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ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED

West Coast Mines

BULGOBAC EXPLORATION LICENCE E.L. 12/72

Progress Report on Activity

July, 1980 - June, 1981

Geological Department

J.H.A. Mill,

Report No. 137

August, 1981.

799002

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LIST OF PLATES

Reference No.	Scale	Title
PLATE 1.		Geological Legend for Exploration Mapping
A2-521-0060A	1:50,000	Exploration Completed July, 1980 - June, 1981
AO-525-0012	1:10,000	Geology Sheet 3
AO-525-0010	"	Geology Sheet 1
AO-525-0182	"	Stream Sediment Geochemistry Sheet 3 Pb
"	"	Stream Sediment Geochemistry Sheet 3 Zn
"	"	Stream Sediment Geochemistry Sheet 3 Cu
AO-525-0178	"	Stream Sediment Geochemistry Sheet 1 Pb
"	"	Stream Sediment Geochemistry Sheet 1 Zn
"	"	Stream Sediment Geochemistry Sheet 1 Cu
VA-525-0065	1:1,000	Silver Falls, Geology, Geochemistry & Geophysics

REFERENCE 5

WEBSTER S.S. & SKEY E.H. Geophysical & Geochemical Case Study of the Que River Deposit, Tasmania, Australia. Aberfoyle Exploration Limited.

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LIST OF APPENDICES

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1.2.	C.M.S. Report 81/2/35	Panned Concentrates from Hay Creek Area.
1.3.	C.M.S. Report 81/2/10	Thin Section descriptions from Silver Falls & Hay Creek Areas.
1.4.	C.M.S. Report 81/2/42	Thin Section descriptions from Hay Creek Area.

APPENDIX 2. Scintrex Dipole-Dipole & Gradient Array Profiles of line 5,390,300mN.

APPENDIX 3. Stream Sediment Data Sheets.

3.1. Western Area.

3.2. Northern Area (Hay Creek).

APPENDIX 4. Silver Falls Costean Sample Data.

APPENDIX 5. Histograms of Stream Geochemical Data.

APPENDIX 6. A review of the Geophysics over the Boco Grid, E.L. 12/72 by Mitre Geophysics Pty. Ltd, EZ/MG81/02.

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SUMMARY OF EXPLORATION ACTIVITY 30.6.'80 - 30.6.'81

(Refer to 1:50,000 scale plan "Exploration Completed July, 1980 - June, 1981" Reference No. AO-521- 0060)

The following work was completed between July, 1980 and June, 1981 on E.L. 12/72.

Western Area

A track totalling 1.1 km was bulldozed from Silver Falls to line 5,390,300mN* where a costean was dug between 376,910mE and 377,180mE. The costean exposed an acid volcanic intrusive/extrusive complex flanked to the east and west by sediments.

The costean was rock chip sampled, mapped and dipole-dipole and gradient array I.P. surveys were completed over the line between 376,730mE and 377,330mE.

A stream sediment survey, designed to infill gaps in Comstaff's stream sediment coverage was commenced.

Northern Area

A stream sediment survey of the northern area was commenced.

*Note: All grid references are in A.M.G. unless otherwise stated.

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1. INTRODUCTION

E.L. 12/72 of 94 sq.km. was aquired by E.Z. in 1972 when Comstaff Pty. Ltd. relinquished selected areas from their E.L. 5/63. Subsequently E.L. 12/72 was Joint Ventured with Getty Oil Development Co. Ltd., with E.Z. continuing as operators.

The work completed during 1980/81 was designed to:-

1. Follow-up Pb/Zn soil geochemical anomalies in the Silver Falls area.

2. Investigate the potential for base metal and tin mineralisation in the remainder of the area not already covered by grids or surficial cover (Tertiary Basalts and/or Pleistocene glacials).

Previous work on E.L. 12/72 has been reported in E.Z. Geological Departmental Reports No's 128 (1977), 129 (1978), 130 (1979) and 132 (1980).

2. OBJECTIVES

The main targets for exploration on E.L. 12/72 are:

1. Massive volcanogenic Zn/Pb/Cu deposits of the Rosebery - Que River type associated with thin sedimentary lenses within Cambrian Volcanics.

2. More distal Pb/Zn/Cu deposits associated with sediments of the Dundas Trough.

3. Tin deposits associated with calcareous sediments of the Dundas Trough in proximity to acid intrusives.

3. WESTERN AREA - SILVER FALLS COSTEAN

3.1. Work Completed

A track was constructed from Silver Falls north to line 5,390,300mN, a distance of 1.1 km. A series of short costeans were then dug on line 5,390,300mN between 376,910mE and 377,180mE to explore a Pb/Zn soil geochemical anomaly and the contacts between the acid volcanics and the flanking sediments. The costean over the Pb anomaly was channel sampled at 1.0m intervals and 5.0m chip samples were taken of the remaining exposures.

Contractors then completed dipole-dipole and gradient array I.P. surveys over line 5,390,300mN between 376,730mE and 377,330mE.

3.2. Geology (Refer to 1:10,000 Geology Plan Sheet 3 Ref. No. AO-525-0012, Costean Sheet VA-525-0065 and Appendix 1, C.M.S. Report 81/2/10)

The track and costean assisted in further defining the geology of the Silver Falls area. The rocks consist of a band of acid volcanics trending north-south in the Silver Falls area but swinging north-east after crossing 5,390,000mN. The volcanics are flanked to the west by micaceous sandstones, siltstones and grey shales and to the east by well laminated shales, siltstones and tuffaceous sediments.

1. Western Sediments:

Adjacent to the contact on line 5,390,300mN the sediments consist of a massive pale grey quartzite containing conspicuous detrital muscovite mica. The rock is uncleaved and outcrops poorly. The contact of the sandstone with the volcanics is poorly exposed in the costean but the presence of puggy clay along the contact zone suggests a faulted contact. No dips were observed in the costean, however consistant dips (60-70°E) have been observed in this unit in the Que River 3 km north and in the Lynch Creek (60°E) 1 km south of the costean. Strikes vary

from north (at Silver Falls) to N45°E in the Que River. No mineralisation was observed.

2. Central Volcanics:

The Central Volcanics form a narrow band (up to 240m wide) trending north from Silver Falls but changing direction to N45°E after crossing line 5,390,000mN. Another band of similar material has been mapped by Aberfoyle Exploration to the west of E.L. 12/72.

Petrological evidence indicates that the volcanics are a complex group consisting of quartz rich, sericitised albitic rhyolite in the Silver Falls area. The rock is considered to be a minor intrusive. This grades northwards through a transitional ignimbrite into a silicified "rhyolitic tuff" or ignimbrite, exhibiting a weak eutaxitic texture. The intrusives have been mildly stressed and are cut by stressed and partly recrystalised quartz veins which contain disseminated galena. The veins are considered epithermal in character.

Exposed in the costean is a flow brecciated rhyolitic ignimbrite containing frequent crystals of sericitic albite and subordinate quartz and sporadic clasts of lava and crystal tuff in a sericitic, silicified, microfelsitic matrix. No fresh sulphides were observed in the costean although the rock was pervasively stained with manganese and iron oxides.

The mineralisation is discussed below.

3. Eastern Sediments:

The eastern sediments were well exposed in the costean although once again contact relationships were obscure. The lack of an obvious fault may indicate a sedimentary contact. In the vicinity of the contact the unit consists of a coarse volcanoclastic lithicwacke which becomes finer to the east. This suggests a possible east facing in the area of the contact.

A suspected east dip was observed in the costean which is substantiated by known dips to the north and south. This further confirms that the structure to the east of the central volcanics is a relatively simple syncline. No mineralisation was observed.

3.3. Geochemistry (Refer to Sheet VA-521-0065 and Appendix 4)

On the track to the costean fresh outcrop of the rhyolitic intrusive was cut by frequent quartz veins which contained minor galena. Lead values of up to 1.65% were obtained from fresh rock chip samples. The mineralisation style is similar to that observed at Silver Falls and reported previously.

Results of the costean sampling showed a Pb anomaly peaking at 1.08% at 377,092E. Pb concentrations dropped to 10 ppm at the western end of the costean in micaceous sandstone. To the east Pb values remained high with up to 1050 ppm Pb in lithic wackes to the east of the ignimbrite. Zn values roughly reflected the Pb values but were much lower. For example the Zn concentration at 133,092E was 230 ppm (1.08% Pb). Copper values were generally less than 50 ppm with the exception of 950 ppm at 5,390,300N 377,060E. Sn was not detected in samples except some low values, less than 24 ppm, near the western contact. Ag values were low, 1.5 ppm being the best value obtained. While no sulphide mineralisation was observed in the volcanics, it is felt that the soil geochemistry has been adequately explained by the lead mineralisation observed elsewhere in the acid volcanics.

3.4. I.P. Geophysics (Refer to Appendix 2)

A dipole-dipole survey using a dipole spacing of 40m was conducted over line 5,390,300mN between 376,820mE and 377,300mE. A gradient array traverse using 20m electrodes was conducted over the same line between 376,760mE and 377,320mE. The purpose of the survey was to define any significant amounts of mineralisation which might have been missed by the reconnaissance I.P. survey completed during 1979/80 (see E.Z. Report No. 132).

The gradient array shows background chargeability values of about 6 mv/v with 4 zones of up to 12 mv/v above background. The anomalies all occur associated with relatively high resistivities (up to 2300 Ω m) which indicates that if they are due to mineralisation then the source is likely to be very disseminated.

The dipole-dipole survey, in general terms, shows a similar response to the gradient array. The results suggest that the responses are shallow which probably explains why the deeper sensing 100m dipole-dipole survey failed to register any anomalies. The only possible exception at 377,300mE lies outside the geochemical anomaly and outside the volcanics. The anomaly occurs in volcanoclastic sandstones to the east of the acid volcanics which host the Pb mineralisation.

3.5. Mineralisation

The only mineralisation observed in the area was the pretectonic epithermal quatrz/galena veins associated with the intrusive phase of the acid volcanics. While galena was the only sulphide observed, minor amounts of sphalerite, chalcopyrite and pyrite could be inferred from the soil geochemistry. Similar mineralogy was observed in the Burns' Peak Rhyolite in DDH's NPP 213, 214 and 215. The pervasive manganese and limonite staining observed in the costean over the rhyolitic ignimbrite indicates that a similar mineralisation style is a probable explanation for the soil geochemical anomaly on line 5,390,300mN. No massive sulphide mineralisation was observed.

3.6. Conclusions

The style and nature of the mineralisation observed on the track and in the costean appear to adequately explain the soil geochemical anomalies over the volcanics at Silver Falls. The I.P. indicates that the sources are weak, narrow and do not continue to depth. The nature of the volcanics (inferred to be subaerial - Fander 81/2/10) indicates that massive Pb/Zn deposits of the Rosebery type

are unlikely in this area. The overall grade of the known mineralisation is insufficient to warrent further follow-up by E.Z. and Getty unless a model, by which the mineralisation could be concentrated at depth, could be designed.

4. WESTERN AREA - REGIONAL EXPLORATION

4.1. Work Completed

In 7.2 km of creek mapping and sampling 42 stream sediment samples 9 rock samples and 5 heavy mineral panned concentrates were collected. The -80 mesh portion of the stream sediment samples was analysed for Pb, Zn, Cu, Fe, Mn, Co and Ag by A.A.S. after perchloric/nitric leach and for Sn by XRF.

4.2. Geology

Mapping of the creek on the western flank of the Burns Peak Rhyloite (Dream Creek) confirmed the rock consists of interbedded grey and green sandstone, siltstone and laminated shale. The sediments are feldspathic and are locally tuffaceous. They are cleaved in places and occassionally silicified.

Mapping of creeks north of the Burns' Peak Rhyolite (Fly and Tick Creeks) revealed rocks consisting of laminated grey shales, siltstones and minor sandstones. A weathered intrusive? quartz feldspar porphyry occurs between 5,389,570N 380,260E and 5,389,360N 380,300E. The porphyry is of similar type to others mapped further east and is probably a small dyke attached to the main body at depth. No anomalous stream geochemical values are associated with the creek which disects both the porphyry and the surrounding sediments.

4.3. Geochemistry (Refer to Stream Geochemistry Sheet 3 AO-525-0182 for Pb, Zn & Cu and Appendices 3.1 and 5)

No significant anomalies were returned from the geochemical analysis. Highest values were 70 ppm Cu, 150 ppm Pb and 55 ppm Zn from three different and dispersed samples. No sample was high in more than one element. All tin values were below the limit of detection.

Source? glacial?

Five panned concentrate samples were collected and examined (Refer to Appendix 1.1 - C.M.S. Report 81/2/16). Cassiterite was positively identified in trace amounts in one sample and trace amounts of possible cassiterite were identified in one other.

Histogrammes have been prepared for Pb, Zn and Cu using 1979/80 and 1980/81 results. The histogrammes are appended to this report (Appendix 5). Data has been divided into two separate histogrammes vis North Pinnacles and Silver Falls. In calculating threshold and anomalous values both sets of data have been used.

Element	Mean	Std Deviation	Threshold	Anomalous
Pb	47	25	75	100
Zn	51	51	100	150
Cu	7	9	20	30

Population: 181 samples

Low threshold and anomalous levels probably indicate that very little mineralisation is present in the area sampled. The data is presented on Stream Sediment Sample Plan, AO-525-0182 for Pb, Zn and Cu. Threshold anomalous values of 100 ppm and 200 ppm respectively have been used of Pb, Zn and Cu, were obtained last year.

For comparison Webster & Skey (1979) state that the local background around the Que River Mine was 20 - 80 ppm Pb, 50 - 100 ppm Zn and 15 - 20 ppm Cu. Values of up to 300 ppm Pb, 340 ppm Zn and 45 ppm Cu were clustered around the deposit.

The most significant values are two Pb values (120 ppm and 150 ppm) obtained from a creek draining west along line 5,387,000mN. The anomalies occur over sedimentary rocks flanking the Burns' Peak Rhyolite. Further elevated background results were obtained from the rhyolite itself. The anomalies have not been explained but could be caused by:-

1. Concentration downstream of lead weathering from the rhyolites.
2. Minor vein type mineralisation within the sediments.

It appears unlikely that strataform volcanogenic mineralisation would cause these results because the values appear too low, scattered and non-coincident.

No anomalous stream geochemical values were obtained from Tick Creek or Fly Creek.

4.4. Conclusions

Apart from scattered raised Pb, Zn and Cu values in Dream Creek west of the Burns Creek Rhyolite, no anomalous results were obtained. Tin values were invariably low. In addition, no significant alteration was observed in any of the rocks traversed apart from minor silicification in some sediments in Dream Creek.

It is likely that the raised samples referred to above are caused by minor local concentrations of mineralisation. The nature and mode of concentration is unknown, however comparison of results with those obtained from the Que River area indicate that massive Pb/Zn volcanogenic mineralisation is unlikely to be the cause.

It is also apparent from the low tin values obtained that the area sampled is not stanniferous.

5. NORTHERN AREA - REGIONAL EXPLORATION

5.1. Work Completed.

Work on the stream sampling/mapping programme commenced on 30th December, 1981. The programme was not as large as initially envisaged because of the acquisition of Comstaff's comprehensive stream sediment sampling data. Because of staff reallocations the work was not completed during the period to June, 1981.

In 16.7 km of stream sampling and mapping, 119 stream samples and 46 rock samples were collected from around the Hay Creek area in the extreme northwest of E.L. 12/72. In addition two panned concentrate samples were collected.

5.2. Geology (Refer to Geology Sheet 1 - A0-525-0010)

Mapping in the Hay Creek area revealed two different lithological sequences.

On the western edge of the exploration licence lies a group of slightly contorted sericitised and silicified volcanomictic lithic sandstones, siltstones and shales with minor sericitised pelitic ash near its contact with the eastern sequence. Bedding generally strikes between 340° and 040° with steep dips to both east and west. Alteration increases close to the eastern contact, cleavage is more pronounced and bedding is more contorted. This suggests a faulted contact.

East of this unit mapping has shown an interbedded sequence of uncleaved siltstone and conglomerate. The unit is made up of two conglomerate lenses separated by laminated siltstone and is conspicuous because of their reddish haematitic colour in outcrop. A thin limestone conglomerate with distinct alternating 2cm wide shaley limestone and limestone breccia bands outcrops in the upper Hay Creek at the base of the sequence.

The conglomerate further up the sequence is composed of rounded microcrystalline limestone, chert and mafic volcanics. No alteration or cleavage is visible. The rocks strike north-north-east to north-east with a consistant east dip between 30° and 60°.

Both the altered western sequence and the haematitic eastern sequence disappear beneath Tertiary Basalt on the northern edge of E.L. 12/72.

5.3. Geochemistry (Refer to Stream Sediment Geochemistry Sheet 1 AO-525-0178, Appendices 1.2, 1.3, 1.4, 3.2 and 5)

A total of 119 bulk stream sediment samples were collected and analysed in the same way as samples from the Western Area. The highest assay for Cu was 100 ppm and the highest assays for Pb and Zn were 260 ppm and 190 ppm respectively. All Sn analyses were below the level of detection (10 ppm). The highest Ag analysis was 5 ppm (2 samples) with another 5 samples at 2 ppm and the remainder being below 2 ppm.

The best result of 260 ppm Pb was associated with 170 ppm Zn and 20 ppm Cu. The result occurred in 'Bilbo Creek', where further elevated Pb (100 ppm) and Zn (100 ppm) values occur 200m upstream. The results occur over red haematitic conglomerate with no noticible alteration.

In the 'Ronks Creek' area elevated Cu results (up to 100 ppm) perhaps indicate proximity to Tertiary Basalts. Pb and Zn were not elevated in this vicinity.

A similar area of elevated Cu results (upto 100 ppm) occurs in the 'Tolkein Creek' area. No basalt has been mapped and the values apparently come from interbedded conglomerate sandstone and siltstone. Other values were isolated and scattered.

Two heavy mineral concentrates (Appendix 1.2) were collected from Hay and Coldstream Creeks at their junction on the western boundary of the E.L.. The sample from Hay Creek contained only a doubtful trace of cassiterite.

5.4. Conclusions

Sampling of the Northern Area is incomplete at present but results to date indicate that creeks sampled are not stanniferous. No significant alteration was located in the eastern rock unit. The more altered and contorted Western unit remains essentially unsampled and unmapped. This unit is more prospective because it contains thin discontinuous limestone breccia bands along the Hay Creek. It is also closer to the Meredith Granite.

6. BOCO AREA

6.1. Work Completed

A report was prepared by Dr. J.R. Bishop of Mitre Geophysics assessing all previous geophysics carried out over the Boco Grid.

6.2. Geophysics (Refer to Appendix 6 'A review of the Geophysics over the Boco Grid, E.L. 12/72')

The most significant points to come out of the Report are:-

1. Poorly controlled line cutting has resulted in erratic interline spacing. The resulting variable density information means that some anomalies are isolated, one line features with no adjacent responses.
2. The gradient array I.P. which formed the basic ground geophysical technique appears to have been more susceptible to responses associated with the glacial moraine cover - bedrock interface than to responses from the bedrock. It is believed that most of the "anomalies" reported from the gradient array survey are not bedrock responses.
3. The dipole-dipole surveys carried out after the drilling of the diamond drill holes suggests that the holes may not have tested the anomalies.

4. The drill holes were sited on one line anomalies rather than anomalous zones which increases the probability of the 'anomaly' being spurious.

6.3 Geology

As part of an alteration study of the Mt. Read Volcanics, sponsored by Getty Oil Development Co. Ltd., Mt. Lyell and E.Z. the Boco area was examined by Dr. C. Eastoe. His findings are detailed in a report entitled "Report on Field Mapping Related to Alteration in the Mt. Read Volcanic Arc".

The following is an extract from the report:-
"Sampling of volcanic rocks in this area is hampered by poor outcrop and a general predominance of sediments including reworked tuffs.

North of Boco Siding (at 5,387,700N 382,400E) the sediments comprise grey and white, laminated sandstones and shales. A small body of pink, massive (?) ashflow tuff is apparently interbedded with the sediments. Extensive outcrops of a massive, pink to brown quartz-feldspar porphyry occur on the track north-west of Sawmill Creek (5,390,300N 381,700E and environs). This has been interpreted as an intrusion by E.Z. Co. geologists. It's texture could be consistent with an intrusive origin, but no corroborative contact relationships have been observed.

Between Animal Creek and Mt. Charter, only sediments (some of pyroclastic derivation) are exposed along the Murchison Highway. A north-west facing, based on truncated cross-bedding, was found in the cutting just north of Animal Creek.

With the permission of Aberfoyle Exploration (on whose exploration lease it lies), the Mt. Charter barite was examined. Evidence regarding the origin of the barite is as follows:-

(i) Much of the barite is coarsely crystalline, similar to vein barite elsewhere in the Mt. Read Volcanics.

(ii) Abundant pyrite is present with the barite, and in one specimen the barite (of sugary texture in this case) and pyrite are vaguely banded. Sphalerite and galena are also present locally. These sulphides, and especially pyrite are not commonly remobilised into barite veins elsewhere. The banding may be a sedimentary texture.

(iii) Sharply-bounded clasts of pyritic shale occur within a layer of (?)volcanic rock of different weathering characteristics within the barite mineralisation. Another rock-type nearby consists of grey chert-like clasts in a pyritic matrix. Both of these suggest syngenetic pyrite mineralisation.

A syngenetic origin for the barite cannot be ruled out, even though much of it is coarsely crystalline presumably recrystallised in situ or remobilised.

Preliminary petrographic work on samples from the HEC Pieman Road section indicated a zone of distinctive alteration between Farm Creek and a point about 1 km east of Boco Creek (Fig. 1). Calcium-bearing minerals (calcite and epidote) replace plagioclase on either side of this interval. A comparison with the mineralogy of the volcanics in the Rosebery area suggests that this difference in alteration style might represent hangingwall to footwall transitions (with respect to repetitions of a massive sulphide host horizon), although much more subtly expressed than near Rosebery.

The regional strike is north-east. A north-eastward continuation of the distinctive interval in the Pieman Road coincides with the line of mineralisation defined by Que River (Pb, Zn, Cu; syngenetic), Mt. Charter (Ba; possibly syngenetic) and Mt. Block (Ba; unknown origin). The line crosses the Murchison Highway between the Pieman Road and Burns Peak Track intersections. This section of the high-

way was sampled in order to see whether the zone of distinctive alteration could be located.

In and around three of the four sample sites, the volcanics are massive, hard rocks of relatively fresh appearance. Coarse fragmental varieties are prominent. Only in the cuttings north of Farm Creek (5,382,900N 383,500E) do the rocks appear more altered. This may be the zone sought, but confirmation awaits the preparation of thin sections."

7. GENERAL

In hand with the alteration study mentioned above, a compilation project at 1:50,000 scale has been continued through the year.

Work has included:-

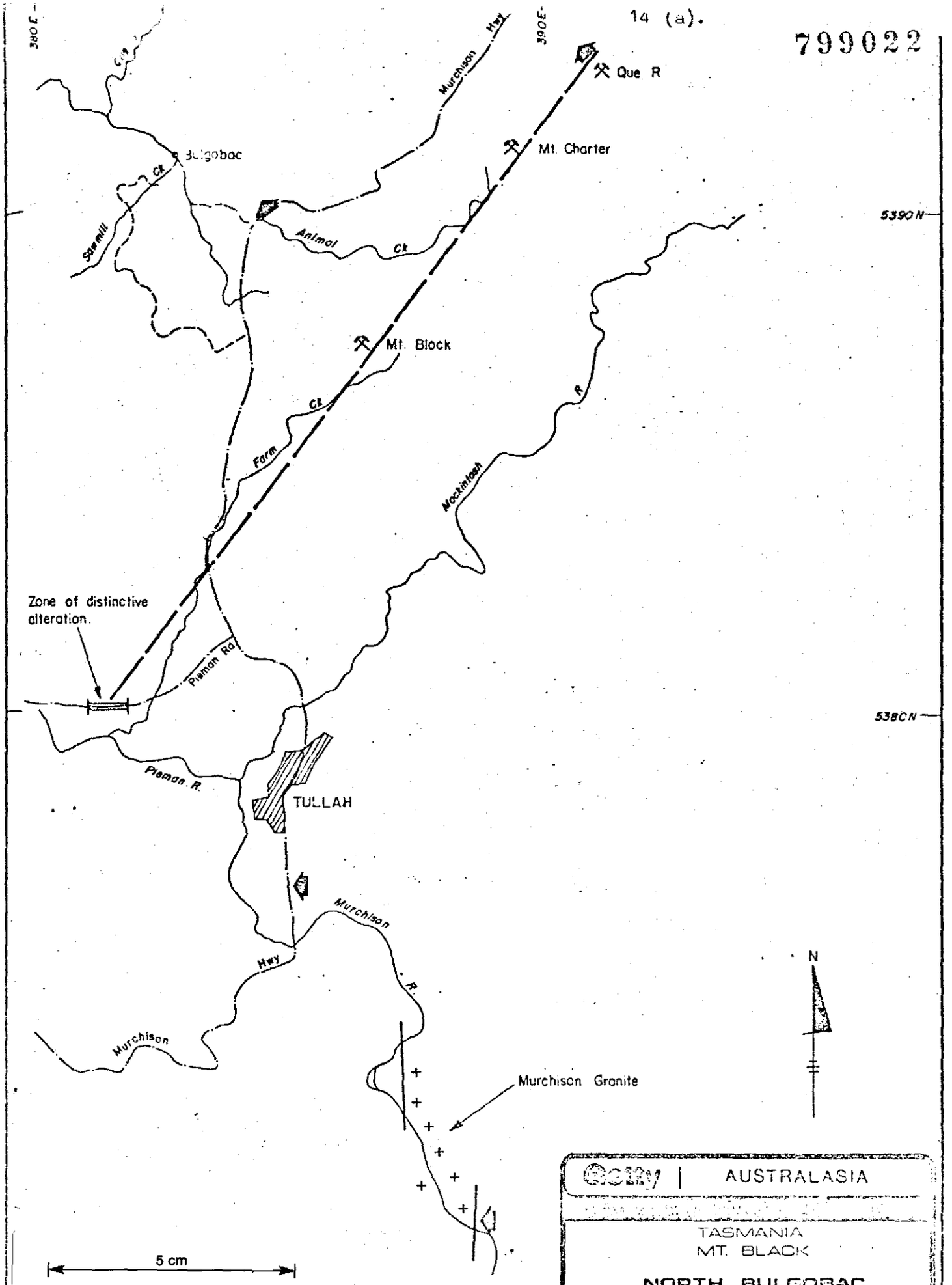
1. A study of Landsat linear feature and their relationship to magnetics and mineral occurrences has been completed.
2. Photo linear features have been compiled at 1:10,000 scale.
3. Geochemical and geophysical compilations at 1:50,000 have been initiated.
4. A compilation of geology at 1:50,000 scale has also been started.
5. Work on plotting Mineral Occurrences, diamond drill holes and previous stream sediment sampling has also been completed.

8. RECOMMENDATIONS FOR FURTHER WORK

Western Area

The stream sediment sampling programme should be completed. Results of E.Z's programme together with Comstaff's programme should be assessed together once all results have been received. Only those creeks not already covered by Comstaff mapping, formal gridding or surficial cover should be sampled.

799022



AUSTRALASIA

TASMANIA
MT. BLACK

NORTH BULGOBAC
PIEMAN RD &
MURCHISON GORGE

Author
Drawn
Revision

FIGURE No 1

FILE No 4400/27

Nothern Area

Stream sampling and mapping of the Northern Area should be completed in the same fashion as the Western Area.

Boco Area

A gridding programme designed to infill unexplored areas in the Boco region should be completed. A total of 33.4km of line cutting and recutting is required to complete this work. Lines should be geologically mapped and surveyed with magnetics and dipole-dipole I.P..

Those portions of lines not covered with glacials should be soil sampled.

Three dipole-dipole I.P. traverses should be placed across the volcanics in an attempt to locate the alteration horizon postulated to exist by Dr. C. Eastoe.

JHAM/amd
October, 1981

APPENDIX 1.

C.M.S. Reports	81/2/10	T.S. Silver Falls & Hay Creek.
	81/2/16	Panned Concentrates Silver Falls
	81/2/35	" " Hay Creek
	81/2/42	T.S. Hay Creek
	81/6/29	

799025

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MGR | P.MGR | MINE SUPT
ACCTS | 16 MAR 1981 | SUPT
FOL

The Manager
Attn. Geology Department
Electrolytic Zinc Co. of
Australasia Ltd.
West Coast Mines
P.O. Box 21
ROSEBERY / TAS. 7470

12th March, 1981

REPORT CMS 81/2/16

YOUR REFERENCE:	Order No. 900248
DATE RECEIVED:	11th February, 1981
SAMPLE NOS.:	40116, 40119, 40124, 40125, 41519
SUBMITTED BY:	A. Mollison
WORK REQUESTED:	Mineralogy

H.W. Fander, M. Sc.

REPORT CMS 81/2/16

Mineralogy of Panned Concentrates

Five samples of panned concentrates were received for mineralogical examination; sample numbers were 40116, 40119, 40124, 40125 and 41519. After drying, each sample was examined (as received) under the stereo-binocular and polarizing microscopes. The results are given semi-quantitatively in the attached table.

Comments

Four of the five samples are mineralogically very similar, consisting almost entirely of chromite, quartz and zircon, with trace amounts of various other minerals as listed. The fifth sample (41519) is different in both major and trace minerals, particularly in the paucity of chromite and abundance of ilmenite.

Cassiterite was positively identified in 40119, and may be present in 40125. No gold was seen, but could occur in economically significant amounts without being mineralogically detectable.

H.W. Fander, M. Sc.

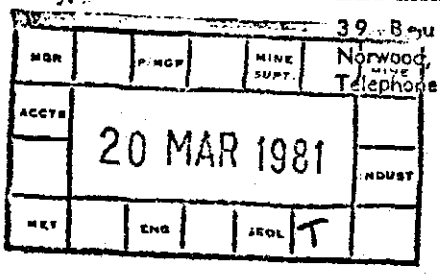
SAMPLE DETAILS	OPAQUES		NON-OPAQUES					COMMENTS
	Chromite	Others	Zircon	Cassiterite	Quartz	Tourmaline	Other Silicates	
40116 Ag. Falls Ck above costean track.	M	Ilmenite m Leucoxene m	m	--	M	trace	--	Zircon mostly euhedral; chromite subhedral to subrounded.
40119 Dream Ck where it crosses Ag. Falls tk.	M	Leucoxene m	m	trace	M	--	--	?Azurite, rutile, anatase - isolated grains. Cassiterite as abraded fragments up to 0.6 mm.
40124 Fly Ck where it crosses northern Ag Falls tk.	M	Ilmenite m Leucoxene m	m	--	M	trace	Garnet - trace	Traces rutile, anatase, monazite, green spinel
40125 Tick Ck where it crosses northern Ag Falls tk	M	Ilmenite m Leucoxene m	m	trace ?	M	trace	Garnet - trace Augite - trace	Traces of rutile, anatase, epidote. Possible isolated cassiterite grains.
41519 Dream Ck where it crosses old cow staff tk.	trace	Ilmenite M Leucoxene m	a	--	M	--	Augite - a Epidote - trace	Traces of rutile, anatase. Differs from the other concentrates.

12007

799028

Central Mineralogical Services

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The Manager
Attn. Geology Department
Electrolytic Zinc Co. of
Australasia Ltd.
West Coast Mines
P.O. Box 21
ROSEBERY / TAS. 7470

18th March, 1981

REPORT CMS 81/2/35

YOUR REFERENCE:	Order No. 900282
DATE RECEIVED:	23rd February, 1981
SAMPLE NOS.:	40166, 40167
SUBMITTED BY:	A. Mollison
WORK REQUESTED:	Mineralogy

H.W. Fander, M. Sc.

799029

CENTRAL MINERALOGICAL SERVICES

Date 18th March, 1981

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
40166, 40167
Heavy Mineral Concentrates

Job No. CMS 81/2/35 Date Received: 23.2.1981

Reference Order No. 900282

Sample No. 40166, 40167

Nature of Sample: Panned Concentrates

DESCRIPTION **SECTION No.**

a. Hand Specimen:

b. Microscopic:

Representative fractions of both samples were mounted in oil on a slide and examined in oblique incident light and transmitted light, to determine opaque and non-opaque phases; the following minerals were identified:

Mineral	40166 (Hwy Cabin, 30 m above coldstream)	40167 (coldstream, 30 m above Hwy CA.)
Opaques	Dominant (> 60 %)	Dominant
Quartz	Minor (10-30 % range)	Minor
Rutile	Accessory (1-10 % range)	Trace (< 1 %)
Zircon	Trace	Accessory
Cassiterite	Doubtful trace	---
Others	Garnet - trace	Green Spinel - trace
	Tourmaline - trace	Tourmaline - trace
	Pyroxene - trace	Pyroxene - accessory
		Monazite - accessory

"Opaques" in both samples comprise chromite (euhedral and rounded), ilmenite, hematite, leucoxene. No gold was seen, but could be below the limit of mineralogical detection in significant amounts; an assay check is recommended.

H.W. Fender, M. Sc.

799030

Central Mineralogical Services

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MGR | M/MGR | MINE SUPT. | MINE ENGR
ACCTS | 26 MAR 1981 | ADMIN
WKS | ENG | GEOL | 1

The Manager
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Electrolytic Zinc Co. of
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West Coast Mines
P.O. Box 21
ROSEBERY / TAS. 7470

24th March, 1981

REPORT CMS 81/2/10

YOUR REFERENCE:	Order No. 900245
DATE RECEIVED:	6th February, 1981
SAMPLE NOS.:	13 Samples
SUBMITTED BY:	A. Mollison
WORK REQUESTED:	Petrology

H.W. Fander, M. Sc.

REPORT CMS 81/2/10

Notes:

Brief petrological descriptions were prepared in tabulated form and these incorporate data from petrological and stereobinocular microscopic examination of representative thin-sections and offcuts, together with auxiliary data from K-feldspar and carbonate staining tests.

Specimens 40044, 58, 59, 40101, 07 and 09 comprise a suite of sodic rhyolites, typically tuffs of subaerial character, but including subordinate mildly brecciated minor intrusives. These rocks reflect a pervasive and consistent silicification/sericitisation alteration pattern with minor base metal mineralisation associated with quartz veinlets and predating a weak stress phase. Characteristic of this group is the presence of traces of carbonaceous matter. This phenomenon is not uncommon in the Mt. Read Volcanics and related Palaeozoic lithologies of N.W. Tasmania, where it appears to reflect migration of material from pelitic intraclasts and intercalations.

The remaining rocks comprise a diverse suite of weakly volcanomict psammites (40143, 44, 47) with subordinate acid tuffs (40110, 40142), limestone breccia (40129) and a single, presumed Tertiary olivine microgabbro (40136). It should be noted that of the fourteen listed samples 40111 wasnot received.

D. Cowan, B. Sc.

A

Central Mineralogical Services

Sample No.	Classification - Composition	Fabric	Accessories	Comments
40055 (T.S. 35856)	"Rhyolitic" Tuff. Abundant silicified/sericitised microfelsitic lithic clasts, sparse quartz, albite crystals/fragments, sparse sericite-stained microcrystalline quartz matrix.	Closely packed, partly moulded clasts (to 1 cm) with vague relict eutaxitic microtextures.	Traces carbonaceous matter, degraded ?chlorite, secondary albite.	Flow- or autobrecciated ignimbritic characteristics. Carbonaceous matter probably derived from shaly xenoliths but poorly defined.
40058	"Rhyolitic" Tuff. Silicified/sericitised microfelsitic lithic clasts, sparse albite, subordinate quartz crystals/fragments. Sparse, vague sericite-quartz matrix. Minor quartz veinlets.	Closely analogous to 40055, but relatively coarser clasts.	Traces carbonaceous matter, degraded chlorite. Minor leucoxenic semi-opaques.	Autobrecciated ignimbritic vitric crystal tuff with very close affinities to 40055.
40059	Rhyolitic Tuff. Disseminated quartz, weakly sericitised albite crystal fragments in weakly sericite-stained microfelsitic (devitrified) quartzofeldspathic matrix. Frequent quartz veinlets.	Crystals mean 150 μ. Faintly, but pervasively relict shardy matrix.	Traces degraded chlorite. Minor traces late Mn-oxide, limonite.	Fine-grained vitric-crystal tuff with homogeneous fabric. Flow-brecciation would have resulted in 40055, 58-like facies.
40101	Porphyritic Rhyolite. Frequent quartz, weakly sericitised albite phenocrysts in sericitic/silicified microfelsitic groundmass. Minor quartz veinlets.	Porphyry-like with semi-pervasive in-situ brecciation and mild late stress effects.	Sparse leucoxenised opaques, apatite. Traces K-spar. Rare carbonaceous stylolites.	Sodic rhyolitic (affinities with 40055, 58, 59 and similarly altered). Fabric consistent with autobrecciated minor intrusive ("intrusive breccia").
40103	Porphyritic Rhyolite. Frequent quartz, weakly sericitised albite phenocrysts/fragments in sericitic/silicified/partly albitised microfelsitic groundmass. Minor quartz veinlets (+ galena).	Closely analogous to 40101.	Traces carbonaceous matter. Minor traces degraded ?phlogopite and oxidised siderite	Close affinities with 40101 compositionally and texturally. Galena restricted to stressed/partly recrystallized quartz veinlets of epithermal character.
40107	Rhyolitic Tuff. Frequent sericitic albite, subordinate quartz crystals/fragments, sporadic lava and (vitric-crystal) tuff clasts, sericitic/silicified microfelsitic matrix. Sparse quartz veinlets.	Analogous to 40055, 58, but with conspicuous coarse crystals/fragments. Mildly stressed.	Disseminated leucoxenised (veinlets), opaques. Traces oxidised pyrite, ?siderite (films, selvedges on	Fabric transitional between the ?minor intrusives (40101, 107) and the flow-brecciated ignimbrites (40055, 59). Typical alteration pattern.
40113 Dreamick (T.S. 35862)	Rhyolitic tuff. Abundant quartz, albite, subordinate K-spar crystals/fragments, disseminated microcrystalline rhyolitic lava clasts. Weakly chlorite-sericite-stained microfelsitic matrix.	Poorly sorted, crudely banded. Faint, but pervasive relict, semi-lineated shards.	veinlets). Conspicuous fine to ultrafine leucoxenised opaques. Minor chloritised ?biotite.	Considered as ignimbritic, but distinctly sodi-potassic, thus contrasting with 40055, etc. Only mildly altered, essentially unstressed.
40125 (T.S. 35864)	Limestone Breccia. Clasts, rafts of microcrystalline limestone, weakly dolomitised in variably ferruginised, weakly carbonaceous silty shale matrix (slightly tuffaceous, ankeritic).	Soft-pebble conglomerate-like with weak slaty cleavage overprint.	Clastic leucoxenic semi-opaques, biotite, zircon. Rare oxidised ?pyrite microfilms.	Interpreted as intraformationally brecciated/mildly sheared intercalation of limestone and weakly tuffaceous calc-pelite.
40126 (T.S. 35865)	Olivine microgabbro. Disseminated olivine phenocrysts in groundmass of felted labradorite laths, pigeonitic pyroxene, minor mesostasis chlorite.	Fine-grained, ophitic (doleritic).	Fine ?ilmenite flakes, extremely fine magnetite.	Mildly deuterically altered basic minor intrusive or core of flow. Completely unstressed. Tertiary character.

799032

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Sample No.	Classification - Composition	Fabric	Accessories	Comments
40142 (T.S. 35866)	Sericitised Pelitic Ash. Silt-sized, completely devitrified, sericitised shards with sparsely disseminated silt- to fine sandsized quartz, completely sericitised indeterminate feldspar.	Random to weakly lineated shards. Unsheared.	Minor leucoxenic stainings semi-opaques.	Thoroughly altered vitric(-crystal) ash, probably subaerial. Units of this type frequently continuous and thus useful marker horizons.
40143	Sericitic, Lithic Sandstone. Framework (65 %) of subangular quartz, sericitised indeterminate and sericitic pelite/argillaceous chert fragments. Matrix of overgrowth and sericitic intergranular quartz.	Weakly bedded, incipiently sheared, fine-grained sandstone.	Minor carbonaceous matter, clastic leucoxenic semi-opaques, muscovite flakes.	Conceivably weakly volcanomict or reworked tuffaceous, but finer detail obliterated.
40144	Dolomitic Protoquartzite. Framework (60 %) of subangular quartz, subordinate chert, impure chert, sericitic pelite and sparse sericitic rhyolite clasts. Matrix overgrowth quartz, intergranular dolomite.	Weakly bedded, bimodally sorted, fine to coarse sandstone. Incipiently stressed.	Minor traces carbonaceous matter, sparse detrital leucoxenic semi-opaques, muscovite flakes.	Weakly volcanomict sand, probably fluvial. Carbonate is ankeritic dolomite as late ?marginal, hydrothermal intergranular cavity fillings.
40147 (T.S. 35869)	Lithic Sandstone. Framework (70 %) sericitic/chloritic pelite, impure chert, minor felsite clasts, slightly subordinate quartz, minor sericitised feldspar. Matrix chlorite, sericite microcrystalline quartz.	Weakly bedded, poorly sorted (silty fine to medium) sand. Mildly microfractured.	Clastic muscovite flakes, trace biotite (chloritised), leucoxenic semi-opaques, opaques, graphite.	Affinities with 40143, 144, mildly volcanomict, ?fluvial. Main contrast is chlorite-sericite alteration assemblage.

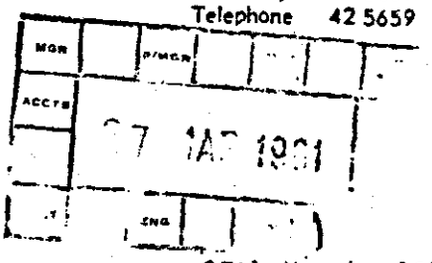
799033

799034

to AJM.

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The Manager
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25th March, 1981

REPORT CMS 81/2/42

YOUR REFERENCE:	Order No. 900284
DATE RECEIVED:	27th February, 1981
SAMPLE NOS.:	40168, 40169
SUBMITTED BY:	V. Webster
WORK REQUESTED:	Petrology

Mclg. - These are hulgobac rocks

H.W. Fander, M. Sc.

799035

CENTRAL MINERALOGICAL SERVICES

Date 25th March, 1981

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
40168
Brecciated Chert

Job No. CMS 81/2/42 Date Received: 27.2.1981

Reference Order No. 900284

Sample No. 40168

Nature of Sample: Hand Specimen

DESCRIPTION SECTION No. 36181

a. Hand Specimen:

Pale quartzose rock.

b. Microscopic:

This is a brecciated chert, which shows two types of brecciation, one prior to consolidation and one after lithification.

The chert itself is featureless, consisting of microcrystalline quartz, scattered small rhomb-shaped cavities after carbonate and a few minute carbonate grains; there are patchy variations in crystallinity, defining rock fragments cemented by chert and representing an early, pre-consolidation phase of brecciation; this phase was evidently accompanied by the introduction of fine limonite, and by minor re-crystallization of quartz.

A later phase of brecciation, of a tectonic nature and post-dating lithification, was accompanied by quartz veining and the formation of a few pyrite crystals (however, the pyrite may be older - the evidence is not clear).

H.W. Fander, M. Sc.

CENTRAL MINERALOGICAL SERVICES

Date 25th March, 1981

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
40169
Polymictic Grit

Job No. CMS 81/2/42 Date Received: 27.2.1981

Reference Order No. 900284

Sample No. 40169

Nature of Sample: Hand Specimen

DESCRIPTION SECTION No. 36182

a. Hand Specimen:

Dark red-brown clastic rock.

b. Microscopic:

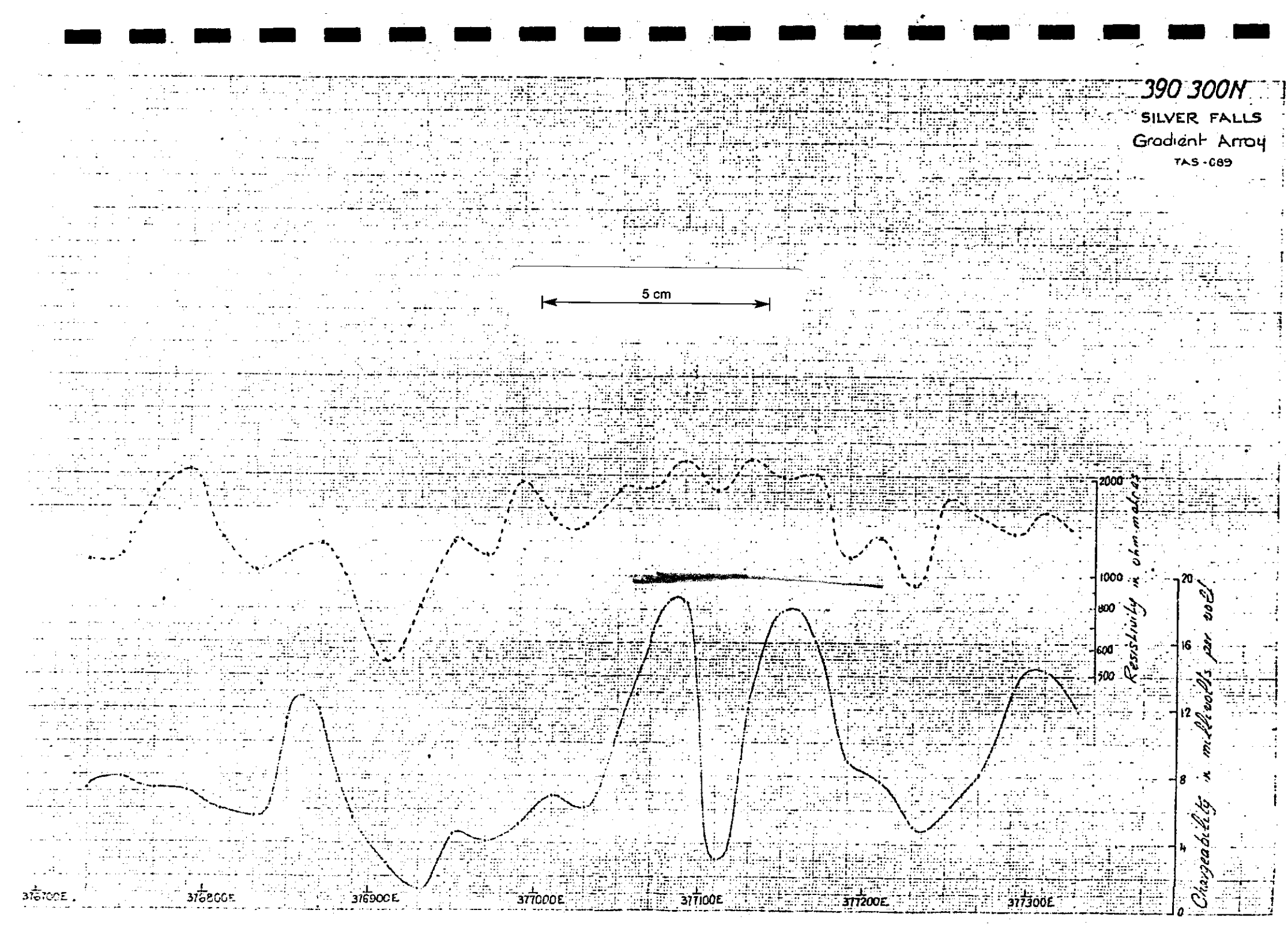
This rock may be termed a polymictic grit, being in between a lithic sandstone (or lithic greywacke) and a polymictic conglomerate.

The constituent coarse-sand and grit-sized grains are generally well-rounded, but both shape and degree of rounding depends on the lithology of each grain; thus, bedded cherts tend to be more irregular and tabular, softer rocks are well-rounded and ovoid. Rock types include carbonate rocks, siltstones/shales, cherts, altered ?tuffs, ferruginised siltstones, volcanomict greywackes (i.e. with reworked volcanic grains), felsite/rhyolite and sideritic chert. The matrix/cement consists of small subangular quartz grains, mica and chlorite flakes, and abundant interstitial goethite; it is fairly sparse because the framework grains are closely-packed.

H.W. Fander, M. Sc.

APPENDIX 2.

Dipole-Dipole & Gradient Array Profiles Line 5,390,300mN.


390 300N
SILVER FALLS
Gradient Array
TAS-089
5 cm
2000
1000
800
600
500
Resistivity in ohm-metres
20
16
12
8
4
0
Chargeability in milliseconds per volt
3767.00E
3768.00E
3769.00E
3770.00E
3771.00E
3772.00E
3773.00E

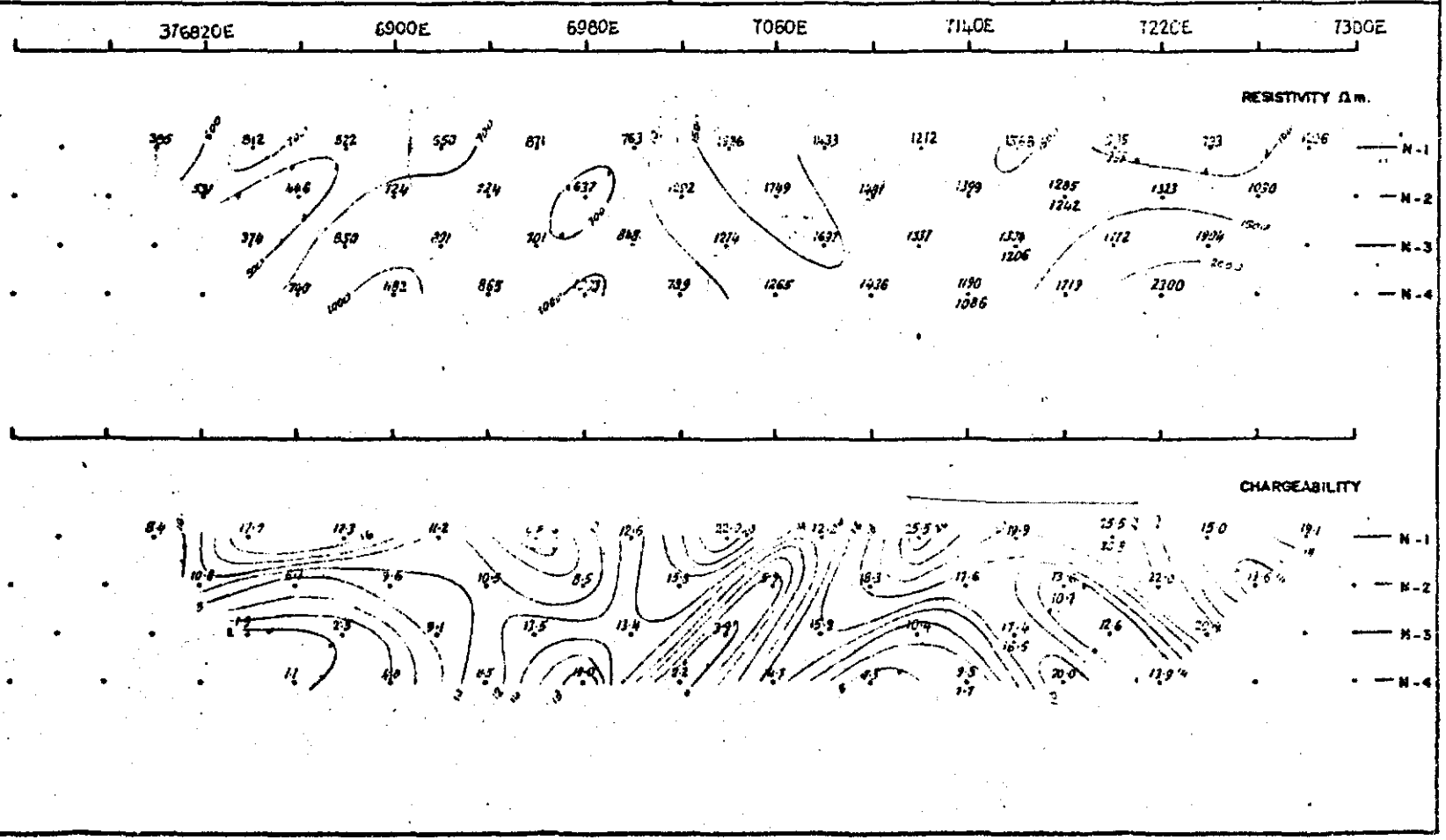
799038

SCINTREX PTY. LTD.

INDUCED POLARIZATION AND RESISTIVITY SURVEY

DIPOLE - DIPOLE ARRAY

DATE 4·5·81	LINE No. 390.300N
PLOTTED BY PADDY D.	PROSPECT SILVER FALLS
PULSE 2 Sec / Rx.	JOB No. TAS-089
DIPOLE SPACING 40m	



79039

APPENDIX 3.

Stream Sediment Data Sheets.

3.1. Western Area

PROJECT: Bulgobac — "Dream" Creek Western Area

CO-ORDINATES — LINE: — FROM: — TO:

SAMPLED BY: A.M & G.J. + BMR

DATE:

MATERIAL: Bulk Stream Sediments

DEPTH:

BOOK Nº

SHEET Nº 1

JOB Nº

SAMPLE NUMBER	CO-ORDINATES ⓝ/S	CO-ORDINATES Ⓔ/W	INTERVAL +/-	Cu	Pb	Zn	Mn	Fe %	Co	Ag	Sn	DESCRIPTION
41501	387210	377540		70	60	35	240	1.9%	<5	<2	<10	
41502	387250	377590		35	45	15	210	1.9%	10	<2	<10	
41503	387220	377590		10	55	25	170	1.7%	<5	<2	<10	
41504	387260	377710		15	50	40	350	3.0%	15	2	<10	
41505	387240	377720		<5	15	30	200	1.1%	15	<2	<10	
41506	387280	377790		<5	60	35	450	2.5%	20	<2	<10	
41507	387260	377810		<5	50	25	110	1.0%	<5	<2	<10	
41508	387290	377880		10	50	35	120	3.1%	10	2	<10	
41509	387310	377870		<5	40	15	150	1.3%	<5	<2	<10	
41510	387400	377930		10	35	55	270	3.1%	<5	<2	<10	
41511	387390	377950		<5	45	15	90	1.0%	<5	<2	<10	
41512	386960	377500		10	120	40	460	1.5%	25	<2	<10	
41513	387650	377690		<5	150	40	1650	1.8%	20	2	<10	
41514	386970	377320		SAMPLE NOT RECEIVED				%			SAMPLE NOT RECEIVED.	
41515	386980	377340		<5	60	35	350	1.0%	15	<2	<10	
41516	386950	377100		<5	45	20	110	1.0%	15	<2	<10	
41517	386980	377070		15	75	30	520	2.3%	<5	<2	<10	
41518	387220	376870		10	65	30	500	2.0%	10	<2	<10	
41520	387500	378070		10	50	25	430	2.0%	10	<2	<10	
41521	387650	378150		<5	70	20	150	2.4%	15	<2	<10	
41522	387680	378150		<5	55	20	170	1.3%	10	<2	<10	
41523	387740	378170		10	80	45	360	4.8%	10	2	<10	
41524	387730	378190		<5	60	30	190	1.4%	10	<2	<10	
41525	387780	378270		10	90	25	930	1.4%	<5	<2	<10	
41526	387800	378250		10	40	20	170	1.5%	<5	<2	<10	

29904

1979

PROJECT: BULGOBAC — DREAM? CREEK Western Au

CO-ORDINATES — LINE: — FROM: — TO:

SAMPLED BY: A.M & G.J & B.McQ.

DATE:

MATERIAL: BULK STREAM SEDIMENTS

BOOK N°

SHEET N° 2

JOB N°

DEPTH

SAMPLE NUMBER	CO-ORDINATES N/S	CO-ORDINATES E/W	INTERVAL +/-	Pb	Zn	Cu	Fe	Mn	Co	Ag	Sn	DESCRIPTION
41527	38790	37830		50	10	10	1.0%	120	<5	<2	<10	
41528	38801	37837		50	10	10	1.5%	170	10	<2	<10	
41529	38803	37834		40	10	<5	1.0%	100	<5	<2	<10	
41530	38805	37837		60	30	<5	1.3%	150	<5	<2	<10	
41531	38806	37835		40	15	<5	1.0%	110	<5	<2	<10	
41532	38824	37848		40	15	10	1.2%	80	<5	<2	<10	
41533	38830	37855		30	20	<5	1.2%	110	10	<2	<10	
41534	38828	37856		40	20	10	1.4%	120	<5	<2	<10	
41535	38937	38023		50	30	10	1.9%	300	<5	<2	<10	
41536	38917	38019		40	20	10	1.7%	280	<5	<2	<10	
41537	38973	38019		50	45	15	2.4%	1400	15	<2	<10	
41538	38951	38028		50	30	10	2.6%	970	10	<2	<10	
41539	38942	38031		40	30	10	1.3%	220	20	<2	<10	
41540	38956	38123		50	25	20	1.7%	300	10	<2	<10	
41541	38958	38118		50	50	10	2.3%	310	15	<2	<10	
41542	38957	38122		55	40	10	1.8%	350	10	<2	<10	
41543	38943	38095		30	30	10	1.7%	110	10	<2	<10	
41544	38940	38097		35	40	10	2.4%	310	<5	<2	<10	

Bulk with Gasnick

Bulk Clin Ck

7990042 LT

APPENDIX 3.

Stream Sediment Data Sheets.

3.2. Northern Area

PROJECT: Bulgobac

CO-ORDINATES
LINE: Bilbo Ck
FROM:
TO:

SAMPLED BY: A. Mollison
DATE: 1/1981

MATERIAL: Stream Sediments
DEPTH

BOOK N°
SHEET N°
JOB N°

SAMPLE NUMBER	CO-ORDINATES (N/S)	CO-ORDINATES (E/W)	Interval +/-	Cu	Pb	Zn	Mn	Fe %	Co	Ag	Sn	DESCRIPTION
41545	39850	37225		15	30	40	100	2.5%	10	<2	<10	
41546	39823	37840		15	25	30	100	1.9%	<5	<2	<10	
41547	39835	37820		15	40	80	530	1.9%	<5	<2	<10	
41548	39830	37820		20	30	1000	410	2.3%	<5	<2	<10	
41549	39846	37810		10	100	75	550	1.8%	<5	<2	<10	
41550	39848	37820		20	45	90	460	3.8%	30	<2	<10	
41551	39852	37929		20	260	170	510	3.5%	20	2	<10	
41552	39850	37990		20	55	120	710	3.3%	20	2	<10	
41553	39857	37710		15	60	110	540	3.5%	20	<2	<10	
REPEAT AND CHECK												
41510	39740	37930		10	40	50	260	3.5%	<5	<2	<10	
41540	38956	38230		20	50	20	310	1.7%	15	<2	<10	
41560	39918	37835		15	45	90	640	3.6%	15	<2	<10	

799044

PROJECT: Bulgobac

CO-ORDINATES — LINE: Hay Ck. — FROM: — TO:

SAMPLED BY: A. Mollison

DATE: January 1981

MATERIAL: Stream Sediments

DEPTH:

BOOK Nº — SHEET Nº — JOB Nº

SAMPLE NUMBER	CO-ORDINATES N/S	CO-ORDINATES E/W	Interval +/-	Cu	Pb	Zn	Mn	Fe %	Co	Ag	Sn	DESCRIPTION
41554	39860	37710		10	40	80	700	2.9%	15	<2	<10	Hay Ck
41555	39820	37820		10	40	70	490	2.3%	15	<2	<10	"
41556	39780	37930		15	45	110	720	3.4%	20	<2	<10	"
41557	39740	38040		10	40	90	450	2.6%	15	<2	<10	"
41558	39700	38150		10	30	40	270	1.6%	10	<2	<10	Bree Cabin
41559	39660	38260		10	40	80	530	2.6%	15	<2	<10	Hay Ck
41560	39620	38370		10	45	90	640	3.7%	20	<2	<10	"
41561	39580	38480		20	90	170	340	3.6%	15	<2	<10	LH Trib Hay Ck
41562	39540	38590		10	45	90	620	3.7%	25	<2	<10	Hay Ck
41563	39500	38700		10	40	100	1350	3.2%	30	<2	<10	RH Trib Hay Ck
41564	39460	38810		10	40	85	530	3.5%	20	<2	<10	Hay Ck
41565	39420	38920		10	50	85	670	3.5%	20	<2	<10	"
41566	39380	39030		<10	<20	40	290	1.5%	10	<2	<10	RH Trib Hay Ck
41567	39340	39140		10	35	60	360	1.9%	20	<2	<10	Hay Ck
41568	39300	39250		15	50	70	260	2.1%	30	<2	<10	"
41569	39260	39360		15	45	85	500	3.2%	25	<2	<10	LH Trib Hay Ck
41570	39220	39470		10	55	70	400	2.0%	40	<2	<10	Hay Ck
41571	39180	39580		<10	50	70	350	1.8%	10	<2	<10	"
41572	39140	39690		15	20	80	400	2.1%	20	<2	<10	"
41573	39100	39800		15	55	65	260	2.0%	15	<2	<10	RH Trib Hay Ck
41574	39060	39910		<10	40	65	390	1.7%	15	<2	<10	Hay Ck
41701	39020	40020		30	70	120	3700	3.4%	25	<2	<10	RH Trib Hay Ck
41702	38980	40130		30	50	110	1000	2.9%	20	<2	<10	Hay Ck
41724	37740	37670		25	50	120	650	3.3%	15	<2	<10	"
41726	37660	37770		30	50	140	910		40	<2	<10	RH Trib Hay Ck

79045

PROJECT: Bulgobac

CO-ORDINATES
LINE:
FROM:
TO:

SAMPLED BY

DATE

MATERIAL

DEPTH

BOOK N°
SHEET N°
JOB N°

SAMPLE NUMBER	CO-ORDINATES N/S	CO-ORDINATES E/W	Increm +/-	Cu	Pb	Zn	Co	Mn	Ag	Fe %	Sn.	DESCRIPTION
41585	37780	37660		10	<20	85	20	1000	<2	2.4%	<10	
41586	37820	37620		15	40	120	10	1200	<2	2.4%	<10	Duck Creek
41587	37782	37615		15	50	90	30	500	<2	2.0%	<10	
41588	37780	37570		20	30	140	20	790	<2	2.6%	<10	
41589	37780	37550		20	<20	90	30	540	<2	2.5%	<10	Misty Creek
41590	37780	37530		15	45	90	20	540	<2	2.7%	<10	
41591	37760	37750		20	55	140	30	1400	<2	2.7%	<10	RH Trib of Misty Creek
41592	37780	37820		15	30	85	15	1900	<2	2.5%	<10	"
41593	37830	37900		15	50	90	10	1100	<2	2.3%	<10	"
41594	37910	37820		15	40	70	10	420	<2	2.1%	<10	Misty Creek
41595	37850	37780		10	20	70	20	370	<2	1.6%	<10	RH Trib of Misty Creek
41596	37850	37900		10	40	70	20	390	<2	2.6%	<10	Misty Creek
41597	37910	37620		10	<20	80	20	430	<2	2.4%	<10	"
41598	37960	37710		15	30	70	30	350	<2	2.5%	<10	LH Trib of Misty Creek
41599	37970	37900		20	50	85	55	430	<2	2.7%	<10	Misty Creek
41600	37920	37840		15	35	90	20	630	<2	3.3%	<10	"
41601	37910	37900		20	20	130	30	770	<2	2.5%	<10	RH Trib of Misty Creek
30096	37290	37985		25	90	110	30	510	<2	4.9%	<10	Misty Creek
30095	37290	37900		20	50	80	10	490	<2	3.0%	<10	RH Trib of Misty Creek
30096	37290	37860		30	60	110	20	780	<2	4.8%	<10	" Misty Creek
30097	37290	37820		25	50	110	20	450	<2	4.9%	<10	LH Trib of Misty Creek
30098	37290	37785		25	50	80	40	300	<2	4.5%	<10	Misty Creek

799046

PROJECT: Bulgobac

CO-ORDINATES
LINE:
FROM:
TO:

SAMPLED BY: A.M.
DATE:

MATERIAL:
DEPTH:

BOOK N°
SHEET N°
JOB N°

SAMPLE NUMBER	CO-ORDINATES N/S	CO-ORDINATES E/W	INTERVAL +/-	Cu	Pb	Zn	Co	Mn	Ag	Fe %	Sn	DESCRIPTION
41570	37215	37675		20	70	95	50	380	<2	3.0%	<10	
41571	37172	37665		15	40	70	80	840	<2	2.3%	<10	
41572	37111	37625		20	<20	85	50	600	<2	2.6%	<10	
41573	37074	37581		10	<20	95	40	850	<2	2.9%	<10	
41574	37027	37540		15	30	100	20	960	<2	2.8%	<10	

79904

PROJECT: Bulgobar

CO-ORDINATES — LINE: Tiger Ck. — FROM: — TO:

SAMPLED BY: A.M. — DATE:

MATERIAL — DEPTH

BOOK N° — SHEET N° — JOB N°

SAMPLE NUMBER	CO-ORDINATES N/S	CO-ORDINATES E/W	Interval +/-	Cu	Pb	Zn	Co	Mn	Ag	Fe %	Sn.	DESCRIPTION
41593	37600	37905		10	30	70	20	250	<2	2.5%	<10	
41594	37625	37914		20	60	100	20	420	<2	3.2%	<10	
41595	37625	37917		20	<20	70	10	340	<2	2.5%	<10	
41596	37648	37909		15	30	70	20	330	<2	3.3%	<10	
41597	37648	37904		20	30	80	30	450	<2	3.6%	<10	
41598	37698	37904		25	30	70	<5	390	<2	3.1%	<10	
41599	37698	37903		25	40	90	25	320	<2	3.2%	<10	
41600	37698	37902		25	25	80	25	400	<2	4.0%	<10	

7990148

PROJECT: Bulgobac Hay Creek

CO-ORDINATES — LINE: — FROM: — TO:

SAMPLED BY: A.M — DATE:

MATERIAL: Stream Seds. — DEPTH:

BOOK N° — SHEET N° — JOB N°

SAMPLE NUMBER	CO-ORDINATES N/S	CO-ORDINATES E/W	INTERVAL +/-	Cu	Pb	Zn	Co	Mn	Ag	Fe %	Sn	DESCRIPTION
41703	37916	37810		20	60	60	15	1200	<2	2.6%	<10	
41704	37901	37810		15	50	70	10	700	<2	1.0%	<10	
41705	37902	37815		15	30	30	20	1800	<2	3.6%	<10	
41706	37926	37812		15	50	40	10	420	<2	1.8%	<10	
41707	37905	37805		15	40	30	<5	180	<2	1.4%	<10	
41708	37932	37807		10	30	60	10	360	<2	2.4%	<10	
41709	37952	37815		20	50	90	10	810	<2	4.3%	<10	

790649

PROJECT: Bulgobac Hwy Creek Area

CO-ORDINATES — LINE: Gollum Ck. — FROM: — TO:

SAMPLED BY: A.M. — DATE:

MATERIAL: Stream Sed's. — DEPTH:

BOOK N° — SHEET N° — JOB N°

SAMPLE NUMBER	CO-ORDINATES N/S	CO-ORDINATES E/W	Interval +/-	Cu	Pb	Zn	Co	Mn	Ag	Fe %	Sn	DESCRIPTION
41734	39721	37725		15	30	60	10	380	<2	2.0%	<10	
41735	39722	37724		20	40	70	20	160	<2	2.5%	<10	
41736	39725	37720		15	30	70	<5	340	<2	2.2%	<10	
41737	39730	37744		20	50	60	<5	190	<2	2.6%	<10	
41738	39726	37745		15	30	60	<5	220	<2	2.0%	<10	
41739	39726	37744		20	70	110	<5	310	<2	2.3%	<10	
41740	39725	37743		25	40	70	15	480	<2	2.4%	<10	
41720	39725	37733		25	40	100	20	530	<2	3.3%	<10	
41721	39727	37736		15	50	80	10	420	<2	2.2%	<10	
41722	39731	37713		20	40	100	20	670	<2	2.6%	<10	
41723	39742	37690		25	30	100	10	550	<2	2.7%	<10	
41725	39741	37679		15	40	110	10	660	<2	3.6%	<10	

79905O

PROJECT: Bulgobac

CO-ORDINATES
LINE: Hay Ck.
FROM:
TO:

SAMPLED BY: A-M
DATE:

MATERIAL: Stream Sods.
DEPTH:

BOOK N°
SHEET N°
JOB N°

SAMPLE NUMBER	CO-ORDINATES N/S	CO-ORDINATES E/W	Interval +/-	Cu	Pb	Zn	Co	Mn	Ag	Fe %	Sn	DESCRIPTION
41727	7	7		20	60	130	20	960	<2	4.8	<10	
41728	7	8		30	50	170	30	970	<2	5.2	<10	

79963

PROJECT: Bulgobac/Hay Ck. Area

CO-ORDINATES — LINE: — FROM: — TO:

SAMPLED BY: V. Webster & L. McD

DATE: 3/1981

MATERIAL: B[illegible] Stream Sed.

DEPTH:

BOOK N° — SHEET N° — JOB N°

SAMPLE NUMBER	CO-ORDINATES N/S	CO-ORDINATES E/W	Interval +/-	Cu	Pb	Zn	Co	Mn	Ag	Fe %	Sn	DESCRIPTION
41729	39580	37725		50	40	160	40	2100	<2	4.2	<10	
41730	39560	37625		30	35	110	30	1200	<2	2.3	<10	
31	39602	37725		20	25	70	25	410	<2	3.5	<10	Mark Pb 40 ppm
32	39601	37626		30	20	60	20	440	<2	2.7	<10	Zn 160 ppm
33	39602	37625		20	20	70	25	410	<2	2.7	<10	Cu 20-55 ppm
34	39605	37550		45	<20	55	20	210	<2	2.4	<10	
35	39605	37575		55	<20	60	10	310	<2	2.3	<10	
36	39605	37550		40	40	35	60	500	<2	3.0	<10	
37	39592	37615		20	35	50	15	300	<2	2.5	<10	
38	39604	37592		55	35	130	30	3000	<2	4.2	<10	
39	39643	37582		60	30	150	40	1900	5	4.0	<10	
41740	39640	37550		20	30	90	35	940	<2	3.2	<10	
41	39642	37670		40	25	90	45	1000	<2	3.5	<10	
42	39640	37690		50	<20	90	40	900	<2	4.4	<10	
33	39633	37640		100	35	130	60	1400	2	3.7	<10	Mark Pb 50 ppm
44	39640	37660		60	40	120	35	670	2	2.8	<10	Zn 150 ppm
45	39644	37600		50	30	75	60	1200	<2	2.4	<10	Cu 100 ppm
46	39652	37575		70	<20	70	45	1800	<2	3.2	<10	
47	39642	37570		50	25	140	50	1500	<2	3.3	<10	
48	39661	37690		50	30	100	10	710	<2	3.0	<10	
49	39674	37636		65	50	90	20	1000	<2	3.0	<10	
41750	39595	37996		20	20	90	10	210	<2	2.6	<10	
51	39970	37920		50	<20	80	25	420	5	4.3	<10	
52	39790	37960		35	20	60	25	2600	<2	3.7	<10	
41753	39981	37960		60	<20	85	35	440	2	4.4	<10	

Tributary to Tuchuem Creek — Hay Creek

79052

PROJECT: Bulgobac / Hay Ck Area

CO-ORDINATES
LINE :
FROM :
TO :

SAMPLED BY: V. Webster & L. McD

DATE: -/3/1981

MATERIAL: Stream Sediments

DEPTH:

BOOK N°
SHEET N°
JOB N°

SAMPLE NUMBER	CO-ORDINATES N/S	CO-ORDINATES E/W	INTERVAL +/-	Cu	Pb	Zn	Co	Mn	Mo	Sn	W	DESCRIPTION
41754	3990	3760		90	35	120	40	270	<3	4.6	<10	
41755	3978	3790		45	40	102	40	650	<2	4.5	<10	MAX Pb 100 ppm
41756	3979	3791		100	40	120	30	490	<2	4.3	<10	Zn 190 ppm
41757	3978	3795		65	100	190	50	1700	<2	6.4	<10	Co 100 ppm

290963

APPENDIX 4.

Silver Falls Costean Data Sheets

PROJECT: Bulgobac — Silver Falls Costean (S.F.C.)

CO-ORDINATES: LINE: 5 390 300 | FROM: 376 960 E | TO: 376 010 E

SAMPLED BY: A J M

DATE: 17/12/80

MATERIAL: Chip

DEPTH: VARIES

BOOK N°

SHEET N°

JOB N°

SAMPLE NUMBER	CO-ORDINATES N/S	CO-ORDINATES E/W	INTERVAL	Fe	Mn	Cu	Zn	As	Ag	Pb	Sn	DESCRIPTION
400323	390300	376960	5	5300	210		65	2	x	250	x	
40033		955		1.3%	100	5	110	3	x	230	x	
40034		950		9500	30	5	80	4	0.5	125	x	
40035		945		1.2%	30	5	105	9	0.5	215	x	
40036		940		4200	20	5	50	3	x	120	x	
40037		935		1850	15	6	55	3	x	125	6	
40038		930		2650	80	5	55	1	x	40	6	
40039		925		2100	20	5	10	x	x	20	24	
40040		376920		2650	15	5	10	x	x	10	6	
40041		376160		1.4%	95	30	120	5	0.5	750	6	
40042		165		1.4%	255	50	185	3	x	745	4	
40043		170		3800	15	25	30	2	x	530	x	
40044		175		1.5%	85	25	75	3	0.5	1050	8	
40045		155		1.2%	20	25	55	8	0.5	790	2	
40046		150		1.6%	20	20	55	19	x	740	x	
40047		145		1.2%	45	20	95	12	x	470	x	
40048		377140		1.3%	580	20	65	7	0.5	550	x	
40049		376970		1.4%	710	5	175	4	x	695	x	
40050		376965		5850	14000	5	80	1	x	1150	x	
40051		376990		3450	45	5	90	1	0.5	85	x	
40052		376995		4800	20	5	60	4	0.5	120	x	
40053		377000		9500	45	15	135	22	x	235	x	
40054	390300	377005		9000	85	15	100	24	x	190	x	
		10										

27905

PROJECT: Bulgobac — Silver Falls Corbeau (S.F.C.)

CO-ORDINATES
LINE: 5 390 300N
FROM: 377 050E
TO: 377 060E

SAMPLED BY: A.J.M
DATE: 17/12/80

MATERIAL: Grab
DEPTH: —

BOOK N°
SHEET N°
JOB N°

SAMPLE NUMBER	CO-ORDINATES N/S	CO-ORDINATES E/W	INTERVAL +/-	Fe	Mn	Cu	Zn	As	Ag	Pb	Sn	DESCRIPTION
40061	3900300	377075	5	8.5%	2150	15	130	10	x	2200	x	
62		0700		6900	1300	25	90	9	x	1700	x	
63		0655		1.2%	5050	110	85	12	x	4550	x	
40064	3900300	377060		9500	1900	950	80	13	x	1150	x	

299069

PROJECT: Bulgobac Silver Falls Costean (S.F.C.)

CO-ORDINATES — LINE: 5 390 300 N; FROM: 377 105E; TO: 377 081E

SAMPLED BY: AJM

DATE: 17/12/80

MATERIAL: Channel

DEPTH: 1M

SOCK No:

SHEET No:

JOB No:

SAMPLE NUMBER	CO-ORDINATES N/S	CO-ORDINATES E/W	Interval +/-	Fe	Mn	Cu	Zn	As	Ag	Pb	Sn	DESCRIPTION
40007	390000	377105	1	2.85%	330	15	60	7	1.0	155	x	
40008		104		9.50%	55	5	55	6	0.5	295	x	
40009		103		3.65%	690	5	60	3	1.0	470	x	
40010		102		2.85%	200	5	70	4	0.5	390	x	
40011		101		4.30%	180	5	60	6	x	420	x	
40012		100		5.90%	610	10	90	4	0.5	920	x	
40013		099		11.5%	630	10	105	8	x	730	x	
40014		098		3.6%	45	15	205	18	x	950	x	
40015		097		2.6%	530	10	160	12	0.5	760	x	
40016		096		2.9%	1750	15	170	9	x	1550	x	
40017		095		3.1%	4000	10	120	18	x	3550	x	
40018		094		2.3%	480	10	155	12	0.5	705	x	
40019		093		1.8%	1450	10	105	9	0.5	1500	x	
40020		092		1.5%	1.2%	5	230	7	1.0	1.08%	x	
40021		091		1.4%	4800	5	305	8	1.5	5500	x	
40022		090		1.7%	7000	5	225	7	x	6700	x	
40023		089		1.3%	3150	5	155	5	0.5	3300	x	
40024		088		1.08%	1800	5	90	5	0.5	2000	x	
40025		087		9000	605	5	75	4	x	7700	x	
40026		086		5300	230	5	65	2	0.5	440	x	
40027		085		8500	420	5	65	10	0.5	535	x	
40028		084		1.1%	400	5	95	6	0.6	560	x	
40029		083		5850	220	5	60	3	x	370	x	
40030		082		8500	390	5	70	5	0.5	730	x	
40031	390000	377081		8500	285	5	95	5	x	590	x	

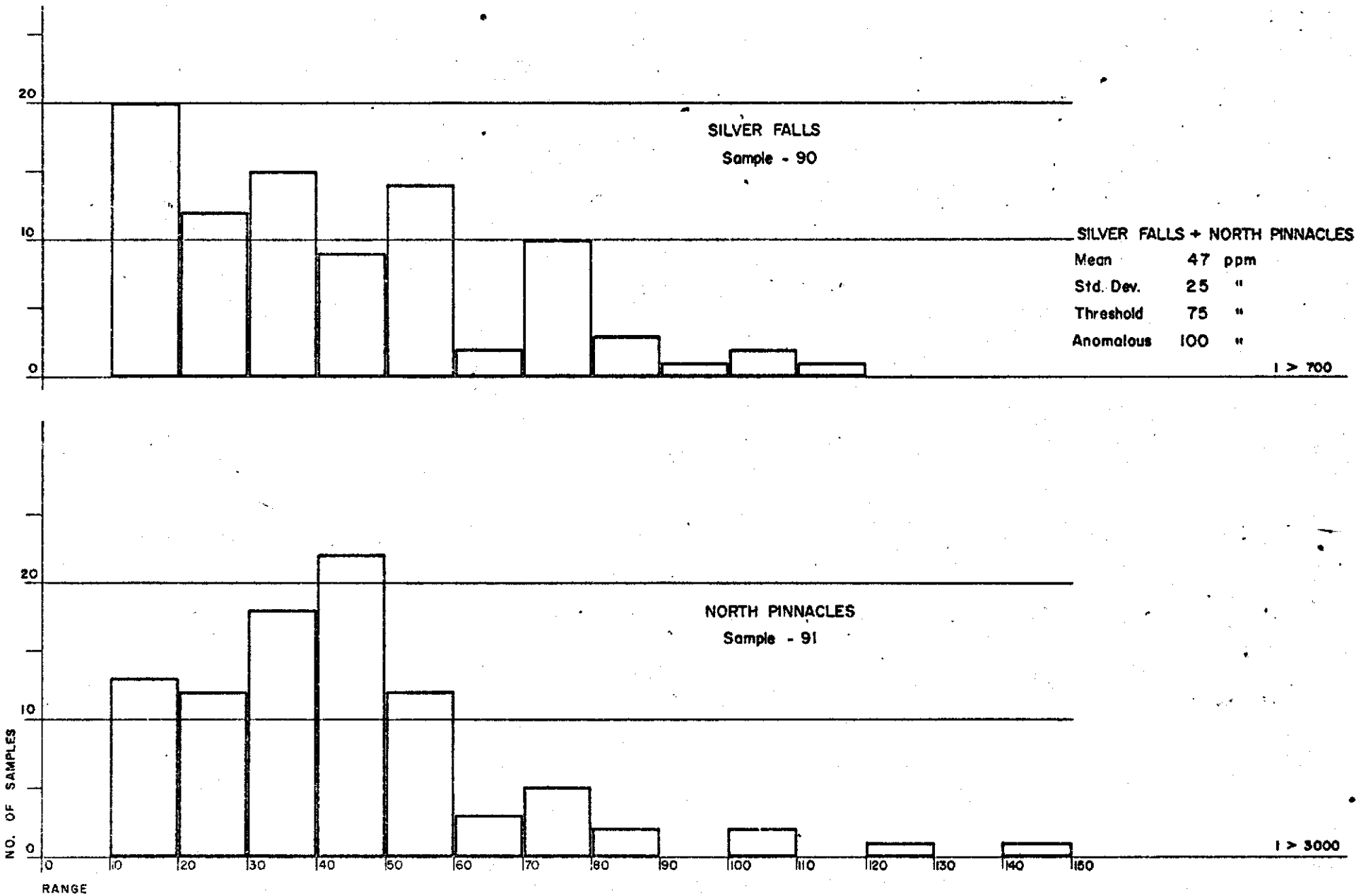
29062

APPENDIX 5.

Histogrammes of Stream Geochemical Data

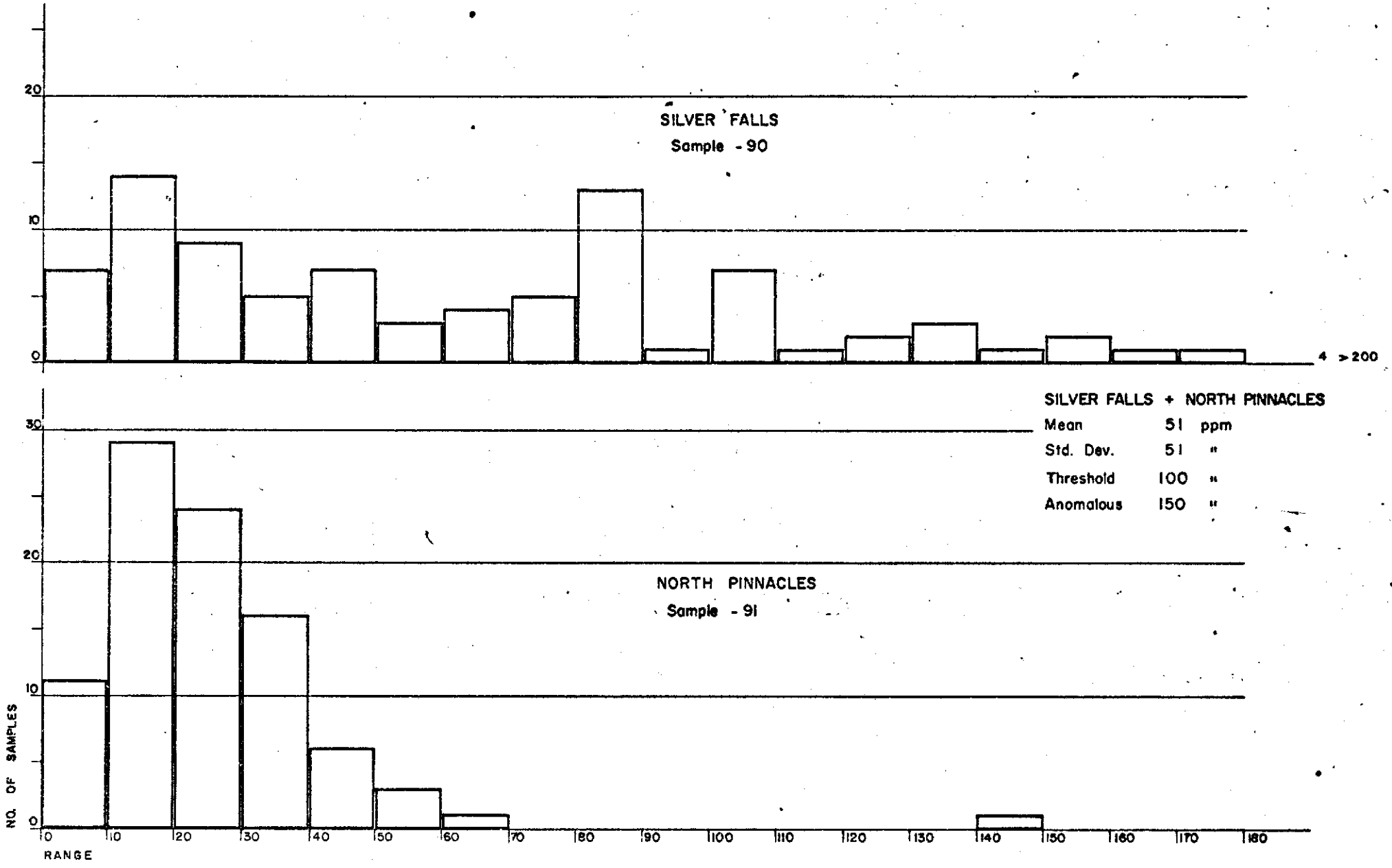
5.1. Western Area

799059



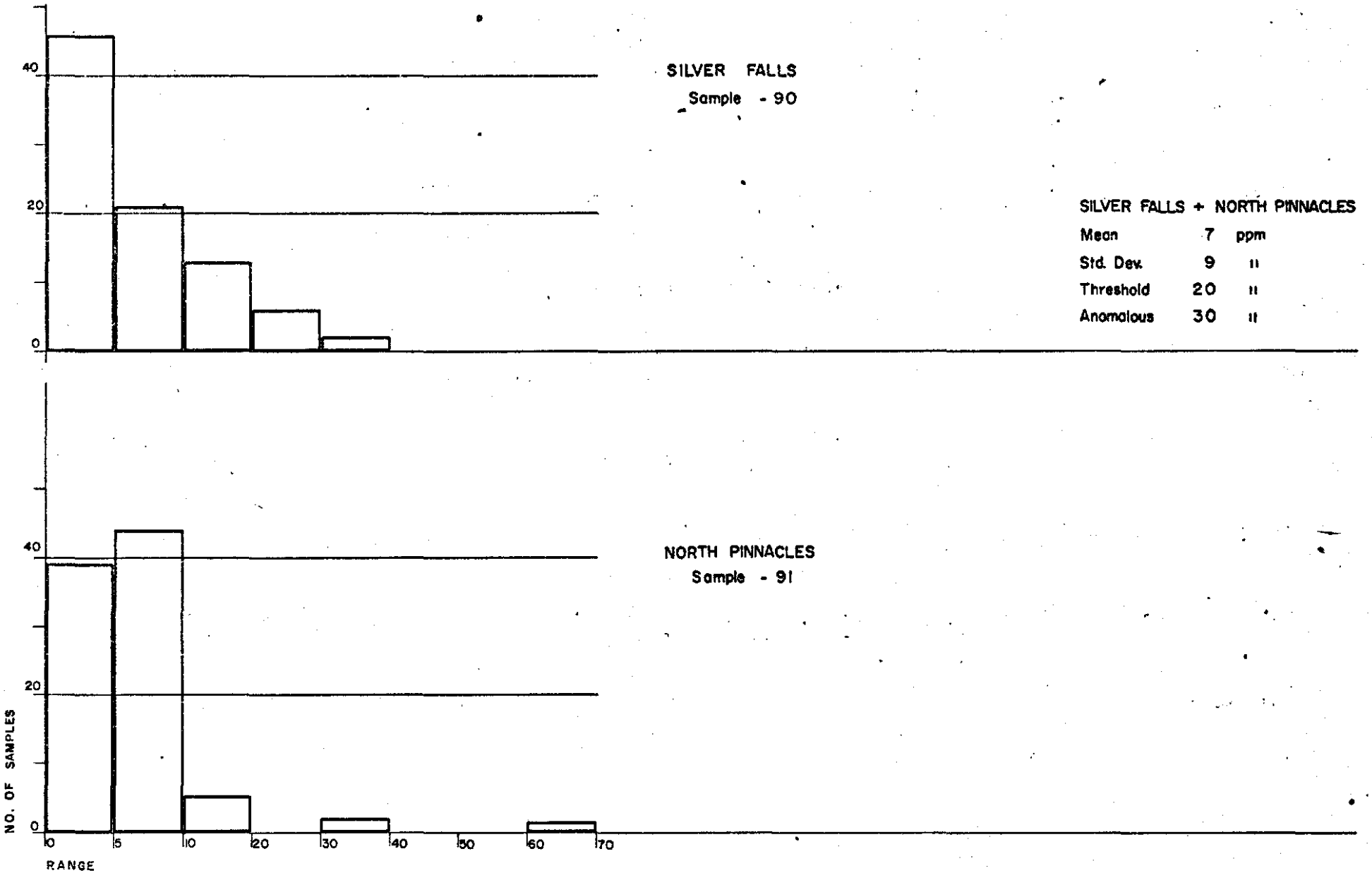
WESTERN AREA — STREAM SEDIMENT GEOCHEMISTRY Pb

799060



WESTERN AREA — STREAM SEDIMENT GEOCHEMISTRY **Zn**

799061



WESTERN AREA — STREAM SEDIMENT GEOCHEMISTRY Cu

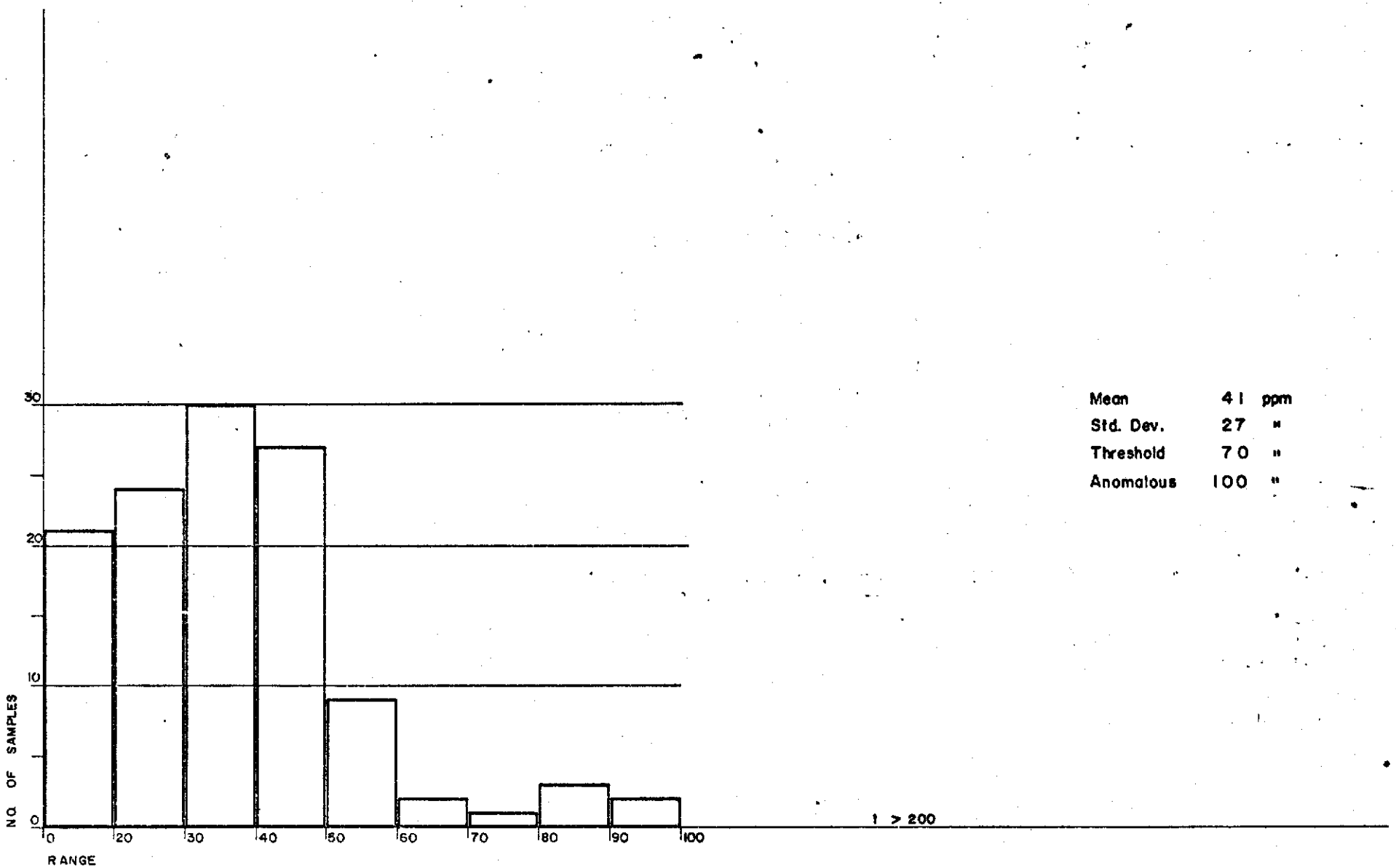
799062

APPENDIX 5.

Histogrammes of Stream Geochemical Data

5.2. Northern Area

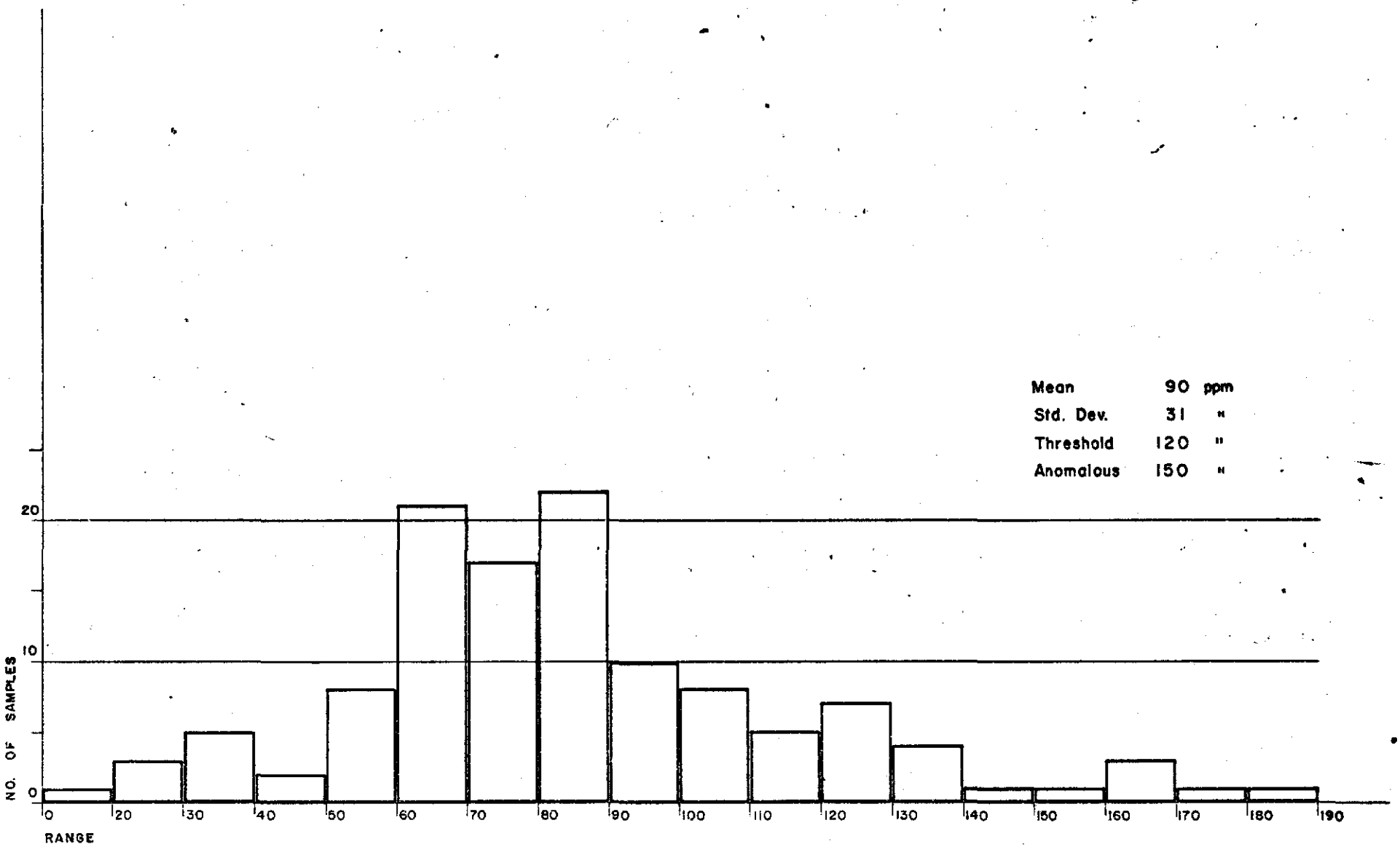
799063



Mean	41	ppm
Std. Dev.	27	"
Threshold	70	"
Anomalous	100	"

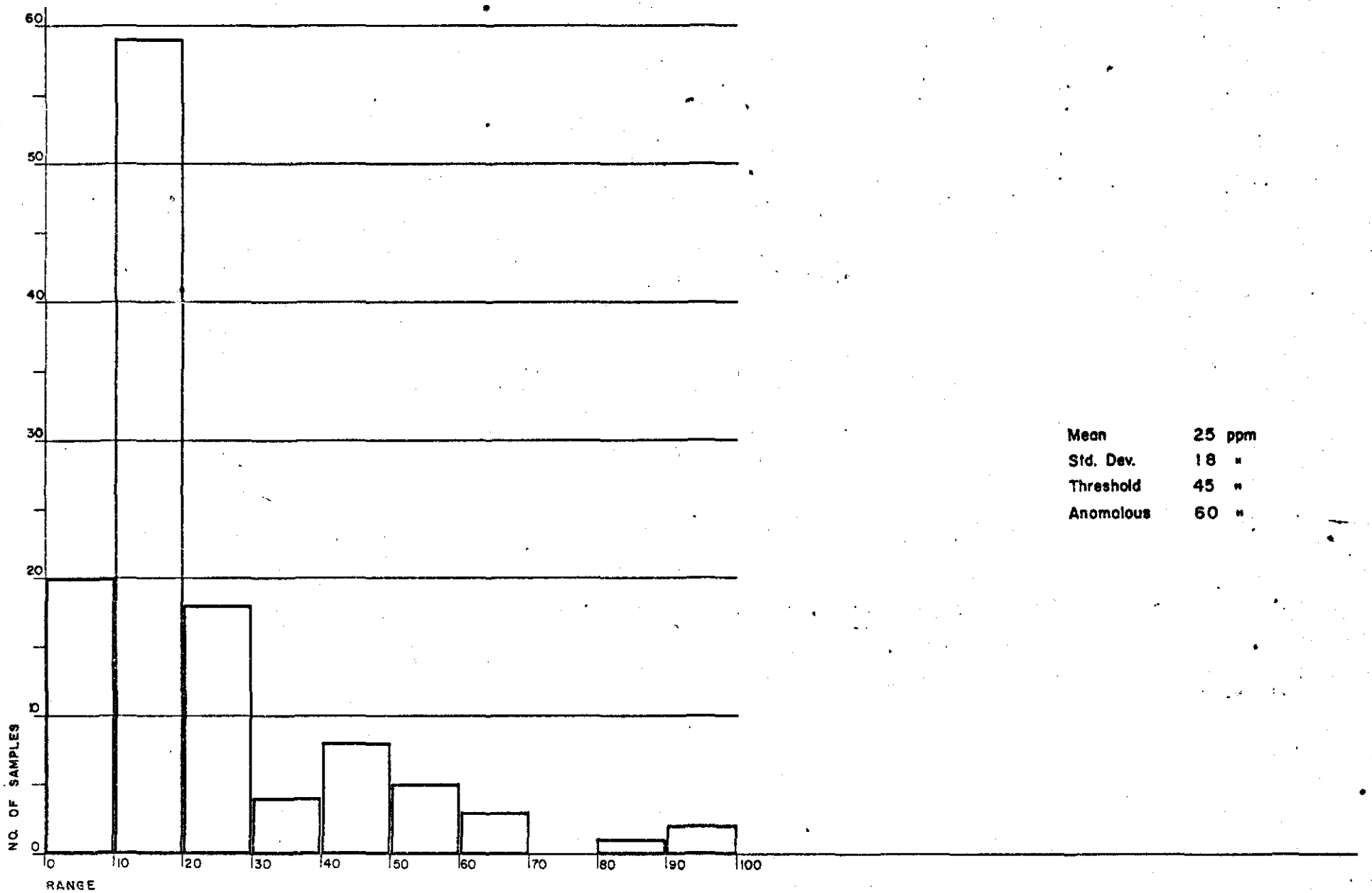
NORTHERN AREA — STREAM SEDIMENT GEOCHEMISTRY Pb

799064



NORTHERN AREA — STREAM SEDIMENT GEOCHEMISTRY Zn

799065



Mean	25 ppm
Std. Dev.	18 "
Threshold	45 "
Anomalous	60 "

NORTHERN AREA — STREAM SEDIMENT GEOCHEMISTRY Cu

APPENDIX 6.

A Review of the Geophysics over the Boco Grid, E.L. 12/72.

EZ/MG81/02 - by Mitre Geophysics Pty. Ltd.

799067

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

A REVIEW OF THE GEOPHYSICS

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

FOR

ELECTROLYTIC ZINC COMPANY OF AUSTRALIASIA LIMITED
West Coast Mines

BY

DR. J.R. BISHOP

EZ/MG81/02
MARCH, 1981

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Figure 2. Boco Geology (Scale 1:20,000)

Figure 3. Boco Gradient Array Chargeability Contours (Scale 1:10,000)

Figure 4. Boco Gradient Array Resistivity Contours (Scale 1:10,000)

Figure 5. Boco Total Magnetic Field Contours (Scale 1:10,000)

Figure 6. Dipole-Dipole (Time and Frequency Domain) and Gradient Array IP results over BBP 207. (Scale 1:2,500)

Figure 7. Dipole-Dipole and Gradient Array IP results over BBP 208. (Scale 1:2,500)

Figure 8. Dipole-Dipole and Gradient Array IP results over BBP 209. (Scale 1:2,500)

Figure 9. IP response over a flat and shallow chargeable body. A model for BBP 208.

Figure 10. IP response over an outcropping chargeable body of limited depth extent. A model for BBP 209.

Figure 11. Dipole-Dipole and Gradient Array IP results over Line 5,376,000N Murchison River Grid.

Figure 12. Gradient Array and Pole-Dipole results from Pine Point N.W. Territories, Canada (Lajoie and Klein, 1979).

Figure 13. Boco Grid IP, Metal Factor profile, Line 11,960N.

Figure 14. Boco Grid IP, Metal Factor profile, Line 13,880N (BBP 207).

SUMMARY

The Boco area is situated in the southernmost section of E.L. 12/72. The rocks are part of the prospective Mt. Read Volcanics, however much of the area is covered by glacial moraine, the thickness of which is variable and may extend upto 100m.

The geophysical grid covers nearly all of the Boco area with a nominal line spacing of 160m. Gradient Array IP surveys cover all of the grid (with the apparent exception of three gaps, see Figure 1).

The Gradient Array IP survey had originally been commissioned to follow up anomalies from an airborne electromagnetic (Input) survey. The IP was done in two stages; the major part in 1976 and a NW extension in 1977. Magnetometer readings were taken over the area covered by the IP surveys. The surveys did not locate the EM anomalies which have been explained as being due to superficial conductive effects within the button grass plains and overburden, however several anomalies were defined elsewhere on the grid. Three drill holes (BBP 207, 208 and 209) were sited on the most promising geophysical and geological targets; results were disappointing, with only minor disseminations of sulphides being intersected. Dipole-dipole IP surveys were subsequently carried out over the drilled anomalies and over anomalies on three other grid lines.

It is argued in this report that the gradient array IP has responded to variations in the thickness of the overburden. Evidence for this is the parallelism between the chargeability and resistivity profiles that occurs in much of the data. Further, it was noted in the contractor's report (Howland-Rose, 1976) that the chargeabilities are unusually low for the West Coast; since the rocks are presumed typical Mt. Read Volcanics then, it is argued, the low chargeabilities are due to the response of the gradient array to (variations in) the overburden. (A limited amount of electrical sounding data confirms that the overburden has a low chargeability.)

A Canadian case history of base-metal ore deposits subcropping in an area with a glacially derived overburden is sited as further evidence of the gradient array's unsuitabilty for this type of environment and of the much

better results that may be expected from multi-separation (i.e. pole-dipole or dipole-dipole) arrays.

The metal factor parameter has been used in frequency domain IP in attempts to reduce the effect of differences in resistivities when comparing results from various areas; it is suggested that the parameter may be useful here, where there is a parallelism between resistivity and chargeability. Limited testing from sections of two lines, shows a marked reduction in variability of the profiles and possibly better agreement with dipole-dipole survey results. It is recommended that the metal factor be calculated for the rest of the gradient array coverage and that the results be compared with the chargeability/resistivity and magnetic data. It is possible that a few areas could be selected from this data for follow up by dipole-dipole surveys.

It is not recommended that the rest of gradient array anomalies be checked by dipole-dipole surveys, since it is argued that many of these may be false. Rather it is suggested that three broadly spaced lines be surveyed across the area with (say) 100m dipoles in an attempt to locate favourable ore-horizons. Results of this survey could be combined with the suggestions of ~~Butt~~ (eruptive centres) or the work by Eastoe (alteration to identify ore-horizons) to define more restricted areas for detailed exploration. Line 13,720N extends right across the grid and is already about one third surveyed by 100m dipole-dipole IP. Lines 12,600N and 15,480N would give the grid an even-spaced coverage. In the conclusions, the report briefly discusses other methods such as down-hole EM which may be applicable for more detailed exploration.

AIM AND INTRODUCTION

The Boco area covers the southernmost part of E.Z's 'Bulgobac E.L.', E.L. 12/72. The rocks within the E.L. are part of the highly mineralised Cambrian belt of Mt. Read Volcanics which extends down much of Tasmania's West Coast. This E.L. is close to the northern limit, the volcanics being overlain by Tertiary basalts a few kilometers north of Bulgobac.

The geophysical grid lines are perpendicular to the geological strike and are approximately NW-SE. The original line spacing was nominally 320m, however many intermediate lines have been surveyed, and the spacing between most lines on the grid is now 160m (Figure 1). The bedrock geology (Figure 2) consists of a central belt of NE striking acid pyroclastics with intermediate lavas and pyroclastics to the SE. NW of the central belt, in faulted contact, are sandstones, siltstones, black slate and ash; and to the NW of these, a quartz feldspar porphyry. The geophysical grid covers all of 'Boco' except for the SE and SW corners. Glacial moraine covers much of the area and in places is quite thick, electrical soundings suggest up to 100m.

The grid has been covered by gradient array IP and magnetics. Several chargeability anomalies were defined and three of these have been drilled, with disappointing results (minor sulphides in two holes, and "gossaneous material" in the third). Responses within the area to a regional airborne electromagnetic survey (Input) have been ascribed to conductive layers within the overburden. A limited geochemical survey was conducted over moraine-free ground, however all anomalies were close to the railway line and were considered to be due to contamination from ore-trains.

Thus exploration, and particularly the geophysical methods, have been disappointing. Nevertheless, the area is regarded as being highly prospective. The presence of glacial moraine of variable thickness makes exploration difficult and it is the purpose of this report to evaluate the effectiveness of the geophysics carried out so far and to make suggestions for any further programmes.

GEOPHYSICAL SURVEYS

This section describes the surveys that have been conducted over the Boco Grid up to March, 1981.

ELECTROMAGNETICS

An airborne electromagnetic (Input) survey was flown by Geoterrex for Australian Anglo American Ltd. (Comstaff) in April, 1975 (Butt et al 1975). The survey covered part of E.Z. leases and this data was made available to E.Z.. The line spacing was 400m and the mean terrain clearance was between 120 and 180m (400 to 600ft). Several anomalies occurred in the Boco-Bulgobac areas and an IP survey was commissioned to locate these anomalies (this decision is criticised in the Conclusions where it is suggested than an EM method should be used to locate EM anomalies). None of the airborne EM anomalies were particularly strong and several appear to be associated with the Murchison Highway or the Emu Bay Railway. No IP anomalies were found in the near vicinity of the Input anomalies and they have been 'explained as superficial conductive effects within the button grass plains and overburden' (Hanson, 1977). I have not made any detailed assessment of the Input survey, but am in agreement with Hanson's explanation after a rather brief examination of the profiles.

GRADIENT ARRAY INDUCED POLARISATION

Data Coverage

The gradient array IP was carried out by Scintrex in two stages; the first survey was conducted between March and July, 1976 and the coverage is shown in Table 1 (from Scintrex report TAS-033). The potential dipole "ranged between 20 and 25m" (TAS-033) and the current electrodes were mostly 1600m apart. The nominal line spacing was 320m, however several infill lines were surveyed, so that the majority of the lines had a spacing of 160m. The survey was made using an IPR-7, the station spacing was 20m and a total of 55.4 line kms was surveyed. The data was presented in Scintrex report TAS-033 as line profiles of chargeability and resistivity and as contour maps, all at a scale of 1:5,000.

TABLE 1.

GRADIENT ARRAY IP SURVEY, BOCO
(Survey Dates April, May, July, 1976)

(From Scintrex report TAS-033)

LINE	8800E-10400E on 15480N	9700E-11300E on 15480N	10200E-11800E on 15000N
15960N		10050E-10530E	
15800N	9210E-10090E		
15640N	9110E-10090E	10070E-10810E	
15480N	9110E-10130E	10070E-10990E	
15320N	9110E-10090E	10070E-11070E	10710E-11050E
15160N	9110E-10110E		10730E-11390E
15000N	9110E-10090E	10070E-11170E	
	9200E-10800E on 14360N	**11700E-10100E on 14360N**	**10600E-12200E on 15000N**
15000N			10910E-11910E
14840N	9510E-10470E	10410E-11390E	11010E-11750E
14680N	9490E-10470E	10410E-11390E	11110E-11770E
14520N	9510E-10450E	10410E-11390E	
14360N	9510E-10450E	10410E-11390E	
14200N	9510E-10450E	10410E-11390E	
14040N		10410E-11390E	
13880N	9510E-10490E	10410E-11390E	
	8500E-10100E on 13240N	**9350E-10950E on 13240N**	**10200E-11960E on 13240N**
13720N	8970E-9750E	9710E-10590E	10510E-11330E
13400N	8930E-9810E	9710E-10590E	10510E-11410E
13240N	8810E-9810E	9710E-10590E	10510E-11910E
13080N	8850E-9790E	9710E-10590E	10510E-11590E
12760N	8850E-9790E	9170E-10590E	10610E-11630E
	9200E-10800E on 12120N	**10200E-11800E on 12120N**	
12600N	9450E-10510E	10470E-11570E	
12280N	9450E-10510E	10450E-11590E	
12120N	9230E-10510E	10470E-11770E	
11960N	9450E-10630E	10590E-11710E	
11640N	9450E-10650E		

A magnetic survey was conducted by E.Z. during this period and the results, processed and presented by Scintrex, were also presented in report TAS-033 in profile and contour form. This survey is discussed in a later section, as are data from electrical soundings which were carried out on the grid and are interpreted in TAS-033.

A NW extension to the IP coverage was carried out in 1977. The work was again done by Scintrex and consisted of approximately 15.5 line kms. The results, with magnetics, were presented by Scintrex as line profiles (at 1:5,000) in report TAS-051 (May, 1978). Contour plans of chargeability, resistivity and magnetics, incorporating data from the earlier survey were included (at 1:5,000). The report also contained pseudo-sections of 5 dipole-dipole surveys conducted over anomalies defined during the first gradient array survey. The potential dipole spacing for the gradient array survey was not stated in TAS-051, but is assumed to be the same as the 1976 survey and "range between 20 and 25m" (TAS-033). A list of lines covered by each current dipole was not provided and Table 2 merely lists the overall coverage. An IPR-7 receiver was again used for this survey.

Inspection of Tables 1 and 2 suggests that there are the following gaps within the survey:

Line	15,160N	10,110E	to	10,730E, a distance of 620m
	14,040N	9,490E	to	10,410E, a distance of 920m
	13,880N	9,190E	to	9,510E, a distance of 320m

These gaps are not obvious in the contour plans and they are adjacent to two of the drilled anomalies (BBP 207 and 208). This point is further discussed under 'Drilling'.

TABLE 2.

GRADIENT ARRAY IP SURVEY - BOCO NW EXTENSION

(Survey Date Sept/Oct., 1977)

LINE			
14,840N	9,010E	to	9,390E
14,680N	9,010E	to	9,490E
14,520N	8,510E	to	9,490E
14,360N	9,010E	to	9,490E
14,200N	8,510E	to	9,490E
14,040N	8,850E	to	9,490E
13,880N	8,590E	to	9,190E
13,720N	8,190E	to	9,090E
13,400N	8,170E	to	9,110E
13,240N	8,110E	to	9,090E
13,080N	8,110E	to	9,090E
12,920N	8,110E	to	9,110E
12,760N	8,110E	to	9,010E
12,600N	8,410E	to	9,390E
12,280N	8,410E	to	9,390E
12,120N	8,410E	to	9,390E
11,960N	8,410E	to	9,360E
11,640N	8,410E	to	9,390E

Results

In the 1976 IP survey, Scintrex defined 22 anomalies (identified by roman numerals). From the 1977 NW extension survey, a further 11 anomalies were picked and these were labelled A to K. The results were generally disappointing with chargeability anomalies rarely exceeding 20ms.

Whilst one could argue that some anomalous areas have not been defined, all major responses have been recognised and described in detail by Scintrex, in report TAS-033 and TAS-051. The relative merits of these anomalies are not discussed here, but some general observations are made below.

The original 1:5,000 contour plans of the chargeabilities and resistivities from Scintrex report TAS-051 are reproduced here at 1:10,000 (Figures 3 and 4 respectively). There are some inconsistencies in the contour intervals and minor errors in the labelling but these have not been changed since the figures are not intended for detailed analysis of the results. The dotted contours are mostly where the 1976 and 1977 surveys joined, with often quite large differences; others are near the railway line. It is likely that there is some error in the positioning of the results: The Scintrex plan (revised version plate 2, TAS-051) shows spot co-ordinates on the lines, and rarely do these agree with the measured value (which may be longer or shorter).

The chargeability contour plan (Figure 3) shows an area of high values defined by the NW extension survey and at least part of this area has matching low resistivities. Much of the area is shown as being not covered by moraine, however the boundaries are very approximate. (The extent of the moraine was taken from a 1:40,000 figure by Butt in Hanson, 1977. An example of the inaccuracy is beneath BBP 209, which though shown as being on bedrock, drilled through about 15m of moraine.) The lack of an overburden is considered important, since it is argued later that much of the anomalous response may be due to variations within the moraine. The geology of this area is indicated as sediments, including black slates (Figure 2) and this is supported by the generally low magnetic activity (Figure 5). However, presumably such an area is highly regarded, given the proximity of black slates to the Rosebery ore-body which lies on strike about 12kms to the south.

Another large area of anomalous chargeabilities lies about 1km to the SE of the above zone. The area is mostly moraine covered and has high resistivities. Anomalies with this zone may be examples of the argument given later, that the gradient array IP may be responding to variation within the moraine. The anomaly drilled by BBP 209 forms part of this zone, however although the drill site was (well) covered by moraine, the anomaly itself lies beneath a hill with little, if any, cover ("gossanous" material, with only very minor sulphides, was intersected).

Otherwise the area consists of a number of discrete anomalies, the largest of which (in areal extent) is on the NW end of lines 14,680N and 14,840N. The railway line runs sub-parallel to line 14,840N for much of this anomaly and it is possible that this may have contributed to the IP response. (The response of the IP survey to the railway line was quite varied, some lines showing large 'anomalies', others none. Apart from line 14,840N, the railway intersects the grid lines at high angles.) The Scintrex anomaly 'K' is part of this anomaly which overlies the contact between the acid pyroclastics and sediments previously mentioned. The anomaly is only about half-covered by moraine and 'K' is on the uncovered section. The 22 ms chargeability response is among the highest recorded in the area, however it does not appear as a particularly prospective target, particularly so, since there has apparently been no dilution of the response by overburden. (Although the very approximate nature of the moraine boundary as shown in Figures 2 and 3 is again noted.)

Diamond drill holes BBP 207 and 208 were drilled on isolated chargeability targets within the moraine. Although it is later shown that the drill holes could have been better positioned (in hindsight, using the results of subsequent dipole-dipole surveys), the results were most disappointing, minor sulphides only being intersected. It will be argued in the Discussion sections (with examples) that the gradient array is not the most suitable geometry for exploration over glacially covered terrain.

The resistivity contour plan (Figure 4) shows the somewhat lower resistivites associated with the sediments and some isolated resistivity lows throughout (not associated with chargeability highs). The main feature of the map,

is the large area of low resistivity (less than 500 ohm-metres) in the north western corner of the grid. This area, mapped as being within (undifferentiated) acid pyroclastics, is most likely a different rock type; rocks of low resistivity to the NW, and of higher resistivity to the SE. There is no corresponding chargeability anomaly, such as might be expected over black shales (within the sediments to the NW). Butt's outline of the moraine does not extend this far noth.

DIPOLE-DIPOLE INDUCED POLARISATION

Data Coverage

Five dipole-dipole spreads were surveyed by Scintrex in February and April, 1978. The surveys were made over gradient array anomalies from the 1976 survey described above. A 50m dipole was used and the lines and extent of coverage are listed in Table 3. Two more lines were surveyed by Scintrex in February, 1979, and these are also listed in Table 3. A frequency domain dipole-dipole survey was conducted by Geoex in February, 1978 over DDH BBP 207 on line 13,880N, which had (one week previously) been similarly surveyed by Scintrex with time domain equipment (Coverage given in Table 3). The results of these two dipole-dipole surveys, plus those over DDH's BBP 208 and 209 are shown in Figures 6, 7 and 8 respectively. For the others, the reader is referred to Scintrex reports TAS-051 and TAS-065 (August, 1979).

Results

The dipole-dipole spreads were placed over gradient array anomalies, presumably to check their validity. An exception is the 100m dipole-dipole on line 13,720N which is a SE extension to the grid. A detailed comparison of the two array types is given in the Discussion, however the gradient anomaly was located by each dipole-dipole survey, the latter usually giving better definition to the causative body(s).

Presumably the Geoex dipole-dipole survey was done to compare the relative merits of frequency and time domain systems and/or the relative merits of the 2 contractors. The resistivity pseudo-sections of the two methods are comparable, however the 2 IP results (frequency effect and chargeablity)

TABLE 3.

DIPOLE-DIPOLE SURVEYS OVER THE BOCO GRID

(Coverage defined by the extreme data points)

Line	Coverage			Dipole Spacing
TIME DOMAIN SURVEYS BY SCINTREX				
1. Survey Date: February, April, 1978 (Results in Scintrex report TAS-051, May, 1978.)				
16,440N	9,000E	to	9,550E	50m
13,880N*	9,050E	to	10,350E	50m
13,720N*	9,050E	to	9,725E	50m
13,720N*	10,875E	to	11,400E	50m
13,080N	9,750E	to	10,250E	50m
2. Survey Date: February, 1979 (results in Scintrex report TAS-065, August, 1979)				
13,720N	11,400E	to	13,150E	100m
12,760N	10,450E	to	10,950N	50m
FREQUENCY DOMAIN SURVEYS BY GEOEX				
3. Survey Date: February, 1978.				
13,880N*	9,800E	to	10,400E	50m

* Results reproduced in this report.

are quite different. The western end of the frequency domain survey has apparently been strongly affected by the railway line, producing some negative effects. Time domain systems are of course equally affected by cultural objects (grounded fences, railways, powerlines etc.) as is shown in the profiles of the gradient array data (Scintrex report TAS-033). It is possible that the diffences between the two surveys in this example, are due to slightly different electrode positions. (Studies have shown that grossly different results can be obtained with small changes in electrode positions in close proximity to surface conductors). However, the frequency effect results shows much less variation than the chargeability results, the results of which are in some agreement with the dubious gradient array survey. Nevertheless the time domain results are considered the more reliable (and useful) of the two dipole-dipole surveys. Apart from electrode positioning, this difference may be due to instrumentation or field operation: it is not considered to be due to inherent differences between the two domains.

It is interesting to note that the gradient array apparent resisitivities in Figure 6 are much higher (an order of magnitude) than the dipole-dipole values. In a medium of one resistivity, all arrays should measure the one (true) value, therefore the marked difference between the gradient and dipole-dipole arrays, in this instance, suggests that quite different horizons are being measured.

In Figures 7 and 8, the resistivity pseudo-sections have not been included, since the drill holes were targeted on chargeability anomalies. The drill hole sections have been superimposed on the dipole-dipole chargeabilities and their positions, with respect to these values and those of the gradient array surveys, are discussed in the Drilling section. The magnetic profile is also shown in Figure 7, since the cause of the well-defined anomaly, should perhaps form part of the drill target. (The gradient array resistivity values shown in Figure 7.8 Hanson, 1977 are incorrect. The correct profile is shown in Figure 7.)

ELECTRICAL SOUNDINGS

Electrical soundings were carried out by Scintrex before the 1976 gradient array IP, to determine the thickness and electrical properties of the overburden (glacial moraine). An expanding Schlumberger array was used and both chargeability and resistivity were measured.

The survey locations were:

1. Line 15,160N, peg 9,760E.
2. Line 14,680N, peg 10,920E.
3. Line 13,880N, peg 10,040E.

The resistivity results are shown in the standard log-log form while the chargeability has been plotted log (distance)/linear (M) in Scintrex report TAS-033. All the soundings were expanded out to 150m. The report states that the expansion was parallel to strike, however it is most likely that it was along the survey lines which are perpendicular to strike. This is also suggested by the symbols for the soundings on the Scintrex plans.

The data show a thin (8 to 20m) surface layer of high resistivity and low chargeability above a more conductive (500 ohm-m), thicker layer also of low chargeability. Beneath these two layers is a highly resistive and more chargeable zone inferred to be fresh bedrock. As admitted by Scintrex, the soundings did not extend far enough to enable confident depth calculations to be made, however a depth to bedrock of no more than 70 to 100m is mentioned in TAS-033. Surveys of this nature should be made with a geophysicist or experienced technician in the field and results must be processed during the survey, thus ensuring that it is properly completed. Further, electrical sounding interpretations are based on the assumption of horizontal (resistivity) layers; in areas such as this where the subsurface is quite unknown (and in areas where it is thought to be known), two orthogonal expansions should be made at the one site to determine whether these assumptions are valid.

A third plot, $M_a - M_1$ is shown on two of the sounding graphs. On both graphs, it is a steeply rising curve. It is not defined in the report, however apparently it is an estimate of the surface chargeability (M_1) subtracted from the measured chargeability (M_a). This has been plotted on a logarithmic scale and it suggests "a more chargeable layer at depth".

MAGNETICS

The area was covered by an aeromagnetic survey conducted by Scintrex in 1973. The results of this survey are on 1:10,000 (10γ contours) and 1:50,000 (50γ contours) scale maps. A comparison of this latter map with the 1:50,000 geology shows that the acid pyroclastics in the Boco area are more magnetic than the intermediate lavas to the south; and, whilst much of the area mapped as sediments and porphyries to the north of Boco is non-magnetic, there is one strongly magnetic belt (parallel to strike) within the sediments. This zone between the Que River and Silver Falls extension grids is not, however, relevant to this report.

Ground magnetic surveys were carried out over the area covered by the IP surveys and these results have been shown as contours (Scintrex report TAS-051) and profiles (Scintrex report TAS-051 and TAS-033) at 1:5,000 scale. The 1:5,000 ground magnetic contours have been reduced to 1:10,000 for this report (Figure 5). It should be noted that the contour intervals of this figure are not consistent; in particular, the 1976 data is mostly contoured at a 25 or 50 gamma interval, and the 1977 data at a 5 gamma interval. The possible importance of magnetics to the exploration of areas covered by overburden is discussed later in this report.

DRILLING

Three holes have been drilled on the Boco Grid, in each case the target was a gradient array anomaly. Table 4 gives location and depths of the three holes (from Hanson, 1977). The bore hole sections have been superimposed on the chargeability pseudo-sections in Figures 6, 7 and 8.

TABLE 4.

DRILL HOLE LOCATIONS
(From Hanson, 1977)

DRILL HOLE BBP 207

COLLAR CO-ORDINATES

Boco Grid		A.M.G.	
13,880mN	10,150mE	5,380,130mN	383,370mE
R.L. 360m A.S.L.		360m A.S.L.	

COLLAR ORIENTATION:
DIP -60° Direction 288° wrt Boco Grid north
TOTAL DEPTH: 159m.

DRILL HOLE BBP 208

COLLAR CO-ORDINATES

Boco Grid		A.M.G.	
13,720mN	11,240mE	5,385,315mN	383,935mE
R.L. 332m A.S.L.		332m A.S.L.	

COLLAR ORIENTATION:
DIP -60° Direction 265° wrt Boco Grid north
TOTAL DEPTH: 154m

DRILL HOLE BBP 209

COLLAR CO-ORDINATES

Boco Grid		A.M.G.	
13,720mN	9,440mE	5,386,525mN	382,730mE
R.L. 411m A.S.L.		411m A.S.L.	

COLLAR ORIENTATION:
DIP -50° Direction 270° wrt Boco Grid north
TOTAL DEPTH: 162m

The location of the drill holes is also shown on Figures 1 and 3 where it can be seen that single line anomalies rather than anomalous zones have been drilled. At BBP 207, the adjacent northern line (14,040N) has apparently not been surveyed by IP and the line 230m to the south (13,720N) does not have the anomalous response. Similarly for BBP 209, the area on the adjacent line to the north (line 13,880N) has not been surveyed and the line 310m to the south (13,400N) has a considerably reduced response. The lines adjacent to BBP 209 have both been surveyed; lines 13,400N and 13,880N, but to the south, the line is 370m distant, with a reduced response and the anomaly does not extend to the northern line, 140m away. The dipole-dipole surveys were conducted over the drill hole locations after the drilling.

As shown in Figure 6, the gradient array anomaly on line 13,880N over BBP 207 is poorly defined; the eastern peak is a single point anomaly and is therefore undistinguishable from the noise level; the western anomaly consists of the minimum 2 points. Around (and including) the western anomaly, the resistivity and chargeability profiles parallel each other. This rather disquieting feature is further discussed below. The time domain dipole-dipole pseudo-section shows two poorly defined zones much further apart than the two gradient array highs; the former may represent edge effects from a horizontal, (poorly) chargeable body.

Over BBP 208 on line 13,720 (Figure 7), the gradient array anomaly appears to be due to two or three shallow sources combining to form one large anomaly. The hole has been collared 'within' the anomaly and may have passed over it. This view is to some extent reinforced by the dipole-dipole data - the form of which suggests a shallow flat lying body giving rise to the trouser leg-type anomaly (although more data is required on the eastern side, as does the gradient array). If this is the causative body, the drill hole is over the western edge of the conductor. A type curve for a shallow flat chargable body is shown in Figure 9. The magnetics results do not substantiate this model and to site a drilling target, joint modelling should be attempted, to define a magnetic and chargeable source. (It is of course possible that there are two separate sources, one magnetic, the other chargeable. However, at least attempts should be made to integrate all results.

A possible answer in this case might be a magnetic/chargeable source on the western side, with a non-magnetic body (extension?) to the east.) Before drilling this type of dipole-dipole anomaly, a more detailed survey would be advised, to determine the body's upper limit and better define its extent.

The dipole-dipole anomaly over BBP 209 has a well developed trouser leg-type anomaly in the chargeability parameter only. The pattern indicates a very shallow polarisable body of limited extent. This has been confirmed by modelling. Figure 10 shows the results for an outcropping two dimensional body, 37.5m deep (i.e. $\frac{3}{4}$ of a dipole spacing) and 50m wide (1 dipole spacing). The contrast of peak value to background is smaller in the model and the anomaly is narrower at n=1, but the agreement is certainly close enough to verify the above interpretation. It would be even more advisable for a detailed dipole-dipole survey to be carried out on this line before siting a drill. However, the very shallow, restricted area of the anomaly makes it an unattractive and unlikely target.

Thus the following general points are made from this examination of drill holes and geophysical anomalies.

Drill holes should be sited on zones, rather than single-line anomalies (a single IP survey off the end of a body may still record a 'drillable' target). That is, the geophysics should be used to determine the extent of a target and the location of its most anomalous area before drilling.

Whilst the gradient array method has good lateral resolution, dipole-dipole surveys (sometimes more than one) are recommended for drill hole selection. (The question of the gradients array's suitability as a 'first-pass' method in areas of uneven, and possibly conductive, cover is discussed in the next section.)

All (geophysical) data should be thoroughly interpreted for precise location of drill hole targets. Often the interpretation may consist of matching to type-curves, however for many cases, computer modelling is required (E.Z. will be given the appropriate IP and EM programs through its sponsorship of an A.M.I.R.A. project). The need for integration of the results of the various methods is emphasised.

Where poor results are obtained from drilling, downhole geophysical methods should be used to determine the location of the (elusive) source of the anomalies. (Downhole geophysics was attempted at the Boco holes in May, 1977 (*Hanson, 1977*) *however, the holes caved in.*) All holes should be cased with perforated plastic pipe and capped as a matter of routine.

DISCUSSION

The subsequent dipole-dipole surveys over the gradient array anomalies labelled III, XIII and XVI by Scintrex, have shown these areas to be of poor potential (although it is suggested that this has not been proven by the drilling which could have been better sited from dipole-dipole information). Thus there seems little point in further follow-up of any more (weaker) gradient array anomalies with dipole-dipole surveys, particularly so since it is argued below that some of the 'anomalies' may be merely reflections of the bedrock topography.

Several of the gradient array profiles possess some parallelism between the chargeability and resistivity responses. I believe that this correlation *is due to variations in the thickness of the glacial cover:* thinner cover over fresh, more resistive and chargeable rock giving chargeability and resistivity highs, and thicker cover, being less resistive and of lower chargeability, giving lows. (*The limited electrical sounding data supports the proposition* of low resistivity and chargeability in the overburden and higher resistivity and chargeability in the bedrock.)

A further argument that the gradient array results are not recording changes in the bedrock electrical properties is taken from a statement by Howland-Rose in Scintrex report TAS-033, which notes that the chargeability background is very low and that "this situation is quite atypical of the West Coast". Since the suites of rocks below the cover are apparently considered typical West Coast volcanics, it is suggested that the atypical response may be due to the glacial overburden. Also it can be seen from the chargeability contour map that the covered areas do appear to have a somewhat lower background than the uncovered areas.

Drilling of the gradient array anomalies has nevertheless shown them to be associated with, if not due to, at least some sulphide mineralisation. A good example of the complete down-grading of a gradient array anomaly over glacial overburden is shown in Figure 11. Largely because of the subsequent dipole-dipole survey there is no drilling data. The survey results are from line 5,376,000mN, Murchison River Grid (Scintrex report TAS-065, October, 1980 and TAS-065 July, 1979); the gradient array chargeability shows an apparently deep-seated anomaly, (the depth to source was interpreted to be about 60m). The dipole-dipole survey with dipole spacing 100m showed the source likely to be very much shallower. An electrical Schlumberger sounding over the anomaly defined the chargeable source to be "near surface to a maximum depth of 9 metres" (Scintrex report TAS-065, October, 1980). If drilling were planned, it is interesting to note that there is a 50m offset between the peak gradient array and dipole-dipole values. A more detailed dipole-dipole survey would be needed to better define the target.

An example of the reverse situation, i.e. a multi-separation array anomaly where none existed or was only poorly defined by a gradient array, is given by Lajoie and Klein (1979). This paper is a case history of the geophysical exploration at Pine Point, North West Territories, Canada. The area contains several Mississippi Valley type ore bodies (lead-zinc mineralisation in limestones) covered by glacial overburden which varies in thickness from 5 to 30m and averaging 15m. The ore bodies are chargeable but not conductive. The multi-separation array used was pole-dipole, rather than dipole-dipole, however their conclusions may be directly applied to the latter. Figure 12 shows that with a current electrode spacing of 1037m (3400ft) and a dipole spacing of 61m (200ft) no anomaly was detected by a gradient array survey. With a reduced electrode spacing (to 610m (2000ft)) and dipole spacing (to 30m (100ft)) a distinct anomaly appears. A somewhat stronger anomaly occurs on a pole-dipole survey over the same line. On the N=2 figure, the expected double peaking of the anomaly, with the strongest peak on the side of the current electrode can be seen. (The area has a particularly low geologic noise for IP surveys and after the initial survey all four areas with chargeabilities over 5ms were each developed into orebodies.)

The 'metal factor' parameter was developed in frequency domain IP to try and compare IP results from areas of contrasting resistivities; that is, the parameter is an attempt at removing the effect of the resistivity from the IP results. Lajoie and Klein give an example of a correlation between resistivity and chargeability (related to a change in bedrock-type rather than change in bedrock topography as I have suggested is the case at Boco) and they show that the metal factor (defined as $\frac{\text{chargeability} \times 1000}{\text{resistivity}}$) may be used to filter the effect of the bedrock change. This has been tried on two short portions of Boco lines; one where there was good correlation between resistivity and chargeability (Figure 13), and one over a DDH site (BBP 207) (Figure 14). From this exercise it is not clear whether the metal factor may be useful in reducing what I believe may be an overburden response at Boco. Certainly the metal factor profiles appear to be less variable than the chargeability, and one could argue that the metal factor profile on line 13,880N is in better agreement with the dipole-dipole survey than is the chargeability of the gradient array survey. One undesirable effect would be an enhancement of chargeable layers within the moraine. Such cases should have no parallelism between chargeability and resistivity, and might be indistinguishable from the desired 'true' anomalies. Nevertheless the calculation is quick and straight forward, and may provide some additional information, particularly within those areas where parallelism is evident.

Lajoie and Klein also carried out SP, EM, gravity, magnetic and seismic surveys over Pine Point. Since the mineralisation was not conductive, SP and EM were not successful. The gravity method was successful in defining massive mineralisation and sink holes in the limestone. However, "most anomalies were due to varying overburden thickness". Lajoie and Klein therefore point out, that, to be "truly effective, gravity surveying should be accompanied by refraction seismic surveying. ...However, this considerably lowers the cost-effectiveness of the gravity method in reconnaissance surveys at Pine Point in comparison with the IP technique and may not be feasible for general use". Seismic reflection techniques were tried "to determine its usefulness as a mapping tool, a direct ore finder, and to find disturbances in the bedrock such as faults and collapse structures which may lead to mineralisation". The results were not encouraging.

Their experience with magnetics is unlikely to be relevant to Boco, but is mentioned here for completeness. An example is shown of a 20 gamma anomaly over mainly barren sulphides with more than the usual amount of pyrrhotite in it. But "since Pine Point is in the auroral zone, the area is subjected to severe magnetic storm activity" and since a 20 gamma anomaly is larger than usual, the magnetic method was considered unlikely "to be a significant exploration tool at Pine Point in comparison with IP".

Lajoie's and Klein's paper is interesting for the large number of methods tried and the detailed experimentation "to determine more diagnostic survey parameters of ore definition". Despite the quite different ore-type, the occurrence of subcropping mineralisation beneath glacial overburden makes much of their experiences relevant to Boco. They strongly favour IP and state that "such field tests showed that, here at least, multi-separation arrays (i.e. pole-dipole or dipole-dipole) are better focused for the detection of weak mineralisation than the gradient array. Also, they make it easier to interpret the depth and the lateral limits of polarizable sources".

CONCLUSIONS

Several arguments have been put forward in this report to suggest that the gradient array IP data over the Boco Grid has responded to variations in the glacial cover as well as variation in the bedrock. The true resistivity of the glacial overburden does not appear to be very low and multi-separation arrays such as pole-dipole or dipole-dipole should, it has been argued, be much less sensitive to the glacial moraine and should have no difficulty in penetrating the overburden. However, it is not suggested the whole of the Boco Grid be resurveyed with dipole-dipole IP (or by pole-dipole which would be somewhat cheaper), although it might have been, had the gradient array survey not been carried out. Nor is it suggested that all of the gradient array anomalies be resurveyed by dipole-dipole IP, since experience to date has shown the targets so defined to be fairly uninteresting and anyway it is argued that many of them are 'false' anomalies.

Nevertheless, it is believed that IP is the best exploration tool for the area. The results of two or three regional dipole-dipole surveys across the grid could be used with Butt's ideas of eruptive centres (Hanson, 1977) and with Eastoe's work on alteration to define favourable horizons.

The use of IP in areas of glacial cover and the superiority of the dipole-dipole or pole-dipole arrays over the gradient array was demonstrated in the case history which also suggested the use of the metal factor parameter to reduce the effect of variable resistivities. I have suggested that the same parameter may serve to filter the effect of the overburden response from the gradient array results. It may, for example, reduce the number of anomalous areas (i.e. areas with coincident chargeability and metal factor highs) to a small number that could be further explored with dipole dipole IP.

The role of magnetics has received little mention in this report, my main brief being to evaluate the effectiveness of the gradient array data. Paterson (1967) writing about the Canadian shield noted that most massive sulphide orebodies (as distinct from occurrences or deposits) in Canada, where copper or nickel was of prime interest, have a magnetic response whereas those that were mainly lead-zinc did not. The number of orebodies on the West Coast is insufficient to make any meaningful generalisations, but neither Rosebery nor Que River (both in the latter category) have a magnetic response and Mt. Lyell (in the former) does (that is, at least some of its orebodies do). Nevertheless the Boco Grid has been completely covered by magnetics at a 20m station spacing and this data should be integrated with any subsequent exploration data.

Despite the emphasis on IP there are other geophysical methods which may prove cost-effective at Boco. Gravity has been mentioned in the context of the Canadian experiece, but it is unlikely that it would be useful in areas with (variable) overburden thickness of the order of 100m. The seismic surveys needed to define the bedrock topography for gravity could possibly be used to locate the orebodies directly; by detecting anomalous low velocity zones. Neither of these methods could be used for regional work.

The effective search radius of some downhole EM methods is claimed to be up to 100m from the hole and the high resisitivity of the Mt. Read Volcanics makes them an excellent host rock for EM targets. Presuming that a zone could be narrowed down on geologic grounds, and given suitable mineralisation, such methods may become practicable.

RECOMMENDATIONS

It is recommended that the metal factor be calculated from the gradient IP data and a contour map prepared. Although this recommendation is made more on the ground of experimentation than from conviction that it will reveal orebodies; 'it's worth a try'; and the results of such a try should be examined together with the chargeability, resistivity and magnetic maps. It is possible that a small number of anomalies will result that may be considered worthwhile for dipole-dipole follow-up.

Whatever the outcome of the above recommendation, two or three broadly spaced lines should be surveyed by large-spacing (e.g. 100m) dipole-dipole IP. Line 13,720N extends right across the grid and has about one third of its length already surveyed by 100m dipole-dipole IP. To give an even-spaced coverage, the other lines might be 12,600N and 15,480N. These lines would be used to try and locate 'ore horizons' within the grid. More detailed IP would be needed to follow-up any such horizon along strike.

Work by Eastoe (pers. comm.) uncompleted at the writing of this report, suggests that a favourable horizon may pass through the SW corner of the Boco Grid. Depending on Eastoe's report, consideration should be given to surveying this area with IP.

J.R. BISHOP

JRB/amd

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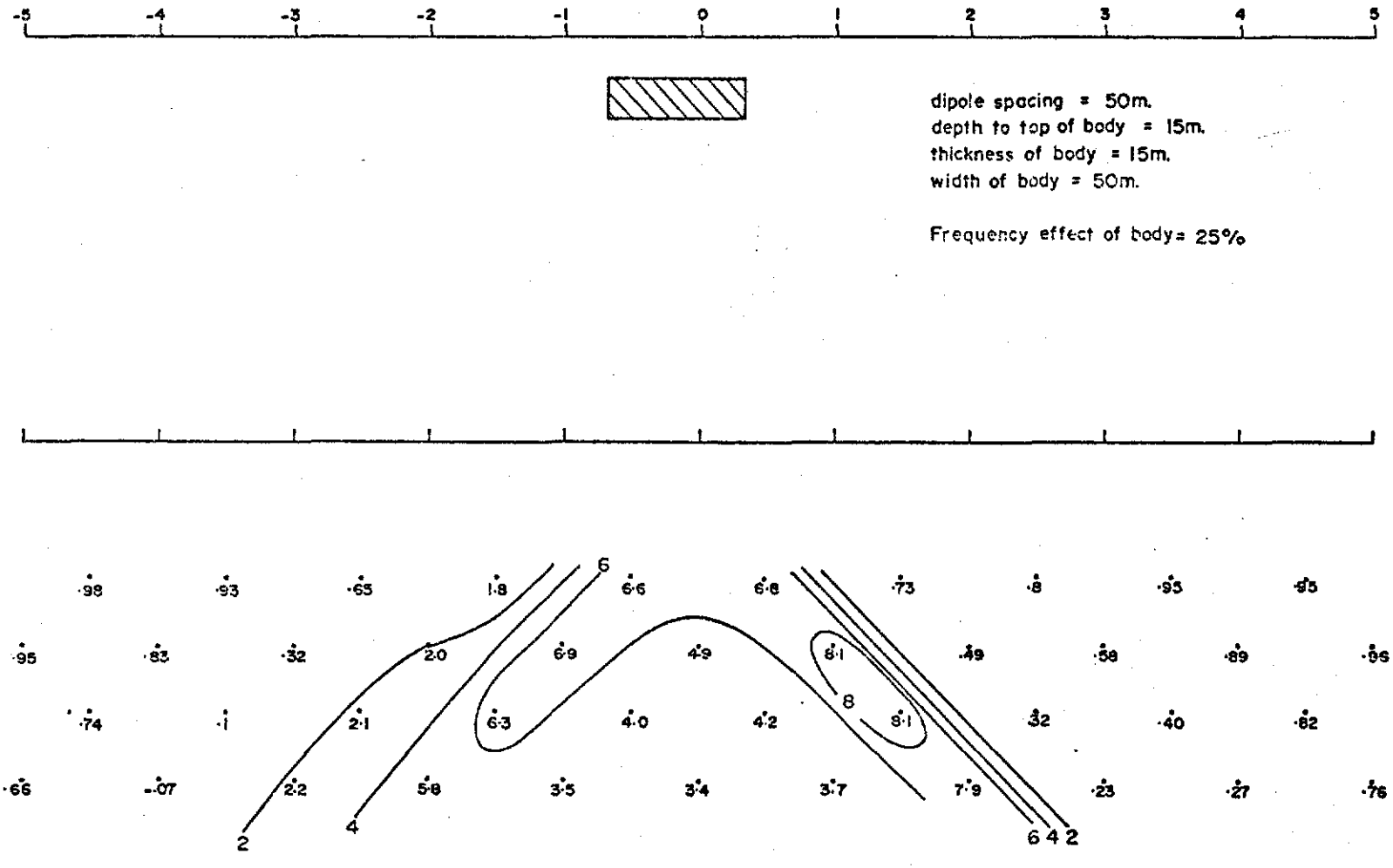
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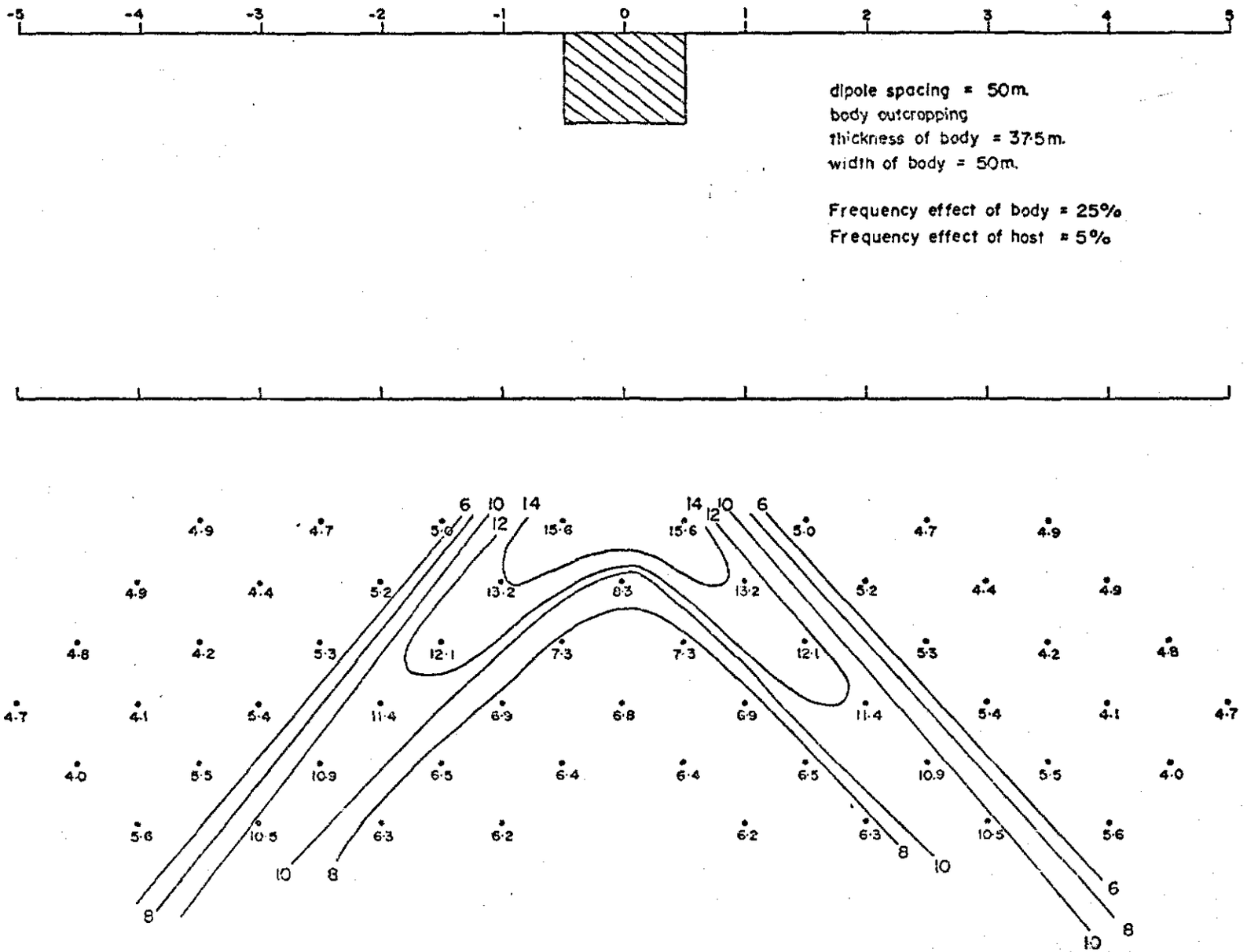
660664

MITRE GEOPHYSICS PTY. LTD.

BOCO GRID
I.P. Survey
Computer Model
for BDP 208

DRAWN: J.B. | SCALE: 1:2 1/2"=1"
TRACED: T.G.D.S. | DATE: March 1981

FIG. 9



960664

5 cm

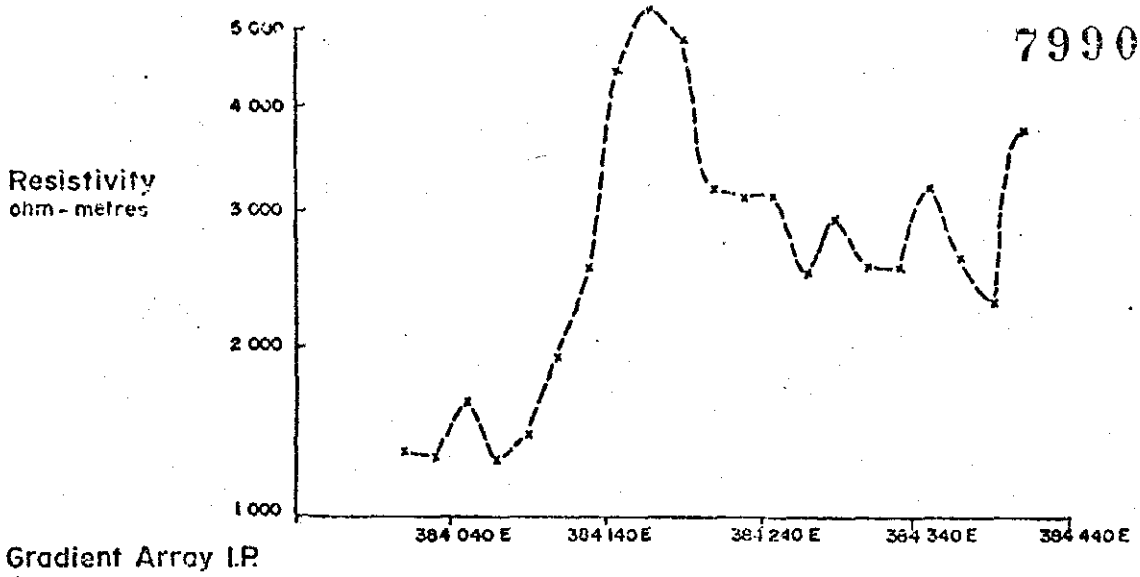
MITRE GEOPHYSICS PTY. LTD.

BOCO GRID
I.P. Survey
Computer Model
for BDP 209

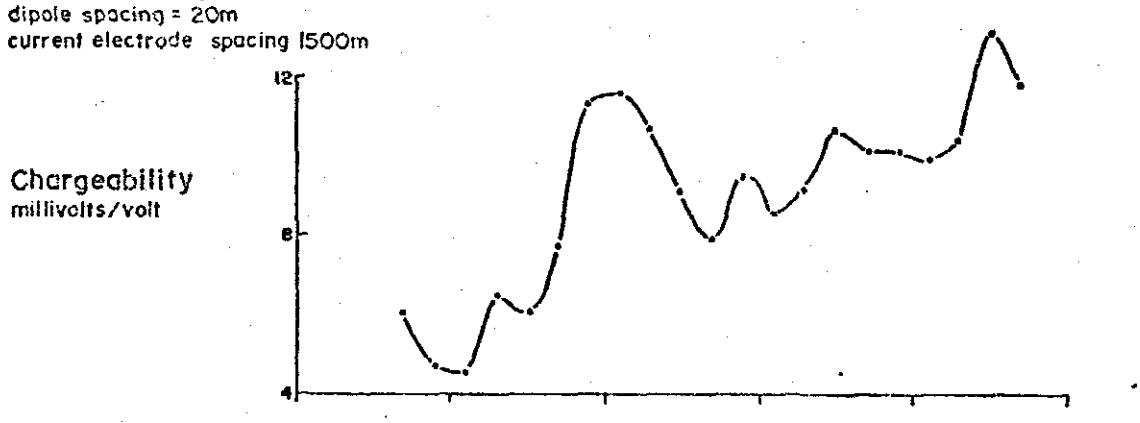
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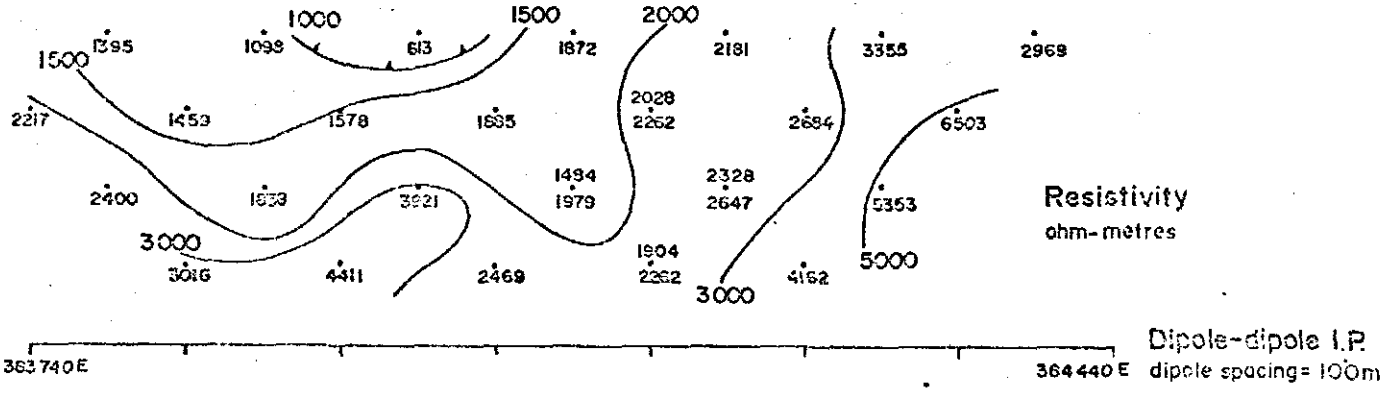
FIG. 10

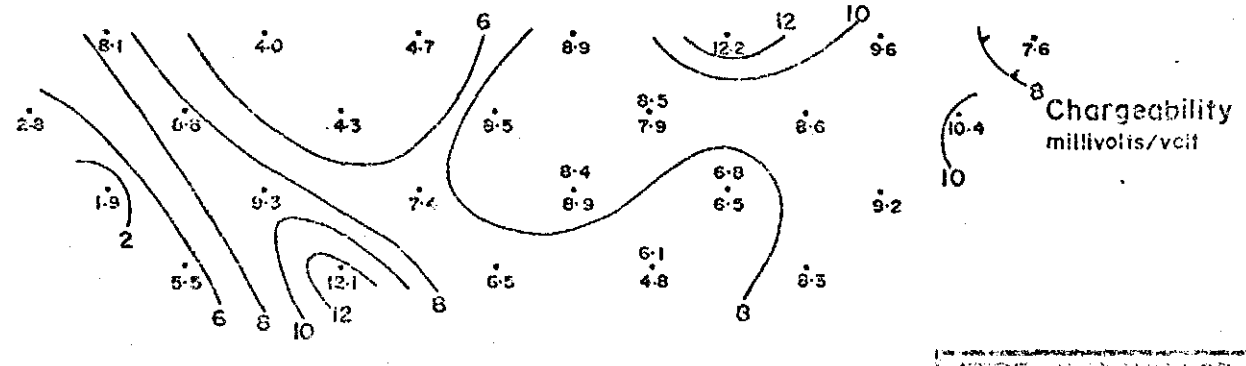
799097



Gradient Array I.P.
dipole spacing = 20m
current electrode spacing 1500m

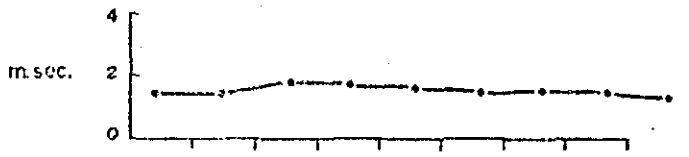




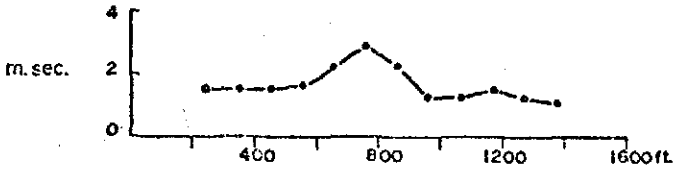


MINE GEOPHYSICS LTD.
MURCHISON RIVER GRID
Gradient array and
dipole-dipole I.P.
Line 5 373 000 N

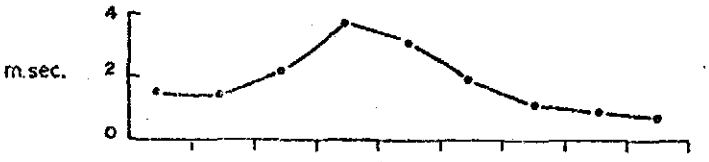
5 cm



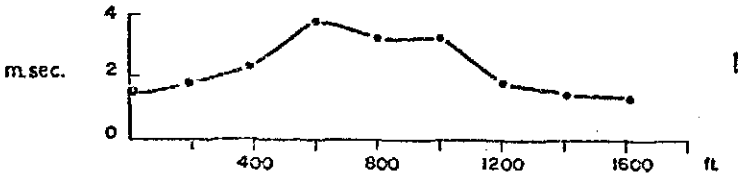
Gradient Array chargeability.
current electrode spacing 1037 m.
dipole spacing = 61m.



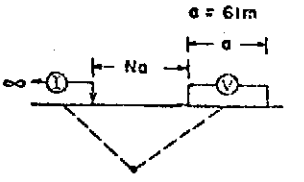
Gradient Array chargeability.
current electrode spacing 610 m.
dipole spacing = 30m.

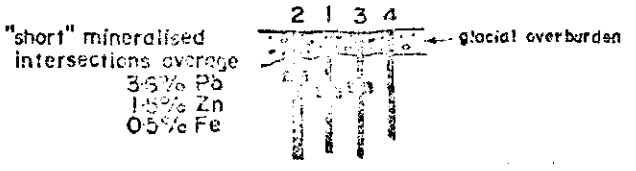


N=1 Pole-dipole chargeability.



N=2 Pole-dipole chargeability.





(from Lajoie and Klein, 1979.)

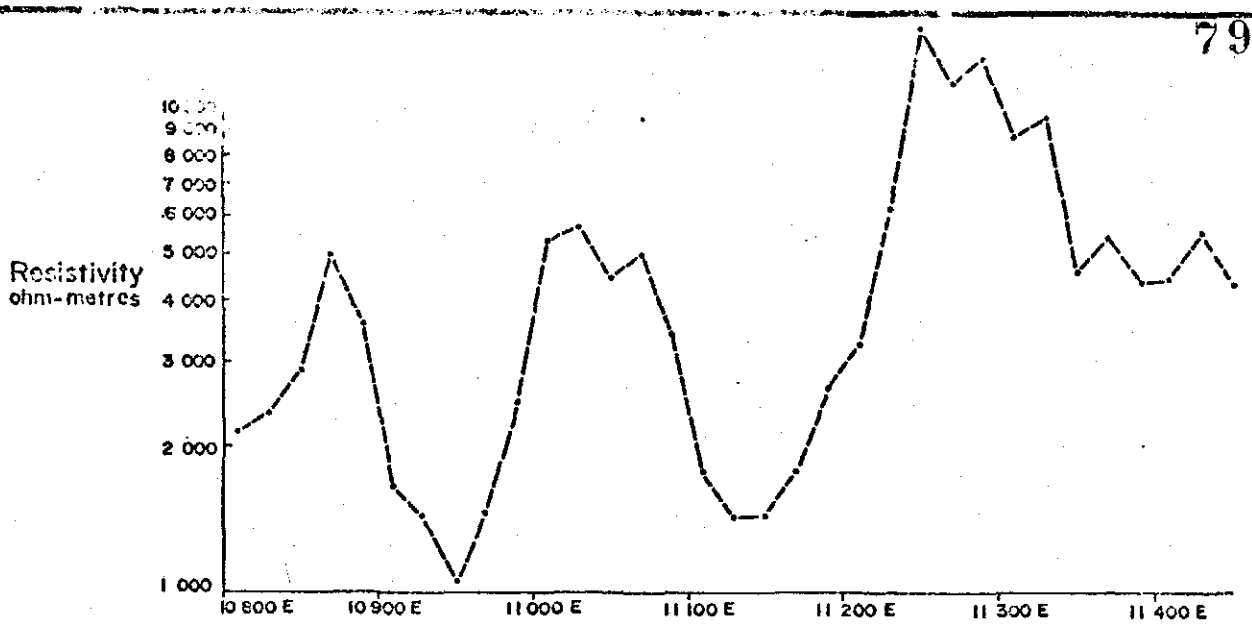
5 cm

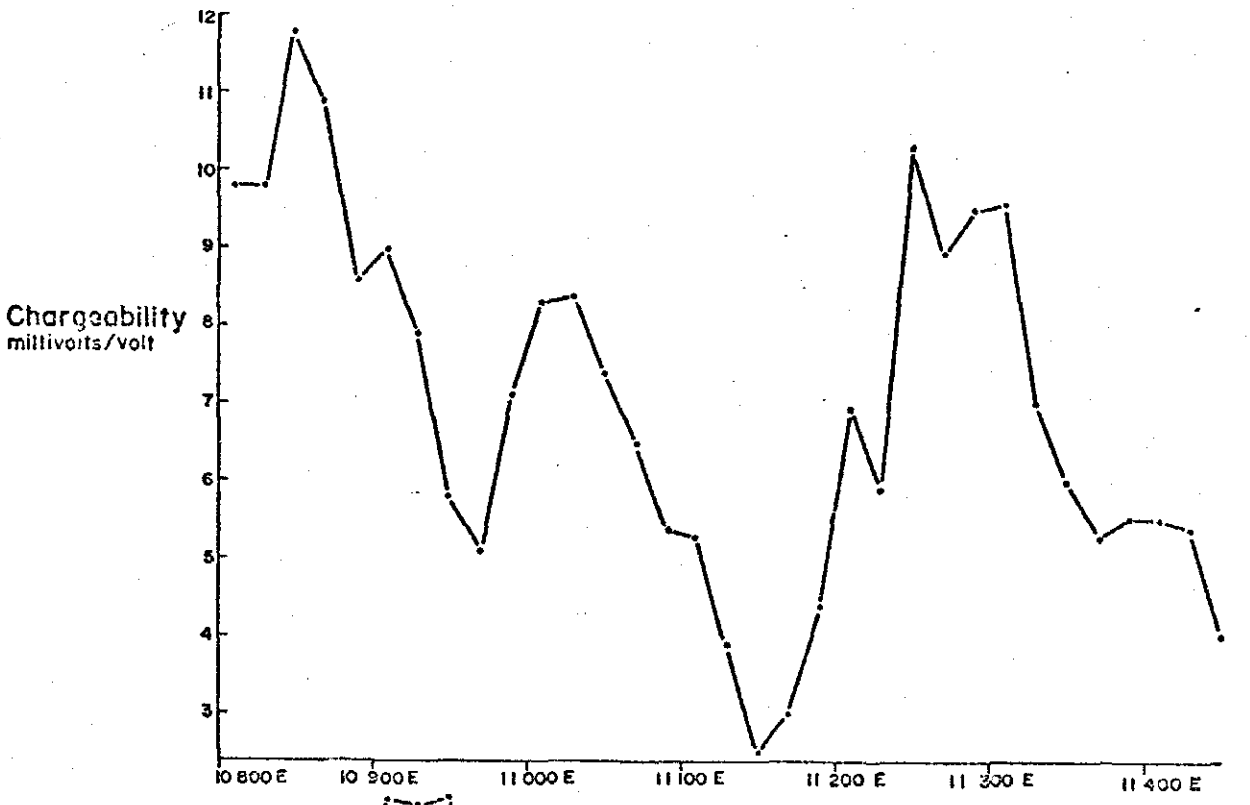
MITRE GEOPHYSICS PTY LTD

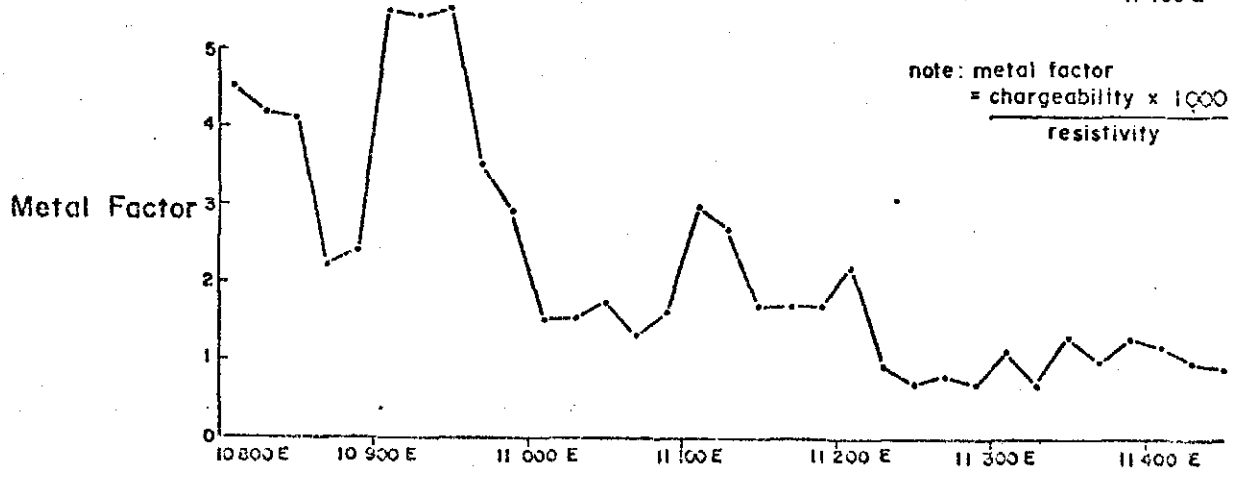
A comparison of Gradient Array and Pole-dipole I.P. results.

Pine Point, Canada.

799099







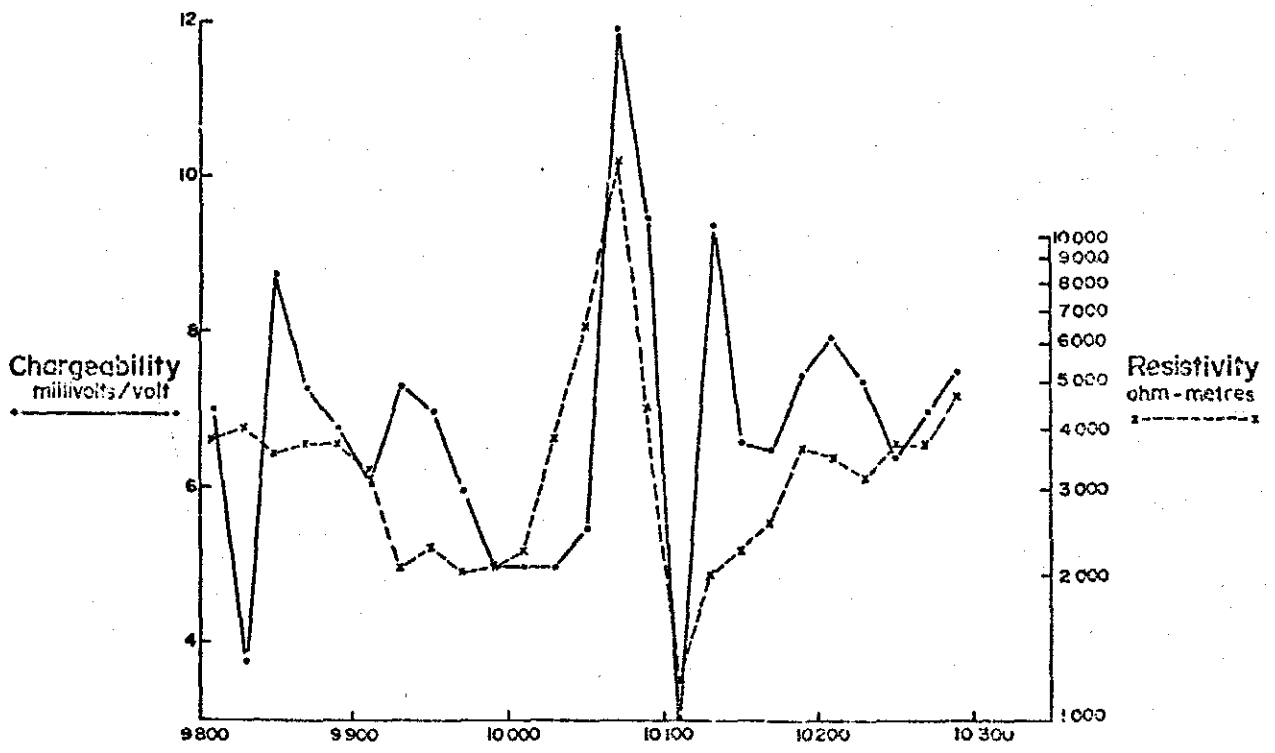
note: metal factor
$= \frac{\text{chargeability} \times 1000}{\text{resistivity}}$

5 cm

MITRE GEOPHYSICS PTY. LTD.

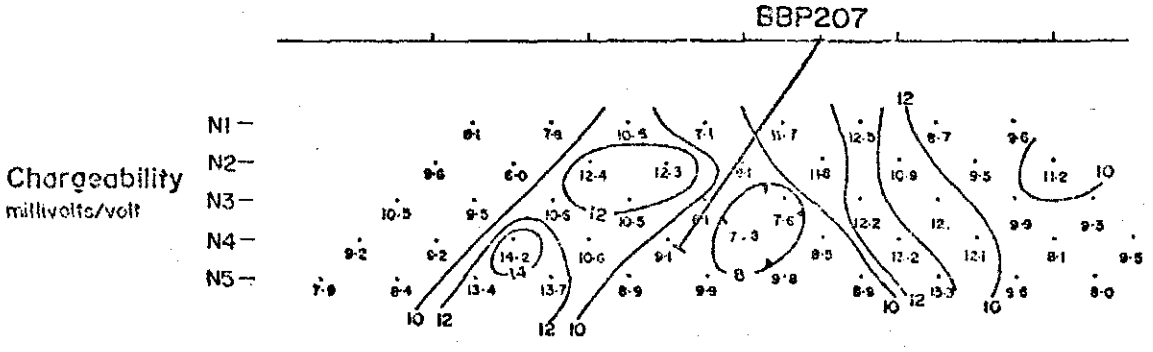
BOCO GRID
Metal Factor
Line 11 930 N

799100



note: metal factor
$= \frac{\text{chargeability} \times 1000}{\text{resistivity}}$





5 cm

MITRE GEOPHYSICS PTY. LTD.

BOCO GRID
Metal Factor
Line 13000 N

799101

5 388 000 N

5 386 000 N

5 384 000 N

381 000 E

383 000 E

385 000 E

E.L. 12/72

E.L. 12/72

HIGHWAY

BOCO SIDING

MURCHISON

RAILWAY

Creek

Tramway

Creek

BAY

EMU

Boco

B.B.P.209

B.B.P 207

B.B.P 208

S1

S2

S3

16 920 N

16 600 N

16 280 N

16 440 N

15 800 N

15 960 N

15 640 N

15 320 N

15 480 N

15 160 N

15 000 N

14 840 N

14 680 N

14 520 N

14 200 N

14 040 N

14 360 N

13 880 N

13 720 N

13 400 N

13 080 N

13 240 N

12 760 N

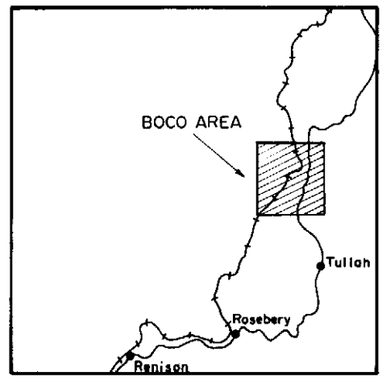
12 600 N

12 280 N

12 120 N

11 960 N

11 640 N



LOCATION
1:500 000

KEY

X S1 Schlumberger sounding

Dipole-dipole surveys

1976 gradient array I.P.

1977 gradient array I.P.

BBP207 Diamond drill hole

5 cm

MITRE GEOPHYSICS PTY. LTD.

BOCO GEOPHYSICAL GRID

DRAWN: J.B.
TRACED: T.G.D.S.
SCALE: 1:20 000
DATE: April, 1981

FIG. 1

799102

GEOLOGICAL LEGEND

Quaternary		Moraine.
Cambrian	€sbs	Black Slate, Sandstone, Siltstone and ash.
	€sshssst	Grey Shales, Tuffaceous, Sandstone and Siltstone and minor Conglomerate.
	€Ar	Acid Lavas (Rhyolitic)
	€tAr	Acid Pyroclastics (Rhyolitic)
	€Idct-a	Intermediate Lavas (Dacitic-Andesitic)
	€tIdct-a	Intermediate Pyroclastics
Cambrian?	€iAr	Quartz Feldspar Porphyry

— — Inferred Contact

— — Faulted Contact

70° Strike / Dip

70° Strike of Primary Foliation in Volcanics

70° Facing

Note: geology taken from the 1979 1:50,000 bedrock geological plan
: moraine cover according to Batt (from Hanson, 1977)

5 cm

MITRE GEOPHYSICS PTY. LTD.

BOCO GEOLOGY

DRAWN: J.B. TRACED: T G D S | SCALE: 1: 20 000 DATE April 1981 | FIG. 2

381 000 E

383 000 E

385 000 E

EMU BAY RAILWAY

E.L. 12/72

5 388 000 N

5 386 000 N

5 384 000 N

BBP 209

BBP 207

BBP 208

16 920 N

16 600 N

16 280 N

16 440 N

15 800 N

15 960 N

15 640 N

15 480 N

15 160 N

15 000 N

14 840 N

14 680 N

14 520 N

14 200 N

14 360 N

14 040 N

13 720 N

13 880 N

13 400 N

13 080 N

13 240 N

12 760 N

12 600 N

12 280 N

12 120 N

11 960 N

11 640 N

MURCHISON HIGHWAY

NOTES:

1. Survey by Scintex 1976-1977.
2. Station interval 20m. with 20m. dipole spacing.
3. Instrument used, IPR-7; 2 secs. on, 2 secs. off.
4. Reduced from the original 1:5000 scale plans. Scintrex report TAS-051.

glacial moraine

5 cm

799103

82-1737 Vol 1

MITRE GEOPHYSICS PTY. LTD.

BOCO GRID

Gradient Array I.P. Survey

Chargeability Contours
(milliseconds)

DRAWN: J.B.	SCALE: 1:10,000	FIG. 3
TRACED: T.G.D.S.	DATE: April 1981	

381 000 E

383 000 E

385 000 E

EMU BAY RAILWAY

E.L.12/72

5 388 000 N

5 386 000 N

5 384 000 N

16 920N

16 600N

16 280N

16 440N

15 800N

15 980N

15 640N

15 480N

15 160N

15 000N

14 840N

14 680N

14 520N

14 200N

14 360N

14 040N

13 880N

13 720N

13 400N

13 080N

13 240N

12 760N

12 600N

12 280N

11 960N

12 120N

MURCHISON HIGHWAY

NOTES:

1. Survey by Scintex 1976-1977.
2. Station interval 20m with 20m dipole spacing.
3. Reduced from the original 1:5000 scale plans. Scintrex report TAS-051.

—— — gradient array block boundaries.

5 cm

799104

82-1737. Vol 1.

MITRE GEOPHYSICS PTY. LTD.

BOCO GRID

Gradient Array I.P. Survey

Resistivity Contours

DRAWN: J.B.	SCALE: 1:10,000	FIG. 4
TRACED: T.G.D.S.	DATE: April 1981	

381 000 E

383 000 E

385 000 E

EMU BAY RAILWAY

E.L. 12/72

5 388 000 N

5 386 000 N

5 384 000 N

16 920 N

16 600 N

16 280 N

16 440 N

15 960 N

15 800 N

15 640 N

15 480 N

15 320 N

15 160 N

15 000 N

14 840 N

14 680 N

14 520 N

14 360 N

14 200 N

14 040 N

13 880 N

13 720 N

13 560 N

13 400 N

13 240 N

13 080 N

12 920 N

12 760 N

12 600 N

12 440 N

12 280 N

12 120 N

11 960 N

11 640 N

MURCHISON HIGHWAY

NOTE:

1. Data collected during 1976 and 1977 I.P. surveys.
2. Station interval 20m.
3. Reduced from the original 1:5000 scale plans. Scintrex report TAS-051.

5 cm

799105

82-1737. Vol 1.

MITRE GEOPHYSICS PTY. LTD.

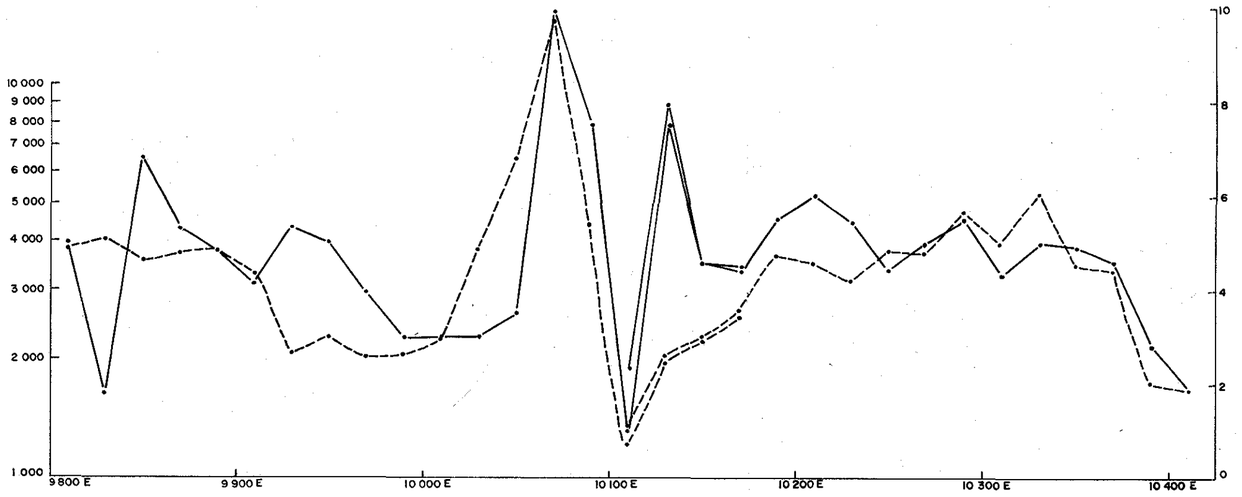
BOCO GRID

Ground Magnetic Survey

Total Magnetic Field Contours

DRAWN: J.B.	SCALE: 1:10,000	FIG. 5
TRACED: T.G.D.S.	DATE: April 1981	

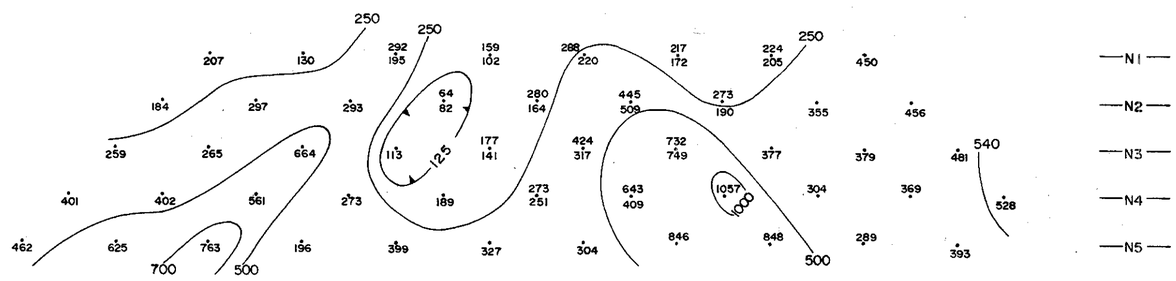
Resistivity
ohm-metres



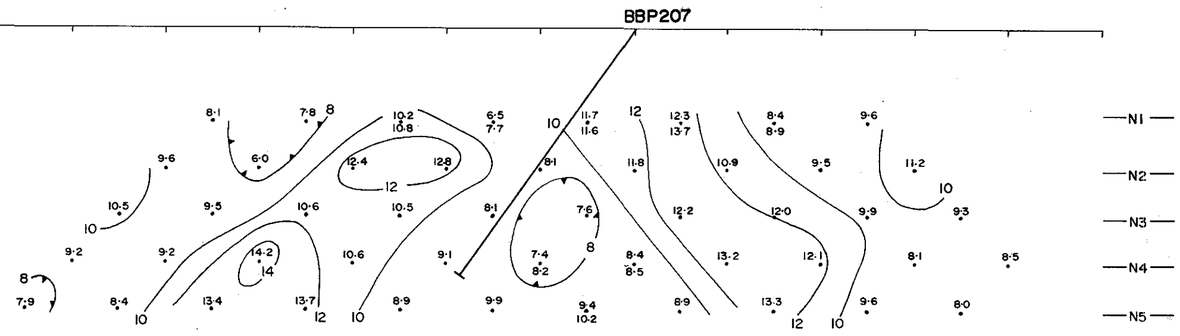
Chargeability
milliseconds

Gradient array
TIME DOMAIN I.P. Survey
Pulse 2 secs. on, 2 secs. off
(Survey by Scintrex, April, 1976)

Resistivity
ohm-metres

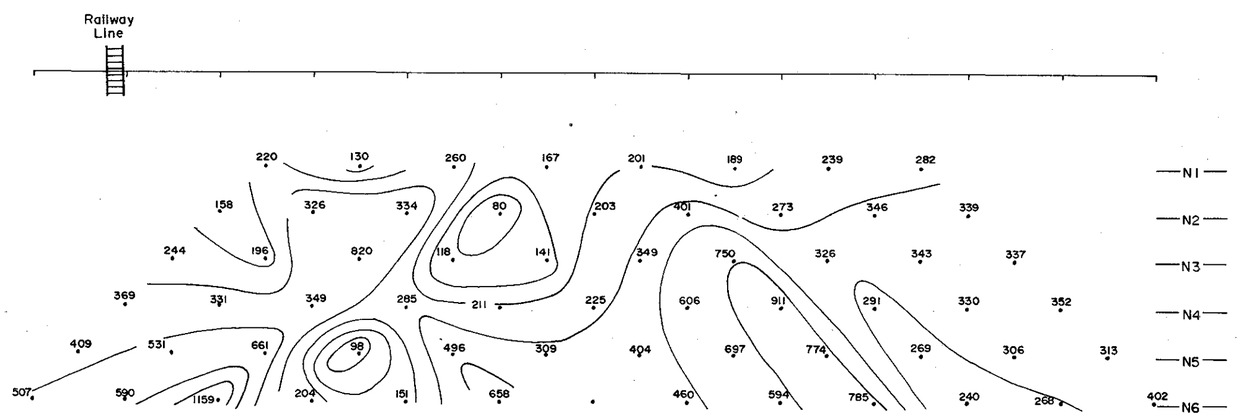


Chargeability
millivolts/volt



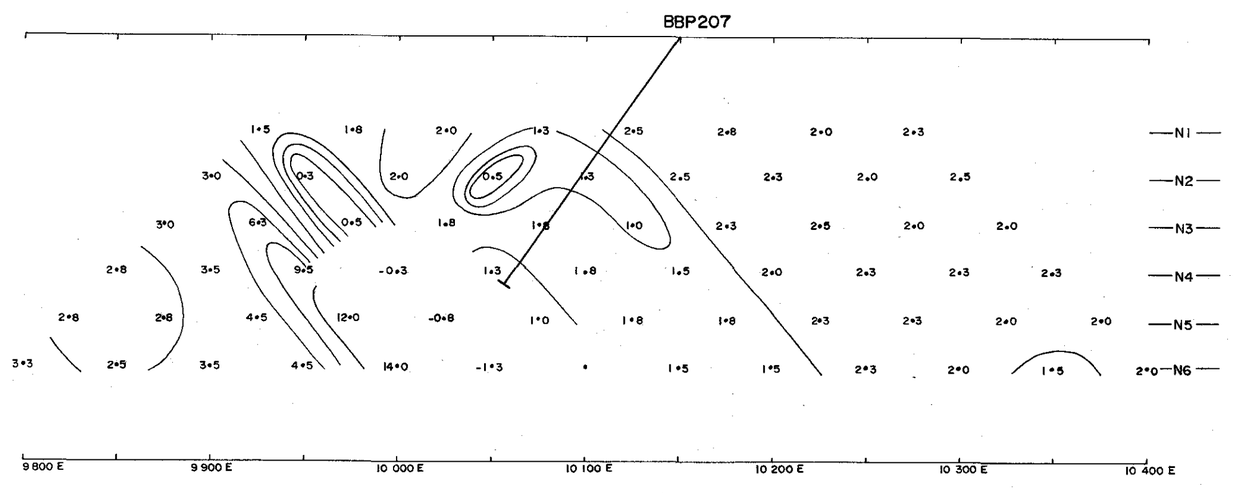
Dipole-dipole
TIME DOMAIN I.P. Survey
Dipole spacing = 50m
Pulse 2 secs. on, 2 secs. off.
(Survey by Scintrex, 17th. Feb. 1978)

Resistivity
ohm-metres



Dipole-dipole
FREQUENCY DOMAIN I.P. Survey
Dipole spacing = 50m
Frequencies 0·3 and 2·5 Hz
(Survey by Geoex, 23rd. Feb. 1978)

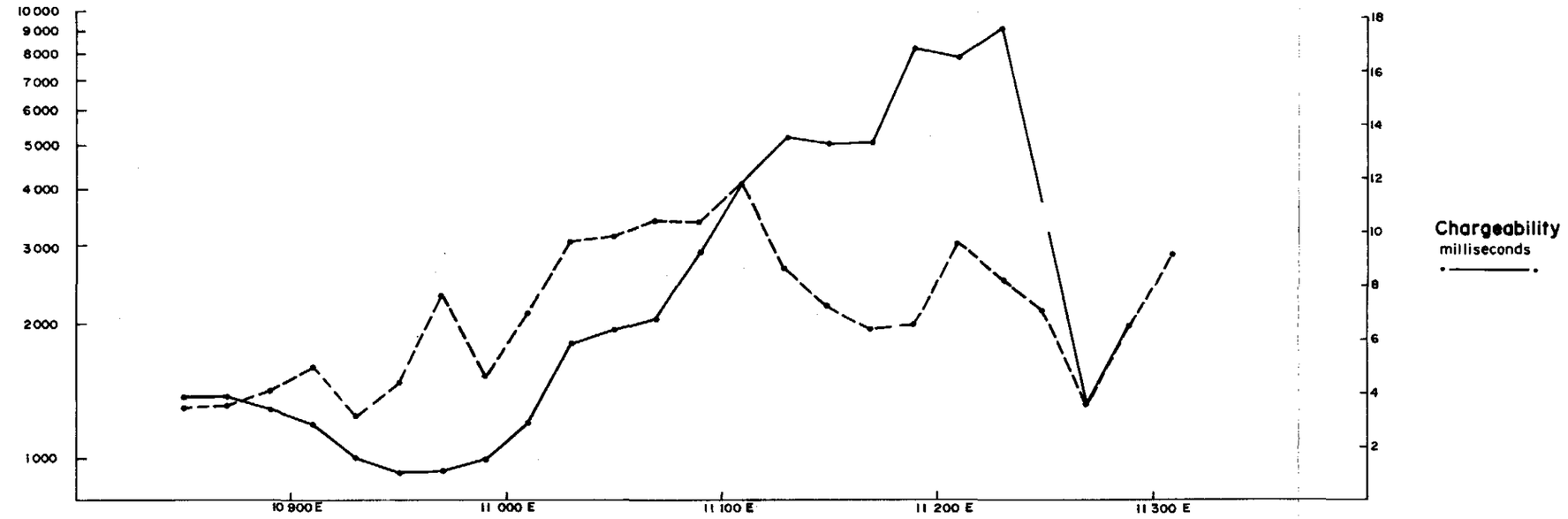
Frequency Effect
%

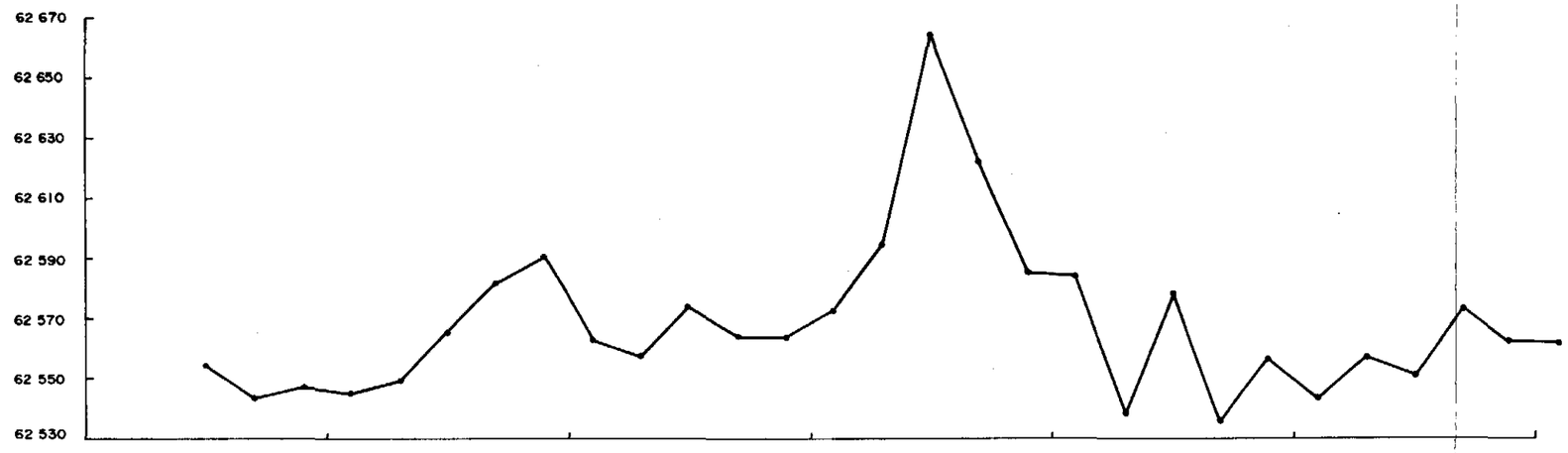


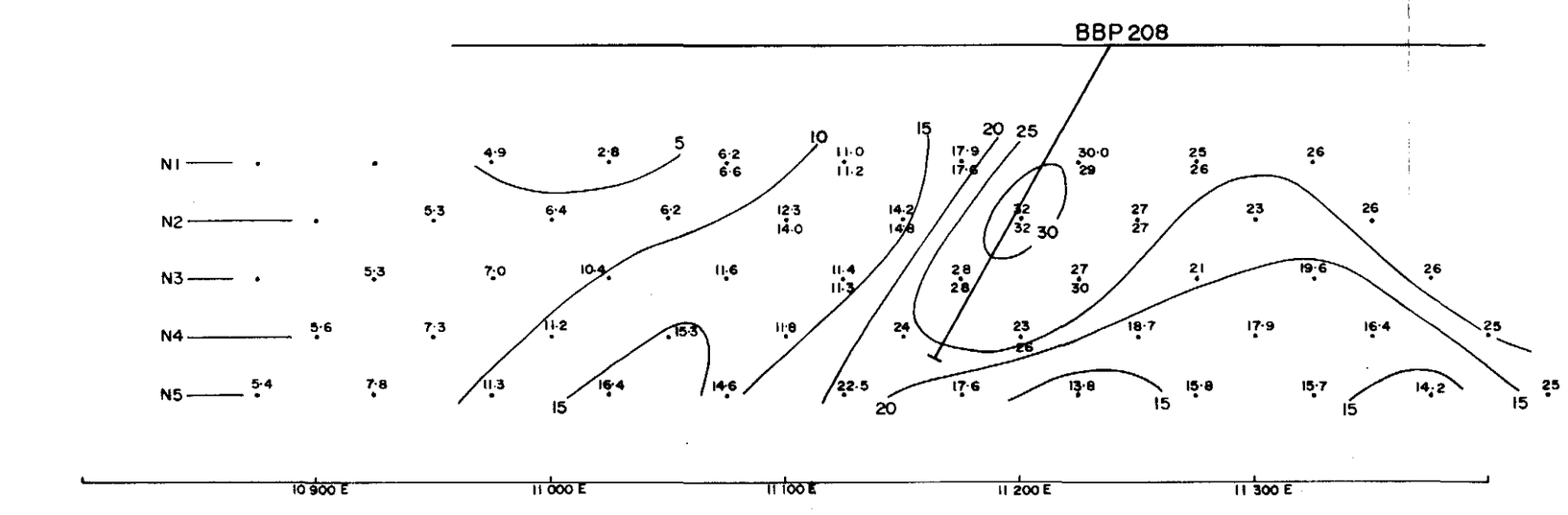
799106
82-1737, Vol 1.

5 cm

MITRE GEOPHYSICS PTY. LTD.		
BOCO GRID I.P. Surveys Line 13880 N		
DRAWN: J.B.	SCALE: 1:2500	FIG. 6
TRACED: T.G.D.S.	DATE: April 1981	







799107

5 cm

MITRE GEOPHYSICS PTY. LTD.

BOCO GRID
I.P. Surveys
Line 13 720 N

DRAWN: J.B. | SCALE: 1:2 500
TRACED: T.G.D.S | DATE: April 1981
FIG. 7

Resistivity
ohm-metres

10 000
9 000
8 000
7 000
6 000
5 000
4 000
3 000
2 000
1 000

9100 E
9200 E
9300 E
9400 E
9500 E
9600 E
9700 E

Chargeability
milliseconds

20
18
16
14
12
10

Chargeability
millivolts/volt

N1
N2
N3
N4
N5
N6

BBP 209

799108

5 cm

MITRE GEOPHYSICS PTY. LTD.

BOCO GRID
I.P. Surveys
Line 13720 N

DRAWN: J.B.
TRACED TGDS
SCALE: 1:2500
DATE: APRIL 1981

FIG.8

IGNEOUS ROCKS

UNCLASSIFIED

A — UNCLASSIFIED ACID ROCKS (>66% SiO_2)
- Av — ACID VOLCANICS
  - 10 tA — ACID PYROCLASTICS
  - 6 A — ACID LAVAS
- 6 tA — MINOR ACID INTRUSIVES
- 19 GR — MAJOR (PLUTONIC) ACID INTRUSIVES
- AA — ALKALINE ACID ROCKS

I — UNCLASSIFIED INTERMEDIATE ROCKS (52% - 66% SiO_2)
- Iv — INTERMEDIATE VOLCANICS
  - 51 It — INTERMEDIATE PYROCLASTICS
  - 47 I — INTERMEDIATE LAVAS
- 47 tI — MINOR INTERMEDIATE INTRUSIVES
- 41 DI — MAJOR (PLUTONIC) INTERMEDIATE INTRUSIVES
- IA — ALKALINE INTERMEDIATE ROCKS

M — UNCLASSIFIED MAFIC ROCKS (<52% SiO_2, <90% Mafic Minerals)
- 60 Mv — MAFIC VOLCANICS (BASALT)
- 54 tMaf — MINOR MAFIC INTRUSIVES
- 54 Maf — MAJOR (PLUTONIC) MAFIC INTRUSIVES
- MA — ALKALINE MAFIC ROCKS

45 Strips AN — ANORTHOSITE

64 UM — UNCLASSIFIED ULTRAMAFIC ROCKS (>90% Mafic Minerals)
- 64 Us — UNCLASSIFIED SERPENTINITES
- UA — ALKALINE ULTRAMAFIC ROCKS

CLASSIFIED

10 A — RHYOLITE, RHYODACITE, DACITE
- 19 QFP — QUARTZ - FELDSPAR PORPHYRY
- GR — GRANITE
- AM — ADAMELITE
- GD — GRANODIORITE
- TO — TONALITE
- GP — GRANITE PEGMATITE

51 It — TRACHYTE, LATITE, ANDESITE
- 41 SY — SYENITE
- MO — MONZONITE
- DI — DIORITE

60 Mv — THOLEIITIC BASALT, CALC - ALKALINE BASALT, SPILLITE
- 54 tMaf — DOLERITE
- 54 Maf — GABBRO, NORITE, TROCTOLITE

64 UPX — PYROXENITE
- 64 UPD — PERIDOTITE
- 64 UD — DUNITE

POSSIBLE ALTERATION ASSEMBLAGES

10 6 Aqsb — QUARTZ - SERICITE - BIOTITE
- Aqabsc — QUARTZ - ALBITE - SERICITE - CHLORITE
- Aqscb — QUARTZ - SERICITE - CARBONATE
- Afcbq — FELDSPAR - CARBONATE - QUARTZ

51 47 Ipcb — PLAGIOCLASE - CHLORITE - BIOTITE
- Ipscb — PLAGIOCLASE - CHLORITE - CARBONATE

60 54 Mabe — AMPHIBOLE - EPIDOTE - PLAGIOCLASE
- Mchp — CHLORITE - PLAGIOCLASE - QUARTZ
- Mdqc — DOLOMITE - QUARTZ - CHLORITE
- Mcdp — CHLORITE - DOLOMITE - PLAGIOCLASE

64 Uac — AMPHIBOLE - CHLORITE
- Ucdp — CHLORITE - DOLOMITE - PLAGIOCLASE
- Usac — SERPENTINE - AMPHIBOLE - CHLORITE
- Utcd — TALC - DOLOMITE - CHLORITE
- Usat — SERPENTINISED OLIVINE ROCK
- Utcb — TALC - MAGNESITE

SEDIMENTARY ROCKS

33 S — UNCLASSIFIED SEDIMENTS

VOLCANOGENIC
- 27 VS — VOLCANICLASTIC SEDIMENT - REWORKED TUFF
- Sv — VOLCANOGENIC SEDIMENT

CLASTIC
- 28 Sst — RUDITES >2.0 mm
  - BOULDER 256 mm
  - COBBLE 64 - 256 mm
  - PEBBLE 4 - 64 mm
  - GRANULE 2 - 4 mm
  - 28 Sgmt — CONGLOMERATE
  - 28 Sbr — BRECCIA
  - Stl — TILLITE
- 33 Sasst — SANDSTONES (ARENITES) 0.06 - 2.0 mm LT 68
  - VERY COARSE (vcg) 1.0 - 2.0 mm
  - COARSE (cg) 0.5 - 1.0 mm
  - MEDIUM (mg) 0.25 - 0.5 mm
  - FINE (fg) 0.12 - 0.25 mm
  - VERY FINE (vfg) 0.06 - 0.12 mm
  - 33 Sar — ARENITES <15% Matrix
    - Sqtz — ORTHOQUARTZITE
    - Sqar — QUARTZ ARENITE
    - Sfar — FELDSPATHIC ARENITE
    - Sak — ARKOSE
    - Slar — LITHIC ARENITE — Svar — VOLCANIC ARENITE
  - 33 Swk — >15% Matrix WACKES
    - Sgwk — GREYWACKE
    - Sqwk — QUARTZ WACKE
    - Sfwk — FELDSPATHIC WACKE
    - Slwk — LITHIC WACKE — Svwk — VOLCANIC WACKE
- 23 Sas — ARGILLITES <0.06 mm
  - Sslt — SILTSTONE
  - Ssh — SHALE
  - Sbs — BLACK SHALE

CHEMICAL
- LT 116 34 Slst — LIMESTONE
- Sdst — DOLOMITE
- 31 Scht — CHERT
- Sif — IRON FORMATION
- Sev — EVAPORITE

SURFICIAL
- 4 Sgl — UNCLASSIFIED GLACIAL OVERBURDEN
- Sfgl — FLUVIO - GLACIAL SEDIMENT
- Sgtl — GLACIAL TILL
- Sal — ALLUVIUM

METAMORPHIC ROCKS

69 (Igneous overstripe if required)

SCH — UNCLASSIFIED SCHISTS

IGNEOUS GRAIN SIZE

vcg	VERY COARSE GRAINED	>5cm
cg	COARSE GRAINED	5cm - 5mm
mg	MEDIUM GRAINED	5mm - 1mm
fg	FINE GRAINED	<1mm

STRUCTURAL AND TEXTURAL SYMBOLS

LT 958		MAJOR INTRUSIVES
LT 963	t	MINOR INTRUSIVES
LT 132	t	UNDIFFERENTIATED TUFF
LT 132	lt	LITHIC TUFF
LT 132	xt	CRYSTAL TUFF
LT 132	vt	VITRIC TUFF
LT 130	lpt	LAPILLI TUFF 4 - 32mm
LT 970	bx	PYROCLASTIC BRECCIA >32mm
LT 970	ag	AGGLOMERATE >32mm
LT 191	af	ASH FLOW
LT 132/153	ashfl	ASH FALL (AIR FALL TUFF)
LT 973		LAVA
	bm	BOMBS
	pm	PUMICE
	fm(s)	FIAMME (LENGTH IN cms)
	p	PORPHYRITIC
	a	AMYGDALOIDAL
	ves	VESICULAR
	s	SPHERULITIC
	w'd	WELDED
	rwk'd	REWORKED
	Σ	ACICULAR
	oph	OPHITIC
	cl	CLOTS
	pg	PEGMATIC
	qeyes	QUARTZ EYES / AUGEN TEXTURE
	bnd	BANDING
	fb	FLOW BANDING
	fΔ	FLOW BRECCIA
	pil	PILLOWS (WITH FACING)
	chill mgn	CHILLED MARGIN
	vns	VEINS
LT 153	bd	BEDDED
	Xbd	CROSS BEDDED
	tkbd	THICK BEDDED
	tnbd	THIN BEDDED
	lam	LAMINATED
	gd	GRADED or DIRECTION OF DECREASING GRAIN SIZE
	ld cst	LODE CAST
	sf	SCOUR AND FILL
	m	MASSIVE
	clvd	CLEAVED
	sch	SCHISTOSE
	jt'd	JOINTED
	bx'd	BRECCIATED (TECTONIC)
	ox	OXIDISED
	L	LATERITE
	stn	STAINING

STRUCTURAL SYMBOLS

- FAULT
- DEFINITE CONTACT or OUTCROP LIMIT
- APPROXIMATE CONTACT or RUBBLE BOUNDARY
- INTERPRETED CONTACT or FLOAT BOUNDARY
- SCHISTOSE ZONE
- UNCONFORMITY
- BEDDING
- OVERTURNED BEDDING
- CLEAVAGE
- PRIMARY FOLIATION
- JOINTING
- PLUNGE
- FOLD AXIS PLUNGE
- FACING

SULPHIDE AND OXIDE MINERALOGY

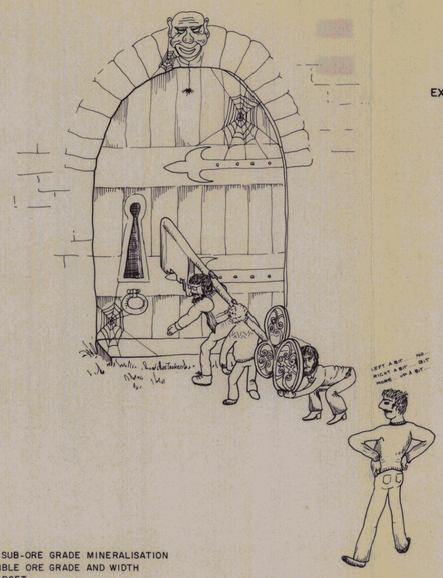
	bwk	BOXWORK
	sul	SULPHIDES
RED INK	gos	GOSSAN
	pn	PENTLANDITE
	hm	HÆMATITE
	cc	CHALCOCITE
	cv	COVELLITE
	bn	BORNITE
	cp	CHALCOPYRITE
	sp	SPHALERITE
	gn	GALENA
	po	PYRRHOTITE
	py	PYRITE
	ilt	ILLMENITE
	lc	LEUCOXENE
	mag	MAGNETITE
	lim	LIMONITE
	Mn	MANGANESE OXIDES
	chr	CHROMITE

MINERALISATION

STAEDTLER 104 - 2	DISS	10% DISSEMINATED
	DISS	10 - 20% DISSEMINATED
	DISS	~25% DISSEMINATED
	STR	STRINGER
	MAS	MASSIVE

DRILL HOLE SYMBOLS

- DRILL HOLE - BARREN
- DRILL HOLE - MINOR OR POSSIBLE SUB-ORE GRADE MINERALISATION
- DRILL HOLE - SIGNIFICANT OR POSSIBLE ORE GRADE AND WIDTH
- DRILL HOLE - FAILED TO REACH TARGET



SILICATE MINERALOGY

20	q	QUARTZ
51	k	K - FELDSPAR
17	ab	ALBITE
45	p	PLAGIOCLASE
45	a	AMPHIBOLE
64	px	PYROXENE
10	b	BIOTITE
45	c	CHLORITE
55	cb	CARBONATE
31	s	SERICITE
46	e	EPIDOTE
64	t	TALC
6	ba	BARITE
45	f	FELDSPAR
45	hb	HORNBLENDE
55	sd	SIDERITE
47	to	TOURMALINE
51	ov	OLIVINE

ALTERATION MINERALOGY

17	a'b	ALBITISED
55	cb'd	CARBONATED
45	c'd	CHLORITISED
31	s'd	SERITICISED
20	si	SILICIFIED
45	hb'd	HORNBLENDISED
47	to'd	TOURMELINISED
27	kl'd	KAOLINISED

COLOURS

ple	PALE
dk	DARK
pk	PINK
rd	RED
org	ORANGE
yel	YELLOW
ol	OLIVE
grn	GREEN
bl	BLUE
gry	GREY
blk	BLACK
brn	BROWN
wht	WHITE
crm	CREAM
purp	PURPLE

TOPOGRAPHICAL SYMBOLS

- WATER RACE
- FENCE
- FORMED ROAD
- TRACK
- RAILWAY
- RAILWAY (ABANDONED)
- RIVER
- STREAM
- LAKE
- SWAMP
- BUILDING
- POWER LINE
- TRIG. STATION
- WET HILL — HILL
- SHAFTS
- ADIT
- TRENCH
- MINE OR QUARRY

OPERATION OF LEGEND

DESCRIBING ROCK UNITS

1. CAPITAL LETTER : indicates primary classification eg. S - sedimentary rocks; A - acid igneous rocks
2. LOWER CASE LETTERS : indicates the following -
   - 2.1. AS PREFIXES : in progressive order
     - (i) COLOURS eg. gmM : green mafic igneous rock; pk/gmA : pink fragments or phenocrysts in an acid igneous rock with a green matrix
     - (ii) STRUCTURAL or TEXTURAL FEATURES eg. xtA : crystal tuff of acid composition; xbdS : cross bedded sedimentary rock
   - 2.2. AS SUFFIXES : in progressive order
     - (i) CATEGORISED eg. Ar : rhyolite, Ssh : Shale
     - (ii) MINERALOGY eg. pArf : rhyolite with feldspar phenocrysts; Aqs : quartz sericite rock of acid igneous origin; Ara'b : albitised rhyolite

EXAMPLE : pk/grn clvd xvt Ard ab c'd
- pk/grn : (Colours) pink crystals in a green matrix
- clvd : (Structural feature) cleaved
- xvt : (Texture) crystal vitric tuff
- A : (Primary subdivision) acid igneous rock
- rd : (Categorised) rhyodacite
- ab : (Primary mineralogy) albite phenocrysts
- c'd : (Alteration mineralogy) chloritised

LT 132 : Code Number of LETRATONE pattern 82-1737. Vol/.
10 : Number of CUMBERLAND DERWENT SERIES No. 19 Coloured Pencil

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT: TAS.

799109
GEOLOGICAL LEGEND

EXPLORATION

Plate 1

SCALE:	Survey: I.R.M.	Revised:
Reference:	Date: August 1980	REF. NO.
Drawn: R.P.T.	Checked: I.R.M.	A1-504 - ORIGINAL

380 000 mE

390 000 mE

5 400 000 mN

5 390 000 mN

5 380 000 mN

BULGOBAC E.L. 12/72

to Burnie

Hay Creek

Hatfield River

EMU BAY RAILWAY

Que River

Que River Grid

Que River

Silver Falls Extension Grid

Bulgobac River

QUE RIVER
Pb, Zn, Cu

Access Track

SOCK CREEK
Pb, Zn

Northern HIGHWAY

MURCHISON

MT. CHARTER
Ba

SILVER FALLS
Pb, Zn

North Pinnacles Grid

NPP 213 NPP 214

NPP 215

BOCO SIDING

Boco Grid

BP 209

BP 207

BP 208

BURNS PEAK
Pb, Zn

to Chester Mine, H.E.C. Road

PINNACLES
Pb, Zn

MT. BLACK
E.L. 1/62

to Tullah 6 km

LEGEND

- Track constructed and geologically mapped
- Costean constructed, sampled and geologically mapped
- Access Mapping completed
- Streams geologically mapped and sampled
- Line I.P. dipole-dipole and gradient array

82-1737. Vol 1.

ELECTROLYTIC ZINC CO. OF A'ASIA LTD.

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

799110

EXPLORATION COMPLETED

JULY 1980 - JUNE 1981

5 cm

SCALE: 1:50,000	Survey: A.J.M.	Revised:
Reference:	Date: 28.7.80	REF. No.
Drawn: R.P.T.	Checked:	A2 - 521 - 0060A

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.

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

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

THE ARGYLE TRACK

E.L. 12/72

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

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

82-1737. Vol 2.

ELECTROLYTIC ZINC CO. OF AASIA. LTD.

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

5 cm

GEOLOGY

COMPILATION OF MAPPING TO JUNE 1981

799111

SCALE: 1:10,000	Survey: J.M.	Revised: 29.7.80
Reference:	Date: 14.5.80	REF. NO.
Drawn: R.P.T.	Checked:	AO-525-0012

EZ PLAN CABINET TRIM LINE

E.L. 12/72

E.L. 12/72

E.L. 12/72

DENSE TIMBER

LEGEND

REFER TO SHEET 2

1	2
3	4
5	6
7	8

42-1737. Vol 2.

ELECTROLYTIC ZINC CO. OF A'ASIA LTD.

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

5 cm

GEOLOGY

COMPILATION OF MAPPING TO JUNE 1981

SCALE 1:10,000 | REF NO. AO - 525 - 0010

REFERENCE

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

799112

E.Z PLAN CABINET TRIM LINE

ELECTROLYTIC ZINC CO OF ASIA LTD

PROJECT:

82-1237 Vol. 2

799143

STREAM GEOCHEMISTRY

5 cm

SCALE: 1:10,000	Survey: AK Revised:
Reference:	Date: January 1981 REF NO AO-525-0182
Drawn: 7883	Checked:

E.L 12/72

NORTH PINNACLES GRID

SILVER FALLS EXTENSION GRID

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

384 000 mE
383 000 mE
382 000 mE
381 000 mE
380 000 mE
379 000 mE
378 000 mE
377 000 mE
376 000 mE
375 000 mE

Pb	Zn	Cu
25 - 74 ppm	75 - 99 ppm	
75 - 199 ppm	100 - 199 ppm	
> 199 ppm	> 199 ppm	

1 2 3 4 5 6 7 8 9 10 11 28 29 30 32

LEGEND

Sampled by E.Z 1972 -

Sampled by Comstaff 1970-72

Sampled by Comaco

Values plotted thus:

Pb, Zn, Cu
Cu, Sb, Fe
Ag, Sn

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

Flexural Compression
Simple fault

Notes

1 E.Z samples were sieved to -80# and analysed (AAS) for Pb, Zn, Cu, Ni, Fe, Ag, other parameters/mine. Operation by ACS Laboratories - Adelaide. Sn (AAS) was later analysed by Analabs - Perth.

2 Comstaff analytical methods unknown.

3. Samples collected from the North Pinnacles and Silver Falls Extension Grids were taken where active streams cross grid lines.

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

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

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. Comstaff 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 -

Sampled by Comstaff 1972-73.

Sampled by Cominco.

Values plotted thus:

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

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

Planned concentrate sample result

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

Pb	Zn	Cu	
			100 - 149 ppm
			150 - 199 ppm
			> 199 ppm

82-1737. Ver 2.

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT:

799114

STREAM GEOCHEMISTRY

5 cm

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

E.Z. PLAN CABINET TRIM LINE

A0 TRIM LINE

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

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

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. Comstaff 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 -

Sampled by Comstaff 1972-73.

Sampled by Cominco.

Values plotted thus:

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

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

Panned concentrate sample result

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

Pb	Zn	Cu	
			20 – 29 ppm
			30 – 39 ppm
			> 39 ppm

82-1737. Vol 2.

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT:

799115

STREAM GEOCHEMISTRY

5 cm

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

E.Z. PLAN CABINET TRIM LINE

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. Sb (AAS) was later analysed by Analabs - Perth.
2. Comstoff analytical method unknown.

LEGEND

Sampled by E.Z. 1979 - 81.

Sampled by Comstoff 1970 - 72.

Sampled by Cominco.

Values plotted thus:

Pb, Zn, Cu
Co, Mn, Fe
Ag, Sb

– indicates element not analysed

X indicates element below limit of detection

Panned concentrate sample results

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

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

82-1737. Vol. 2.

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD

PROJECT: ROSEBERY AREA | TAS

799116

STREAM GEOCHEMISTRY Pb

5 cm

SCALE: 1:10 000	Survey: A.M.	Revised:
Reference:	Date: January 1981	REF NO
Drawn: T.E.D.E.	Checked:	AO - 526-0178

E Z PLAN CABINET TRIM LINE

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. Comstaff analytical method unknown.

LEGEND

Sampled by E.Z. 1979-81.

Sampled by Comstaff 1970-72.

Sampled by Cominco.

Values plotted thus:

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

— Indicates element not analysed.

X Indicates element below limit of detection

Pointed concentrate sample results

Pb	Zn	Cu	
			100 - 149ppm
			150 - 199 ppm
			> 199 ppm

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

82-1737. Vol 2.

ELECTROLYTIC ZINC CO. OF A.ASIA. LTD.

PROJECT: ROSEBERY AREA | TAS

799117

STREAM GEOCHEMISTRY Zn

5 cm

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

E.Z. PLAN CABINET TRIM LINE

E.L. 12/72

5 402 000 mN
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
5 394 000 mN

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

5 402 000 mN

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

5 394 000 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

E.L. 12/72

COLEMANS RIVER

BASIE CK.

BLOCK

MAIN CK.

ROGERS CK.

HOBBITT CK.

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. Comstaff analytical method unknown.

LEGEND

Sampled by E.Z. 1979 - 81.

Sampled by Comstaff 1970 - 72.

Sampled by Cominco.

Values plotted thus:

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

\- Indicates element not analysed

X Indicates element below limit of detection

Panned concentrate sample results

Pb	Zn	Cu
		20 - 29 ppm
		30 - 39 ppm
		> 39 ppm

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

82-1737 Vol 2.

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

PROJECT: ROSEBERY AREA | TAS

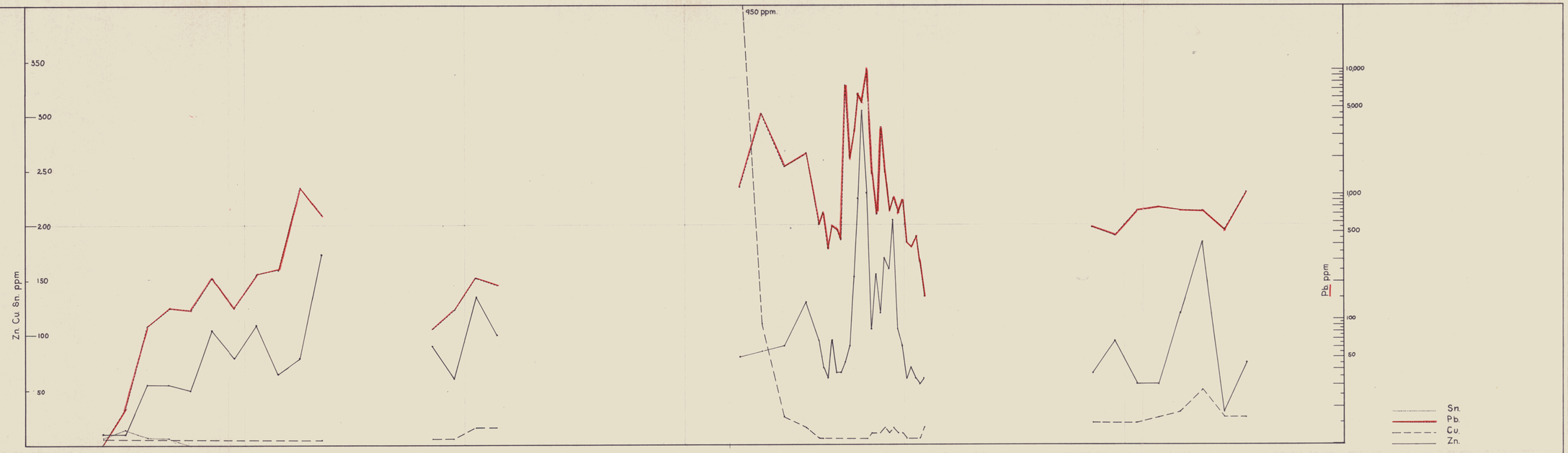
799118

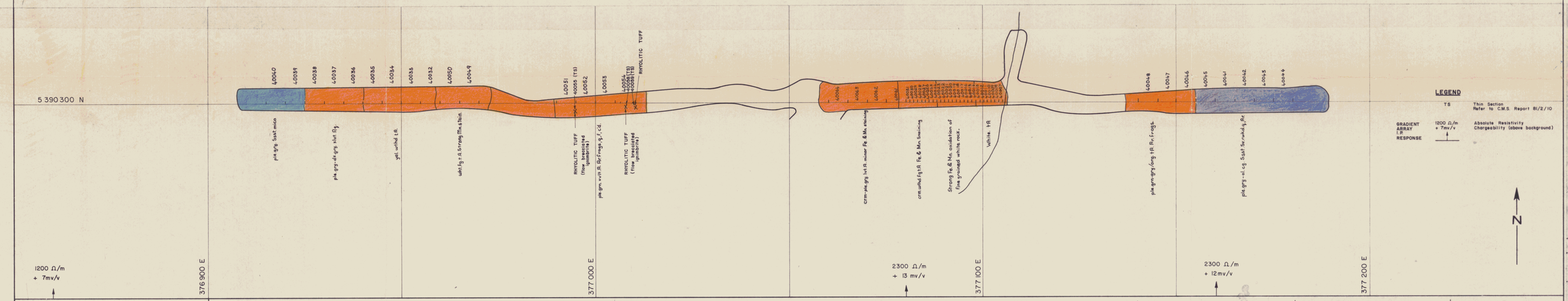
STREAM GEOCHEMISTRY Cu

5 cm

SCALE: 1:10 000	Survey: A.M.	Revised:
Reference:	Date: January 1981	REF NO. AO - 525 - 0178
Drawn: T.E.D.E.	Checked:	

E-Z PLAN CABINET TRIM LINE





82-1737 Vol 2.

ELECTROLYTIC ZINC CO. OF AASIA. LTD.		
PROJECT: BULGOBAC		T.A.S.
SILVER FALLS COSTEAN 5390,300 mN GEOCHEMISTRY , GEOLOGY GEOPHYSICS 5 cm		
SCALE 1:500	Survey A.J.M.	Revised
Reference	Date 4-9-1981	REF. NO
Drawn R.T.	Checked	VA-521-0065

799119