Open File Envelope No. 8071

EL 1514

MOUNT CHAMBERS

PROGRESS AND TECHNICAL REPORTS TO LICENCE EXPIRY/SURRENDER FOR THE PERIOD 13/9/1988 TO 12/9/1989

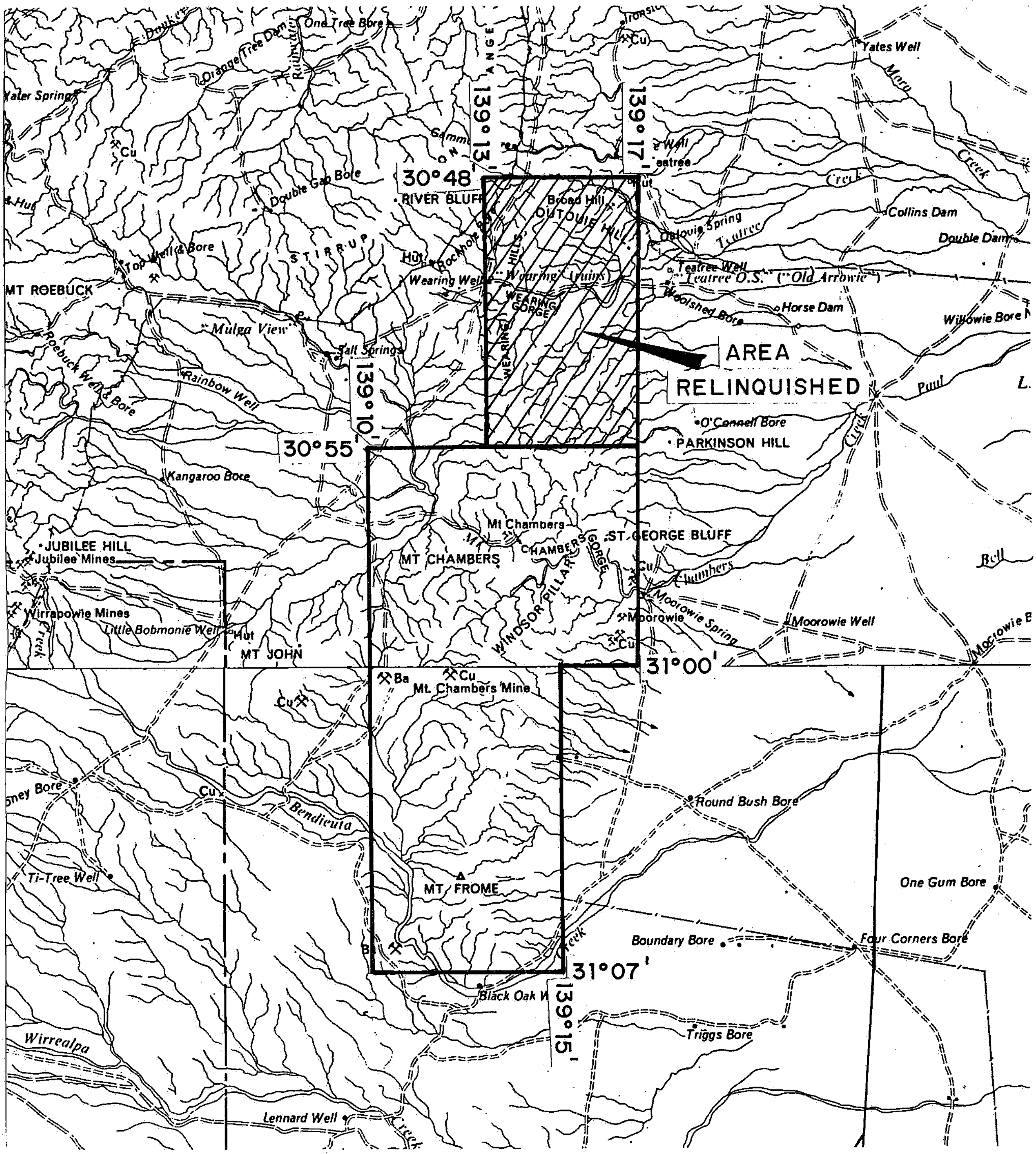
Submitted by
Mining Corp. of Australia Ltd
1989

Enquiries: Customer Services Branch
Minerals and Energy Resources
7th Floor
101 Grenfell Street, Adelaide 5000

Telephone: (08) 8463 3000
Facsimile: (08) 8204 1880

Government of South Australia
Primary Industries and Resources SA

SCHEDULE A



SURRENDERED.

SCALE 1:250,000

KILOMETRES 5 0 5 10 15 20 25 KILOMETRES

APPLICANT: DEMIS PTY. LTD.

DME 66/88 AREA: ~~288~~ 206 square kilometres (approx.)

1:250 000 PLANS: COPLEY, PARACHILNA

LOCALITY: MOUNT CHAMBERS AREA - Approx. 35 KM EAST of BLINMAN

DATE GRANTED: 13-9-88 DATE EXPIRED: 12-3-89 EL No: 1514

12-9-90 + red. No. 14202

CONTENTS ENVELOPE 8071

TENEMENT: EL 1514 - Mount Chambers area.

TENEMENT HOLDER: Demis Pty Ltd and Mining Corporation of Australia Ltd.

REPORTS:	Bluck, R G; 1989. EL 1514, Mt. Chambers. Report for the period ending 13th December 1988.	Pgs 3-4
	Curtis, J L; 1988. Mount Chambers joint venture. EL 1514. Exploration report field programme, November 1988.	Pgs 5-31
APPENDIX 1:	File note on mapping.	Pgs 32-33
APPENDIX 2:	Sample record sheets.	Pgs 34-45
APPENDIX 3:	Analytical results.	Pgs 46-51

PLANS:

Fig 1.	Location map EL 1514.	Pg. 10
Fig 2.	MVT mineralisation and geology. Mt. Chambers region.	Pg. 12
Fig 3.	Union Miniere mapping. Revised stratigraphic legend.	Pg. 15
Fig 4.	Geological sketch plan of Breccia Hill.	Pg. 17
Fig 5.	BHP drilling. Maximum lead values, Eric Prospect.	Pg. 25

	Scale	
Geological interpretation map. Eric Prospect (north sheet).	1:1000	8071-1
Eric Prospect - lead - R C. Geochemistry (north sheet).	1:1000	8071-2
Eric Prospect - zinc - R C. Geochemistry (north sheet).	1:1000	8071-3
Geological crosssections. Eric Prospect (north sheet).	1:1000 H 1:1000 V	8071-4
BHP Rep Drilling - Assays profiles. Eric Prospect (south sheet).	1:1000 H 1: 500 V	8071-5
Geological sketch map. Eric Prospect (south sheet).	1:1000	8071-6
Geological crosssections. Eric Prospect (south sheet).	1:1000 H 1:1000 V	8071-7

REPORT:	Curtis, J L; 1989. Demis - MCA Joint Ventures. EL's 1514 and 1515. The regional geological setting of Cambrian MVT mineralisation in South Australia.	Pgs 52-79
APPENDIX 1:	References.	Pg. 80

PLANS:

Fig 1.	Location diagram.	Pg. 57
Fig 2.	Cambrian stratigraphy of the Flinders Ranges.	Pg. 61

PLANS:

Fig 3.	Lower Cambrian facies at Old-Wirrealpa.	Pg. 64
Fig 4.	Cambrian biostratigraphic zones of the Flinders Ranges.	Pg. 68
Fig 5.	Early Cambrian palaeogeography of eastern South Australia.	Pg. 69
Fig 6.	Palaeoenvironments of the Hawker group.	Pg. 71
Fig 7.	The geology of the Wilkawillina Graben.	Pg. 73
Fig 8.	Metallogeny of the Flinders Ranges.	Pg. 75

REPORTS:

Bluck, R G; 1989. EL 1514, Mount Chambers. Second quarterly report for the period 13th December 1988 to 13th March 1989. Third quarterly report for the period 13th March 1989 to 13th June 1989.	Pgs 81-82
Bluck, R G; 1989. EL 1514, Mount Chambers. Fourth quarterly report for the period 13th June 1989 to 13th September, 1989.	Pg. 83

Oxford House Associates Pty. Ltd.

Mineral Exploration Consultants

Principal
Russel Bluck, B.Sc.,M.Sc.

Suite 8,
3 Mount Barker Road,
Stirling,
South Australia 5152

Telephone: (08) 370 9366
Facsimile: (08) 339 4962

The Director General,
Department of Mines and Energy,
P.O. Box 151,
Eastwood. 5063.
South Australia.

2 February, 1989.

Dear Sir,

Exploration Licence 1514, Mount Chambers.

Report for the period ending 13 December, 1988.

Work Completed.

During the period the information from previous exploration in the area was obtained and assessed. A number of conceptual models and exploration hypothesis were developed, and these were then checked by field mapping and sampling. A report detailing the outcome of the work has been compiled by Mr. Lindsay Curtis of JLC Exploration Services and is attached as an appendix.

Geology and Exploration.

In the Mount Chambers area the Cambrian limestones are inferred to have been deposited in a basin margin or median ridge setting and contain several karstified paleosurfaces. Significant lead-zinc mineralisation was discovered by BHP at the Eric prospect. In the subsequent exploration of the property it appears that the geological controls on the mineralisation were misinterpreted, with the result that the most prospective areas have not yet been drilled. From the recent mapping and reconnaissance work the Eric prospect is interpreted as the surface trace of a shallow east dipping paleosurface, with the previous exploration being concentrated in the metal anomalous footwall sequence and residual clays of the karst surface, and terminated against the barren hanging wall. From the surface and RAB data the mineralised palaeosurface, as defined by +1% lead, ranges up to 25 metres thick with a strike length in excess of 700 metres. The subsurface projection of the mineralised paleosurface has not been systematically tested, and it has not been closed off along strike in either direction.

Proposed Programme.

The down dip extensions of the Eric Prospect are highly prospective for primary Mississippi Valley type lead-zinc deposits. During the coming period the strike extent of the prospective horizons will be mapped out, and a review of geophysical methods carried out to determine if effective drill targeting of blind deposits within the horizons can be achieved.

Expenditure to Date.

ITEM	AMOUNT
Geology	$ 8,030.00
Technical Assistant	$ 990.00
Drafting	$ 1,102.50
Vehicle costs	$ 1,520.80
Accommodation and meals	$ 465.42
Field supplies	$ 116.88
Assaying	$ 556.65
Data acquisition, plans	$ 643.79
Reporting and administration	$ 1,678.26
	$15,104.30

Yours faithfully,

R. G. Bluck.

MC:FQR019

MOUNT CHAMBERS JOINT VENTURE
Exploration Licence 1514

EXPLORATION REPORT
Field Programme November, 1988.

JLC EXPLORATION SERVICES
3 Shelley Avenue,
Plympton Park, S.A. 5038
Telephone (08) 2932894

J.L.Curtis.
22 November, 1988
MC:LC128

ABSTRACT

A field inspection of the Mt Chambers MVT lead zinc mineralisation and a review of open file company reports indicates that MVT mineralisation is located in permeable Cambrian aged palaeokarst features which are an integral aspect of the stratigraphy. The Eric prospect is intimately controlled by a karstified palaeosurface that dips away to the east beneath covering units. Friable clay and silt with more than 1.0 % lead and accessory zinc (silver ?) drilled by BHP may be the up dip surface expression of ore.

TABLE OF CONTENTS

		Page No.
1	INTRODUCTION	1
2	LOCATION AND ACCESS	1
3	REGIONAL GEOLOGY	1
	3.1 STRATIGRAPHY	1
	3.2 STRUCTURE	2
4	PROSPECT GEOLOGY	2
	4.1 SEQUENCE	2
	4.1.1 Depositional Environments	3
	4.1.2 Lithotypes	3
	4.1.3 Palaeokarst Surface	4
	4.1.4 Karst Deposits	5
	4.1.5 Synthesis	6
	4.2 MINERALISATION	6
	4.2.1 Stratabound Mineralisation	6
	4.2.2 Southern Copper Pit	7
	4.2.3 Karst-fill Mineralisation	7
	4.2.4 Grid A Mineralisation	8
	4.2.5 Eric Prospect	9
	4.2.5.1 Rock Chip Geochemistry	9
	4.2.5.2 Union Miniere Drilling	10
	4.2.5.3 BHP Drilling	12
	4.2.5.4 Field Mapping	12
	4.2.5.5 Interpretation	14
5	CONCLUSIONS AND RECOMMENDATIONS	16
	5.1 CONCLUSIONS	16
	5.2 RECOMMENDATIONS	17
6	REFERENCES	18

**** LIST OF FIGURES ****

FIGURE No.	TITLE	FACING PAGE No.
1	LOCATION MAP EL No. 1514	1
2	MVT MINERALISATION AND GEOLOGY MT. CHAMBERS REGION	2
3	UNION MINIERE MAPPING REVISED STRATIGRAPHIC LEGEND	4
4	GEOLOGICAL SKETCH PLAN OF BRECCIA HILL	5
5	BHP DRILLING MAXIMUM LEAD VALUES ERIC PROSPECT	12

**** LIST OF DRAWINGS ****

PLATE No.	TITLE	SCALE
1	GEOLOGICAL INTERPRETATION MAP ERIC PROSPECT (north sheet)	1:1000
2	ERIC PROSPECT - LEAD - R C GEOCHEMISTRY (north sheet)	1:1000
3	ERIC PROSPECT - ZINC - R C GEOCHEMISTRY (north sheet)	1:1000
4	GEOLOGICAL CROSSECTIONS ERIC PROSPECT (north sheet)	1:1000 H 1:1000 V
5	BHP REP DRILLING - ASSAY PROFILES ERIC PROSPECT (south sheet)	1:1000 H 1:500 v
6	GEOLOGICAL SKETCH MAP ERIC PROSPECT (south sheet)	1:1000
7	GEOLOGICAL CROSSECTIONS ERIC PROSPECT (south sheet)	1:1000 H 1;1000 V

**** LIST OF APPENDIXES ****

APPENDIX 1 : FILE NOTE ON MAPPING

APPENDIX 2 : SAMPLE RECORD SHEETS

APPENDIX 3 : ANALYTICAL RESULTS

1 INTRODUCTION

Mineralization at Mt. Chambers was first recognized by early prospectors who discovered oxide copper minerals in north-south veins and baryte associated with inferred diapiric breccia.

The Electrolytic Zinc Co. and Union Miniere Co. (1973) investigated the copper occurrence and discovered lead-zinc mineralization .

The BHP Co. whilst exploring for Mississippi Valley Type (MVT) lead-zinc deposits throughout the Flinders Ranges followed up the previous work (1981-86) and showed that mineralization was more extensive.

This report is a reinterpretation of the earlier work that has revealed potential at the Eric Prospect for concealed mineralization which has never been tested .

2 LOCATION AND ACCESS

The Mt. Chambers Exploration title covers an area of 228 km2 in the vicinity of Mt. Frome on the central eastern side of the Flinders Ranges in South Australia approximately 450 km NNE of Port Augusta.

The region is accessible by either Hawker - Wilpena or Hawker - Parachilna - Blinman , the latter parts of each route being over unsealed road.

Parachilna, 75 km to the west, across the ranges is the nearest station on the Port Augusta -Leigh Creek standard gauge railway line. (see figure 1)

3 REGIONAL GEOLOGY

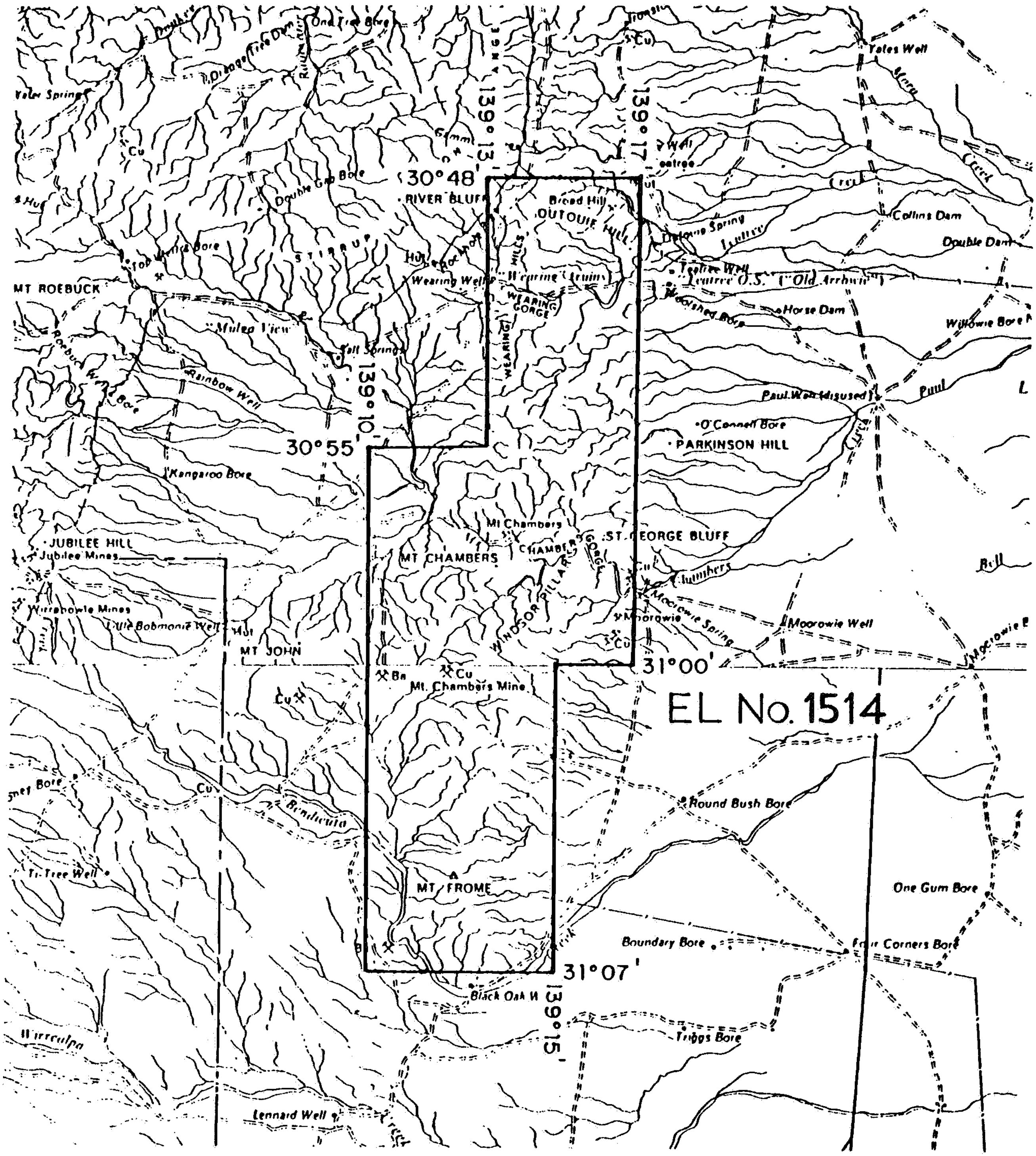
3.1 STRATIGRAPHY

The Finders Ranges comprises a late Precambrian geo-synclinal sequence overlain by Cambrian shelf facies carbonate deposits.

Both of these main stratigraphic subdivisions occur at Mt. Chambers. This report focuses exclusively on the Wilkawillina and Parara Limestones of the Cambrian Hawker Group.

Wilkawillina Limestone

At Mt. Chambers the Wilkawillina Limestone is at the base of the Cambrian succession and lies disconformably upon the Precambrian Pound Quartzite .



LOCATION MAP EL No. 1514

Figure No. 1

SCALE 1:250,000

KILOMETRES 5 0 5 10 15 20 25 KILOMETRES

APPLICANT: DEMIS PTY. LTD.

AREA: 288 square kilometres (approx.)

1:250000 PLANS: COPLEY, PARACHILNA

LOCALITY: MOUNT CHAMBERS AREA - Approx. 35 KM EAST of BLINMAN

It is typically a light to dark grey, massive, bedded, and biostromal archaeocyathid limestone which commonly becomes creamy brown when dolomitised.

Parara Limestone

At Mt. Chambers this unit has been tentatively identified by company geologists although it is unmarked on the published geology maps.

The unit is described as a dark flaggy and silty limestone with interbedded shales,consistent with the mapping of BHP Geologists.

In the field it is readily distinguished from the conformably underlying Wilkawillina Limestone by its thin bedded pattern. The contact between the two units is gradational over about 10 to 15 meters of section.

3.2 STRUCTURE

The Precambrian and Cambrian rocks of the Flinders Ranges were extensively folded and faulted during the Delamarian Orogeny.

At Mt. Chambers this has resulted in regional tilting to the east along the flank of a large complex north plunging anticline which has been locally distorted by a major sheet like breccia body of possible diapiric origin in the crestal region.

Folding at several scales can be observed in the field by routinely mapping out the dip patterns of the bedding.

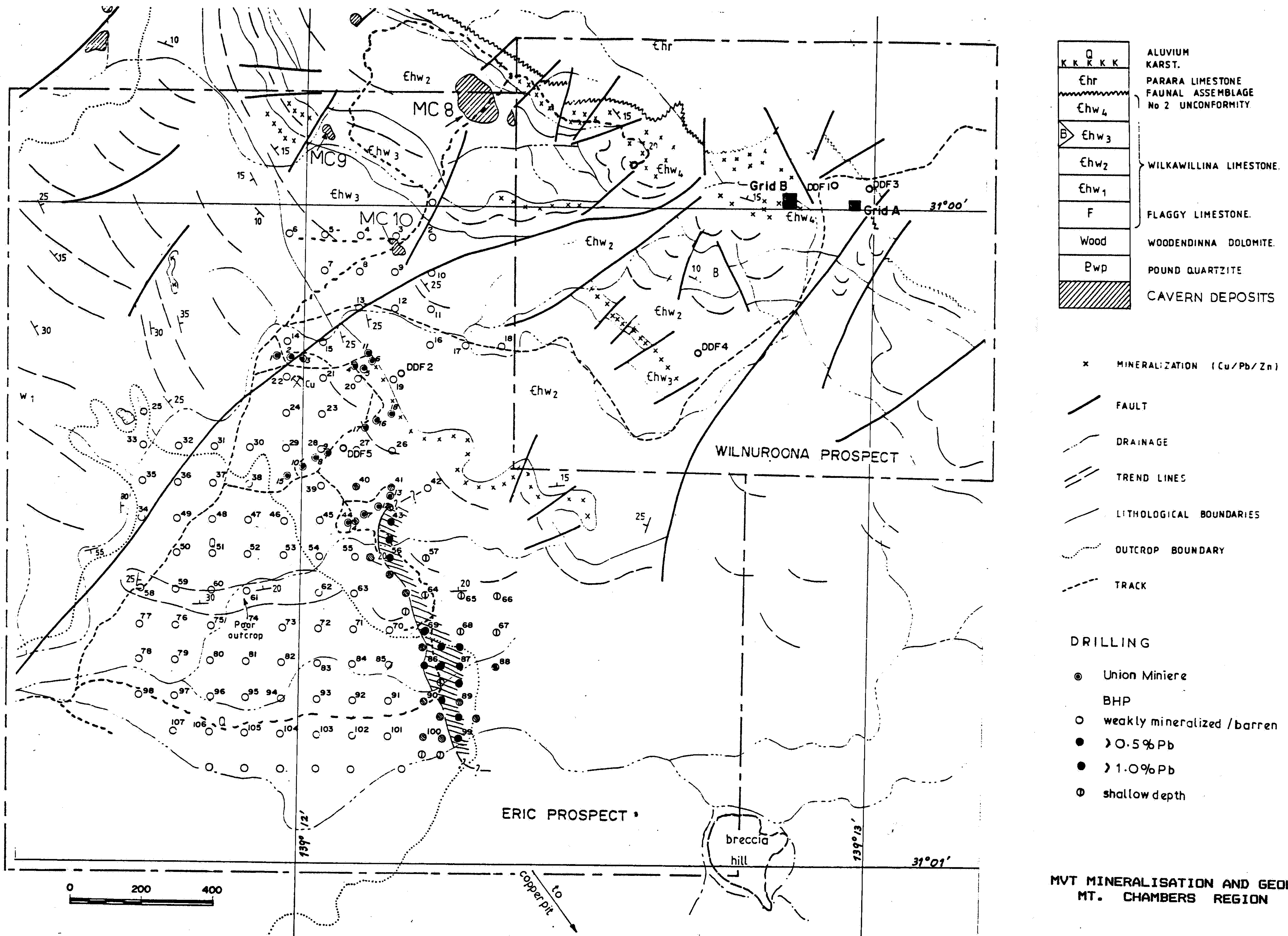
Faulting ,possibly associated with the diapiric? breccia, can be inferred from mapping and airphoto interpretation.

4 PROSPECT GEOLOGY

4.1 SEQUENCE

During a brief field examination of the Eric and Wilnuroona lead/zinc MVT prospects described in BHP company reports aspects of the stratigraphy of the Wilkawillina Limestone and mineral-isation were focused upon. (see figure 2)

The field observation that the strongest geochemical signature of the Eric anomaly coincided with a subtle strike bound topographic cuestiform saddle between the main front line of the hilly ground and low hillocks was considered to possibly indicate stratigraphic control of the mineralization.



MVT MINERALISATION AND GEOLOGY MT. CHAMBERS REGION

Figure No. 2

The stream sediment anomaly investigated by BHP on the adjacent alluvial plain is possibly a down slope dispersion feature arising from either ground water percolation or soil drift.

Because the relationship between mineralization and statigraphy at Eric was unknown and considered to be of likely economic importance, it became the primary object of the current work. A field sketch map of the anomalous saddle zone was generated and some rock chip sampling under taken to establish if the mineralization actually outcropped.

Subsequently the data generated by UM was obtained and amalgamated with the BHP and recent field observations.(see appendix 1)

4.1.1 Depositional Environments

The Wilkawillina Limestone at Mt. Chambers was mapped in detail by UM geologists at a scale of 100 ft. to the inch in the region of the old copper prospect. Mapping at this detail revealed a sequence of limestone beds that have been periodically dolomitised during accumulation. Each cycle has been mapped as a grey and variously grey-brown to yellow-brown limestone-dolomite pair. In all, nine such cycles can be locally recognized.

The abundance of fossils and the cyclic dolomitization at such high frequency implies that sedimentation took place at shallow depth with periodic emergence above sea level. A basin margin or median ridge setting is therefore inferred.

Field inspection outside the area mapped in detail suggests the pattern is continued up the section to the base of the Parara Limestone.

4.1.2 Lithotypes

The primary lithology seems to have been a grey calc-arenite which was deposited in beds up to several meters thick. However, dolomitization and weak oxidation has resulted in several distinctive textural features.

Vugs with convex inward surfaces and spikey outlines are prevalent at particular stratigraphic levels and may be used as local marker horizons. In many instances they are concentrically filled with carbonate minerals, usually calcite .Previous explorers reported fluorite and some base metal mineralization in these zones but recent experience suggests field recognition is difficult without other technical support. Sometimes open cavities are also found.

Lithic 'pseudo-breccia' composed of grey limestone 'clasts' of sub-angular to sub-rounded shape supported in a greyish-brown to light brown silty looking matrix is quite common. This rock type is clearly a late diagenetic replacement alteration feature that probably results from dolomitization along desiccation cracks.

Massive dolomite of medium brown colour is clearly an early diagenetic alteration of former limestone that took place prior to the loss of primary porosity.

Massive bedded limestones (dolomite) with abundant silty to sandy dark brown lenticles of very limited lateral extent with a ferruginous and siliceous composition may be ripple cusp fillings, and could indicate shallow depositional conditions.

A unique occurrence of reddish brown limestone with some zones of intercalated thin mudstone beds was mapped by UM to the south of the copper prospect Irregular dip directions, the colour being indicative of oxidizing conditions and the abundance of fossils suggests a specific depositional environment.(See below)

4.1.3 <u>Palaeokarst Surface</u>

The original UM mapping was reproduced in a simplified form to display the primary stratigraphic elements. The correspoding lithological codes are presented in figure 3.

The red limestone unit,(described above & designated 18 & 18a on the original map) is of generally discordant strike and has dips that suggest a complex sag structure.

Previous authors have attributed this feature to a biohermal reef on account of the abundance of fossil remains. However, given its trough like morphology, and the observation that it lies above/within a local basement of antipathetically occurring light grey vuggy limestone and yellow-brown crystalline dolomite (UM des. 16 & 17 resp.) ,this unit is reinterpreted as a very shallow water deposit (oxidzing conditions) that infilled a depression on a palaeokarst surface undergoing active submergence. The initial depression may have been a collapsed cavern or a ponor.

Such a palaeokarst feature is clear evidence of a time break at this stratigraphic position.

The relatively obscure outcrop relationships of the above discussed units and the overlying grey limestone unit (UM des 19 & 19a) may now be readily interpreted as an intraformational disconformity with a palaeo-rise down dip to the east. (see plate 1)

Union Miniere Code	Revised Code	Stratigraphy/ Lithology
20-24	Uld	Undifferentiated Limestone & Dolomite
		"WILKAWILLINA LIMESTONE"
19, 19a	Ulr	Upper unit of grey Fossiliferrous Limestone with some silty films
18, 18a	Pkl	Post kastic red brown Fossiliferrous Limestone with some limey interbeds.
17	Kd 2	Kasted dolomitised Limestone, of yellow brown colour
16	Klv	Kasted grey Limestone with vuggy carbonate deposits, probably same unit as Kd2.
15	Kd l	Kasted dolomitised Limestone, of dark yellowish brown colour
14	Llr	Lower unit of light grey Fossiliferrous Limestone with some silty bands.
1-13	Lld	Undifferentiated Limestone & Dolomite
	Fe	Ferruginous cherty to gossanous outcrops and rubble.

UNION MINIERE MAPPING
REVISED STRATIGRAPHIC LEGEND

Figure No. 3

4.1.4 Karst Deposits

BHP geologists whilst compiling regional maps recorded the presence of ferruginous and siliceous rock bodies of limited extent within the limestone sequence. Commonly these lithologies have a fragmental texture,and rubbly outcrop without any obvious structural form which has led to their being assigned a diapiric breccia origin. However, of all instances examined in the field not one case of locally disrupted bedding in the enclosing limestones was observed (Mt. Chambers Mine breccia excluded). (see figure 2)

'Breccia Hill'

An inspection of 'breccia hill', a 'diapir' mapped by BHP (illustrated on drawing no A1-523 centred about Lat 31 01 S Long 139 12 45 W) suggests a very different origin.

A lower zone of yellow brown layered silicified carbonate lying upon an irregular limestone surface approximating the local dip slope is capped by an orange to red-brown to nearly black clastic siliceous jasperoidal breccia.

Individual clasts in the breccia appear to have been fine grained before silicification and may have formerly been limestone.

Sugary development of doubly terminated quartz attests to the mobilisation of silica in a very porous environment.

The dipslope parallel disposition of the deposit and the travertinous basal zone with overlying breccia suggests a karst fill (cavern ?) deposit of pre-Delamarian folding age. (see figure 4).

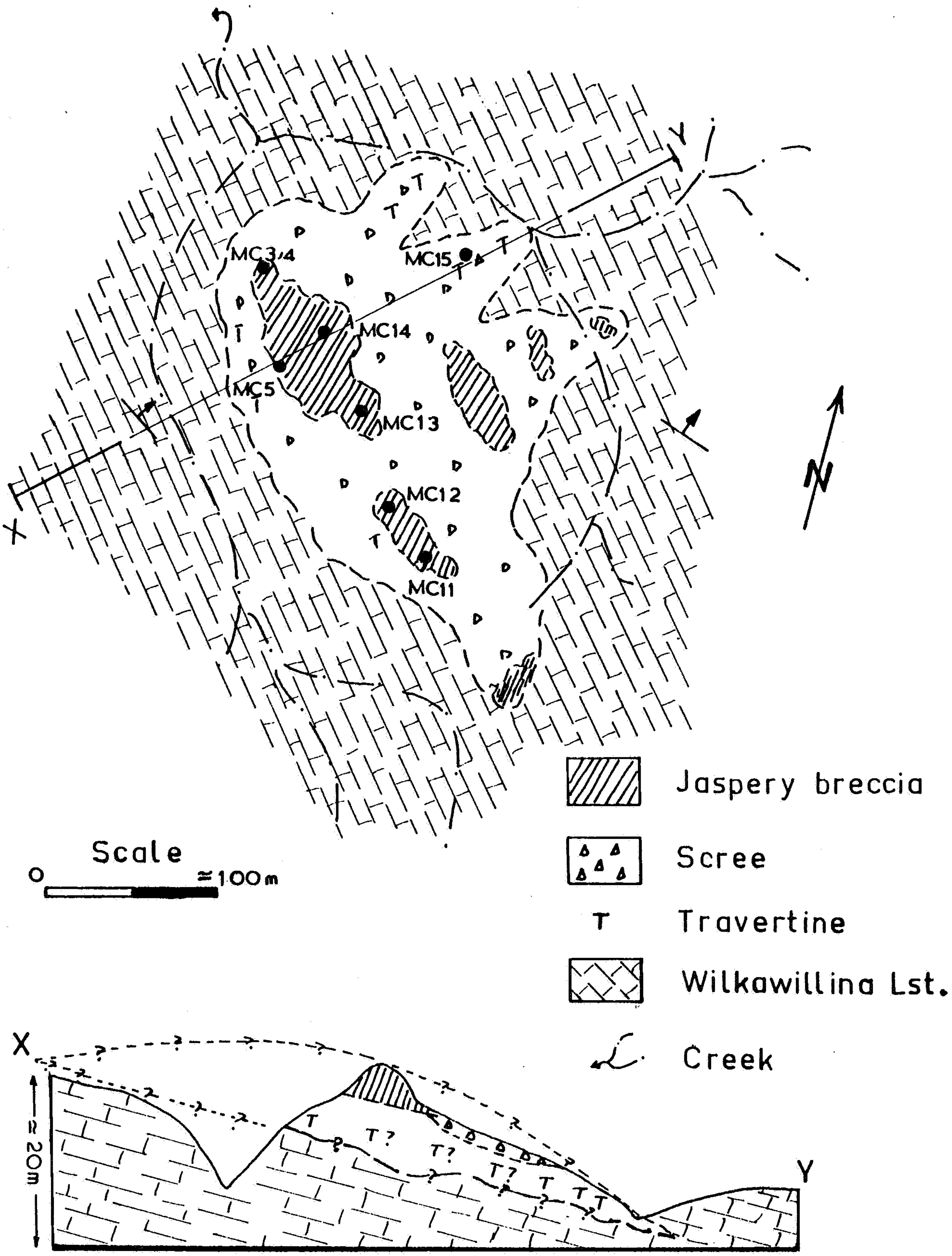
Other examples

By inference all the occurrences of this rock type recently inspected in the field are believed to be of a similar genesis.

Additionally the rock material is often a jasperoidal silica form of a type which is a commonly recognised carbonate weathering product in Cretaceous-Tertiary weathering profiles.

Since some of the material appears to have originally been layered medium grained travertine there is a reasonable possibility that jasperization took place during the development of the present landscape and is a replacement of carbonate / silica mineral assemblage.

The existence of Karst deposit residues of this type at several stratigraphic positions is evidence for the development of caverns and the emergence of the Willkawilina Limestone shortly after deposition and diagenisis.



GEOLOGICAL SKETCH PLAN
OF BRECCIA HILL

Figure No. 4

4.1.5 Synthesis

Examination of the revised geology map based on the inferred stratigraphic model reveals that the distribution of ferruginous jasperoidal material correlates with the inferred palaeokarst surface thereby providing a degree of independent corroboration of the interpretation. A strong correlation with lead-zinc mineralisation was also immediately apparent.(See below).

4.2 MINERALISATION

Places and mineral occurrences identified on BHP drawings were visited in the field and the geological relationships assessed.
Once the significance of possible ferruginous cavern fill deposits was recognized all such material was routinely grab sampled when encountered.

Particular attention was given to the Eric anomaly ,Grids A & B of the Wilnuroona Prospect,and strata-bound mineralization illustrated on BHP maps.

A useful field test (KI test) for lead mineralisation, employing the application to the sample of medium strength nitric acid from a dripper bottle followed by saturated potassium iodide solution which gives a brilliant yellow lead iodide precipitate in the presence of soluable lead, was used.

Ultraviolet light was also used on the basis that fluorescent cerussite might be recognised, but met with little success. A yellow fluorescent mineral seemed to be commonly associated with mineralisation at the Eric prospect but the probability that it is a fine grained encrustation of gypsum is high and therefore of little diagnostic value.

Grab and rock chip samples (43)were collected and submitted to Comlabs Pty. Ltd. for the determination of Cu, Pb, Zn, & As by standard AAS techniques. Samples (12) with high As values were resubmitted for Au & Ag assay. Results are listed in appendix 3.

4.2.1 Stratabound Mineralisation

Illustrated on BHP regional mapping are limestone units marked variously with crosses and squares that are purported to identify mineralisation. These symbols are associated with what is termed 'prepared ground.

Field inspection of these zones stratigraphically above the Eric prospect and associated with Grids A & B of the Wilnuroona Prospect area shows that they are vuggy limestone/dolomite.

Frequent testing of both the carbonate fillings and the host rock by the KI test indicated that any lead mineralization present was of low grade. Visually there were no distinguishing features that seemed to relate to mapped distribution of 'mineralisation'.

In the absence of supporting information it is inferred that either the mineralisation is entirely composed of a white coloured zinc carbonate or the initial expectation that prepared ground referred to carbonate vugs was incorrect. Whether or not the vugs are of themselves the 'mineralisation' and the 'prepared ground' was more generally definable as the dolomitically altered fractured/pseudo-breccia type rocks was not resolved. (see sects. 4.1.2 & 4.2.5.1).

4.2.2 Southern Copper Pit

To the south east of the Eric prospect at the base of the Wilkawillina Limestone a copper prospecting pit was located in a creek bank. The host rock is a siltstone unit of the Adelaidian Pound Quartzite.

Mineralization consisting of chrysocolla in kaolinitic clays with black manganese stain appears to be localised in a minor fault. Since a positive KI test was observed samples were assayed but returned only weak lead and zinc values. (see figure 2 & appendixes 2 & 3)

4.2.3 Karst-fill Mineralisation

The 'breccia hill' deposit (section 4.1.5, figure 4) was radially chip sampled about five centres using 6m annulus returned anomalous metal values :-

min.	element	max.	
310	Pb	630	
1540	Zn	2400	(all values)
810	Cu	1520	(in ppm.)
150	As	250	
<1	Ag	2	
<0.02	Au	0.04	

This result clearly indicates that lead metal bearing fluids were mobilised into the Karst deposit while it was still porous. An association between this event and the development of the sugary free grown quartz is probable.

More importantly this evidence is clearly indicating that MVT model is applicable to the Mt Chambers locality.

Outcrops of similar material sampled directly up section of the Eric prospect were only slightly anomalous. (see figure 2 & appendixes 2 & 3)

4.2.4 Grid A Mineralisation

Grid A is located near the intersection of Lat 31 00 S Long 139 13 E.(Depending upon whether you are examining BHP drawings A3-125 (1982) or A3-372 (1983) the prospect lies to the south or north of 31 00 S).

The mineralisation occurs on the northern slope of a spur on east side of a south flowing creek. The spur is entirely composed of grey brown limestone with a northerly flank of black breccia.

The limestone outcrop is isolated from nearby massive exposures due to scree, alluvium ,and bulldozed rubble. Locally the limestone beds dip shallowly in a northerly direction at a strong variance to the mineralisation that appears to be vertically disposed. (see appendixes 2 & 3)

A veneer of mineralised breccia is exposed in the southern face of a drill pad cut into the northern side of the spur. Both soil at the east end of the cut and the breccia respond positively to the KI test.

A sample of black breccia from the western end of the dozed embankment contained visible galena in a small veinlet. Two samples of breccia were randomly selected and assayed. Values in excess of 3.0 % Pb & 1.0 % Zn, consistent with previous results were recorded. One sample submitted for precious metals returned 8 ppm. Ag without appreciable gold.

The original reference for the systematic jackhammer sampled geochemical grid could not be established reliably because the field relativity of subsequent PWP- RAB/percussion drill holes does not comply with that shown on BHP maps. (see appendix 2).

The location of PWP 1 on the drill pad may have resulted in the first meter of the hole being drilled in fill and therefore not analytically reliable.

Given the disposition of the mineralisation and unique appearance it is concluded that the body is a fissure filling possibly within a fault zone. A tiny outcrop marked as a diapir on the BHP map is a small sandy stream channel deposit of no economic significance.

Unless new evidence suggesting that the Grid A occurrence is the upper most tip of a wholly concealed karstic breccia it is far too small a body of mineralisation to be commercially exploited.

4.2.5 Eric Prospect

The Eric prospect was named by BHP but its northern extent had already been outlined by UM using rock chip geochemistry.

BHP re-discovered Eric by following up a stream sediment geochemical anomaly on the edge of the alluvial plains. The region of the anomaly was interpreted as a karstic depression probably because of its resemblance to an embayment in the local relief pattern.

The locality was routinely drilled to bedrock in the search for a large body of mineralised karstiform breccia occupying a polje (a large depression resulting from solution weathering).

A area of modestly anomalous regolith of up to 10m thick (with local exceptions) was outlined. Along the eastern flank of the anomaly, mineralisation exceeding 1.0 % Pb was intersected in a number of drill holes situated along a linear trend.

The current work programme concentrated on establishing the relationship of this mineralisation to the local geology which was studied using the UM rock chip geochemistry supplemented by a simple field mapping and rock chip sampling programme to the south of the UM grid. A new set of drawings have been generated to illustrate geological setting of the mineralisation.

4.2.5.1 Rock Chip geochemistry

Outcrop rock chip sampling was carried out over the UM map grid and the levels of copper lead and zinc determined. Results for lead and zinc have been reproduced as overlays to the revised geology plan. (see plates 1,2 & 3).

A strong correlation between lead and zinc is immediately apparent over two discretely separate anomalous regions. Spot values of up to 1000 ppm. Zn and +2000 ppm. Pb were recorded.

The significance of a strong zinc only anomaly in the extreme west (not shown on new plans) is not understood.

Northern Anomaly

The northern region is zinc dominant and has a strong copper association consistent with the observed N-S fracture vein copper mineralisation which crosscuts stratigraphy.

The strongest zinc response lies to the north east of the copper prospect and links to a zone of weak indefinite lead and zinc responses in the east following a stratigraphic contact.

This anomalous zone may actually be the 'mineralisation' depicted on BHP plan A4-372 to the north east of Eric and described in section 4.2.1.

Southern Anomaly

The southern region is lead dominant, has a predominant WNW trend and relatively weak copper signature. The zinc anomaly is slightly larger at the 100 ppm. level but shows closer correspondence at the 200 ppm level. Significantly it is open to the south with metal levels increasing towards the south east.

When overlaid on the geology there is am unmistakable correlation between the southern rock chip anomaly and the exposure of the inferred Palaeokarst surface.

The +200 ppm. Pb/Zn zones were drilled by UM. (see plates 1-4) The southern anomaly proves to be the north ward extent of the +1.0 % Pb Eric trend.

4.2.5.2 Union Miniere Drilling

Three crossections utilizing UM drill holes were constructed to compare the tenor of mineralisation with its rock chip geochemical expression and its disposition with respect to stratigraphy.(see plates 1 & 4)

In general the drill logs correlate poorly with the detail disclosed by UM drilling. Of particular note is the predominance of dolomite over limestone which may suggest that different criteria were used to make the distinction.

Crossection A - B

This section is constructed across the northern rock chip anomaly / old copper prospect and shows a weak 5 degree flexure centred about the creek with nearly horizontal bedding on the eastern limb.

Mineralisation in the near surface, contained in clay and limestone, in the order of + 1000 ppm. Pb & Zn lies above weaker sub horizontal zones.

Neither the geology nor the distribution of mineralisation suggests that the copper bearing veins located between the holes occupy faults of significant throw.

Crossection C - D

This section is constructed across the western end of the southern rock chip anomaly on the inferred palaeokarst surface and oblique to the geological strike. Drill logs indicate that a depth extensive dolomitic alteration zone with pervasive lead and zinc mineralisation underlies the probable polje sediment fill.

The mineralisation is weak, only being coherent at the -500 ppm. level,there being only two 5.0 ft intersections that exceeded 1.0 % Pb in holes MCP 8 & MCP 9. Almost all of the drilled intervals were anomalous throughout.

In the uppermost part of drill hole MCP 15, 50 ft of mineralised clay was intersected adjacent to mapped outcrop near the southern edge of the polje sediment fill.

Crossection E - F

This section is parallel to and east of C - D in the same geological setting. As above drilling indicates depth extensive dolomitic alteration with weak mineralisation.

Geologically the drilled stratigraphy is south of C - D and consequently the alteration is less intense and stratigraphic control on the mineralisation is evident.

A mineralised clay body is also present in holes MCP 12 & 13 adjacent to polje sediment fill and may be an aspect of that feature.

Interpretation

Crossections C - D & E - F are effectively strike off-set along the southern edge of the polje sediment fill and can therefor be over lapped at the position of holes MCP 15 & MCP 12/13 respectively.

Combining in this way illustrates that the mineralisation is influenced by both stratigraphy and dolomitic alteration and largely concealed down the dip on the inferred palaeokarst surface. Indeed a case could be put that the mineralisation is open to the north east under cover.

The fade-out of the rock chip sampling anomaly to the west and the low levels of lead and zinc in section A - B at the appropriate geological position suggests that mineralisation is closed off to the north and northwest under cover.

4.2.5.3 BHP Drilling

Drilling Information

BHP followed up the UM work by two diamond holes (DDF-) located in the region to the north of the Eric mineralisation which are therefore not considered in this assessment.

A BHP programme of 107 RAB holes (REP-) on 100 m centres that sought to drill to bedrock located + 1.0 % lead mineralisation along a northwest striking zone approximately 700 m long and 50 m wide. An additional 38 RAB holes were later sited to extend the grid and as infill on 50 m centres in the + 1.0 % zone.

Open file data from the first drilling RAB campaign is generally restricted to maximum values with grade thickness listed for intervals of + 1.0 % Pb without any positional information. Full data is available for the second campaign.

A further four hole programme of diamond drilling (DEP-) placed two additional holes in the + 1.0 % zone but cores were not collected from the mineralised zone.

Data Presentation

The data was presented as contoured plans of maximum metal values, depth of hole and topographic contours at 1:5000 scale. Crossection profiles without geological data were also provided.

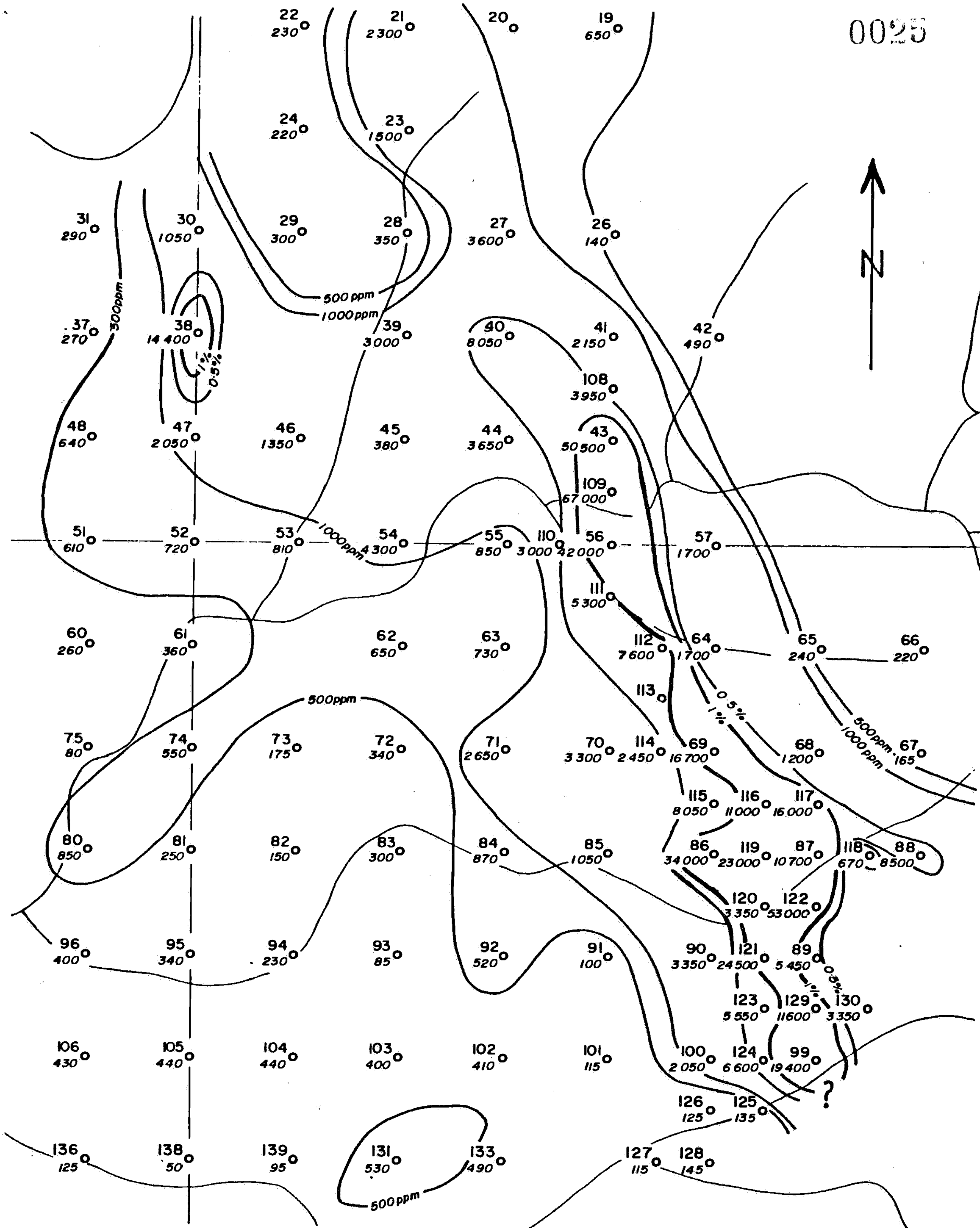
The contour plans clearly show that the + 1.0 % Pb zone occurs within a 1000 ppm (max.) envelope that extends on to the UM southern rock chip anomaly. The mineralisation is clearly contiguous over a strike of about 1.0 km. being open to the south as illustrated by the assay grade profiles in plate 5. (see figure 5)

4.2.5.4 Field Mapping

During the reconnaissance appraisal of the Mt. Chambers lead zinc prospectivity it was noted that the +1.0 % zone at Eric seemed to lie between two limestone/dolomite units in a poorly defined cuestifom topographic saddle.

It was also noted that there was a relative abundance of ferruginous float with rare isolated subcropping red-brown-black jasper.

Since the ferruginous material was very similar to palaeokarst jaspers at 'breccia hill` the Eric mineralisation was envisaged to occur in a related feature, dipping into the hill towards the northeast.



LEGEND

500ppm — Maximum Pb value contours

$\circ^{80}_{850}$ R.A.B. drillhole, prefixed REP *(maximum lead value)*

—— Creeks

0 100 200

Figure No. 5

BHP DRILLING MAXIMUM LEAD VALUES
ERIC PROSPECT

Because the only existing maps showed generalised geology at 1:10000 scale and hard rock geochemical data had not been previously obtained a rough geological sketch map was generated and a limited rock chip sampling programme undertaken.

Field Mapping

The mapping was targeted at establishing the ground truth of drilling information and mineralisation with respect to limestone /dolomite out crops which were not differentiated into specific units.

Although a new base line had been chained in along grid 155 magnetic it was not used because it was found to be more convenient to resurrect the REP drilling grid. By locating drill hole collars on the ground,the layout pattern in conjunction with the two DEP diamond drill holes was used to determine the hole numbering.

The rudimentary map shows that the Eric mineralisation (as drilled) occurs largely in an area of no outcrop between two limestone/dolomite beds that dip gently to the north / northeast at 5 degrees or less. The upper unit to the east was occasionally noted to contain carbonate filled vugs compared to only one such occurrence in the lower unit. (see plate 6)

Dips in some localities were variable due to local short wavelength folding that may be of syn-sedimentary origin. One unambiguous drape structure was identified in the southern bank of a creek just due east of hole REP 109. The zone of strongest disturbance mapped occurs just to the south of hole DEP 4.

Elsewhere, the main problem in mapping was that the regional dip is of a similar magnitude to the errors resulting from solution weathering of the exposed dip slope blocks and a wide spectrum of dip/strike orientation arises.

Mapping confirmed the distribution of ferruginous material was widespread but due to two sources. Much of the material was of a genuine jaspery origin with one example each of chert an silicified travertine being recognised. A second type of ferruginous float material was found to be derived from silty/sandy lenticles in the limestone/dolomite.

Rock Chip Sampling

Thirtythree rock samples were collected from outcrops at Eric in locations that may have been mineralised. The returned values were amazingly low except for four samples of manganiferous black breccia and jasper collected in the region of hole REP 109. These samples were resubmitted for precious metal determination with only the +1.0 % Pb breccia returning high silver values.

It appears that all the 3 m radius and statigraphic profile rock chip samples were probably taken from the cover units to the mineralisation. (see appendixes 2 & 3, plates 1 & 6)

The anomalous nature of the jasper strengthens the palaeokarstic model for the mineralisation. The + 1.0 % values returned for the breccias are in keeping with the grade encountered during drilling and could suggest that this material is the one and same but since none of it was self evident at the drill collars and drill logs are unavailable there is no way of knowing.

4.2.5.5 Interpretation

Comparison of the field map and the reinterpreted UM geology of plate 1,which shows a correspondence between ferruginous residues and the palaeokarst surface, clearly indicates that the Eric zone lies along the same stratigraphic position consistent with the analytical evidence

Pattern of Mineralisation

To finalise the assessment of the Eric Prospect the BHP drilling data was re-compilated at 1:1000 scale along with the field map and a set of 1:1 crossections. (see plates 6 & 7)

This exercise demonstrated that a number of the BHP drill holes were clearly located in the covering unit and others were terminated at too shallow a depth within the mineralised zone..

When these factors are taken into account it can be demonstrated that a continuous body of + 1.0 % Pb mineralisation about 10.0 m thick on the average could be present over the full 700 m of strike. An envelope of +1000 ppm Pb about 10 m thick is indicated to be present, making a target ore zone up to 30 m thick.

The drilling also demonstrates that the weaker mineralisation tends to occur in the west with the best intersections at the foot of the presumed cover unit on the east. This pattern is consistent with mineralisation extending down dip along the inferred palaeokarst surface.

Style of Exposure

The lack of hard rock outcrop is probably a function of weathering on the primary material. Considering that weathering of lead and zinc sulphide generates sulphuric acid ,local breakdown of the mineralised carbonate host rock is assured and the weathering products will mainly be metal sulphate, gypsum, and a residue of the rock's primary silt and clay. Carbon dioxide escapes to the air and magnesium from dolomite into the groundwater.

Given the above, significant MVT mineralisation is likely to develop its own solution karst as it oxidizes which will be largely filled with clay. Mineralisation is likely to be re-distributed in the process and expressed as lower grades over thicker intervals. Boldly outcropping ore is probably unlikely in the absence of silicification or appreciable iron in the primary zone.

Hence it is entirely possible that the + 1.0 % zone at Eric may be the up dip expression of concealed ore and it is therefore concluded that the lack of an outcropping mineralised zone should not be a deterrent to exploration.

Deposit Morphology

Given that mineralisation was probably introduced epigenetically into the palaeokarstic interface within the stratigraphic succession, permeability will dominate the distribution of ore. Two possible scenarios can be envisaged.

The most likely to apply in the case of Eric is porosity along the palaeokarstic disconformity which can be anticipated to undulate irregularly and therefore offer the best porosity where superficial debris may have accumulated. Examples could include solution depressions , and debris/talus slopes. Palaeo-highs would be unlikely locations. Recognition of primary drape and sag structure in the cover sequence could therefore be an important guide to exploration.

The other possibility is typified by the 'breccia hill` cavern deposit which may have no expression excepting where roof collapse to surface has occurred.

Exploration

It is mandatory that further exploration at Eric aim to establish the down dip extension of mineralisation by drilling. However prior to this step a more precise prediction to target depth than that currently available is considered desirable.

Mapping of the cover rocks would seem appropriate, particularly in respect of structure perhaps coupled with a geophysical technique designed to locate the concealed oxidation interface.

Whilst rock chip sampling demonstrably works for low grade mineralisation the inferred clay/silt residue weathering model suggests that soil sampling may be more appropriate. The use of soils in limestone/dolomite outcrop areas would allow faster coverage and reduce the incidence of low tenor anomalies compared to rock chipping.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

* Syn-depositional palaeokarsting took place during the deposition of the Wilkawillina Limestone at Mt. Chambers.

* Brown (oxidized) dolomitisation of primary grey (reduced) limestone is a characteristic alteration product of the karstic processes that also generated solution cavities on minor and macro scales.

* MVT lead zinc mineralisation is associated with these Cambrian palaeokarst features.

* The strongest mineralisation at the Eric Prospect is intimately associated with a disconformable karsted palaeosurface that dips away under cover to the east

* The + 1.0 % Pb zone at Eric may be the up-dip expression of ore and merits follow-up investigation.

* Ore grade Pb mineralisation may contain appreciable silver credits.

* MVT mineralisation is unlikely to be found 'outcropping` an may present as anomalous interbeded clay silt horizons

* Whilst other known mineral prospects do not warrant investigation there is potential for mineralisation with an Eric exposure style to remain undetected.

5.2 RECOMMENDATIONS

* A programme of work should be undertaken to investigate the Eric mineralisation. Geological mapping and trial geophysical surveys should be carried out in the leadup to a mandatory drilling programme designed to test for down dip extensions.

* A programme of soil sampling along the mapped out strike of the Eric palaeokarstic disconformity is considered desirable.

* Systematic testing of high grade Pb zones for silver should be undertaken.

6 REFERENCES

Broken Hill Proprietary Co. Ltd. 1981-86. Open file reports on E L No. 1138 : Mt. Frome , S.A.D.M.E. envelope no. 3722, (unpub.).

Union Miniere Development and Mining Corporation Ltd. 1973. Open file report on E L No. 103 Mt. Frome , S.A.D.M.E. envelope No. 2373, (unpub.).

APPENDIX 1 : FILE NOTE ON MAPPING

FILE NOTE :- MAP PREPARATION J.L.CURTIS.

The geology mapping of UM was enlarged to 1:1000 scale and fitted, using field knowledge, to an enlargement of the BHP drilling at the same scale.

Major disparities exist between the UM drill holes and their respective access tracks on BHP plans, as well as significant miss-matches with the UM plans and field observations.

Because the UM data was examined after the field visit ground truth cannot be guaranteed. It is estimated that matching errors of BHP and UM data may exceed 10 m .

Other disparities that were noted within the BHP plan set include miss plotting of the elevation of REP 56 on the long section and mal-contouring of topographic elevations in the vicinity of REP 124 .

****

It is concluded that the BHP plans were inadequately checked prior to issue and other undisclosed errors may exist.

****

APPENDIX 2 : SAMPLE RECORD SHEETS

SAMPLE RECORD SHEET

JLC EXPLORATION SERVICES

PROS. NAME WILNUROONA. GRIDS A & B AREA. PROJECT MT. CHAMBERS CLIENT DEMIS J.V.

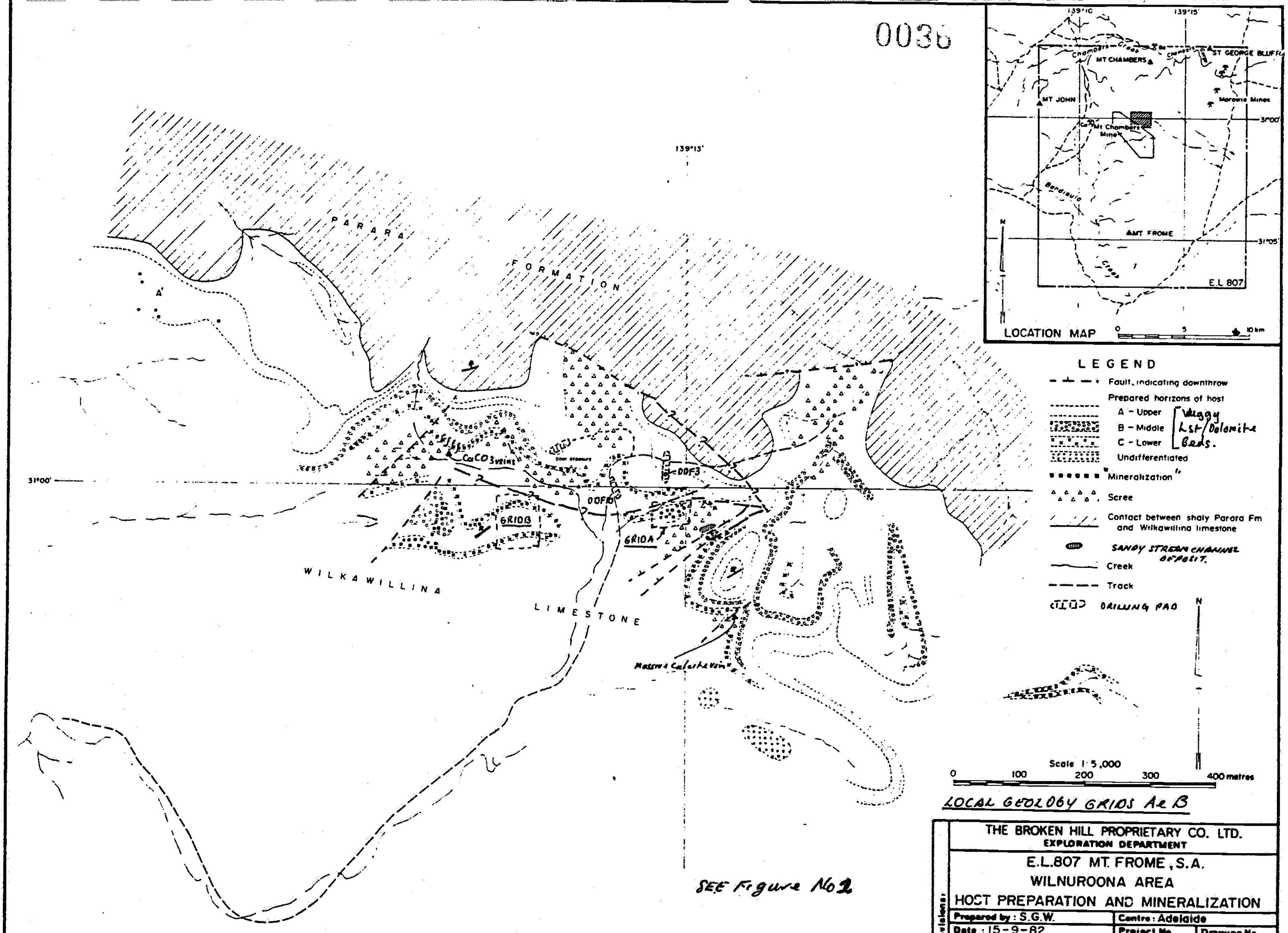
0035

SAMPLE NUMBER	REFERENCE COORDINATES		SAMPLE DESCRIPTION	KI TEST	UV
MC1A	GRID A	GRAB	Dark to medium grey limestone with black selvedges via PbS	+ve	–
MC1B	GRID A	GRAB	Black clasts in lighter grey-brown matrix breccia	+ve	–

NOTES:—

Compiled by: J.L.C.

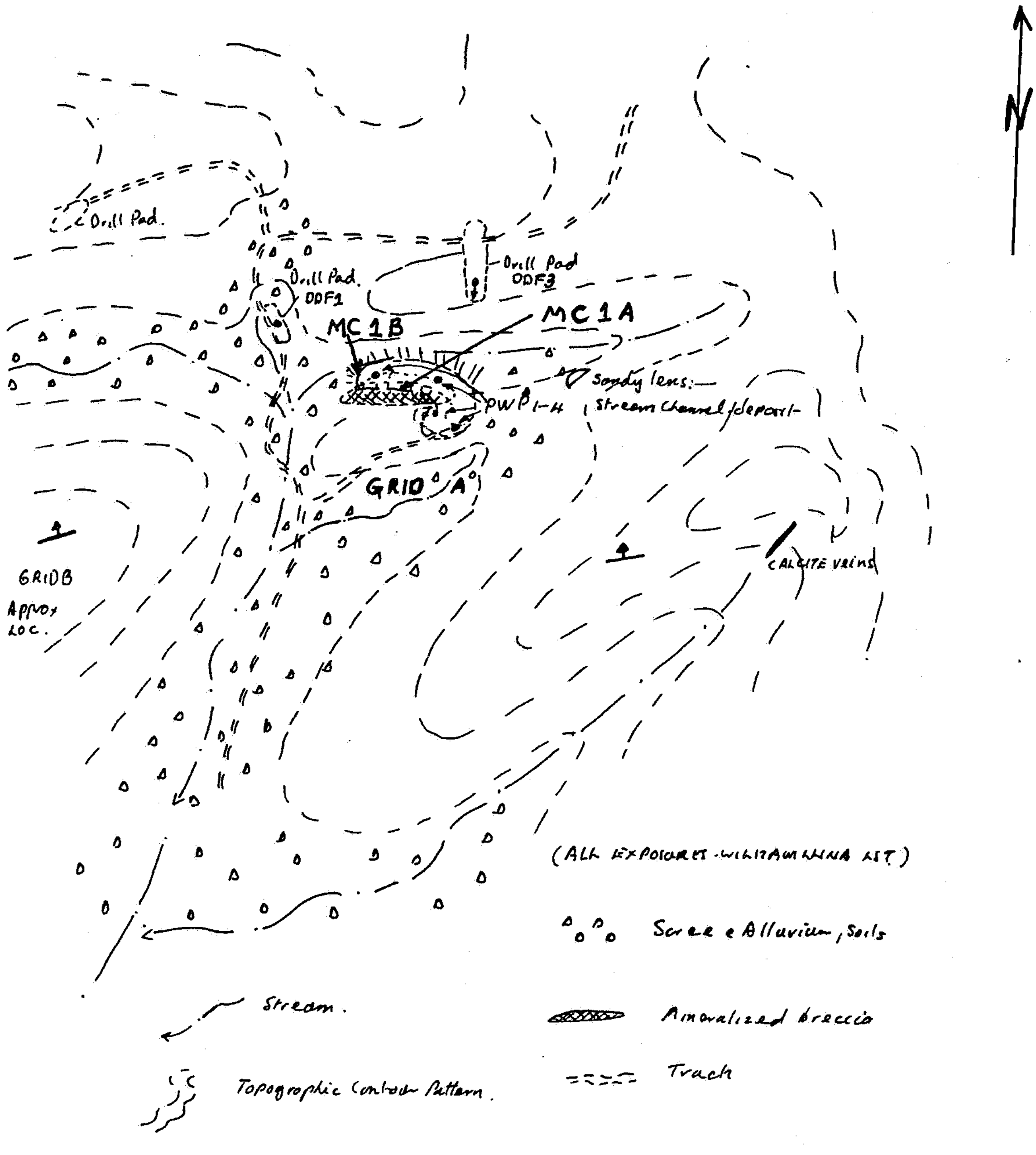
0036



THE BROKEN HILL PROPRIETARY CO. LTD.
EXPLORATION DEPARTMENT

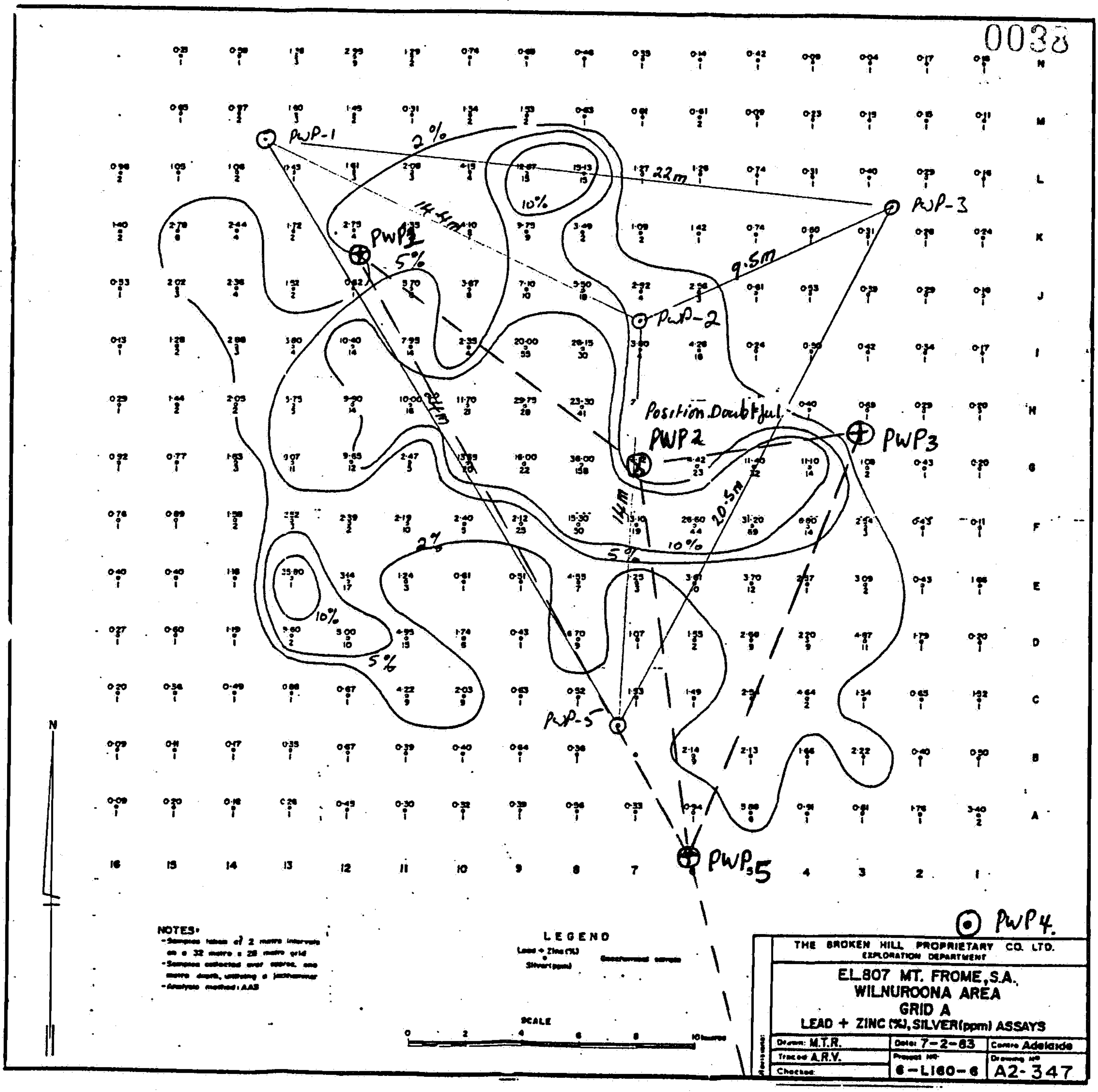
E.L.807 MT. FROME, S.A.
WILNUROONA AREA
HOST PREPARATION AND MINERALIZATION

Revisions		
Prepared by: S.G.W.	Centre: Adelaide	
Date: 15-9-82	Project No. 6-L160-2	Drawing No. A3-125
Drawn: A.R.V		



0 100 APPROX.

FIELD SKETCH OUTLINING TOPOGRAPHY

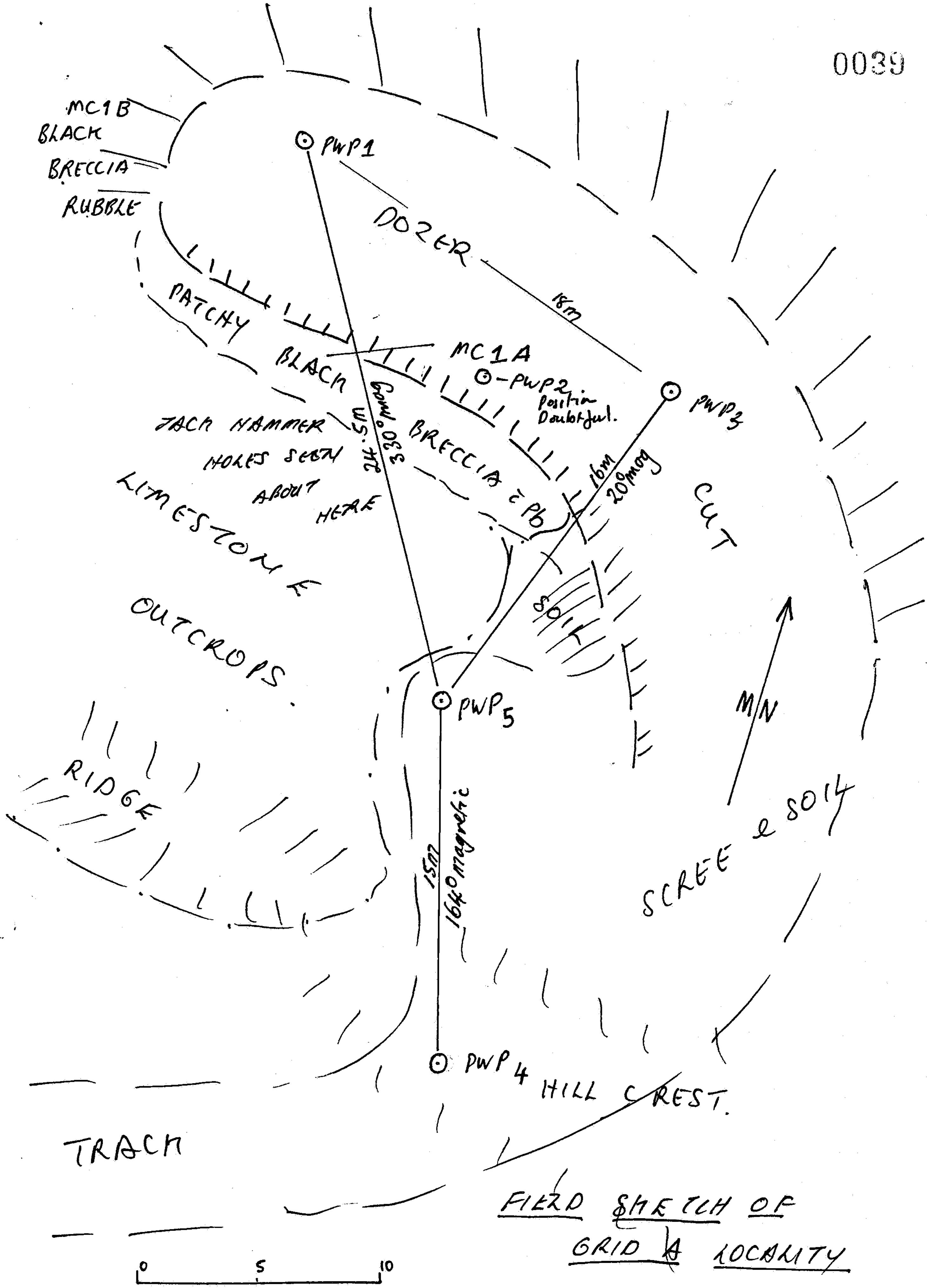


GRID A ROCK GEOCHEMISTRY & PERCUSSION DRILLING

PWP4.

⊙ – Drill holes as plotted - BHP drawing A3-256, – Fence Diagram.

⊕ – Drill holes plotted as best fit, assuming 10% contour approximates black breccia exposed in dozer cut



FIELD SKETCH OF GRID A LOCALITY

SAMPLE RECORD SHEET

JLC EXPLORATION SERVICES

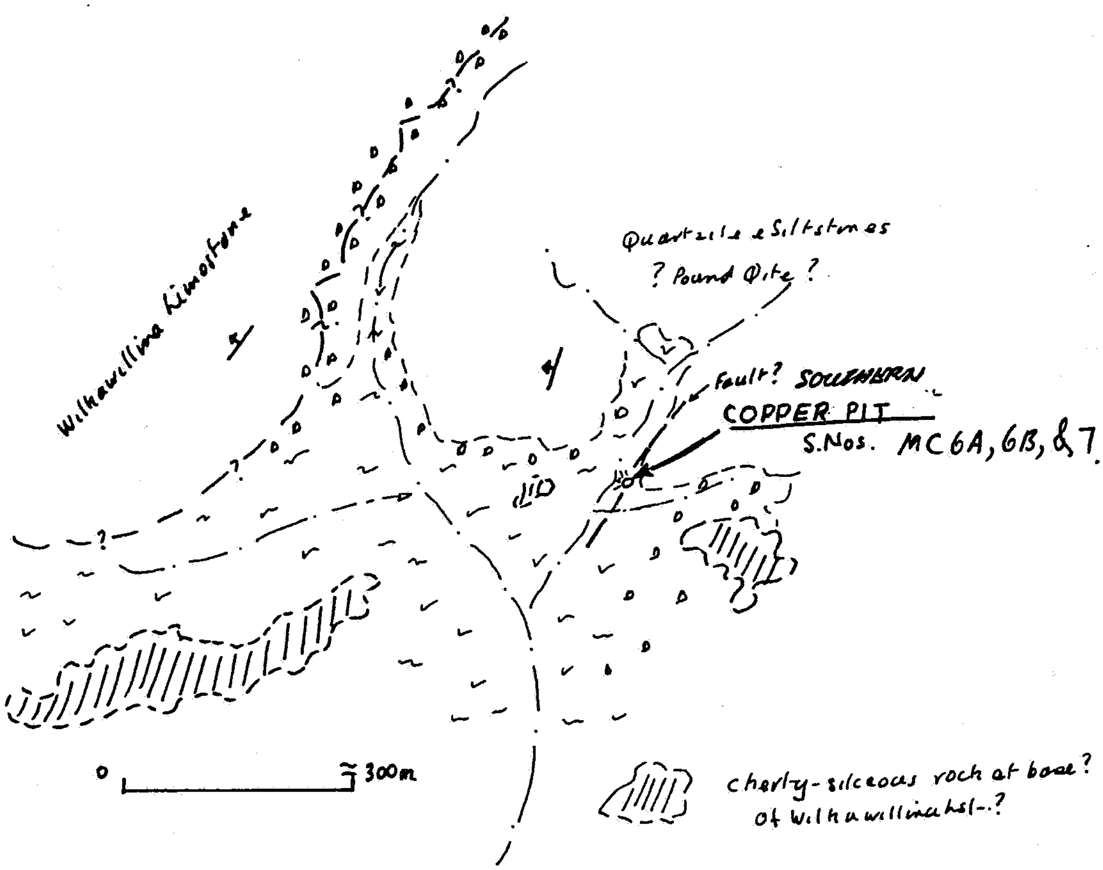
PROS. NAME: REGIONAL (See Figure 2) PROJECT: MT CHAMBERS CLIENT: DEMIS J.V.

0049

SAMPLE NUMBER	REFERENCE COORDINATES	SAMPLE DESCRIPTION	KI	U.V.
MC 6A	SOUTHERN COPPER PIT	Bleached siltstone?-clay with light green copper staining	+ve	—
MC 6B	" " "	" " " sandstone with black encrustation	+ve.	—
MC 7	" " "	Light medium brown hosting siltstone to copper pit	-ve	—
MC 8	NORTH ERIC	Dark haematitic red brown to medium brown cherty, gossany, silicified lst?	-ve	—
MC 9	"	" " " " " " " " "	-ve.	—
MC 10	"	" " " " " " " " "	-ve.	—

NOTES:—

Compiled by: J.L.C.



Wilkawillina Limestone
Quartzite & Siltstones
? Pound Qtz ?
Fault?
SOUTHERN COPPER PIT
S.Nos. MC6A, 6B, & 7
0
≃300m
cherty-siliceous rock at base?
of Wilkawillina Lst-?

SAMPLE RECORD SHEET

JLC EXPLORATION SERVICES

PROS. NAME "BRECCIA HILL" (See Figure 4) PROJECT MT CHAMBERS CLIENT DEMIS J.V.

0042

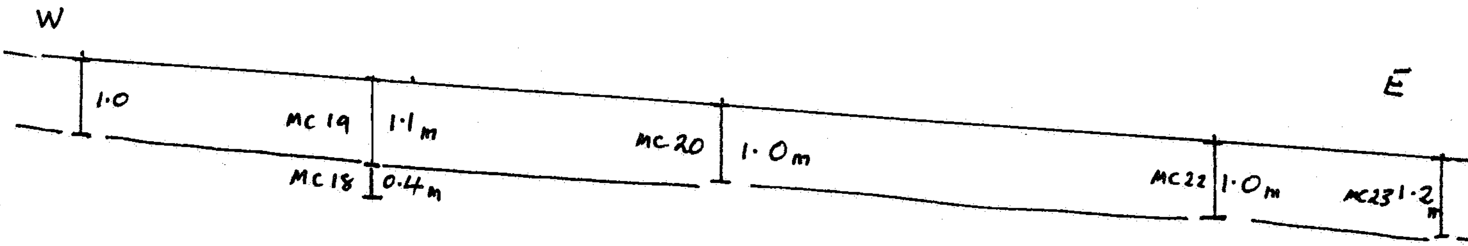
SAMPLE NUMBER	REFERENCE COORDINATES	SAMPLE DESCRIPTION	KI	U.V.
MC 3	NORTH END, HILL TOP	Dark brown cherty jasper with zones of granular euhedral quartz - gossan?	-ve	—
MC 4	" , "	Medium brown " " " " " " " - "	-ve	YELL-GREY
* MC5A	CENTRE WEST SLOPE	Light brown silicified travertine? after carbonate?	-ve	—
MC 5B	" " "	Massive secondary? greyish quartz, granular with drusy vugs	-ve	—
MC 11	SOUTH END SOUTH "POD"	Buff jaspery cherty material and drusy quartz, massive/vugs	-ve	PALE YELL WHITE?
MC 12	NORTH END " "	Dark brown " " " " " " " "	-ve	ON "COATING
MC 13	SOUTH END NORTH "POD"	Dark - light brown cherty and granular euhedral quartz material	-ve	—
MC 14	NORTH END " "	" " " " " " "	-ve	PALE GREEN - WHITE
MC 15	SOUTH END, DIPSLOPE - EAST	" " " " " " float material	-ve	PATCH OF YELLOW

NOTES:— * - Not Analysed - Rock Specimen only.

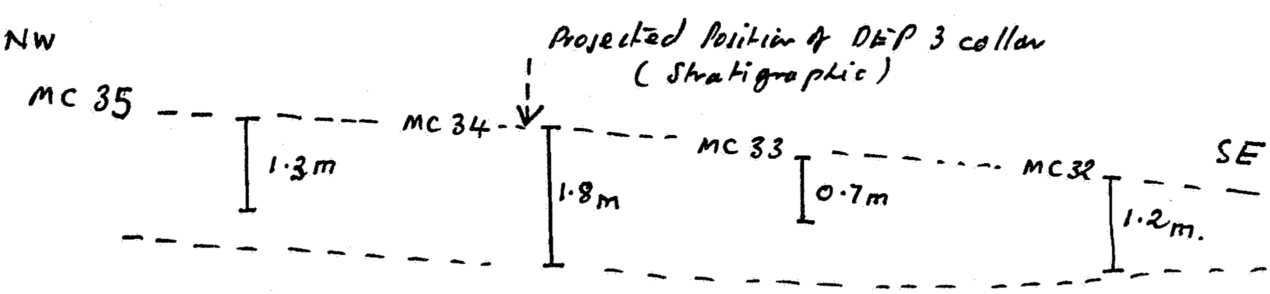
Compiled by: J.L.C.

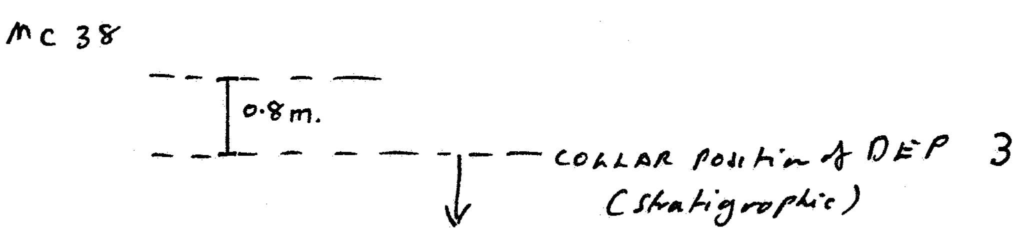
SAMPLING SKETCH ERIC (South). – Chip Profiles

MC 18–23 LINE 7500N, 8550E



ERIC (North)





SAMPLE RECORD SHEET

JLC EXPLORATION SERVICES

PROS. NAME ERIC (South Sheet) (Plate 6) PROJECT MT CHAMBERS CLIENT DEMIS J.V.

0044

SAMPLE NUMBER	REFERENCE COORDINATES	SAMPLE DESCRIPTION	MI TEST	U.V.
MC 2	ADJACENT RAB 109	Light brown limestone with buff encrustation	-ve	LW YELLOW
MC 16	UPSTREAM - SOUTH ERIC lower	Dark greyish brown siderite? limestone - recrystallized, vugs?	+ve	PATCH OF YELLOW
MC 17	" " " upper	" " " " " " + white sec'd Zn min?	-ve.	DULL YELLOW GREEN/WHITE
MC 18	ERIC - SOUTH SHEET	Buff & medium brown limestone, ERIC foot-wall?	-ve.	—
MC 19	"	Dark greyish brown siderite? vuggy lst with light bands	-ve	—
MC 20	"	ditto but paler grey	-ve	—
MC 21	"	ditto but with pinkish dolomite?	-ve	'BURNT' YELLOW SrCO₃?
MC 22	"	ditto as above.	-ve.	—
MC 23	"	ditto but with secondary white Zn? mineral in vugs	-ve.	—
MC 24	"	Buff to light grey lst with dark fracture fillings & mottling	+ve	—
MC 25	"	ditto, higher frequency of fracture material	-ve.	PATCH OF 'BURNT YELL'
MC 26	"	Dark greyish brown mottled limestone with cavities.	-ve.	—
MC 27	"	Dark greyish brown of even colour, recrystallized, cavities	-ve	GREENISH WHITE
MC 28	"	Ditto but with secondary white mineral Zn?	-ve.	"
MC 29	"	Ditto as previously	+ve?	" + BURNT YELLOWN
MC 30	"	Dark greyish brown lst with pink dolomite? blotches	+ve?	GREENISH WHITE
MC 31	"	Buff limestone with dark mottling (specks & banded)	+ve	—
MC 32	"	Buff limestone with pink dolomite? zones	-ve.	—
MC 33	"	Ditto	-ve	—
MC 34	"	Pink dolomitized? limestone	+ve?	—
MC 35	"	" " "	-ve	—

NOTES:—

Compiled by: J.L.C.

SAMPLE RECORD SHEET

JLC EXPLORATION SERVICES

PROS. NAME ERIC (South Sheet)(see plate 6) PROJECT MC JV CLIENT DEMIS

0045

SAMPLE NUMBER	REFERENCE COORDINATES	SAMPLE DESCRIPTION		
MC 36	(LOST) ERIC (SOUTH SHEET)			
MC 37	"	Pink to buff dolomitized limestone	+ve	—
MC 38	"	Dark brown carbonaceous [illegible] and off white-buff limestone	+ve.	GREENISH WHITE
MC 39	"	Black clastic breccia - possibly secondary accum.	+ve.	—
MC 40	"	Dark brown siliceous cherty rock.	+ve ?	GREENISH WHITE
MC 41A	"	Black clastic breccia	+ve	
MC 41B	"	Dark brown siliceous cherty rock.	−ve.	GREENISH WHITE.

NOTES:—

Compiled by: J.L.C.

APPENDIX 3 : ANALYTICAL RESULTS

CLASSIC COMLABS LTD
Analytical Laboratories (INC. IN W.A.)

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

305 South Road, Mile End South, South Australia, 5031
Telephone: (08) 43 5722 Fax: (08) 234 0321 Telex: LABCOM AA89323

Mr. R. Bluch
Oxford house Associates
Suite 8
3 Mount Barker Road
Stirling
SA 5152 AUSTRALIA

JOB NUMBER: 8AD3615

Your Reference:

Date Received: 11-NOV-1988 Turnaround 7 days
Date Relayed: 18-NOV-1988
Date Reported: 18-NOV-1988

Number of Samples: 43

Report Analyte Codes
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficent Sample for Analysis.

Report Comprising: Cover Sheet
Pages 1 to 2

Comments:

Report Dist'n: Carbon Copies(CC),Electronic Media(EM),Magnetic Media(MM)

Type	Recipient	Location	Date	Copies
CC	Mr. Curtis	Plympton Park	18-NOV-88	1

Samples reassayed for Ag, Au
MC 1A
MC 34, 53
MC 11, 12, 13, 14, 15
MC 39 40 41A

Approved Signature:
for

Harry Fishman
Managing Director.
CLASSIC COMLABS LTD
(Please address any enquiries to Mr. Trevor Francis)

This report relates specifically to the sample(s) tested in so far as that the sample(s) is truly representative of the sample source as supplied.

CLASSIC COMLABS LTD
Analytical Laboratories (INC. IN W.A.)

Job: 8AD3615

* — Ag, Au reassay

ANALYTICAL REPORT

GEOLOGY		SAMPLE	Zn	As	Cu	Pb	LOCATION	SAMPLE TYPE
BRECCIA.	*	MC1A	1.87%	150	740	3.85%	GRIDA	G
"		MC1B	1.12%	100	130	3.15%	GRIDA	G
FLUORESCENT FLOAT		MC2	1840	50	135	5200	ERIC/RBP109	G
JASPER/BRECCIA	*	MC3	750	100	230	1060	BRECCIA. HILL.	G
"	*	MC4	330	100	130	430		G
"	*	MC5B	60	50	36	140		G
SILTSTONE		MC6A	86	<50	2.95%	74	SOUTHERN COPPER PIT	G
"		MC6B	310	50	6.95%	190		G
"		MC 07	530	150 ?	1.48%	155		G.
↑ JASPER/BRECCIA ↓		MC 08	28	50	750	24	NORTH ERIC	G
		MC 09	110	50	165	58		G
		MC 10	140	150	88	76		G
	*	MC 11	1540	150	810	330	BRECCIA HILL	RC
	*	MC 12	1720	150	930	330		RC
	*	MC 13	2000	250	1520	410		RC
	*	MC 14	1720	250	1060	310		RC
	*	MC 15	2400	200	1260	630		RC
↑ DOLOMITE/LIMESTONE ↓		MC 16	210	150	145	70	ERIC (South. Sheet.)	RC
		MC 17	140	<50	88	60		RC
		MC 18	48	<50	40	105		RP
		MC 19	84	<50	130	84		RP
		MC 20	68	<50	115	86		RP
		MC 21	76	<50	145	105		RP
		MC 22	96	<50	175	72		RP
		MC 23	90	<50	175	78		RP
		UNITS	ppm	ppm	ppm	ppm		
		SCHEME	AAS1	AAS2	AAS1	AAS1		
		UPPER SCHEME	AAS1C		AAS1C	AAS1C		

RC — Radius Rock Chip, G — Grab., RP Rock Chip Profile

CLASSIC COMLABS LTD
Analytical Laboratories (INC. IN W.A.)

Job: 8AD3615

ANALYTICAL REPORT

Notes	SAMPLE	Zn	As	Cu	Pb	LOCATION	SAMPLE TYPE
* Ag, Au Re-assay	MC 24	68	<50	48	72		RC
	MC 25	42	<50	42	100		RP
	MC 26	130	<50	72	64		RP
DOLOMITE/	MC 27	145	<50	220	74		RP
LIMESTONE	MC 28	165	<50	140	60		RC
	MC 29	125	<50	98	68		RP
	MC 30	115	<50	88	220		RC
	MC 31	170	<50	56	300	ERIC	RC
	MC 32	30	<50	<2	70	(south Sheet)	RP
	MC 33	100	50	170	230		RP
	MC 34	19	<50	26	86		RP
	MC 35	60	50	44	110		RP
	MC 37	74	100	52	540		RC
	MC 38	155	<50	120	380		RP
MANGANIFEROUS? BRECCIA *	MC 39	1780	700	6500	5.30%		G
JASPER/ *	MC 40	1260	400	1200	500		RC
BRECCIA *	MC41A	2200	450	4500	1.47%		RC/G
	MC41B	2050	350	1780	6500		RC/G
	UNITS	ppm	ppm	ppm	ppm		
	SCHEME	AAS1	AAS2	AAS1	AAS1		
	UPPER SCHEME				AAS1C		

CLASSIC COMLABS LTD
Analytical Laboratories (INC. IN W.A.)

305 South Road, Mile End South, South Australia, 5031
Telephone: (08) 43 5722 Fax: (08) 234 0321 Telex: LABCOM AA89323

Mr. Russell Bluck
Oxford House Associates
Suite 8
3 Mount Barker Road
Stirling
SA 5152 AUSTRALIA

JOB NUMBER: 8AD3719

Your Reference:

Date Received: 25-NOV-1988 Turnaround 7 days
Date Relayed: 2-DEC-1988
Date Reported: 2-DEC-1988

Number of Samples: 12

Report Analyte Codes
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficent Sample for Analysis.

Report Comprising: Cover Sheet
Pages 1 to 1

Comments:

Report Dist'n: Carbon Copies(CC),Electronic Media(EM),Magnetic Media(MM)

Type	Recipient	Location	Date	Copies

Approved Signature:

for [signature]

Harry Fishman
Managing Director.
CLASSIC COMLABS LTD
(Please address any enquiries to Mr. Trevor Francis)

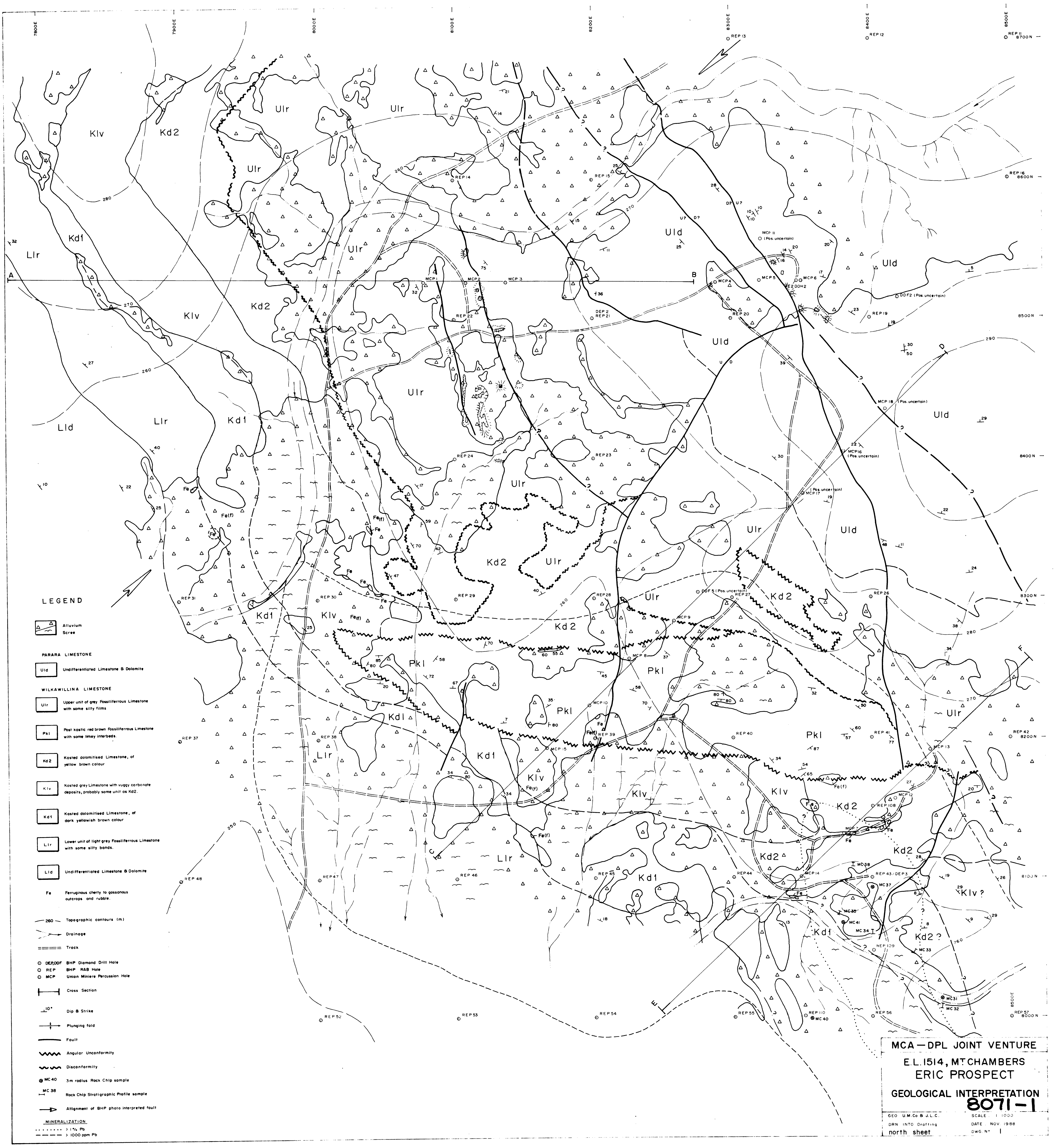
This report relates specifically to the sample(s) tested in so far as that the sample(s) is truly representative of the sample source as supplied.

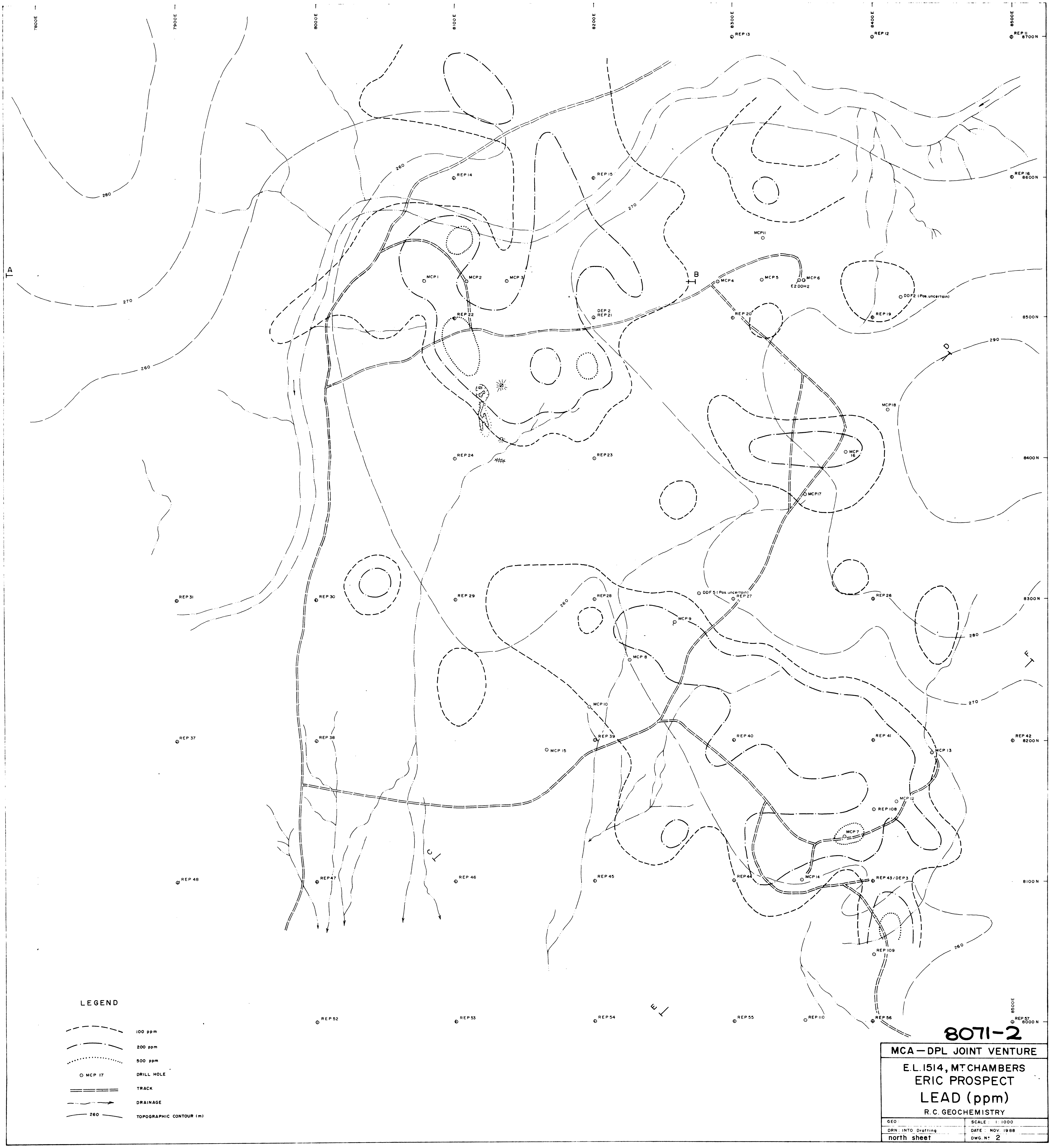
CLASSIC COMLABS LTD
Analytical Laboratories (INC. IN W.A.)

Job: 8AD3719

ANALYTICAL REPORT

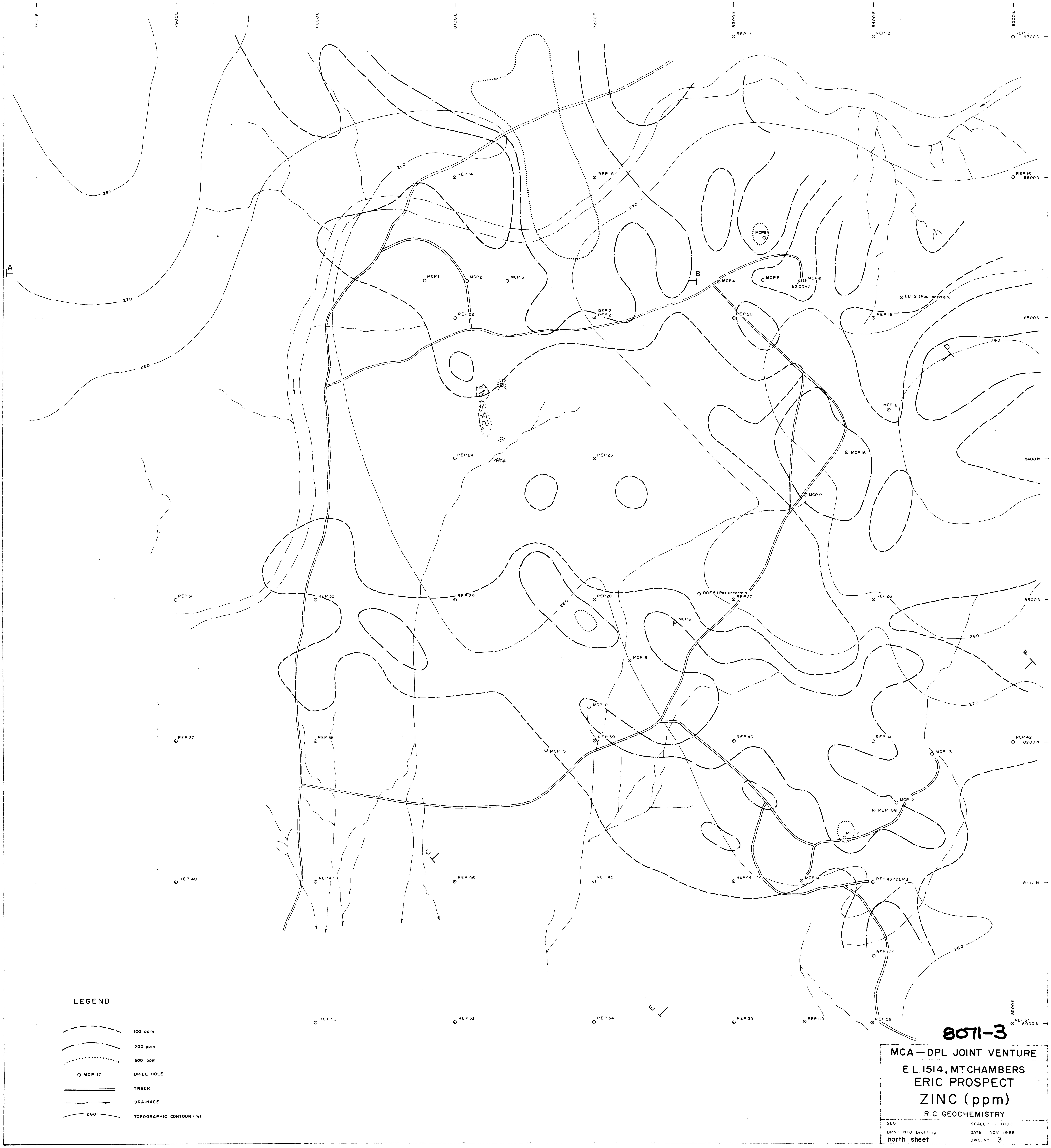
SAMPLE	Ag	Au	
MC 1A	8	<0.02	GRID A.
MC 3	<1	0.04	Breccia Hill.
MC 4	1	0.04	
MC 5B	<1	0.04	
MC 11	2	0.02	
MC 12	<1	0.04	
MC 13	1	0.02	
MC 14	<1	0.04	
MC 15	<1	0.02	
MC 39	120	0.02	North Eric
MC 40	2	0.02	
MC 41A	46	0.04	
UNITS	ppm	ppm	
SCHEME	AAS2	AAS7	

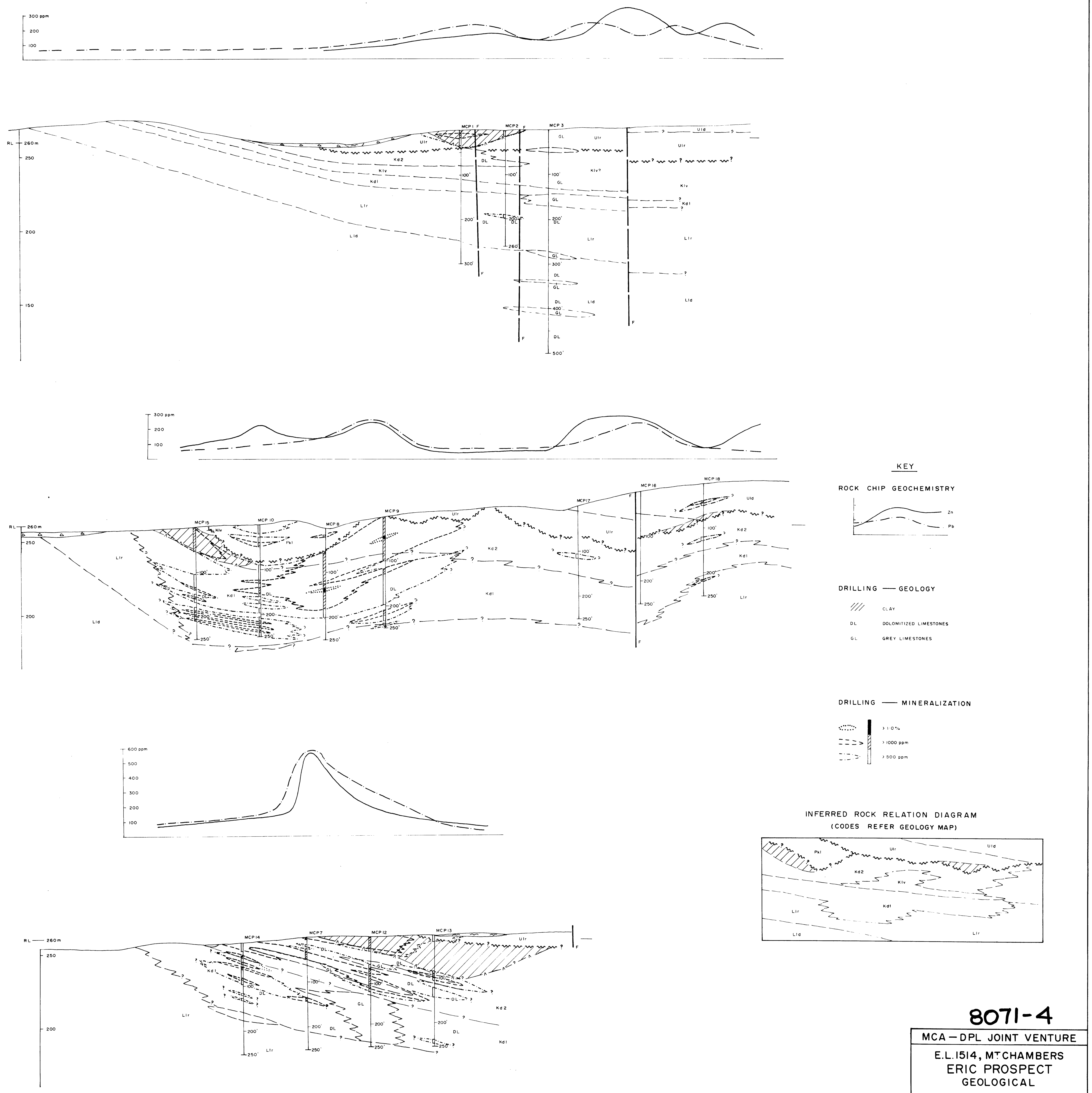

7800E
7900E
8000E
8100E
8200E
8300E
8400E
8500E
8700N
8600N
8500N
8400N
8300N
8200N
8100N
8000N
Ulr
Kd2
Klv
Kd1
Llr
Lld
Uld
Pkl
Kd1
Klv ?
Kd2 ?
LEGEND
Alluvium
Scree
PARARA LIMESTONE
Uld Undifferentiated Limestone & Dolomite
WILKAWILLINA LIMESTONE
Ulr Upper unit of grey Fossiliferrous Limestone with some silty films
Pkl Post kastic red brown Fossilliferrous Limestone with some limey interbeds.
Kd2 Kasted dolomitised Limestone, of yellow brown colour
Klv Kasted grey Limestone with vuggy carbonate deposits, probably same unit as Kd2.
Kd1 Kasted dolomitised Limestone, of dark yellowish brown colour
Llr Lower unit of light grey Fossiliferrous Limestone with some silty bands.
Lld Undifferentiated Limestone & Dolomite
Fe Ferruginous cherty to gossanous outcrops and rubble.
260 Topographic contours (m)
Drainage
Track
DEP,DDF BHP Diamond Drill Hole
REP BHP RAB Hole
MCP Union Miniere Percussion Hole
Cross Section
10° Dip & Strike
Plunging fold
Fault
Angular Unconformity
Disconformity
MC 40 3m radius Rock Chip sample
MC 38 Rock Chip Stratigraphic Profile sample
Allignment of BHP photo interpreted fault
MINERALIZATION
> 1% Pb
> 1000 ppm Pb
MCA — DPL JOINT VENTURE
E.L.1514, MT CHAMBERS
ERIC PROSPECT
GEOLOGICAL INTERPRETATION
8071-1
GEO U.M.Co & J.L.C.
SCALE 1 1000
DRN INTO Drafting
DATE NOV. 1988
north sheet
DWG. N° 1



8071-2

MCA — DPL JOINT VENTURE	
E.L. 1514, MT CHAMBERS ERIC PROSPECT	
LEAD (ppm)	
R.C. GEOCHEMISTRY	
GEO	SCALE : 1:1000
DRN: INTO Drafting	DATE : NOV. 1988
north sheet	DWG. Nº 2


7800E
7900E
8000E
8100E
8200E
8300E
8400E
8500E
8700N
8600N
8500N
8400N
8300N
8200N
8100N
8000N
A
B
C
D
E
F
280
270
260
290
REP 11
REP 12
REP 13
REP 14
REP 15
REP 16
MCP 1
MCP 2
MCP 3
MCP 4
MCP 5
MCP 6
E2 DDH2
MCP 11
DDF2 (Pos. uncertain)
REP 19
REP 20
REP 22
DEP 2
REP 21
MCP 18
MCP 16
REP 24
REP 23
MCP 17
REP 31
REP 30
REP 29
REP 28
DDF 5 (Pos. uncertain)
REP 27
REP 26
MCP 9
MCP 8
MCP 10
REP 37
REP 38
REP 39
MCP 15
REP 40
REP 41
REP 42
MCP 13
MCP 12
REP 108
MCP 7
REP 48
REP 47
REP 46
REP 45
REP 44
MCP 14
REP 43/DEP 3
REP 109
REP 52
REP 53
REP 54
REP 55
REP 110
REP 56
REP 57
LEGEND
100 ppm
200 ppm
500 ppm
MCP 17
DRILL HOLE
TRACK
DRAINAGE
260
TOPOGRAPHIC CONTOUR (m)
8071-3
MCA — DPL JOINT VENTURE
E.L. 1514, MT CHAMBERS
ERIC PROSPECT
ZINC (ppm)
R.C. GEOCHEMISTRY
GEO
SCALE 1:1000
DRN INTO Drafting
DATE NOV 1988
north sheet
DWG. Nº 3



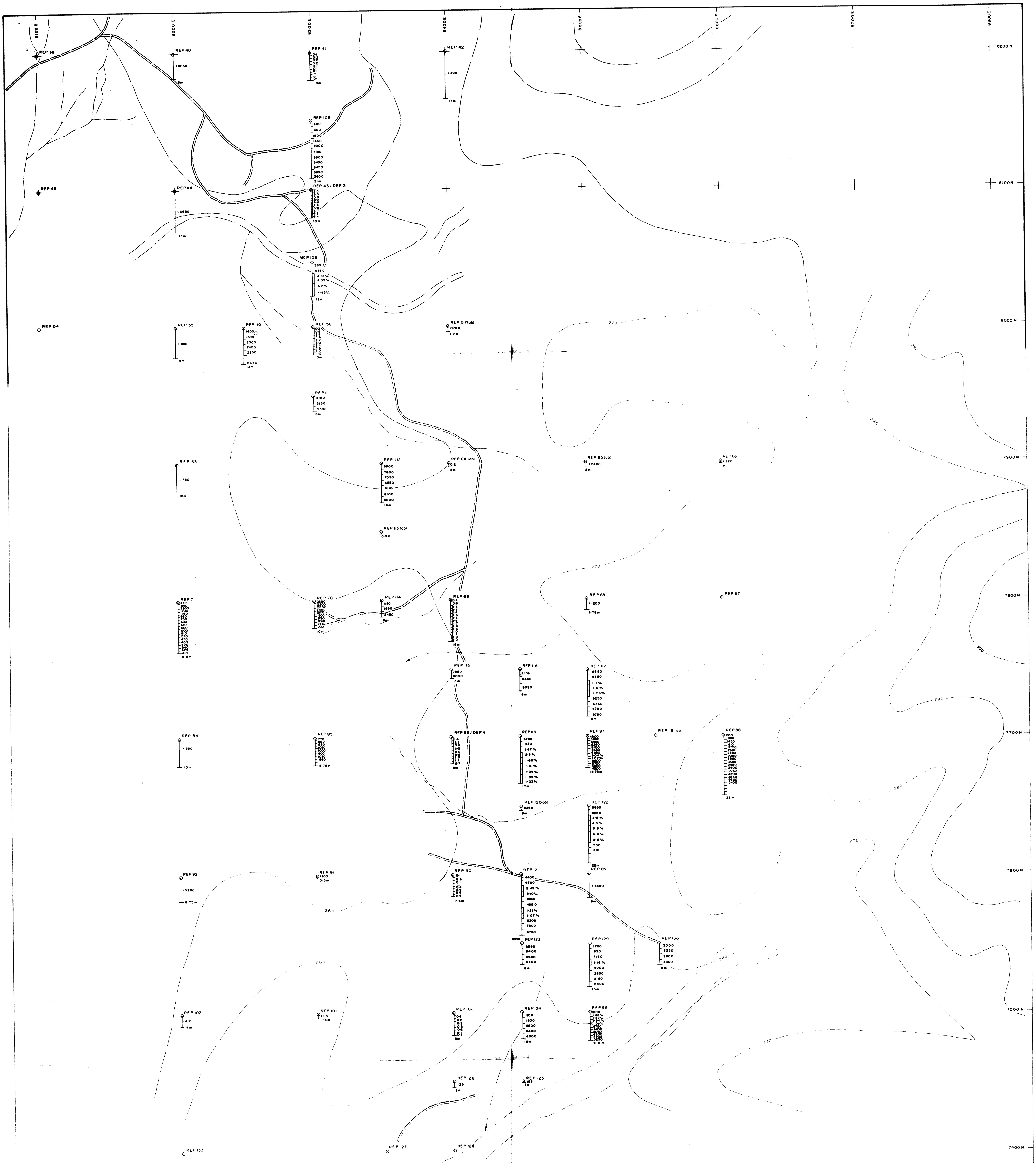
8071-4

MCA — DPL JOINT VENTURE

E.L.1514, MT CHAMBERS
ERIC PROSPECT
GEOLOGICAL
CROSSECTIONS

GEO: J.L.C.	SCALE: H:V: 1:1000
DRN: INTO Drafting	DATE: DEC 1988
north sheet	DWG. Nº 4

8071-5



LEGEND

1st PHASE BHP RAB DRILLING

REP 44
‹ 3650 — Maximum recorded value, ppm Pb (from table)
10m Total Depth

REP 41
0·1
0·2
0·2
1m samples, rounded to nearest 100 ppm as % Pb (from Dwg. Nº A3–275)
‹ 1000 ppm

2nd PHASE BHP RAB DRILLING

REP 117
6650
9350
1·1 %
1·6 %
1·23 %
2m samples, ppm and % (from report appendix)

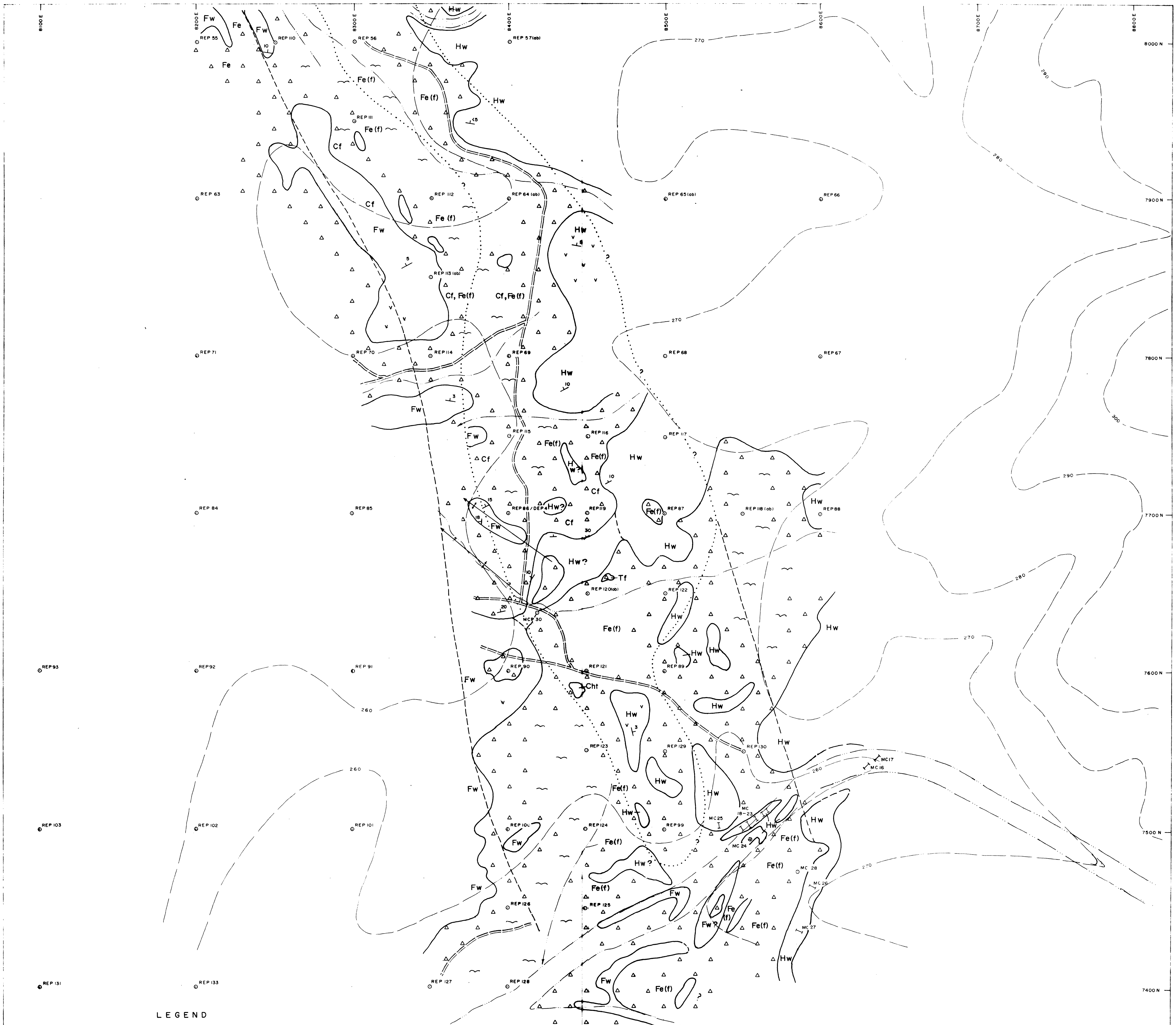
VERTICAL SCALE 1:500

ADDENDUM:
Additional Assay Data REP's 70, 71, 85, 87, 88 and 99.

MCA – DPL JOINT VENTURE

E.L. 1514, M^T CHAMBERS
ERIC PROSPECT
BHP REP DRILLING
ASSAY PROFILES

GEO: J.L.C.	SCALE: 1:1000 H, 1:500 V
DRN: INTO Drafting	DATE: NOV. 1988, JAN. 1989
south sheet	DWG. Nº 5



LEGEND

RECENT

Alluvium

Scree

KASTIC ROCKS (age uncertain)

Fe (f) Ferruginous & siliceous jaspery rock (floaters) (Massive and breccia forms)

Cf Cryptocrystalline silica floaters (massive)

Cht Saccaroidal chert

Tf Travertine, float — banded and siliceous

V Carbonate filled vugs

CAMBRIAN

WILKAWILLINA LIMESTONE

Hw Hanging wall Limestone

Fw Foot wall Limestone

Plunging fold

25 Dip & strike

Outcrop boundary

Stream / drainage

○ REP BHP RAB Drill Hole

○ DEP BHP Diamond Drill Hole

MC29 3m radius rock chip sample

MC16 Profile rock chip sample

MINERALIZATION

········ > 1% Pb

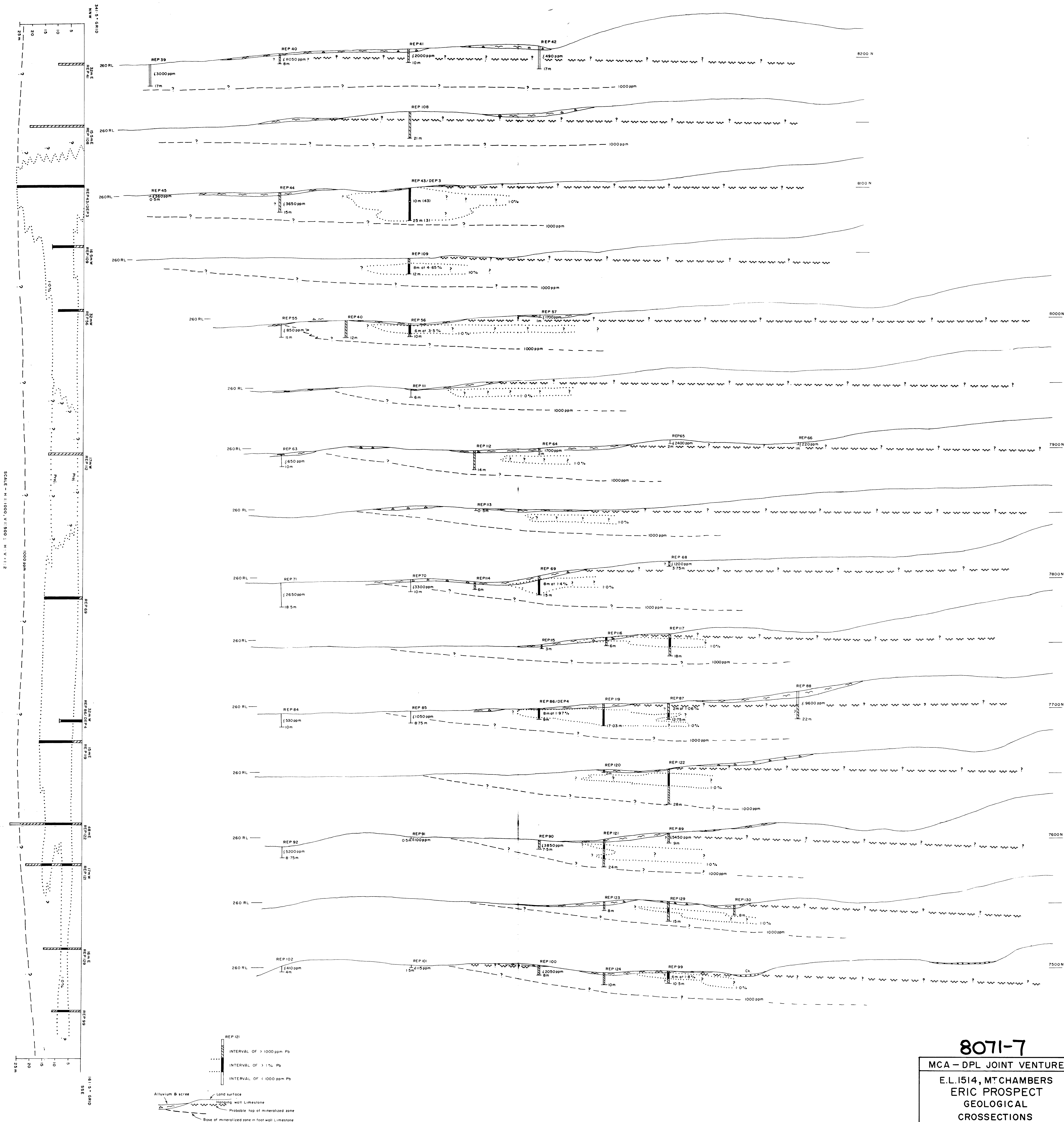
– – – – > 1000 ppm Pb

8071-6

MCA — DPL JOINT VENTURE

E.L.1514, MT. CHAMBERS
ERIC PROSPECT
GEOLOGICAL
SKETCH MAP

GEO : J.L.C.	SCALE : 1:1000
DRN : INTO Drafting	DATE : DEC. 1988
south sheet	DWG. Nº 6



8071-7

MCA – DPL JOINT VENTURE

E.L. 1514, MT CHAMBERS
ERIC PROSPECT
GEOLOGICAL
CROSSECTIONS

GEO: J.L.C	SCALE: 1:1000 H, 1:1000 V
DRN: INTO Drafting	DATE: DEC 1988
south sheet	DWG Nº 7

DEMIS - MCA JOINT VENTURE
Exploration Licences 1414 & 1515

THE REGIONAL GEOLOGICAL SETTING of CAMBRIAIN MVT MINERALISATION in SOUTH AUSTRALIA

JLC EXPLORATION SERVICES
3 Shelley Avenue,
Plympton Park, S.A. 5038
Telephone (08) 2932894

J.L.Curtis.
15 April 1989
MVT*REG

ABSTRACT

Consideration of the typical features of MVT SLZ deposits and an appraisal of the regional geology of the Northern Flinders Ranges of South Australia incorporating unpublished data on aspects of the Lower Cambrian biostratigraphy, facies relations ,and palaeodepositional environment indicates that all the geological conditions for the development of a major mineral province were present. Study of the metallogenic distribution confirms that an early basin dewatering plumbing system conveyed MVT mineralisation to many of the known prospects. Later rejuvenation during the Delamerian Orogeny deposited minor base metal and gold mineralisation in fault structures and diapiric bodies and also economically significant whillemite type zinc mineralisation as late MVT analogues. This study significantly upgrades the prospectivity of the region.

TABLE OF CONTENTS

Page No.

1 INTRODUCTION 1

2 LOCATION AND ACCESS 1

3 GEOLOGICAL MODEL 1

3.1 OBSERVED FEATURES 2

3.2 INTERPRETATION 3

3.3 ORE EMPLACEMENT 3

4 REGIONAL GEOLOGY 4

4.1 STRATIGRAPHIC UNITS 5

4.2 DEPOSITIONAL ENVIRONMENTS 7

4.3 SEDIMENTATION IN THE ARROWIE BASIN 8

4.3.1 REGIONAL ASPECTS 8

4.3.2 SHELF MARGIN 9

4.4 STRUCTURE 10

4.4.1 DEFORMATION AND SEDIMENTATION 10

4.4.2 METALLOGENIC DISTRIBUTION 11

5 ECONOMIC POTENTIAL 12

6 CONCLUSIONS AND RECOMMENDATIONS 14

6.1 CONCLUSIONS 14

6.2 RECOMMENDATIONS 14

REFERENCES

APPENDIX

**** LIST OF FIGURES ****

FIGURE No.	TITLE	FOLLOWING PAGE No.
1	LOCATION DIAGRAM	1
2	CAMBRIAN STRATIGRAPHY OF THE FLINDERS RANGES	4
3	LOWER CAMBRIAN FACIES AT OLD-WIRREALPA	6
4	CAMBRIAN BIOSTRATIGRAPHIC ZONES OF THE FLINDES RANGES	9
5	EARLY CAMBRIAN PALAEOGEOGRAPHY OF EASTERN SOUTH AUSTRALIA	9
6	PALAEOENVIRONMENTS OF THE HAWKER GROUP	10
7	THE GEOLOGY OF THE WILKAWILLINA GRABEN	11
8	METALLOGENY OF THE FLINDERS RANGES	12

1 INTRODUCTION

This report sets out to describe the currently accepted geological model of Mississippi Valley Type (MVT) type lead zinc deposits and demonstrate its relevance to similar mineralisation in the Flinders Ranges of South Australia.

MVT style mineralisation has been long recognised to occur within Cambrian carbonates of the Hawker Group from the central north of the Adelaide Geosyncline. Mineral occurrences occur widely within the Wilkawillina Limestone at the base of the Group and therefore the prospectivity of this unit is the focus of the report.

The Flinders Ranges occur in an arid climatic zone that receives irregular rainfall. Weathering has caused many units to develop strong relief with aesthetic appeal. The climatic and visual aspects of the region have led to the development of environmental protection legislation. However there is provision for exploitation of resources "in the national/state interest".

Aboriginal Land/Sacred Site aspects are subject to current legislative review.

2 LOCATION AND ACCESS

The region with the greatest mineralisation potential occupies the Northern Flinders Ranges in South Australia, centred approximately 400 km NNE of Port Augusta.

Road access to the region is by either Hawker-Wilpena or Hawker-Parachilna-Blinman, the latter parts of each route being over unsealed surface.

To the west of the ranges is the Port Augusta-Leigh Creek standard gauge railway line. (see figure 1)

3 GEOLOGICAL MODEL

Geological research into MVT deposits has been controversial ever since their recognition as a distinct class of deposit. This section sets out to outline the salient features and the current understanding of these deposits.

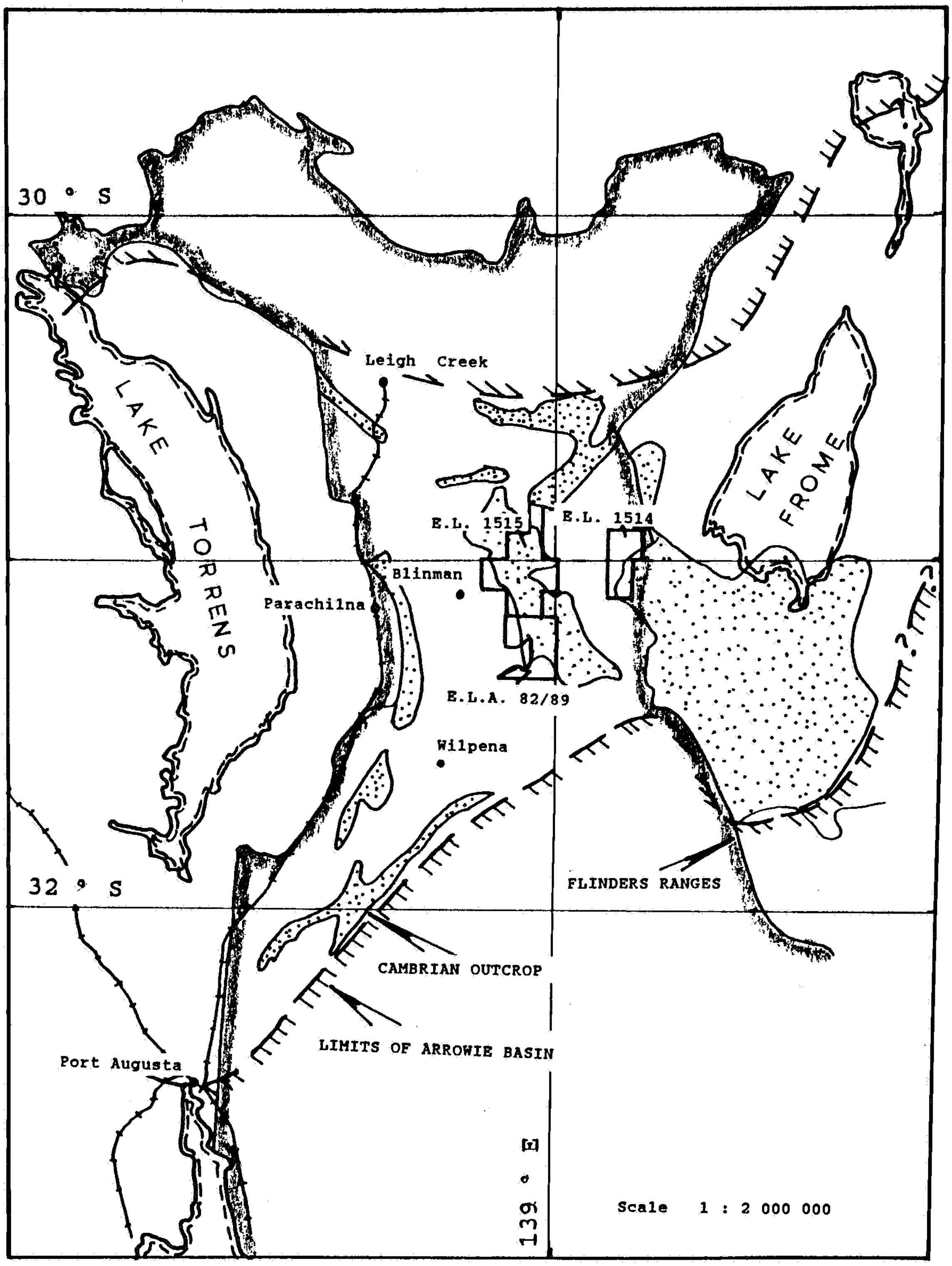


FIGURE No. 1 LOCATION DIAGRAM

3.1 OBSERVED FEATURES

Research by workers Beales and Anderson shows that whilst individual deposits may vary from each other there are many aspects that clearly indicate a common genetic origin :-

* MVT mineralisation is ubiquitous in carbonate sequences within most sedimentary basins of Proterozoic to Cretaceous age, with economically important deposits predominantly in Cambro-Ordovician and Carboniferous units.

* Within any one basin with substantial and widely distributed MVT mineralisation all deposits are remarkably similar.

* MVT deposits occur on basin margins or intrabasin domes/ridges where they formed at less than 1 km below surface.

* The host lithologies may be of either fore-reef, back-reef or less commonly reefal bioherm facies, typical of the platform margin.

* Structural/hydrochemically induced porosity and permeability can be demonstrated to predate mineral deposition. Dolomitisation of the primary limestone is commonly associated.

* Mineralisation often postdates the filling of many voids by marine cements.

* The deposits invariably are dominantly galena and/or sphalerite with accessory pyrite or marcasite. Galena has a typically low silver content and a gangue of barite and/or fluorite may be present. Copper as chalcopyrite is invariably very minor.

* Deposits were formed from hypersaline (4 X sea water) with an SG of about 1.1 at temperatures of 80 to 200%C, commonly 100 to 150%C which are not attributable to a local depth related thermal gradient.

* Thermal sources of igneous or metamorphic association appear to be absent.

* MVT deposits occur antipathetically with respect to petroleum reservoir but traces of hydrocarbons have been noted as immiscible phases in fluid inclusions and bitumen/kerogen residues recorded form many deposits.

* Isotopic data suggests that whilst a primary igneous or metamorphic source for Pb and S may be the case, a strong sedimentary/biogenic influence on the fractionation is commonly evident.

* Typical primary shales which carry 20-200 ppm Pb & 50-300 ppm Zn compared to 4-11 ppm Pb & 20-30 ppm Zn in primary limestones are considered to be a likely metal source.

3.2 INTERPRETATION

Researchers use the above observations to establish that lead and zinc chloride complexes in hypersaline brines at elevated temperatures migrate laterally to basin margin leakage sites from dewatering shales in the basin depocentres.

Prexisting permeable focii around the basin margin are a pre-requisite to the delivery of adequate metal inventories to deposit sites where sufficient reactive sulphur is available to cause reduction of the brine.

A strong biogenic influence observed in sulphur isotopic data is interpreted to mean that it has been also locally sourced from the sediments. Since shales contain abundant iron, any sulphur present is likely to be bound to it and therefore effectively immobilised. Carbonate sediments are relatively poor in iron compared to their primary organic content and are thus a more likely sulphur source.

The mechanism of the sulphur delivery is conjectural. Since it is unlikely to have been transported in the metal pregnant brine as unstable phase to the site of deposition a mixing fluid model of deposition has been proposed but the mechanism detail seems obscure in the literature.

3.3 ORE EMPLACEMENT

The petroleum residues found in deposits can be interpreted as the remnants of the non-active petroleum phases involved in the metal reduction. The existence of petroleum accumulations in some MVT provinces indicates that substantial mobilisation of hydrocarbons into the basin plumbing systems was probably common to all MVT provinces.

The MVT dewatering model clearly indicates a focused open discharge plumbing system that would ensure full flushing of hydrocarbons from any MVT deposit site.

Hydrocarbons would be expected to be sourced predominantly from shallow marine deposits near the basin margin where marine life flourished. Elevated temperatures due to the efflux of deeper basin brines could be expected to rapidly advance the primitive organic kerogens petroleum maturity index.

Separation of hydrocarbons and metal pregnant brines in the same plumbing system is readily achievable by virtue of salinity stratification. The deep basin metal pregnant brines as envisaged are very mature and carry maximum totally dissolved solids and are therefore very dense waters. Less mature more locally derived basin waters from near basin margin sediments would be expected to be of much lower density. Should these latter brines contain hydrocarbons their density would be lowered even more by comparison.

For example the hydrocarbon bearing fluids clearly might have an SG $<$ 1.0 whereas the MVT brines might have an SG $\simeq$ 1.1, a not an insignificant contrast.

Separation of otherwise mutually unstable phases in the same aquifer by this mechanism is conceivable over long periods of time providing migration by laminar flow parallels iso-density surfaces.

Disturbance of this regime in the cases where pressure loss, permeability conditions or a significant change in the migration path vector ,particularly steepening, is likely to destroy the stratification and result in fluid mixing.

A combination of lateral to upward migration with pressure loss associated with entry into a void could result in hydrocarbon degassing, attendant cooling, localised turbulent flow, and supersaturation of dissolved phases. Ideal circumstances for mineral deposition from a once stable hydrochemical regime by mixing.

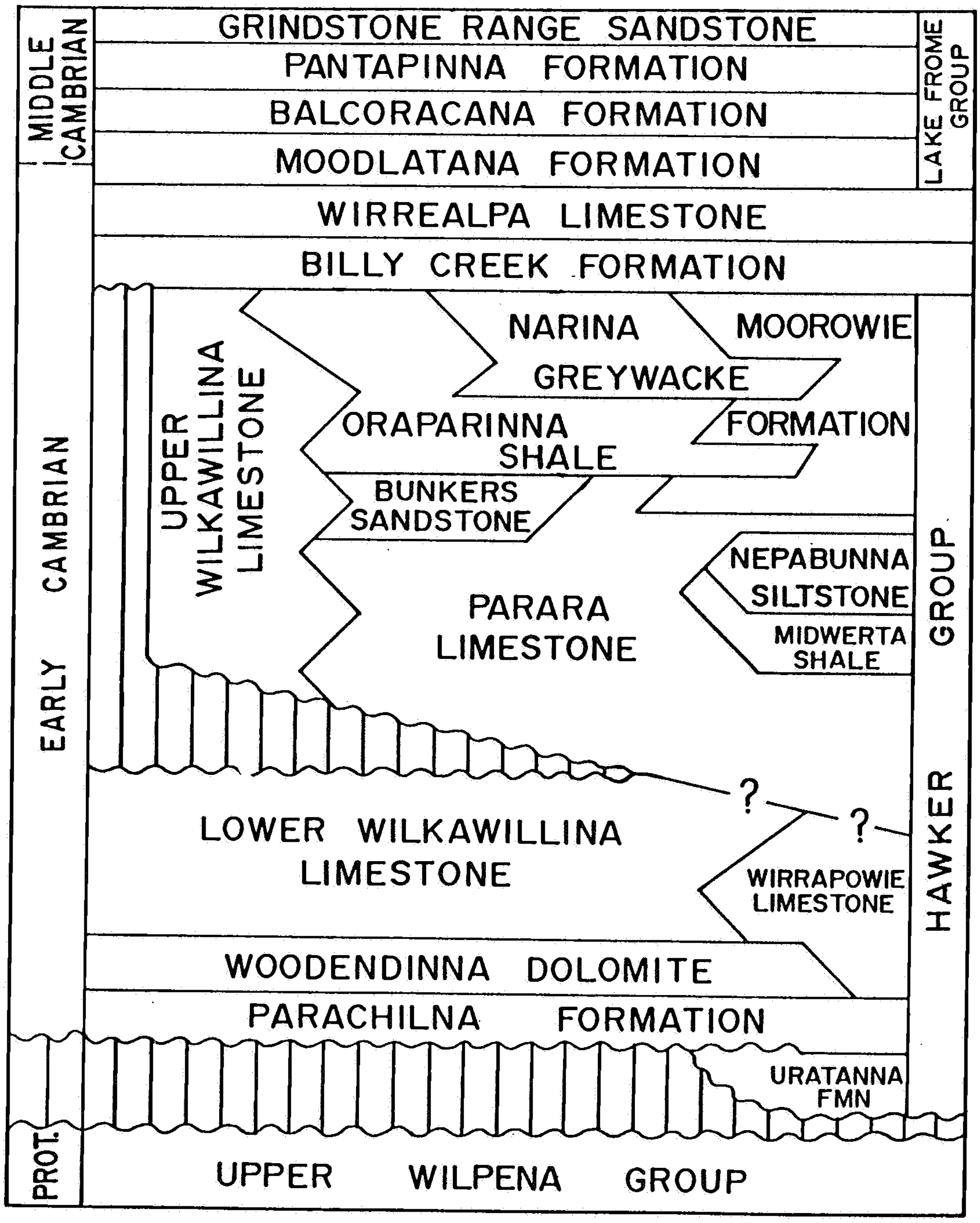
4 REGIONAL GEOLOGY

The Flinders Ranges comprises a late Precambrian geosynclinal sequence overlain by Cambrian shelf facies carbonate deposits that have been regionally folded into a dome and basin interference pattern.

At a number of locations large bodies of complexly deformed rock disrupt the layered sequences. Such bodies have been ascribed to a diapiric emplacement origin.

Cambrian carbonate sequences of the Arrowie Basin form the last cycles of shallow marine deposition in the northern parts of the Adelaide Geosyncline. Regional conformity with the underlying Pound Quartzite of the Wilpena Group is readily demonstrated.

CAMBRIAN STRATIGRAPHY FLINDERS RANGES



Gravestock 1989

FIGURE No. 2 CAMBRIAN STRATIGRAPHY OF THE FLINDERS RANGES

These deposits were extensive and spread out laterally over the adjacent lower/middle Proterozoic basement margins of the aucalogen within which the Geosyncline developed. Only remnants of these units are preserved in fold keels resulting in some correlation uncertainty both locally and regionally.

4.1 STRATIGRAPHIC UNITS

The Cambrian sequence is subdivided into the basal Hawker Group, Billy Creek Formation, Wirrealpa Limestone and Lake Frome Group. (See figure 2)

HAWKER GROUP

The Hawker Group embraces two sedimentary facies, a shallow marine basin edge platform environment with abundant biogenic forms typified by reefal limestones (Wilkawillina/Ajax Limestones) and a deeper marine basinal environment with a significant clastic component (Parara Limestone, Midwerta Shale, Nepabunna Siltstone, Bunkers Sandstone, Moorowie Formation, Oraparinna Shale and Narina Greywacke.

Parachilna Formation

The Parachilna Formation is commonly of restricted extent being confined to probable palaeogeographic lows at the base of the Cambrian succession. Mapping by the Geological Survey of S.A. describes this unit as argillaceous sandstones with vertical worm? burrows with intercalated lenses of oolite and shale. It is conformably overlain by the Wilkawillina Limestone.

Wilkawillina Limestone

The Wilkawillina Limestone commonly forms the base of the Cambrian succession and often lies disconformably upon the Upper Proterozoic Pound Quartzite.

The unit is predominantly light to dark grey, massive, bedded and biostromal archaeocyathid limestones which are often creamy brown where dolomitised. Variants are often sufficiently distinct that they have been described as separate stratigraphic units. Notable are the Woodendinna Dolomite and Wirrapowie Limestone, the former being quite widely recognisable whereas the latter is clearly a restricted facies type. (See figure 3)

Mottled limestone is often recorded as distinct subunit. Its appearance is due to abundant algal filaments being preserved. It is thus a primary feature which occurs at a number of stratigraphic positions that can be locally used for mappable marker beds on occasion. Such units are not used for stratigraphic correlation.

Recent studies have led to the this unit being subdivided into upper and lower members. (see section 4.12)

Parara Limestone

The unit, described as a dark flaggy and silty limestone with interbedded shales, is widely distributed.

In the field it is readily distinguished from the underlaying Wilkawillina Limestone by its thin bedded pattern. The contact between the two units is either gradational over about 10 to 15 meters of section or quite sharp at an erosional surface where clastic debris and/or the presence of finely laminated silty deposits are likely to be observed.

The Midwerta Shale and Nepabunna Siltstone are members of the Parara Limestone being two prominent units recognised in the Arrowie Syncline. The former is typically grey green shale, sometimes calcareous with minor nodular limestone and the latter dark blue grey calcareous siltstone with minor limestone.

Bunkers Sandstone

This unit, described as a crossbedded sandstone with calcareous interbeds, is restricted to the Donkey Bore Syncline.

Oraparinna Shale

This unit, described as green finely micaceous and carbonaceous fossiliferous siltstone, is known from both the Donkey Bore and Arrowie Synclines.

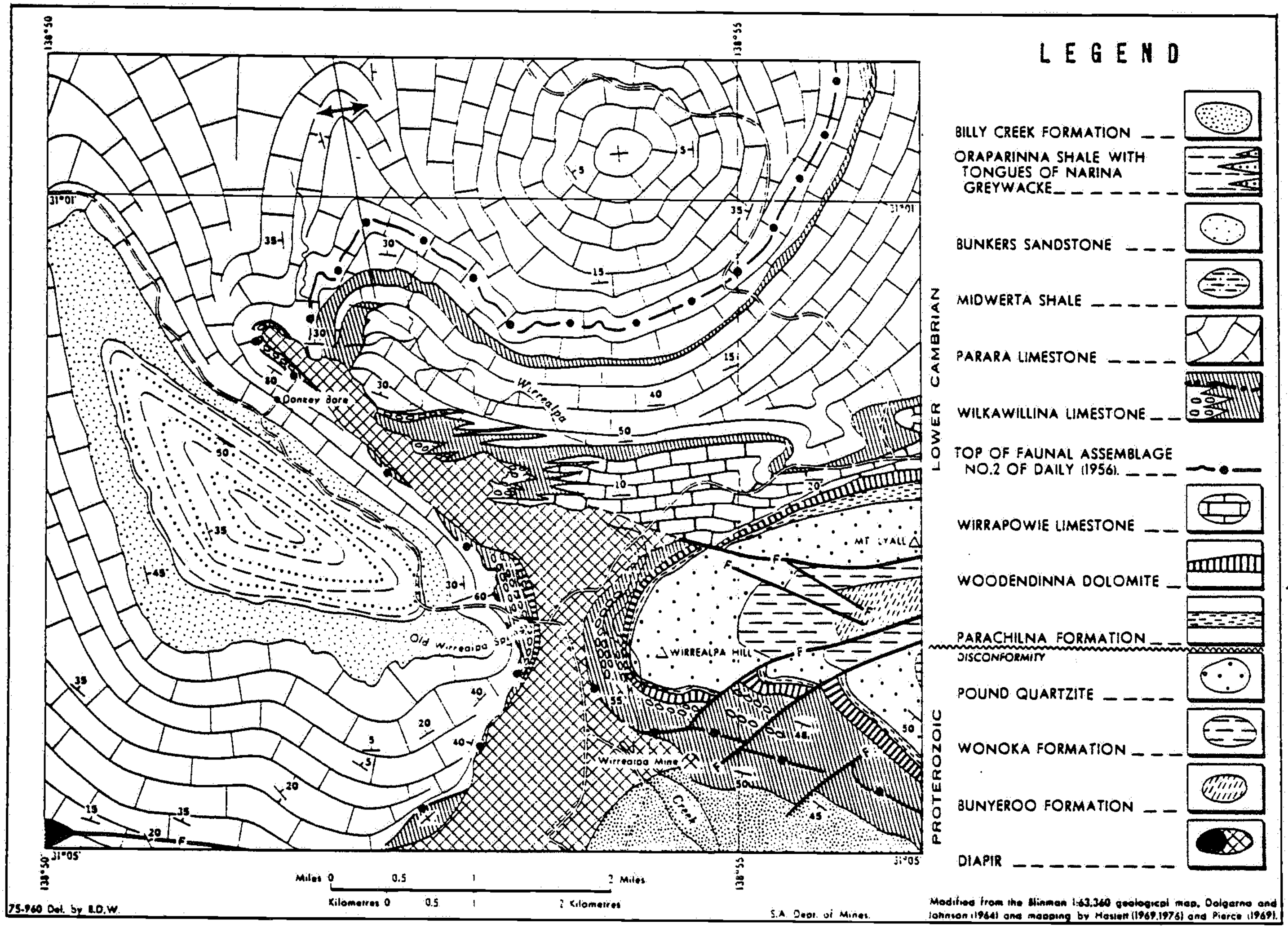
Narinna Greywacke/Moorowie Formation

These units appear to be equivalent since they occupy the same stratigraphic slot if the Oraparinna Shale is considered to be absent at Moorowie.

The Greywacke is described as grey green interbedded calcareous siltstone and chloritic sandstone which may be coarse and gritty. Some interbeds of cream/purple flaggy dolomite may be present. Distribution is as for Oraparinna Shale.

The Moorowie Formation is described as sandy limestones, siltstones, shales and massive flaggy limestone of variable colour that suggests deposition at or near an oxidation interface.

BILLY CREEK FORMATION



Upper

Lower

Daily 1976

FIGURE No. 3

LOWER CAMBRIAN FACIES AT OLD-WIRREALPA

The Billy Creek Formation comprises a sequence of red brown micaceous sandstone and shales with halite pseudomorphs. Green/red shales and limestone at the base of the succession contain intercalated tuffs.

WIRREALPA LIMESTONE

The Wirrealpa Limestone is a grey, nodular and shaley fossiliferous limestone.

LAKE FROME GROUP

The Lake Frome Group is comprised of four units. They are the Moodlatana Formation (sandstone), Balcoracana Formation (siltstone), Pantapinna and Grindstone Range Sandstones (sandstones).

These units are predominantly of red brown to pinkish colours throughout which coupled with the evidence of halite implies a semi-terrestrial environment of deposition. Minor carbonates are present at two levels suggesting possible marine incursions of short duration occurred.

4.2 DEPOSITIONAL ENVIRONMENTS

The sedimentology described in the foregoing section is considered to indicate that following early cycle arenite deposition (Parachilna Formation) widespread shallow marine carbonates were laid down (Lower Wilkawillina Limestone).

Sedimentation was briefly interrupted by minor tectonic disturbance throughout the geosyncline, probably epirogenisis of deeply buried basement, which caused some portions of the Cambrian sea bed to become depressed and the local emergence of the earliest units. (See section 4.4)

Marine carbonate deposition then resumed. Both shallow shelf facies (Upper Wilkawillina Limestone) and basin facies limestone (Parara Limestone) were deposited coevally. Initially the basin deposits were conformable but later disconformable with respect to earlier deposits as marine transgression reclaimed some of the initially emergent areas. Simultaneously in more stable environments shallow carbonate deposition was sustained without significant interruption.

This interpretation adequately explains the existence of conformable succession, lateral interdigitation and simple disconformity/unconformity relationships that are observable between the Parara and Wilkawillina Limestones.

Shallowing of the Cambrian Basin from cyclic shale and limestone sedimentation finally resulted in the deposition of red bed sequences, initially marine oxidizing conditions and later semi-terrestrial deposits (Billy Creek Formation and Lake Frome Group) with temporary near reducing conditions (Wirrealpa Limestone).

Since the MVT model suggests that the foregoing aspects are likely to influence the location of ore, recent studies of the Hawker Group are described separately in Section 4.3.

4.3 SEDIMENTATION IN THE ARROWIE BASIN

The occurrence of MVT ore is profoundly influenced by the interplay of structure and stratigraphy along the shelf margin. In particular sedimentary facies and permeability paths are considered paramount in determining the site of ore.

4.3.1 REGIONAL ASPECTS

The sedimentology of the Arrowie Basin was studied extensively by B. Daily who authored a number of papers on aspects of the subject. (See appendix)

More recent biostratigraphic data assembled by D. Gravestock has resulted in the revision of the facies correlations between the Lower Cambrian units. This data when coupled with the release of petroleum exploration data on the early Middle Cambrian to Devonian Warburton Basin sequence, strongly suggests that deep water facies sediments of the Lower to early Middle Cambrian Arrowie sequence extend northward. (see figures 4 & 5)

Gravestock concludes that a major northward thickening Cambro-Devonian deposystem lies concealed beneath the Cooper Basin with its marginal facies in the northern Flinders Ranges. These deposits are believed to be thickest along the axial trend of the Cooper Basin and formerly extended south westward to an arcuate shelf margin at the latitude of Blinman. To the south east and west of this zone, the Warburton Trough (inferred), shelf facies sediments were predominant.

This places the MVT province associated with the Parara/Wilkawillina Limestone transition on the shelf margin of a major sedimentary system.

In this broad context the basal Hawker Group was deposited in response to localised tectonic adjustments along the shelf margin as were also the later oxide facies of the Hawker Group.

The cusp of the shelf margin was undoubtably determined by the disposition of deep structure since it lies at the generalised inter section of the "Norwest Fault" and the "Paralana Fault" fracture systems.

The coincidence of the these macro features with evidence of MVT mineralisation processes greatly enhanced the possibility of major deposits being present in the region.

4.3.2 SHELF MARGIN

Gravestock has revised the facies relations of the Wilkawillina Limestone utilizing biostratigraphic correlation. On this basis the Wilkawillina Limestone has been subdivided into upper and lower members at the biostratigraphic zone (2)/(3) boundary. Throughout all but the northwestern Flinders Ranges this boundary coincides with a hiatus in deposition. (See figure 4)

Minor tectonic adjustment resulted in sub-basins wherein deposition of the Parara Limestone as a lateral facies equivalent of the Upper Wilkawillina member subsequently took place.

Gravestock has used the distribution of biostratigraphic faunal assemblages in conjunction with the sedimentology of their respective occurrence to build up a palaeoenvironmental reconstruction of the shelf margin during Wilkawillina "time". (See figure 6)

The "partially exposed shelf", "reef rimmed platform margin" and to a lesser extent "bypass margin" environments clearly indicate situations where secondary dolomitisation and solution permeability (palaeokarsting) of the lower Wilkawillina Limestone might be anticipated.

Together with the marginal faults and the deposition of adjacent basin facies sediments these situations (above) offer substantial MVT potential.

Recognition of either of the (2)/(3), (2)/(4), or (2)/(5) faunal boundaries associated with a disconformity should therefore be regarded as encouraging. Locally restricted disconformable contacts without appreciable biostratigraphic contrast may have been due to only short periods of emergence and have consequently limited secondary porosity and lowered mineralisation opportunity. However close spaced stacking of such depositional hiatuses may offer considerable potential. (See figure 4)

The geological models proposed by Gravestock clearly imply that cemented fractures of multiple generation be they of tectonic faults, gravity slip planes or solution cavity origin will be present in any one setting. Clearly the classification of such features and the vein/cements within them are going to be of

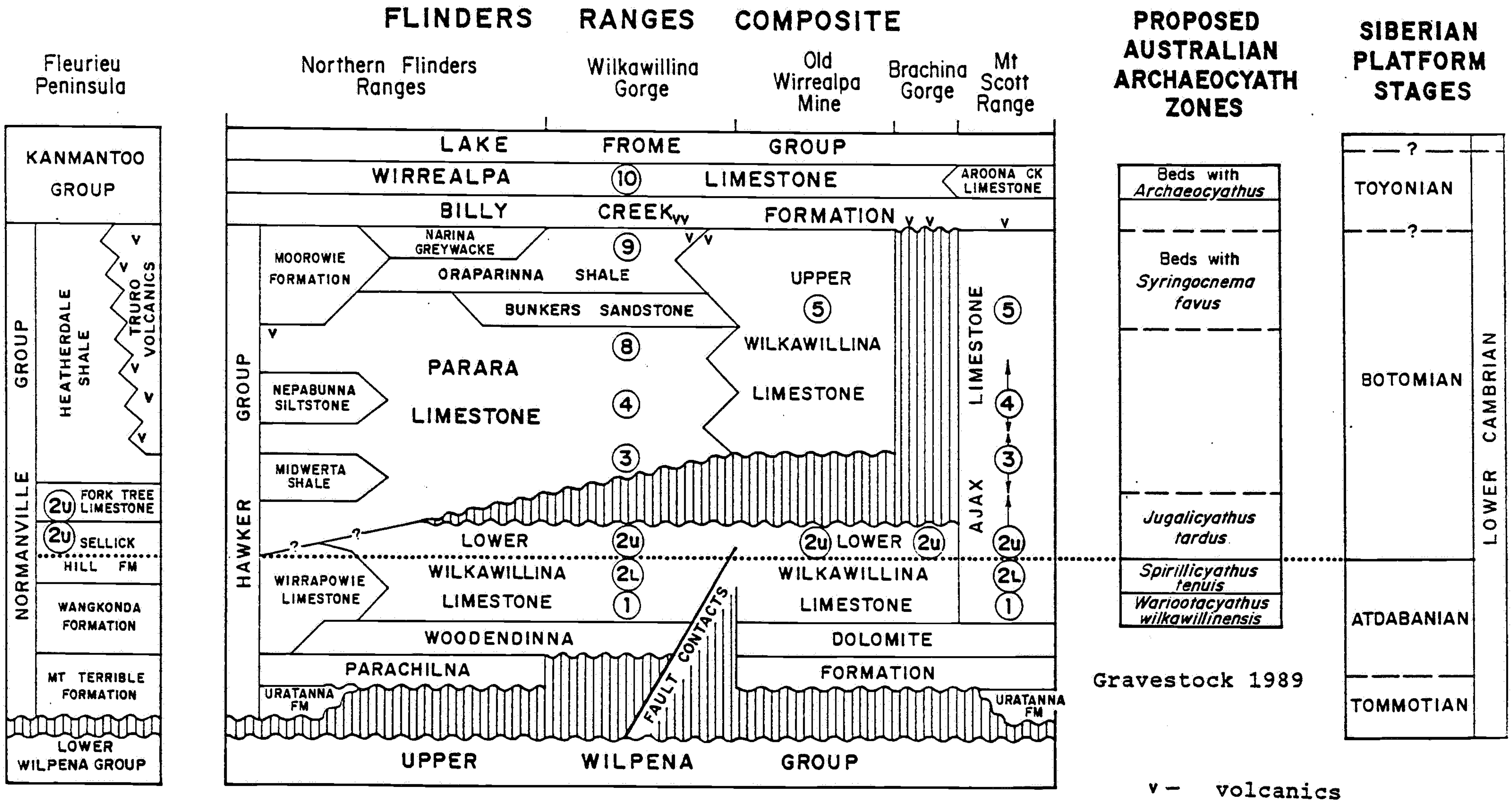
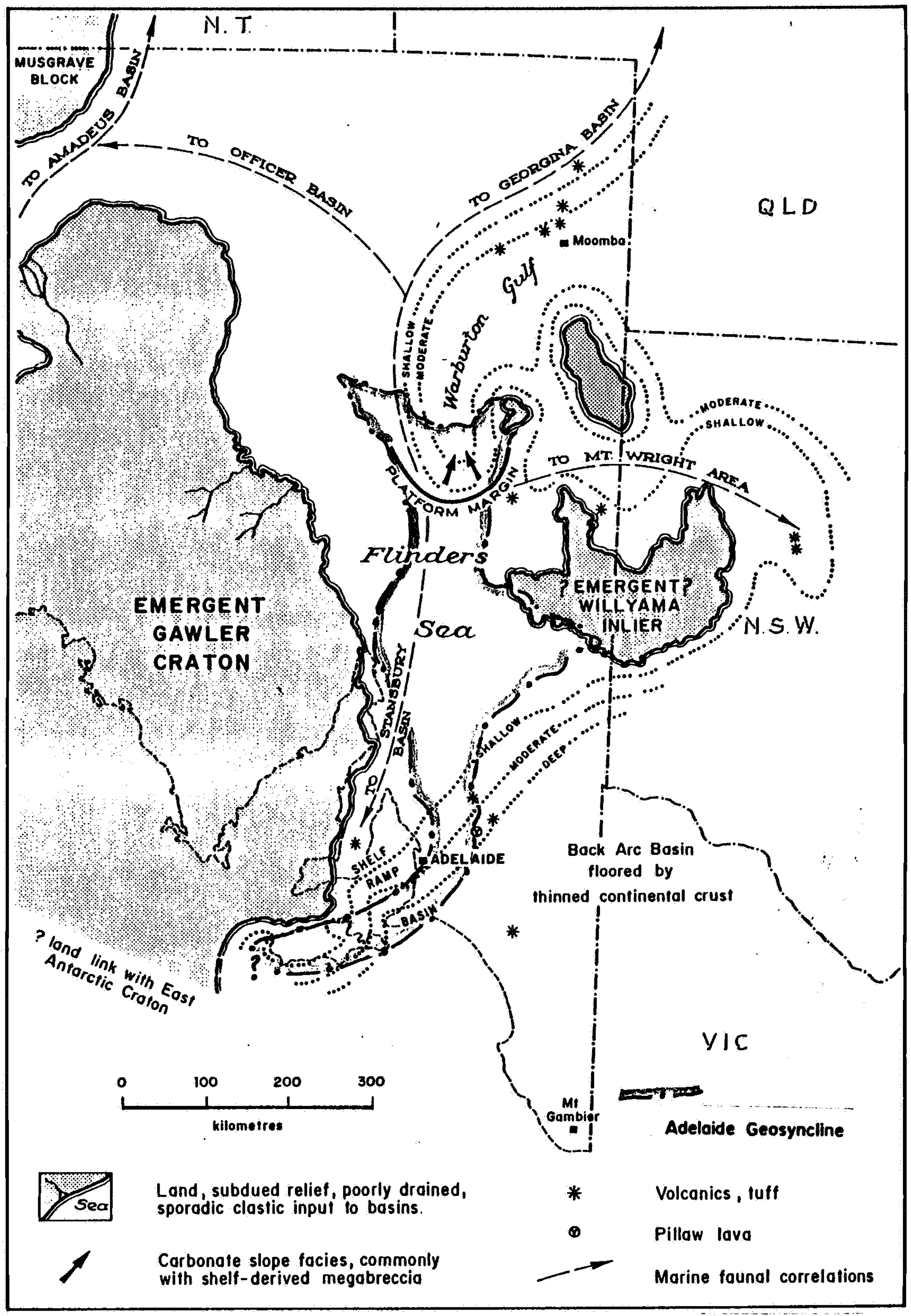


FIGURE No. 4 CAMBRIAN BIOSTRATIGRAPHIC ZONES OF THE FLINDERS RANGES



NB. Emergence of easterly inliers was probably episodic.

Gravestock 1988

FIGURE No. 5 EARLY CAMBRIAN PALAEOGEOGRAPHY OF EASTERN SOUTH AUSTRALIA relevance to MVT exploration. Similarly the relations of these local features to macrofracturing of the region which determined the main dewatering hydrological regime is also important.

Gravestock's work serves to underline that the detailed geology is of considerable relevance to MVT exploration and deserves due attention in any exploration programme.

4.4 STRUCTURE

The Precambrian and Cambrian rocks of the Flinders Ranges were extensively folded and faulted during the Delamerian Orogeny. The earliest disturbance was named the Kangaroovian Movement by B. Daily who observed discontinuities in the stratigraphic record of Kangaroo Island.

Similar discontinuities recognised in the Wilkawillina Limestone facies in the Northern Flinders Ranges indicate that deformation during early Cambrian deposition occurred throughout the Adelaide Geosyncline. Structural and sedimentological evidence suggests that weak tectonic disturbance may have initiated Cambrian deposition and been periodically recurrent thereafter until the major mountain building event.

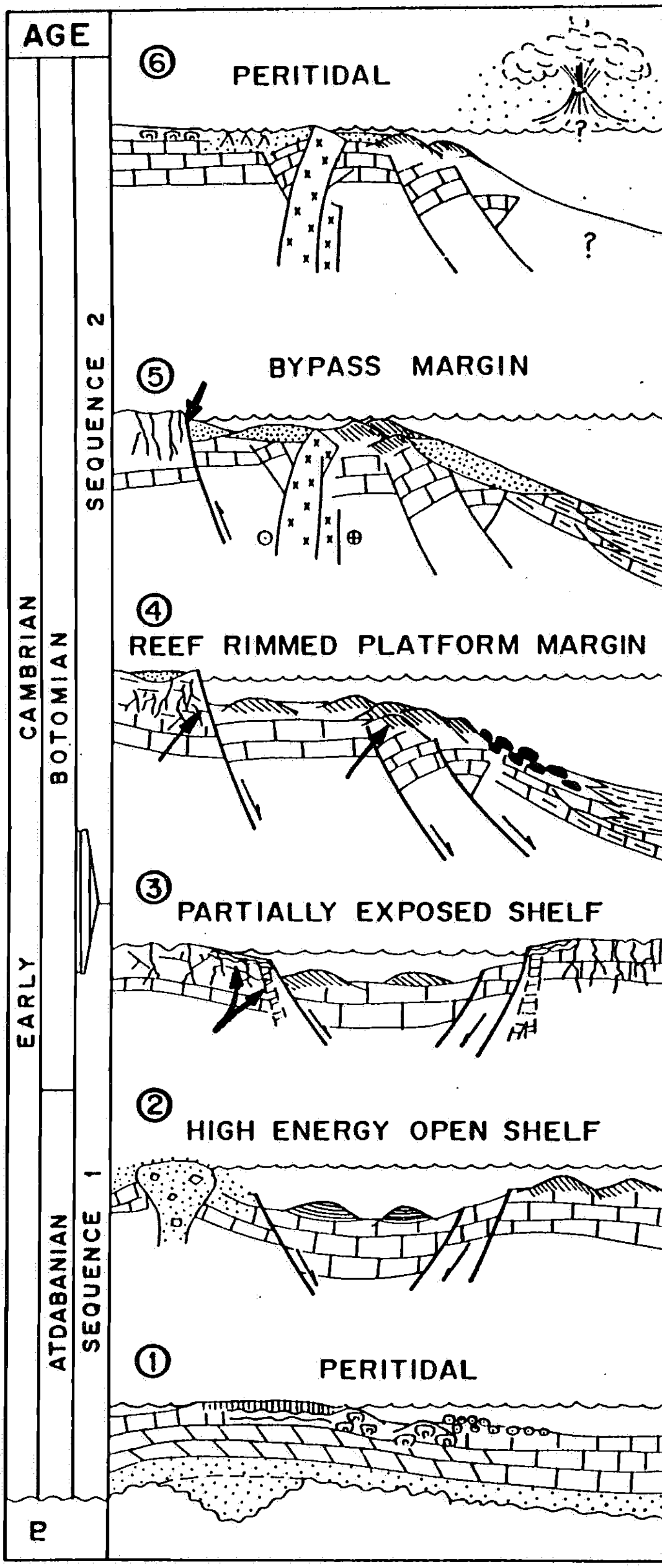
4.4.1 DEFORMATION AND SEDIMENTATION

Study of regional mapping clearly indicates both brittle and ductile response of Adelaidean and Cambrian sequences to stresses generated along deep basement features which are oriented in north west and north east directions.

The deformation style is one of complex interference folding with associated faulting and major piercment diapirs.

Displacements along major fault zones are commonly dissipated into ductile deformation where local flexures or the truncation of major folds occur. Faults frequently focus on to the diapiric bodies. Major breccias along faults that have a similar appearance to diapir bodies are also present.

While on brief inspection, it might appear that these tectonic features could have been due to a single tectonic upheaval, careful appraisal of the mapped stratigraphy unambiguously requires a progressive, if only episodic, tectonic evolution of the region concurrent with sedimentation and a later terminal tectonic event.



Stage	EVENT	SEDIMENTS
⑥ PERITIDAL	Apparent tectonic quiescence but volcanic activity (tuff). Shoaling upward sequence to eventual exposure landward of platform margin.	Billy Creek Formation (not shown) – partly exposed tidal flat redbeds – completes Sequence 2. Stromatolites, platy ? algal dolomite, evaporites e.g. top upper Wilkawillina, Ajax, Moorowie, Edeowie Limestone Calcmicrobe – dominated bioherms. Exposed basement e.g. Benagerie Ridge, Mt. Painter Inlier, Olary Inlier. Volcanic sources not yet located – possibly Mt. Wright (NSW), Gidgealpa, Truro.
⑤ BYPASS MARGIN	Compression, 'Kangaroolan Movements' Uplift of basement blocks. Siliciclastic input to basin via channels breaching margin. ? Sandy turbidites, submarine fan sands.	Erosional channels filled with 'buckshot' sands and sandy limestone breccia in upper Ajax Limestone (Mt. Scott Range), upper Wilkawillina Limestone (Old Wirealpa Mine, Ten Mile Creek) and upper Moorowie Formation (Moorowie Mine). Narina Greywacke may be downslope equivalent. Shelfal sands (Bunkers Sandstone) may be local variant.
④ REEF RIMMED PLATFORM MARGIN	Extension. Differentiation of platform margin, megabreccias, persistent karst on structural highs, first tabulate corals	Platform margin reef complexes of archaeocyaths and calcmicrobes (*Renalcis, Epiphyton, Girvanella*) in upper Wilkawillina Limestone, Moorowie Formation. Slope megabreccias, slumps, turbidites in Moorowie Formation, Parara Limestone, Calc. shales (Oraparinna) in intrashelf basins and possibly seaward of platform margin. Karst on exposed shelf carbonates e.g. North of Brachina Gorge, Ten Mile Creek.
③ PARTIALLY EXPOSED SHELF	Extension. Rapid exposure meteoric overprint, neptunian dykes, structural lows remain submerged, first trilobites.	Lower Wilkawillina Limestone, High energy skeletal sands subaerially exposed. Red laminated crusts, microstromatolites, collapse breccias. Fractures and fissures in active fault zones filled with marine cements and bioclastic debris. *Renalcis* and archaeocyath bioherms in persistently submerged areas.
② HIGH ENERGY OPEN SHELF	Extension. Intrashelf depressions, first archaeocyaths, sponges, calcified microbial communities.	*Renalcis* and *Epiphyton* – archaeocyath bioherms in x-bedded skeletal sands on shelf. Archaeocyaths + sponges + stromatactis in deeper water mounds in intrashelf depressions. Lithified mottled limestones, thrombolites. Pebbles shed from locally exposed diapirs e.g. Wirrealpa
① PERITIDAL	Coastal onlap. Basal transgressive sands, locally channel – forming, stromatolites, cyanobacterial mats, ooid shoals.	Woodendinna Dolomite. Wirrapowie Limestone + basal Ajax + basal Wilkawillina Limestone. Stromatolites, cryptalgal laminites, ooids, mud – cracks, sand. Commonly dolomitised, chert nodules. Parachilna, Uratanna Formations. Transgressive sheet sands, burrowed shoreface sands, channels.

After James & Gravestock (in press)

➡ Sites favourable for MVT deposition

FIGURE No. 6 PALAEOENVIRONMENTS OF THE HAWKER GROUP

This aspect is well illustrated by the Wilkawillina Graben that developed as a fault bounded trough during the deposition of the Wilkawillina Limestone. (See figure 7)

Episodic movements resulted in an intricate biohermal reef complex developing along the southern side of the feature.

The boundary faults are intricately linked to the Oraparinna Diapir located in the axial zone of the north west trending the Blinman-Oraparinna Syncline.

The graben is essentially a parasitic feature of the major structure within which it is located namely, the common limb of the Oraparinna Anticline and Balcorcana Syncline.

Significant displacements in basement Adelaidean units and the syndepostional features in the Hawker Group fade upwards into sedimentary draping/ductile response in the overlying Lake Frome Group.

A similar interplay of sedimentary and tectonic processes has been recognized along the Donkey Bore-Wirrealpa Springs Anticline (diapir ridge) where complex facies relations exist. (See figure 3)

The evidence for periodic structural adjustments influencing sedimentology is therefore strong. Cyclic tectonic disturbance along the resulting confined zones of complex geology would also have ensured maintenance of permeable pathways for the egress of basin brines.

Fracture systems that were active during sedimentation are therefore to be regarded as the most likely conduits for conveying metal pregnant brines to MVT depositional sites. MVT deposits are therefore more likely to occur in proximity to such structural "trends" given the tendency to some of the regional faults to express ductilely.

4.4.2 METALLOGENIC DISTRIBUTION

If the metallogeny of the Northern Flinders Ranges is studied many occurrences of gold, copper, and lead-zinc within the Adelaidean and Cambrian successions are clearly associated with the main NW-NE fracture system. However, a major subset of lead-zinc occurrences are also clearly associated with the basal Cambrian. (See figure 8).

The density of lead-zinc occurrences falls off from north to south with the basal Cambrian subset scattered about the location of the inferred shelf margin. (see section 4.3.1)

Regional Fault Zone

potential target zone

PROSPECTS

M	MVT type
W	Whillemite type
U	unclassified

FIGURE No. 7

THE GEOLOGY OF THE WILKAWILLINA GRABEN

The Cambrian subset is also less clearly linked to major fractures which are now prominent because of the degree of deformation.

It is therefore probable that there are two generations of SLZ deposits.

A late suite of occurrences associated with epigenetic fluids mobilised during the major terminal phase of Delamerian folding is considered likely. Fluids of this generation would have been able to migrate relatively freely along the open plumbing system of the major fault/diapir network throughout the stratigraphic pile. Almost all of the copper and gold, and the late Precambrian hosted lead/zinc mineralisation appears to be of this type.

The Cambrian subset does not fit well with the late fluid model but rather better with a situation where permeabilities along regional, local, and stratigraphic boundaries were similar. An early basin dewatering model is consistent i.e. an MVT model.

Field observations by S.A.D.M.E. personnel whilst mapping the Brachina George region suggest that MVT mineralisation was related to second order SW-NE fractures which were active during and shortly after deposition.

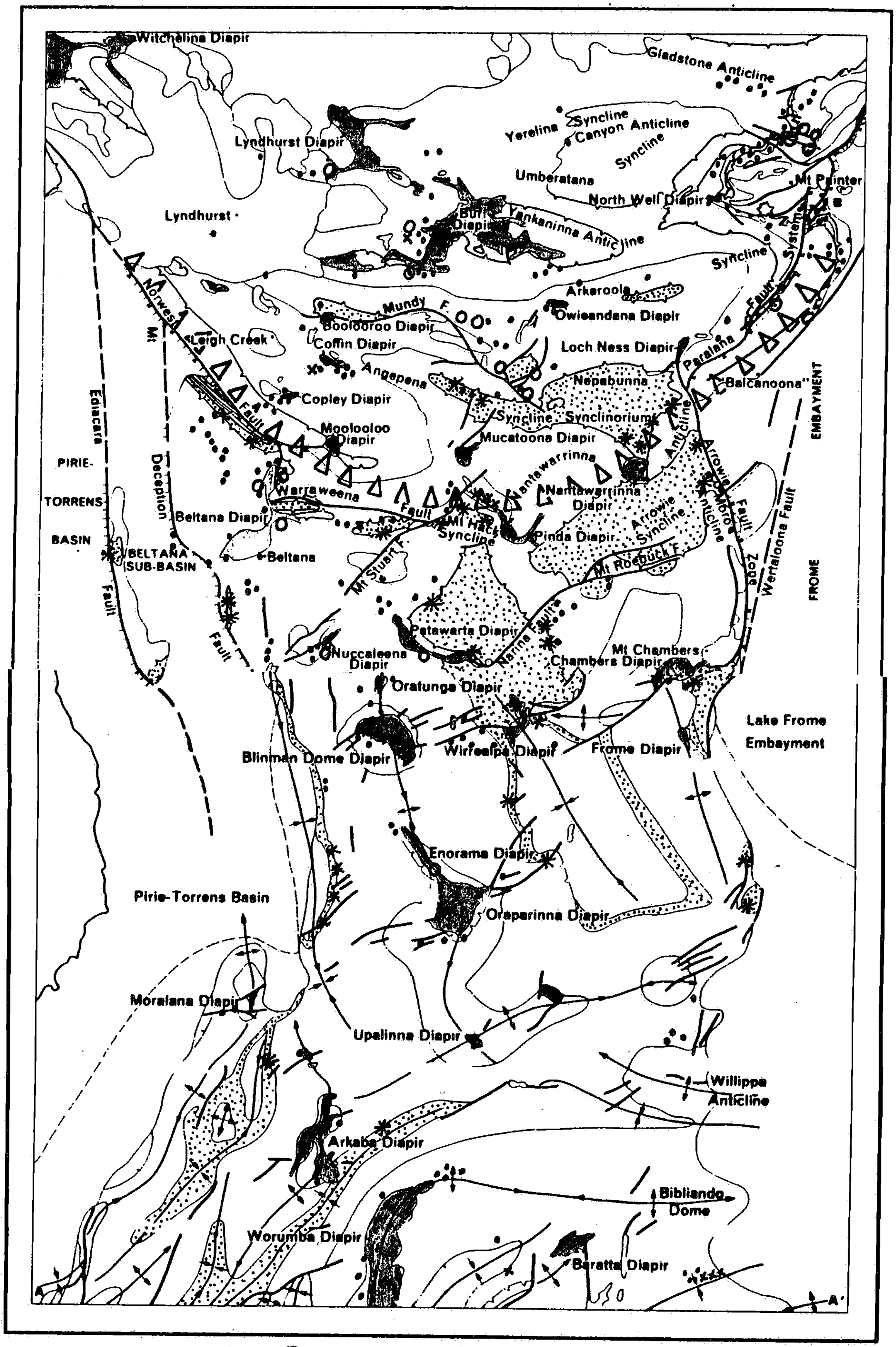
The field relations of whillemite zinc deposits in Lower Cambrian units, namely open fracture vein stockworks of late Delamerian? age, suggests they were deposited from the late fluids. The common trace element characteristics and sulphur isotopy of these and MVT deposits probably reflect a common parental source and fluid mobilisation path. (R. Horn , Pers. cóm.)

Spatially separate deposition of sulphide and whillemite from late fluids, reflecting Eh? Ph, T, P, and fugacity conditions is to be expected. Sites of early fluid sulphide MVT mineralisation may also have been favourable for late fluid whillemite, but direct local derivation of whillemite from nearby sulphide mineralisation is considered less probable.

Because of common source and similar emplacement mechanisms whillemite and MVT mineralisation are of virtually equal regional metallogenic significance.

The metallogenic distribution of MVT mineralisation supports the conclusion that regional conditions at the southern extremity of the Warburton Trough were such that a significant MVT plumbing system functioned during dewatering of the Hawker Group..

TECTONIC SKETCH



PROSPECT TYPE (inferred)

Cambrian Sediments	o late fluid : fracture type	• Copper	ΔΔ Inferred Shelf Margin
Diapir	✱ early fluid: MVT type	✱ Gold	0 — 50km

FIGURE No. 8 METALLOGENY OF THE FLINDERS RANGES

5 ECONOMIC POTENTIAL

The crossover of the Norwest and Paralana Fault systems ,centred on the Wirrealpa Diapir ,being also on the southerly cuspate terminus of the Warburton Trough is the most prospective region for MVT deposits.

It is inferred that the Wirrealpa Diapir is a manifestation of the Norwest structure which as expressed by the Fountain Head Thrust, the Donkey Bore-Wirrealpa Springs facies transition, and the long axes of the Ben Lomond and Donkey Bore Synclines. Similarly the Mt. Lyall-Mt Falkland, Mt. Emily, Dawson Hill and Mt. Frome Fault zones are an expression of the Paralana structural zone.

MVT mineralisation along the Donkey Bore-Wirrealpa trend at the Wirrealpa mine, Linda and Eric Prospects and the Third Plain whillemite deposit lie in close proximity to the above structural features where they intersect the Wilkawillina Limestone. Similarly the Mt. Emily zone influenced MVT mineralisation near Mt. Hayward and another NE fault zone (Iron Knob-Reaphook Hill Lineament) relates to whillemite mineralisation at Reaphook Hill.

Three structurally favourable locations for MVT mineralisation along the Wilkawillina Limestone are predicted by the model. Two of these locations lie within EL 1515 ,being at the northern and southern ends of a Pound Quartzite outcrop that extends from the neighbourhood of Ti-Tree Well south easterly to Wirrealpa Creek. The third is located within EL 1514 almost due north of Mt. Frome in an analogous situation to the nearby Eric Prospect. (See figure 7)

Of the presently known prospects listed above ,those with structural and stratigraphic features described in the preceding sections should be considered to have high prospectivity. Those currently under title .Eric in EL 1515 ,Donkey bore Old Wirrealpa trend in EL 1514 and Linda in ELA 82/89 are therefore rated highly.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

* Palaeogeographic reconstruction of the Lower Cambrian depositional environment confirms that sedimentary, hydrological, and structural features were favourable for the formation of MVT deposits during dewatering.

* Metallogenic evidence indicates that an early basin dewatering event was responsible for the deposition of known MVT type mineralisation in the Wilkawillina Limestone.

* The economic prospectivity of the region is enhanced and the currently held exploration ground is very favourably located.

* Additional potentially favourable and accessible exploration locations have been identified.

* Rejuvenation of the plumbing system late in the Delamerian Orogeny resulted in the deposition of Whillemite Zinc deposits at similar geological sites.

6.2 RECOMMENDATIONS

* Exploration for MVT type deposits should be focused on localities where the interplay of regional structure and sedimentary processes have generated suitable MVT entrapment sites.

* Evidence for features such as lateral facies changes, palaeokarsted disconformity surfaces, and growth faulting in proximity to the inferred position of the Warburton Trough margin should be sought during exploration.

REFERENCES

Anderson, G.M., and Mac Queen, R.U., 1982. Ore deposits models-6. Mississippi Valley lead-zinc deposits. Geosci. Canada, V.9 , pp. 108-117.

ASARCO (Aust.) Pty. Ltd. 1978-79 . Open file reports on S M L No. 166 : Oraparrina and Wirrealpa Diapirs ,S.A.D.M.E. envelope No. 965, (unpub.).

Beals, F.W., and Jackson, S.A., 1966. Precipitation of lead-zinc ores in carbonate reservoirs as illustrated by the Pine Point ore field . Trans. Can. Inst. Min. Metall., 75, Sec. B., pp. B278-285.

Beals, F.W., and Onasick, E.P., 1970. The stratigraphic habit of Mississippi Valley type ore bodies. Trans. Can. Inst. Min. Metall., 79 Sec. B., pp. B145-B154.

Broken Hill Proprietary Co. Ltd. 1979 - 82. Open file reports on E L Nos. 436/809 : Wirrealpa (E L No. 1138 : Mt. Frome) , S.A.D.M.E. envelope No. 3427, (unpub.).

Broken Hill Proprietary Co. Ltd. 1980 - 85. Open file reports on E L Nos. 725,726,1080,1085,& 1463 Reap Hook Hill, Commodore ,and Third Plain areas S.A.D.M.E. envelope No. 3968, (unpub.).

Broken Hill Proprietary Co. Ltd. 1981 - 86. Open file reports on E L No. 1138 : Mt. Frome , S.A.D.M.E. envelope No. 3722, (unpub.).

Curtis J.L. 1988., Mount Chambers Joint Venture Exploration Report , November 1988., (unpub.).

Curtis J.L. 1989., Wirrealpa Joint Venture, Quarterly Exploration Report , December 1988., (unpub.).

Gravestock, D.I., 1989. Geology and hydrocarbon potential of the Cambrian in S.A.. in : Petroleum Exploration and Development in South Australia , Ed. No. 6., April 1989, S.A.D.M.E. Rept. Bk. No. 89/18.

Gravestock, D.I., in prep. Chapter 7?, Early Palaeozoic of South Australia, in R.K.Johns (Ed.), Hand Book of South Australian Geology.

Jenkins, R.J.F., and Gravestock, D.I. 1988. Proterozoic ediacara fauna and Cambrian archaeocyatha of the Flinders Ranges, South Australia., Excursion A2 Handbook ,Proc. Fifth International Symposium on Fossil Cnidara.

Morris, B.J. 1986., Base metal exploration in the Flinders Ranges National Park ., final report Stages 1 and 2., S.A.D.M.E. Rept. Bk. No. 86/18.

Robertson, R.S.,1988., Review of lead-zinc mineralisation in South Australia -Adelaide Geosyncline and Inliers, Stuart Shelf., S.A.D.M.E. Rept. Bk. No. 88/41.

Thompson, B.P.,Daily, B., Coats,R.P., and Forbes, B.G., 1976., Late Precambrian and Cambrian geology of the Adelaide `Geosyncline' and Stuart Shelf ,South Australia., in: Excursion Guide No. 33A ,Proc. 25 Th. International Geological Congress.

APPENDIX

Daily, B., 1956: The Cambrian in South Australia; *in* Rodgers, J. (Ed.), *El sistema Cambrico, su paleogeografia y el problema de su base. Int. geol. Congr., XX Sess.*, Mexico, 1956, 2, pp. 91-147.

Daily, B., 1963: The fossiliferous Cambrian succession on Fleurieu Peninsula, South Australia. *Rec. S. Aust. Mus.*, 14, 579-601.

Daily, B., 1969: Fossiliferous Cambrian sediments and low-grade metamorphics, Fleurieu Peninsula, South Australia. *In* B. Daily (Ed.) *"Geological Excursions Handbook,"* 49-54, ANZAAS, Section 3, 1969.

Daily, B., 1972a: The base of the Cambrian and the first Cambrian faunas. *Centre for Precambrian Research, Univ. Adelaide, Spec. Pap.*, 1, 13-41.

Daily, B., 1972b: Aspects of carbonate sedimentation in the Cambrian of South Australia. *Absracts Joint Specialists Groups Meetings, Canberra. Geol. Soc. Aust.*, C10-14.

Daily, B., 1973: Discovery and significance of basal Cambrian Uratanna Formation, Mount Scott Range, Flinders Ranges, South Australia. *Search*, 4, 202-205.

Daily, B., 1974: The Precambrian-Cambrian boundary in Australia. *Abstracts Specialist Group in Biostratigraphy and Palaeontology, "Precision in Correlation"*, Hobart. *Geol. Soc. Aust., pp. 48.*

Daily, B., 1976: New data on the base of the Cambrian in South Australia. *Izv. Akad. Nauk Ser. geol.* No. 2 (In Russian)

Daily, B., & Forbes, B.G., 1969: Notes on the Proterozoic and Cambrian, southern and central Flinders Ranges, South Australia. *In* B. Daily (Ed.) "Geological Excursions Handbook", 23-30, ANZAAS, Section 3, 1969.

Daily, B., Gostin, V.A. & Nelson, C.A., 1973: Tectonic origin for an assumed glacial pavement of late Proterozoic age, South Australia. *J. geol. Soc. Aust.*, 20, 75-78.

Daily, B. & Rozanov, A. Yu., 1976: The age of the oldest archaeocyathid faunas in the Ajax Limestone, Mount Scott Range, South Australia. *J. geol. Soc. Aust. (In press).*

Daily, B. Twidale, C.R., & Alley, N.F., 1969: Occurrence of Lower Cambrian sediments in Wilpena Pound, Central Flinders Range, South Australia. *Aust. J. Sci.* 31, pp.301-302

Oxford House Associates Pty. Ltd.

Mineral Exploration Consultants

Principal
Russel Bluck, B.Sc.,M.Sc.

Suite 8,
3 Mount Barker Road,
Stirling,
South Australia 5152

Telephone: (08) 370 9366
Facsimile: (08) 339 4962

The Director General,
Department of Mines and Energy,
P.O. Box 151,
Eastwood. 5063.
South Australia.

21 July, 1989.

Attention Mr. I. Faulks.

Dear Sir,

Exploration Licence 1514, Mount Chambers.

~~Third~~ 2nd Quarterly Report for the period 13 December, 1988 to 13 March, 1989.

~~Fourth~~ 3rd Quarterly Report for the period 13 March, 1989 to 13 June, 1989.

Introduction.

Reporting for the above two periods has been consolidated into a single report consisting of this letter summarising the work completed and the expenditure incurred, and a separate technical report compiled by JLC Exploration Services (report attached, "The Regional Geological Setting of Cambrian MVT Mineralisation in SA").

Work completed.

Compilation of the data collected during field reconnaissance in the first quarters indicated that the potentially mineralised horizon was more extensively developed that previously reported. Accordingly, a review of the prevailing models for the formation of Mississippi Valley style lead-zinc deposits was carried out and considerable time spent in obtaining an understanding of the stratigraphy of the area. The data collected by earlier explorers was re-examined in the context of the models and stratigraphy and targets for further field checking identified.

The "Aboriginal Heritage Act, 1989" was enacted during the fourth quarter of the title. Contact was made with the Flinders Ranges Consultative Committee and time spent in reviewing the legislation and deciding an appropriate course of action. Despite severe reservations by the Joint Venture partners it was decided to proceed with a limited field programme while investigating the attitude of the Consultative Committee.

Field programmes were scheduled to commence in June but were delayed by a combination of other work commitments, wet weather in the Flinders Ranges and the uncertainties associated with the introduction of the "Aboriginal Heritage Act, 1989" discussed above. Work finally commenced in July, 1989.

Forward Programme.

Field work is being directed at examining the strike extensions of the Eric mineralisation and field checking the relationships between stratigraphy, structure and mineralisation discussed in the review report. A number of specific target areas will be tested for significant mineralisation by rock chip and soil sampling.

Expenditure.

The statement of expenditure does not take account of the following matters;

* discussion with SADME geologists to concerning the detailed stratigraphy of the area and its relationship to mineralisation,
* reviewing the Aboriginal Heritage Act and Regulations,
* discussion with various government agencies and the Consultative Committee concerning the interpretation and operation of the Act,
* discussion between the Joint Venture partners as to whether or not to proceed with exploration.

Geology	$ 3,646
Drafting and printing	$ 233
Reporting and administration	$ 485
	$ 4,364

Yours faithfully,

R. G. Bluck.

MC:t/fqr079

Oxford House Associates Pty. Ltd.

Mineral Exploration Consultants

Principal
Russel Bluck, B.Sc.,M.Sc.

The Director General,
Department of Mines and Energy.
P.O. Box 151,
Eastwood. 5063.
South Australia.

14 November, 1989.

Attention Mr. W. Newton.

Dear Sir,

Exploration Licence 1514, Mount Chambers.

Fourth Quarterly Report for the period 13 June, 1989 to 13 September, 1989.

Introduction.

A short field programme was carried out in the area in conjunction with work on the adjacent Exploration Licence 1515, Wirrealpa. The title lapsed on 13 September, 1989, and an application has been lodged by the Joint Venture (Mining Corporation of Australia Limited and Demis Pty Ltd) for a new title to incorporate the Wirrealpa and Mount Chambers prospects within a single Exploration Licence.

Work Completed.

Following the review of exploration data and subsequent field programme undertaken in the previous period a short follow-up was carried out to verify some data. Work was concentrated on the setting of mineralisation in the Cambrian limestones south and east of the Eric Prospect. The results of the programme are being complied into a brief report by JLC Exploration Services.

Expenditure.

ITEM	PREVIOUS PERIODS	FOURTH QUARTER	TOTAL
Geology	$11,676	$ 603	
Technical Assistant	$ 990	$ 119	
Drafting	$ 1,335	$ 65	
Vehicle costs	$ 1,521	$ 89	
Accommodation and meals	$ 465		
Field supplies	$ 117	$ 58	
Assaying	$ 557		
Data acquisition, plans	$ 644		
Reporting and admin.	$ 2,163	$ 425	
	$19,468	$ 1,359	$20,827

Yours faithfully,

R. G. Bluck.

MC:4q119