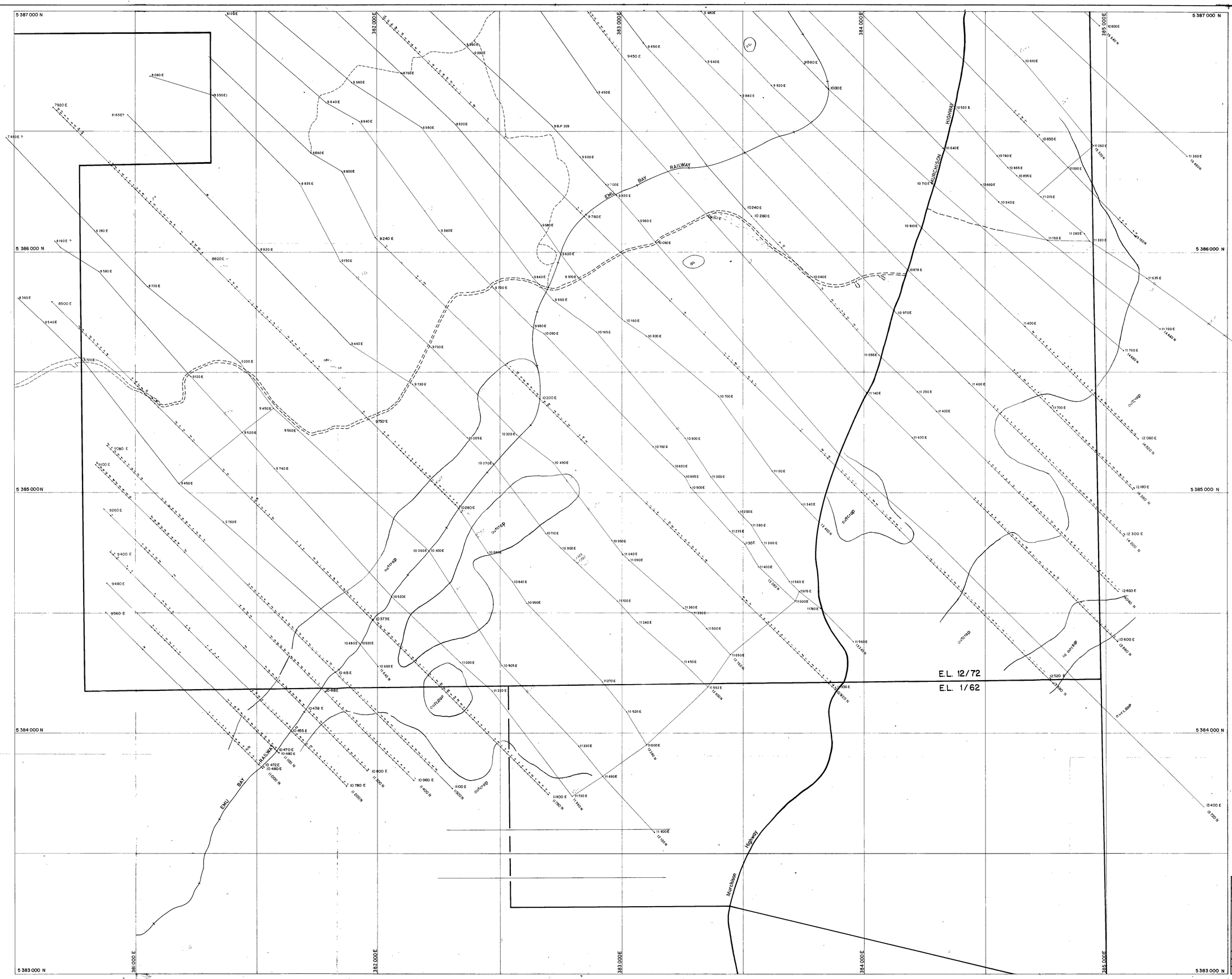
SCALE: 1: 5 000 | REF. NO.

REFERENCE: | AO-521-0085

DATE. 23.7.82 | DRAWN. Nik | GEOLOGY. R.S.

5 cm

1074



BOCO SOUTH SHEET (SPECIAL)
COMPILED FROM SHEETS A0-521-0002/0004

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.	
PROJECT: BULGOBAC EL12/72	TAS.
CORRECTED BOCO GRID SHOWING	
SOIL GEOCHEMISTRY	
— As —	
702094	82-1843 V2/3
SCALE: 1 : 5 000	REF. NO. A0 - 521 - 0080
DATE: 23. 7. 82 / DRAWN BY Nik / SURVEY BY R.S.	

5 cm

1075

382 000E

383 000E

384 000E

385 000E

5 390 000 N

5 389 000 N

5 388 000 N

EMU BAY RAILWAY

HIGHWAY

MURCHISON

5 390 000N

5 389 000N

5 388 000N

9510 E

9060E

8770E

9720E

9360E

8860 E

8880 E

9000E

9060

9240 E

9400E

9760 E
16 920N

9800E
16 600N

9810E

9835E

9920E

9900E

10150E

10150 E
16 280N

10320 E
16 040N

9000 E

9350 E

9600 E

9530 E

9480 E

9660 E

9785E

9730 E

10230 E

10460 E
16 040N

10100 E
15 800N

10370E

10520E
15 560N

9710E

9730E

9693 E

9480 E

9450 E

9440 E

9600 E

10100 E

10280 E

9000E
15 000N

9120 E

9280 E

9000 E
15 320N

9120E

9080 E

8750 E
17 480N

7980 E

8240 E
14 920N

8400 E
14 720N

8720 E

8240 E
13 880N

9000E
14 560N

9020 E

9000 E

9450E

9450 E

9600 E

9150 E

9945 E

8840E
14 040N

8840 E

8200 E
13 720N

8220 E
13 560N

7680E
13 240N

8320 E
13 400N

382 000E

383000E

384 000E

385 000E

E.L.12/72

E.L.12/72

BOCO NORTH SHEET

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT: BULGOBAC E.L.12/72 TAS.

CORRECTED BOCO GRID SHOWING

SOIL GEOCHEMISTRY

— As —

702095

82-1843 U2/3

SCALE: 1: 5 000

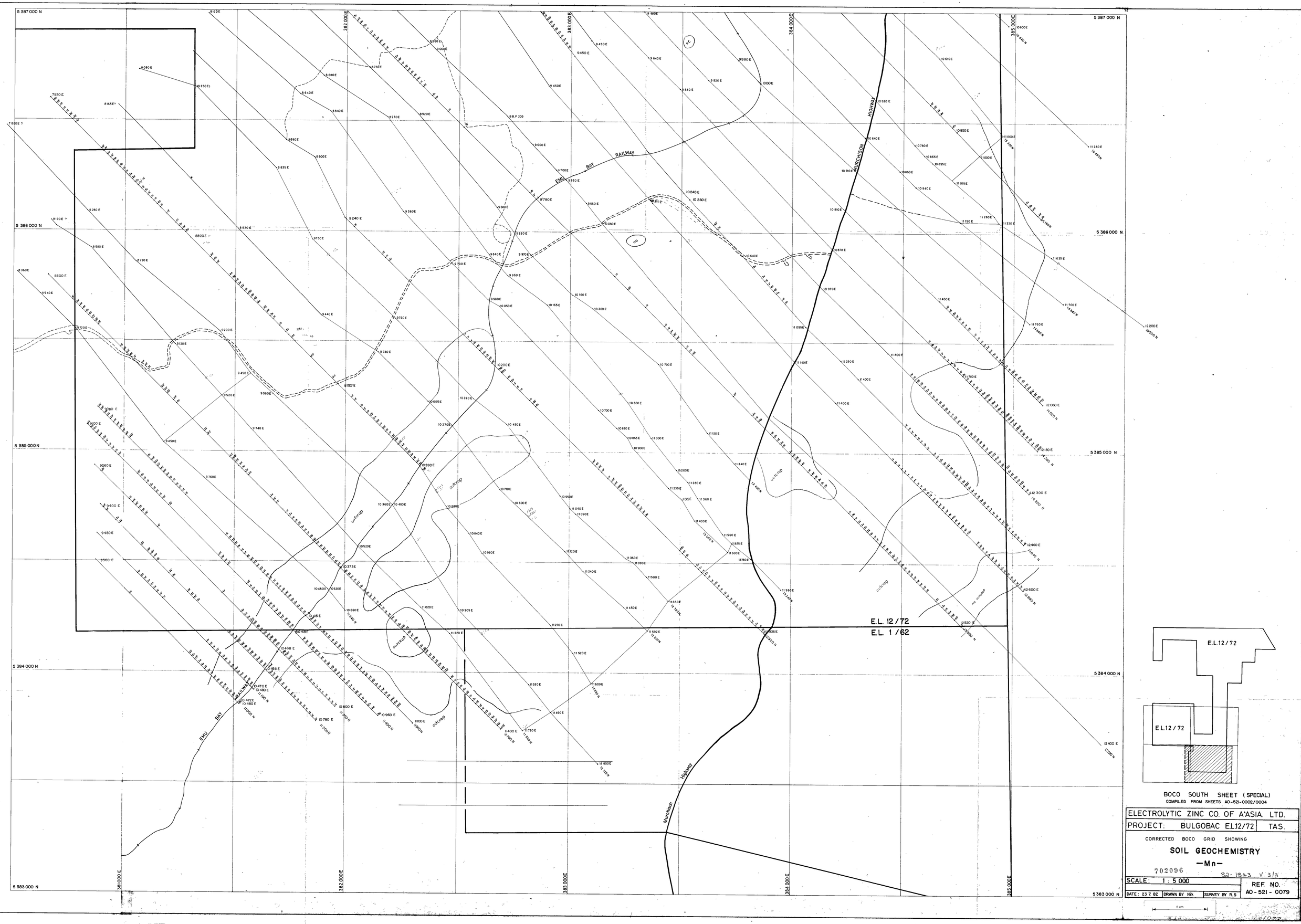
REF. NO. AO-521-0087

REFERENCE:

DATE 23.7.82 DRAWN: Nik. GEOLOGY: R.S.

5 cm

1076



BOCO SOUTH SHEET (SPECIAL)
COMPILED FROM SHEETS AO-521-0002/0004

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.	
PROJECT: BULGOBAC E.L.12/72	TAS.
CORRECTED BOCO GRID SHOWING	
SOIL GEOCHEMISTRY	
—Mn—	
702096 82-1843 V.3/3	
SCALE: 1 : 5 000	REF. NO. AO-521-0079
DATE: 23 7 82 DRAWN BY Nik SURVEY BY R.S	

5 cm

382 000E
383 000E
384 000E
385 000E
5 390 000 N
5 389 000 N
5 388 000 N
EMU BAY RAILWAY
MURCHISON HIGHWAY
5 390 000N
5 389 000N
5 388 000N
E.L.12/72
E.L.12/72
BOCO NORTH SHEET

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.	
PROJECT: BULGOBAC E.L.12/72	TAS.
CORRECTED BOCO GRID SHOWING	
SOIL GEOCHEMISTRY	
— Mn —	
702097	82-1843 Vol 3/3
SCALE: 1: 5 000	REF. NO.
REFERENCE:	AO-521-0086
DATE: 23.7.82 DRAWN: NIK	GEOLOGY: R.S.

5 cm

1078

5 387 000 N

5 386 000 N

5 385 000 N

5 384 000 N

5 383 000 N

382 000 E

383 000 E

384 000 E

385 000 E

EMU BAY RAILWAY

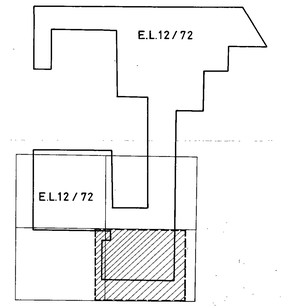
AURCHISON HIGHWAY

E.L. 12/72

E.L. 1/62

Murchison Highway

EMU BAY RAILWAY



BOCO SOUTH SHEET (SPECIAL)
COMPILED FROM SHEETS AO-521-0002/0004

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.	
PROJECT: BULGOBAC EL12/72	TAS.
CORRECTED BOCO GRID. SHOWING	
SOIL GEOCHEMISTRY	
—Sn—	
SCALE: 1 : 5 000	REF. NO. AO-521-0081
DATE: 23.7.82 DRAWN BY Nik SURVEY BY R.S.	

702098

GR-1843 Vol 3/3

5 cm

1079

382 000E
383 000E
384 000E
385 000E
5 390 000 N
5 389 000 N
5 388 000 N
5 390 000N
5 389 000N
5 388 000N
EMU BAY RAILWAY
MURCHISON HIGHWAY
outcrop
8510 E
8770E
9060E
9220E
9360E
8860 E
8880 E
9000 E
9060 E
9240E
9400E
9760 E
15 920N
9800E
15 600N
9000 E
9350E
9810E
9835E
9920E
9900E
10160E
15 960N
10320 E
15 840N
9120E
9280E
9600E
9530E
9480E
9680E
9748E
9730E
9710E
10230 E
10100 E
15 800N
10370E
10460 E
15 680N
10520E
15 560N
9000 E
15 000N
9000 E
15 040N
9120 E
9280 E
9440 E
9450E
9480 E
9593 E
9730E
9600 E
10100 E
10280 E
14 880N
9000 E
14 760N
9000 E
14 640N
9000 E
14 520N
9240E
14 400N
8400 E
14 280N
8720E
14 160N
9000 E
14 040N
8840 E
13 920N
8240 E
13 800N
8220 E
13 680N
8200 E
13 560N
8320 E
13 440N
8580E
7980 E
8750 E
14 880N
9080E
9200E
9020E
9150 E
9450E
9600 E
9450E
9480E
9840E
9945E
E.L.12/72
E.L.12/72
BOCO NORTH SHEET
ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.
PROJECT: BULGOBAC E.L.12/72 TAS.
CORRECTED BOCO GRID SHOWING
SOIL GEOCHEMISTRY
— Sn —
702099
SD-1843 V3/5
SCALE: 1: 5 000
REF. NO.
REFERENCE.
DATE: 23.7.82 DRAWN. Nik GEOLOGY R.S.
AO-521-0088
5 cm
1080

5 387 000 N
5 386 000 N
5 385 000 N
5 384 000 N
5 383 000 N
381 000 E
382 000 E
383 000 E
384 000 E
385 000 E

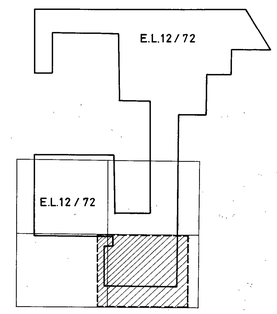
E.L. 12 / 72
E.L. 1 / 62

RAILWAY
EMU BAY
MURCHISON HIGHWAY
Murchison Highway

Legend

1982 IPR-11 60m, n=6, dipole-dipole IP survey (line 14 520 N : 50 m spacing)
Complete coverage (n=1 to n=6)
Incomplete coverage
30 Chargeability anomaly with maximum recorded value shown, (7th Slice of IPR-11 receiver).
24 poorly or incompletely defined anomaly

1978-79 IPR-7 dipole-dipole IP survey, spacing/n as indicated
Complete coverage
Incomplete coverage
20 "definite" chargeability anomaly
15 "possible" chargeability anomaly



BOCO SOUTH SHEET (SPECIAL)
COMPILED FROM SHEETS AO-521-0002/0004

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.
PROJECT: BULGOBAC E.L.12/72 | TAS.

CORRECTED BOCO GRID SHOWING
I.P. COVERAGE AND ANOMALIES

702100

SD-1983 Vol 313

SCALE: 1 : 5 000
REF. NO. AO - 521 - 0089
DATE: 26.7.82 | DRAWN BY Nik | SURVEY: J.Bis., R.S.

5 cm

1051

382 000E

383 000E

384 000E

385 000E

5 390 000 N

5 389 000 N

5 388 000 N

5 390 000N

5 389 000N

5 388 000N

EMU BAY RAILWAY

MURCHISON HIGHWAY

E.L.12/72

E.L.12/72

BOCO NORTH SHEET

Legend

1982 IPR-11 60m, n= 6 dipole - dipole survey

Complete coverage (n = 1 to n = 6)

Incomplete coverage

26 poorly or incompletely defined anomaly.

1978 - 79 IPR-7 50m, n= 6 dipole - dipole survey

Complete coverage (n = 1 - 5 [6])

Incomplete coverage

18 " definite " chargeability anomaly

17 " possible " chargeability anomaly

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT: BULGOBAC E.L.12/72 TAS.

CORRECTED BOCO GRID SHOWING

I.P. COVERAGE AND ANOMALIES

702101 82-1543 V3/3

SCALE: 1: 5 000 REF. NO.

REFERENCE: A0-521-0090

DATE: 26.7.82 DRAWN: Nik SURVEY-JBis, RS

5 cm

1058

E.L. 12/72

E.L. 12/72

E.L. 12/77

LEGEND

REFER TO SHEET 2

1	2
3	4
5	6
7	8

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT: BULGOBAC E.L. 12/72 | TAS

702102 GEOLOGY

COMPILATION OF MAPPING TO JUNE 1982

82-1843 V3/3

SCALE 1:10.000 | REF. NO. A0 - 525 - 0010

REFERENCE:

DATE: 29/1/76 | DRAWN: | SHEET 1

5 cm

1083

NOTE:- No survey control exists for the Silver Falls Extension Grid. The grid has been plotted 60mE of co-ordinate numbers to correlate with the topography.

Rhyolite Lavas

Quartz-Feldspar Porphyry

Crystal Tuffs

Volcaniclastic Sediments with intercalated Tuff bands

Dacite Lavas

Acid Tuffs

E.L. 12/72

SILVER FALLS

5 394 000 mN
5 393 000 mN
5 392 000 mN
5 391 000 mN
5 390 000 mN
5 389 000 mN
5 388 000 mN
5 387 000 mN
5 386 000 mN

376 000 mE
377 000 mE
378 000 mE
379 000 mE
380 000 mE
381 000 mE
382 000 mE
383 000 mE
384 000 mE

28	1	2	
30		4	
32	5	6	
	7	8	
	9	10	
	11		

702103

NB. This plan supersedes a full topo version drawn up 28.1.76, reference number also AO-525-0012, which is now suitably interred in the vault.

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT: BULGOBAC E.L. 12/72 | TAS.

5 cm

GEOLOGY

COMPILATION OF MAPPING TO JUNE 1982

82-1845 V3/3

SCALE: 1:10,000	Survey: J.M.	Revised: 26.8.82
Reference:	Date: 14.5.80	REF. NO.
Drawn: R.P.T.	Checked:	AO-525-0012

1084

E.Z. PLAN CABINET TRIM LINE

5 402 000mN

5 401 000 mN

5 400 000 mN

5 399 000 mN

5 398 000 mN

5 397 000 mN

5 396 000 mN

5 395 000 mN

5 394 000mN

E.L. 12/72

E.L. 12/72

ROSEBERY RIVER

COLEBROOK RIVER

BASE CK.

MAIN CK.

RUDDS CK.

BLDG CK.

FISHER CK.

GRAVEL CK.

ROBIN CK.

ROBERTSON CK.

378 000 mE

379 000 mE

380 000 mE

381 000 mE

382 000 mE

383 000 mE

384 000 mE

385 000 mE

386 000 mE

LEGEND

Sampled by E.Z. 1979 - 81

Sampled by Comalco 1970 - 72.

Sampled by Comalco.

12400 — Planned concentrate sample NT Cmlc Report

Pb	Zn	Cu	
			50 - 99 ppm
			100 - 199 ppm
			> 199 ppm

		2	
	3	4	
	5	6	
28	7	8	
30	9	10	
32	11		

5 cm

ELECTROLYTIC ZINC CO. OF A'SIA. LTD.

PROJECT: ROSEBERY AREA | TAS

702104

SAMPLE LOCATION

SCALE: 1:10 000	Survey: A.M.	Revised: 24.8.82
Reference:	Date: January 1981	REF. NO. AO-525-0177
Drawn: T.B.D.S.	Checked:	

82-1843 Vol 2

1085

NOTES

1. E.Z.'s SILVER FALLS EXTENSION GRID
No survey control exists for this grid. The grid has been plotted 60m to the east to tie in with the drainage pattern.

2. ABERFOYLE'S SILVER FALLS GRID
No survey control exists for this grid. A tape and compass survey has been run to determine the relative position of this grid and E.Z.'s Silver Falls Extension Grid.

3. NORTH PINNACLES GRID
Positions of all grid lines on the North Pinnacles track have been determined by E.D.M. and theodolite traverse.

4. ROCO GRID
Grid line positions have been plotted from 1:50,000 scale aerial photographs which postdate the grid.

LEGEND

Sampled by E.Z. 1979-1982

Sampled by Comstaff 1970-72.

Sampled by Cominco.

12400 Planned concentrate Sample No 81/2/16 CMS Report

Silver Falls Extension Grid

Aberfoyles Silver Falls Grid

North Pinnacles Grid

E.L. 12/72

5 394 000 mN
5 393 000 mN
5 392 000 mN
5 391 000 mN
5 390 000 mN
5 389 000 mN
5 388 000 mN
5 387 000 mN
5 386 000 mN

376 000 mE
377 000 mE
378 000 mE
379 000 mE
380 000 mE
381 000 mE
382 000 mE
383 000 mE
384 000 mE
385 000 mE

1	2
3	4
5	6
28	7	8
30	9	10
32	11

5 cm

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT:

702105

SAMPLE LOCATION

87-1843.U3/3

SCALE 1:10,000	Survey: E.M.	Revised: 28.8.1982
Reference:	Date: January 1981	REF. NO. A0-525-0181
Drawn T.A.D.S.	Checked:	

1086

E Z PLAN CABINET TRIM LIME

NOTES:

1. E.Z. samples were sieved to -80 # and analysed (AAS) for Pb, Zn, Cu, Co, Mn, Fe, Ag after perchloric/nitric digestion by ACB Laboratories - Adelaide. Sn (AAS) was later analysed by Analabs - Perth.
2. Comstaff analytical method unknown.

LEGEND

Sampled by E.Z. 1979-82.

Sampled by Comstaff 1972-73.

Sampled by Cominco.

Values plotted thus:

Pb, Zn, Cu
Co, Mn, Fe
Ag, Sn, W
As.

— Indicates element not analysed

X Indicates element below limit of detection

Panned concentrate sample results

Anomalous
Anomalous
Anomalous

Pb	Zn	Cu	
			75 - 99 ppm
			100 - 199 ppm
			> 199 ppm

	2	
3	4	
5	6	
28	7	8
30	9	10
32	11	

5 cm

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT: ROSEBERY AREA | TAS

702106

STREAM GEOCHEMISTRY

SCALE: 1:10,000	Survey: A.M.	Revised: 28 FEB 82
Reference:	Date: January 1981	REF. NO. AO-525-0178
Drawn: T.B.D.S.	Checked:	

E.Z. PLAN CABINET TRIM LINE

E.L. 12/72

COLDSTREAM RIVER

BEARD CK.

MAIN CK.

BLOCK CK.

TRIBUTARY CK.

TRIBUTARY CK.

TRIBUTARY CK.

TRIBUTARY CK.

HORBUTT CK.

5 402 000mN

5 401 000 mN

5 400 000 mN

5 399 000 mN

5 398 000mN

5 397 000 mN

5 396 000 mN

5 395 000 mN

5 394 000 mN

375 000 mE

376 000 mE

377 000 mE

378 000 mE

379 000 mE

380 000 mE

381 000 mE

382 000 mE

383 000 mE

384 000 mE

385 000 mE

SILVER FALLS
EXTENSION GRID

NORTH PINNACLES
GRID

E.L. 12/72

5 394 000 mN
5 393 000 mN
5 392 000 mN
5 391 000 mN
5 390 000 mN
5 389 000 mN
5 388 000 mN
5 387 000 mN
5 386 000 mN

379 000 mE
380 000 mE
381 000 mE
382 000 mE
383 000 mE
384 000 mE
385 000 mE

Notes:

1. E.Z. samples were sieved to -80 # and analysed (AAS) for Pb, Zn, Cu, Co, Mn, Fe, Ag after perchloric/nitric digestion by ACS Laboratories - Adelaide. Sn (AAS) was later analysed by Analabs - Perth.
2. Comstoff analytical method unknown.
3. Samples collected from the North Pinnacles and Silver Falls Extension Grids were taken where active streams cross grid lines.

LEGEND

Sampled by E.Z. 1979 - 82

Sampled by Comstoff 1970 - 72

Sampled by Cominco.

Values plotted thus:

Pb, Zn, Cu
Co, Mn, Fe
Ag, Sn, W
As

– Indicates element not analysed
X Indicates element below limit of detection.

Planned concentrate sample result.

Anomalous Sn
Anomalous Pb
Anomalous Zn
Anomalous Cu

1	2	
3	4	
5	6	
28	7	8
30	9	10
32	11	

Pb	Zn	Cu	
			50 - 99 ppm
			100 - 199 ppm
			> 199 ppm

5 cm

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT:

702107

STREAM GEOCHEMISTRY

82-1343 (W3)

SCALE: 1:10,000	Survey: A.M.	Revised:
Reference:	Date: January 1981	REF. NO. AO-525-0182
Drawn: T.B.S.	Checked:	

1088

E.Z. PLAN CABINET TRIM LINE