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EXPLORATION LICENCE 47/71

QUEEN HILL

TASMANIA
MICROFILMED

FINAL REPORT

INCLUDING REPORT ON EXPLORATION

FOR THE PERIOD JANUARY 1985 TO NOVEMBER 1986

DISTRIBUTION

GIPPSLAND OIL AND MINERALS NL
ABERFOYLE - HAWTHORN
ABERFOYLE - BURNIE
DEPARTMENT OF MINES

COMPILED BY:

J. R. SISE
REGIONAL MANAGER
NOVEMBER 1986.

AMG REFERENCE POINTS ADDED

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LIST OF PLATES

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QH 233 (In text)	Queen Hill EL 47/71 - Regional Geology	1:50,000
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SUMMARY

Exploration Licence 47/71 was sub-divided in December 1984. The western portion being held by Gippsland Oil and Minerals NL as a new and separate licence (now relinquished), while the eastern area surrounding Zeehan was retained as EL 47/71, and remains subject to the Queen Hill Joint Venture between Gippsland Oil and Minerals NL and Aberfoyle Resources Ltd.

Exploration on EL 47/71 during 1985-86 focussed exclusively on assessing the potential of the Gordon Limestone sequence to host significant lead-zinc-silver mineralisation. Due to poor exposure the programme relied heavily on a bedrock drilling programme for geological and geochemical information.

A geological map was produced by logging bedrock samples and incorporating surface information.

Several zones of anomalous bedrock geochemistry were defined both within the Gordon Limestone and at the contacts with adjacent stratigraphy.

Lead isotope analyses revealed Devonian vein-style signatures rather than the Oceana syn-sedimentary ratios.

Results suggest that the geochemical anomalies represent narrow, discontinuous Devonian vein-style mineralisation, and do not warrant further exploration.

It is recommended that the Exploration Licence be relinquished now ahead of the December 1987 final expiry date, but that the CML enclosing the Zeehan Deposits and Gordon Limestone sequence around the Despatch Mine be retained.

INTRODUCTION

The previous annual report prepared for Exploration Licence 47/71, Queen Hill (Rombouts, 1983) describes activities over the 12 months to December 21, 1983. During this period exploration was designed to assess the regional tin potential of the licence and locate drill targets which might ultimately yield near surface high grade (>1.0% Sn) tin mineralisation to enhance any future mining and milling operation based on Aberfoyle's Zeehan tin resources. Although several areas were explored with detailed geology, geochemistry and geophysics, none produced attractive targets warranting immediate diamond drilling.

During 1984 no exploration was conducted on EL 47/71. This was due to the lack of good targets, the depressed tin market discouraging further expenditure on tin exploration, and the discovery and delineation of the Hellyer massive base metal sulphide deposit near Que River which required both expenditure and staffing priority.

In November 1984 an application for renewal of EL 47/71 was submitted to the Department of Mines seeking continued exploration rights for a reduced licence area. Exploration would now focus on the lead-zinc-silver potential of the Gordon Limestone area around Zeehan. The Department of Mines initially granted a 12 month renewal until December 21, 1985. This was subsequently extended for a further year. Final expiry date for the tenement is December 21, 1987.

LICENCE SUB-DIVISION

The Annual Report for the year ended December 21, 1982 (Richardson and Rombouts, 1982) describes the sequence of events leading to the amalgamation in 1977 of the Queen Hill licence to cover an area of 122 skm.

At renewal in December 1984 the licence was sub-divided with the approval of the Department of Mines, and following Aberfoyle's decision to relinquish rights to the western portion. The western area (EL 2/85) was marked out for retention by Gippsland Oil and Minerals NL and was subject to a separate exploration programme and reporting obligations. This licence has since been relinquished. The eastern area of 36 skm around Zeehan (Plate QH233) is retained as EL 47/71 and remains subject to the Queen Hill Joint Venture between Gippsland Oil and Minerals NL and Aberfoyle Resources Limited. EL 47/71 surrounds CML 36M/81 of 564 hectares centred on the Queen Hill - Severn tin resources.

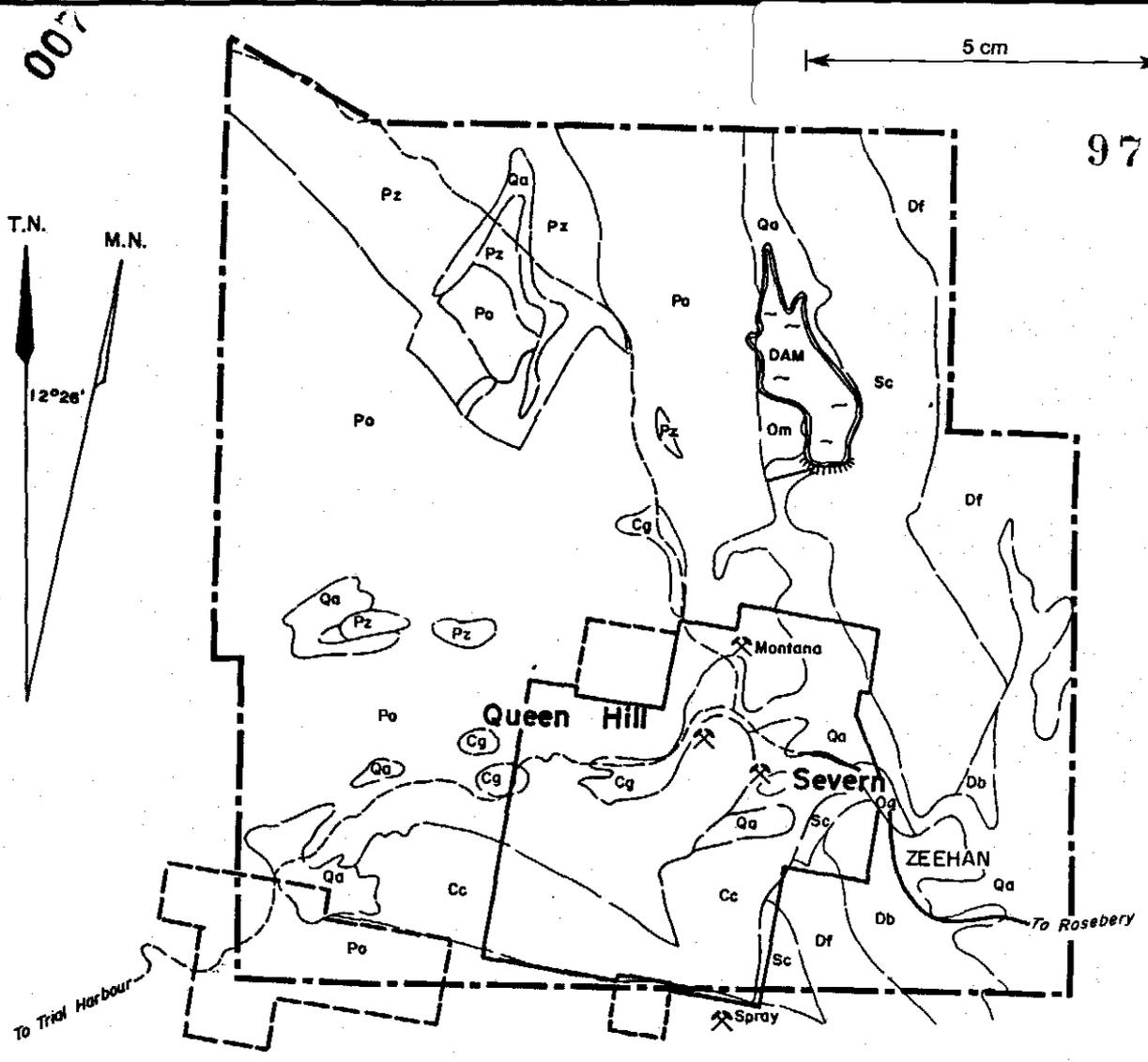
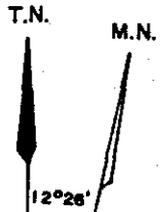
1985-86 EXPLORATION PROGRAMME

Exploration on EL 47/71 during 1985-86 focussed exclusively on assessing the potential of the Gordon Limestone sequence to host significant lead-zinc-silver mineralisation. This unit is exposed in a prominent dark-grey to black road cut on Zeehan's Main Street opposite the Commission Offices, and extends northwards towards the Zeehan Dam and beyond, to be faulted out near the northern licence boundary (Plate QH86B).

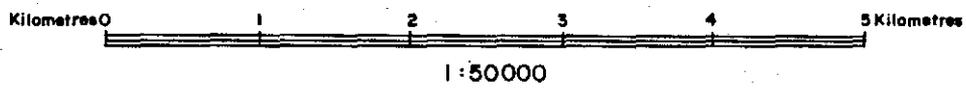
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Quaternary	Qa	Alluvium	Og	Gordon Limestone
Permian	Pz	Zeehan Glacial Formation	Om	Maina Sandstone
Devonian	Db	Bell Shale	Cc	Crimson Creek Formation
	Df	Florence Quartzite	Po	Oonah Quartzite and Slate
Silurian	Sc	Crotty Quartzite	IGNEOUS ROCKS	
			Cg	Gabbro



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REVISIONS			
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NORTH WEST TASMANIA
 QUEEN HILL E.L. 47/71
 REGIONAL GEOLOGY

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3.

Attention was drawn to the Gordon Limestone as a potential ore host horizon, firstly by the reported success (Legge et al., 1984) of other explorers in the district in outlining a resource of approximately 4 mt of 10% Pb + Zn and 80 g/t Ag at Oceana as discordant and stratiform sedimentary-exhalative mineralisation in carbonates, and of similar style to deposits in Eire. Lead isotope analyses also revealed a Cambrian-Ordovician age for Oceana mineralisation, contrary to the previously accepted hydrothermal zoning model related to the intrusion of Devonian Heemskirk Granite. A second factor encouraging exploration by Aberfoyle was the recognition that the Gordon Limestone on EL 47/71 hosts two old silver-lead workings at the Despatch and Crown Mines and is only 5 km along strike from Oceana.

General Geology

The area of Gordon Limestone on EL 47/71 (Plates QH86 A&B) is extremely poorly exposed. Apart from the outcrop on Main Street, all other material is as observed on old mine dumps. The limestone occupies a prominent marshy, button grass valley containing Main Creek, flanked to the west by hills of Oonah Quartzite and Slate Formation and to the east by a ridge of Crotty Quartzite. The Gordon Limestone forms the exposed western basal unit of an Ordovician-Devonian sequence dipping east into an open syncline and faulted to the west against the Precambrian basement along the Despatch Fault. (See also Appendix 1).

Mineralisation

The dumps of two old workings in the Gordon Limestone are evident north of Zeehan on EL 47/71. The Despatch Mine main shaft was located in what is now the Crocoite Caravan Park. All openings have been covered in for some years, and all that now remains is scattered dump material.

Blisset (1962) reports that no production is documented. The Crown Mine, approximately 900 metres north of the Despatch, had more extensive workings in the limestone. A main shaft was sunk to about 80 metres with two levels at 30 and 52 metres. Surface prospecting and trenching on the limestone flats were continually frustrated by water and slurry. Both the Despatch and Crown lodes strike north-west. This is the common orientation of hydrothermal fissures in the Zeehan Field (Both and Williams, 1968). (Further information on mineralisation and exploration history is contained in Appendix 1).

Bedrock Sampling

N. Poltock Field Exploration was contracted to establish a grid and conduct bedrock sampling over an area between Zeehan township and the dam to the north (Plate 86A). A total of 261 samples were collected at 25 metre intervals along 19 grid lines spaced 100 metres apart (Appendix 3). Samples were analysed for Pb, Zn, Ag and later for the additional elements Cu, Mn, Ba (Appendix 4). Bedrock chips were logged under contract by Phil Jones and Associates. The grid and adjacent areas were mapped, rock chip samples collected, and various geochemical contour plans prepared as part of this programme. This work is fully documented in Appendix 1.

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The bedrock sampling programme provided geological information which enabled some interpretation of the stratigraphy beneath the button grass swamp. The main rock types, Oonah Quartzite and Slate, Gordon Limestone, Moina Sandstone and Crotty Quartzite are sufficiently varied to be distinguished in bedrock chips. The contrasting depth of weathering also provided information about possible fault structures.

Four zones of anomalous bedrock geochemistry were defined (refer Appendices 1 and 4). Seven samples exceeded 1% combined lead-zinc.

The contact on the eastern edge of the grid between Gordon Limestone and Crotty Quartzite is marked by an anomalous trend with values peaking at 2.5% Zn, 0.12% Pb. Likewise, the western boundary between Gordon Limestone and Oonah Quartzite and Slate Formation along the Despatch Fault is also anomalous, with up to 2.2% Zn, 1.0% Pb. Both the above contact situations are possible structural loci for hydrothermal activity, and development of vein-style mineralisation.

Within the Gordon Limestone there are three closely linked and strongly anomalous trends. Zone 1 (3500N - 3750N) abuts the Despatch Fault north of the Despatch Mine and is associated with arenaceous limestone, possibly a more permeable host for hydrothermal mineralisation. This anomaly is still open to the south. Zone 2 (3850N - 4150N) peaks at 3.5% Zn and extends as an area >0.1% Zn over 300 metres, in the centre of the limestone belt north of the Despatch Mine. The third trend, Zone 3 (centred on 4600N) is north-east of the Crown Mine and associated with faulted Gordon Limestone.

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In addition to bedrock drilling, rock chip sampling of the scant limestone dump material was undertaken. Some highly mineralised samples (16.9%Pb, 23.3% Zn, 166g/t Ag) were obtained (Appendix 1 & 4).

Lead Isotope Analysis

Three sulphide-rich limestone dump samples containing between 900 ppm and 22.8% Pb were collected from the Crown and Despatch areas and together with three high lead-bearing bedrock samples (Appendix 5) were sent to Sirotope for lead isotope analysis and comment on whether the samples had characteristics of syn-sedimentary mineralisation such as at Oceana or the younger Devonian vein-style common in the Zeehan region.

All samples plot as a homogenous cluster on the two lead isotope ratio diagrams (Appendix 5) and clearly indicate an isotopic signature diagnostic of Devonian vein mineralisation, not the Oceana "target" values.

CONCLUSIONS

Bedrock sampling for geological and geochemical information of a very poorly exposed belt of Gordon Limestone extending north from Zeehan has provided a better understanding of the local geology. Anomalous samples, some containing visible sphalerite, galena and pyrite, were returned and have defined several prominent trends which parallel the strike of local stratigraphy as well as that of the main lodes in the Zeehan Field. Lead isotope analyses did not produce the Oceana "target" signature but confirmed Devonian vein-style mineralisation.

RECOMMENDATIONS

Exploration results over the Gordon Limestone sequence on the licence suggest that the bedrock geochemical anomalies represent narrow, discontinuous Devonian vein-style mineralisation, and do not warrant further work for substantial syn-sedimentary base metal targets.

It is recommended that the Exploration Licence be relinquished now ahead of the December 1987 final expiry date, but that the CML enclosing the Zeehan tin deposits and Gordon Limestone sequence around the Despatch Mine be retained.

REFERENCES

- Blisset, A.H. : 1962 Geological Survey explanatory report - Zeehan. Tasmania Department of Mines.
- Both, R.A. & Williams, K.L., 1968 Mineralogical Zoning in the lead-zinc ores of the Zeehan field, Tasmania. Part I - Introduction and review; Part II - Paragenetic and zonal relationships. J. Geol. Soc. Aust. 15 : P121-137; 217-244.
- Legge, P.J. Haslam, C.O., & Taylor, S., : 1984 Lead-zinc-silver exploration and development in Australia. Proc. Australas. Inst. Min. Metall. Vol. 289 (4) p. 119.
- Richardson, S.M., & Rombouts, M.J., 1982 Annual Report on Exploration Licence 47/71 Queen Hill for the 12 months to 21 December, 1982.
- Rombouts, M.J., 1983 Annual Report on Exploration Licence 47/71 Queen Hill for the 12 months to 21 December, 1983.

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APPENDIX 1

GEOLOGICAL SURVEY AND INTERPRETATION OF BEDROCK GEOCHEMISTRY,
EL 47/71, ZEEHAN. FOR ABERFOYLE EXPLORATION.

PREPARED BY PHIL JONES AND ASSOCIATES,

FEBRUARY 1986.

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Phil Jones and Associates Pty. Ltd.

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Geotechnical Personnel

GEOLOGICAL SURVEY

and

INTERPRETATION OF BEDROCK GEOCHEMISTRY

EL. 47/71 ZEEHAN

for

ABERFOYLE EXPLORATION

by

PHIL JONES + ASSOCIATES

FEBRUARY 1986

9A WAIMEA AVENUE, SANDY BAY, TASMANIA, 7005.

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Figs 1 Location Diagram
 2 Generalized Stratigraphy and
 Stratigraphic extent of mineralization.

Table 1 Chip Sample Descriptions (Whaker program)

Appendices

- | | |
|---|--|
| 1 | Zeehan Geophysical Surveys BMR Record 1966/163 |
| 2 | Zeehan Geophysical Survey BMR Record 1965/138 |
| 3 | Loftus Hills Report - Rotunda 1950 |
| 4 | Loftus Hills Report - Tasmanian Crown 1950 |
| 5 | Loftus Hills Report - Kemp's 1950 |
| 6 | Diamond drill Logs - Zeehan Explorations
Holes 87, 89, 6, 8, 10, 11 |

Enclosures

		Scale
QH 234/A	Detailed Geology - Crown Grid	1:2,500
234/B	Sample Locations	1:2,500
234/C	Lead Geochemistry	1:2,500
234/D	Zinc Geochemistry	1:2,500
234/E	Silver Geochemistry	1:2,500
234/F	Rock Chip Sample Locations and Results	1:2,500
234/G	Isopleth - Depth to unweathered bedrock	1:2,500
234/H	Approximate Locations of Previous Diamond Drill Holes	1:2,500

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SUMMARY AND CONCLUSIONS

The exploration target at Zeehan is an Irish style SEDEX lead zinc deposit (+10 million tonnes of > 10% combined Pb and Zn with silver credits) associated with the Ordovician Gordon Limestone sequence.

The Irish style deposit has many characteristics to the sediment hosted massive sulphide deposits, however, major differences such as breccia's stratabound fracturing and colloform and geopetal textures indicating post sedimentation 'mineralization'.

Previous exploration on the gridded area has been scant with the BMR conducting limited geophysical and minor geochemical surveys. Two diamond holes were drilled into an area north of the Crown workings with poor results. Zeehan Explorations drilled a fence of holes across the despatch section of limestone again with poor results, possibly due to poor recoveries within mineralized horizons.

The 1985 - 1986 programme included detailed mapping of available outcrop on the gridded area of E/L 47/71 as well as chip logging. Geochemical maps were produced along with an isopleth map of the whacker sampling. A map showing approximate positions of previous drillholes was also draughted.

It is recommended that two zones of highly anomalous geochemistry be diamond drilled as they fit the geological and structural model for Irish style lead-zinc mineralization. A detailed magnetic survey may aid the search for further lead-zinc mineralization by delineating the weakly magnetic gangue. It is also recommended that some further work be conducted south of line 3150N.

The tenement is considered to have excellent potential for hosting an Irish style SEDEX lead-zinc deposit associated with the more arenaceous or bioclastic carbonate sequences within the Gordon Limestone.

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RECOMMENDATIONS

Two zones of highly anomalous geochemistry are recommended for diamond drilling as they fit the geological and structural model for Irish style lead-zinc mineralization.

Zone 1.	3500N-3750N	250 x 150 metres.
Zone 2.	3850N-4150N	300 x 100 metres.

Further useful geological information may be gained cheaply by conducting detailed ground magnetic surveys, as the sideritic gangue minerals associated with the lead-zinc mineralization appears to be weakly magnetic. This method may also help define fault zones in the gridded area.

There is possible potential for using a recently developed technique whereby hydrocarbon gases in rocks may be used as pathfinders for Irish style deposits. It involves the analysis of trace amounts of light (C₁ to C₅) hydrocarbons in rocks using a simple heating technique, with analysis of the variations in the amounts and proportions of these hydrocarbons released. Extensive 'haloes' of methane enrichment often many kilometres across occur coincident with mineralized zones. The larger the deposit the larger the methane anomaly.

The technique is more suitable for initial reconnaissance of new areas, however, hydrocarbon gases may also find a role in the later stages of exploration in particular to help locate deeply buried deposits.

It is also recommended that some further work be conducted south of line 3150N in to the town limestone area of Loftus Hills (Rotunda) as numerous lead-zinc workings are evident.

EXPLORATION TARGET

The tenement embraces a significant portion of Gordon Limestone which has been shown elsewhere in the area to have potential for hosting Irish style SEDEX lead - zinc mineralization.

The following is a summary of the geological aspects and constraints of Irish style lead-zinc deposits:

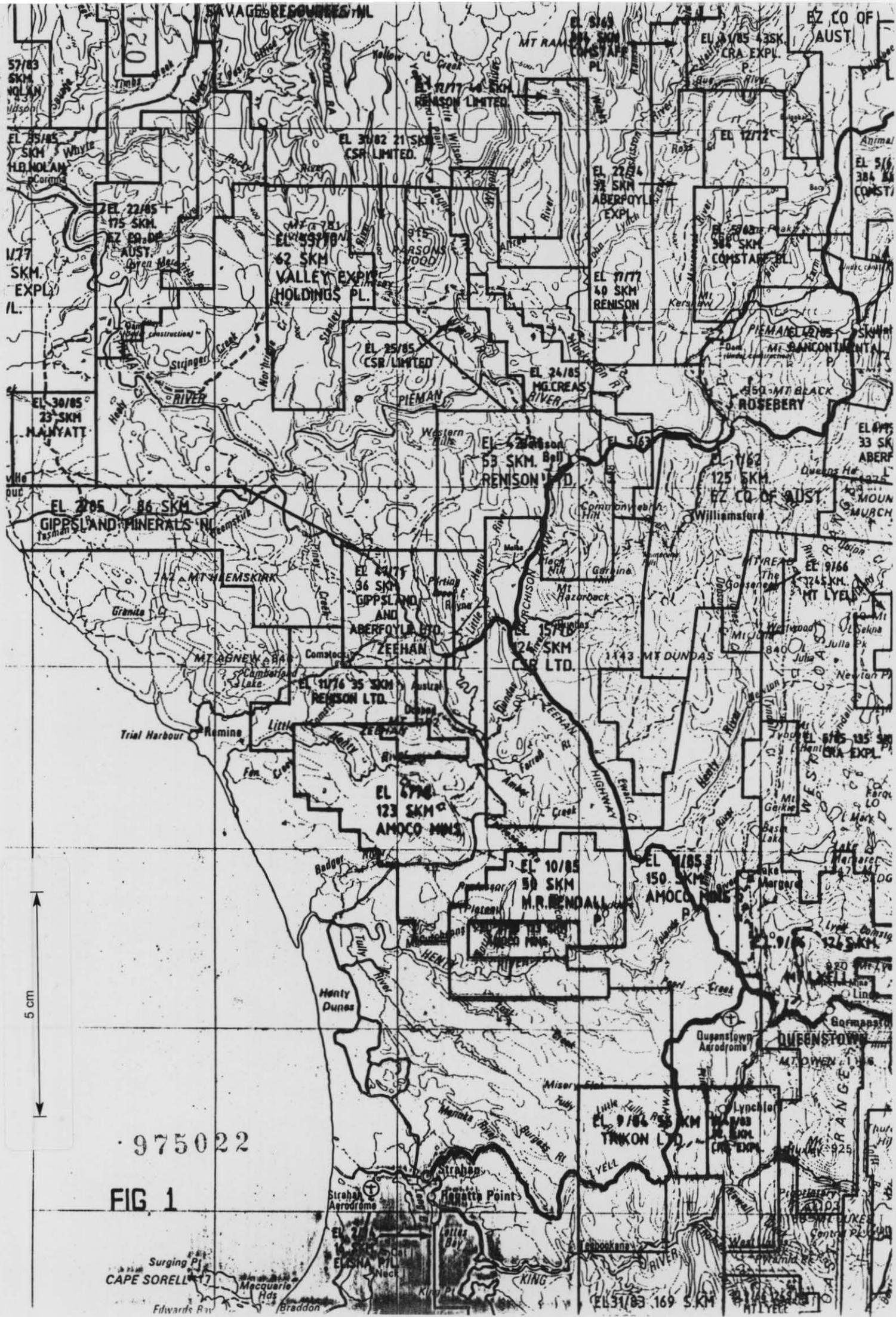
Features that the Irish style deposits have in common with sediment hosted, massive sulphides are:

- 1) Zinc, lead and iron sulphides dominant but containing significant silver and minor copper.
- 2) An active tectonic setting.
- 3) Stratabound and generally stratiform morphology of the mineralized zones.
- 4) Structural control on the location of mineralization.
- 5) Temperatures of sulphide precipitation ranging up to nearly 300° C.

However, unlike the majority of sediment hosted massive sulphide deposits, the sulphides in the Irish deposits in the Navan Beds and Waulsortian facies display an abundance of breccia, stratabound fracture, colloform and geopetal textures indicative of post-sedimentation mineralization. These textures may be explained as a result of the interaction of hydrothermal fluids with the poorly argillaceous carbonate host rocks of these deposits which contrast with the dominantly argillaceous host rocks of nearly all other sediment-hosted massive sulphide deposits.

The Irish shelf carbonates differ from the shelves and platforms that host most MVT deposits in being tectonically active during deposition of the sediments that host mineralization. The majority of the MVT deposits of eastern North America and Silesia are located within thick carbonate sequences which lack volcanism or evidence of nearby, contemporaneous tectonism. Also, unlike Ireland and the basins containing sediment hosted, massive sulphide deposits, most basins adjacent to the shelf sequences hosting the MVT'S did not undergo compression at, or immediately following the period of deposit host sediment deposition.

The two major Irish deposits are described in more detail over.



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 FIG. 1

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At Navan (+70m tonnes @ 10% Zn + 2.6% Pb) mineralization is consistently restricted to non argillaceous units and is generally best developed within micritic, oolitic, pelloidal or slightly sandy carbonate beds indicative of a moderate - to high energy, shallow water and hence oxidising environment. Highest grade mineralization commonly occurs within porous and permeable (?) oolitic, pelloidal or slightly sandy packstones and wackestones adjacent to less (?) permeable argillaceous carbonates, fine grained calcsiltites or micrites.

The deposits associated with the Waulsortian facies - Silver mines Deposit (17.7m tonnes @ 6.4% Zn + 2.5% Pb + 23g/tAg), characteristically display tabular, irregular to well developed stratiform shapes with the thickest and highest grade mineralization commonly restricted to the contact between the Waulsortian facies micrites and adjacent argillaceous biocalcarenite. However, mineralization adjacent to 'feeder' structures clearly cross cuts stratigraphy and is hosted by sediments that range from the base of the carbonate sequence to near the top of the Waulsortian facies.

As stated previously the majority of zinc and lead prospects and deposits in the Irish Carboniferous are adjacent to structures which localize high grade zones of mineralization and are believed to have served as fluid conduits. There is evidence at many deposits and prospects that these faults were active during mineralization giving rise to localized sub-basins as well as chaotic shale breccias activated by seismic activity.

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INTRODUCTION

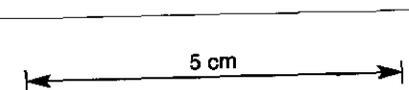
The purpose of this study was to conduct geological surveys over the Dispatch - Crown grid in EL 47/71, immediately north of Zeehan in West Tasmania (Fig 1). The principal aims were:-

- (i) To geologically log bedrock chip samples taken using a whacker driven marlow flow through sampler.
- (ii) To geologically map the gridded area and aim to pin down lithological boundaries as well as defining possible fault zones.
- (iii) To conduct a literature search covering the portion of limestone north of Zeehan to the water supply dam.
- (iv) To suggest possible anomalous zones worthy of drilling.

In addition a brief summary of the geological setting for Irish Style Mineralization was undertaken.

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BASIN

IRISH SHELF

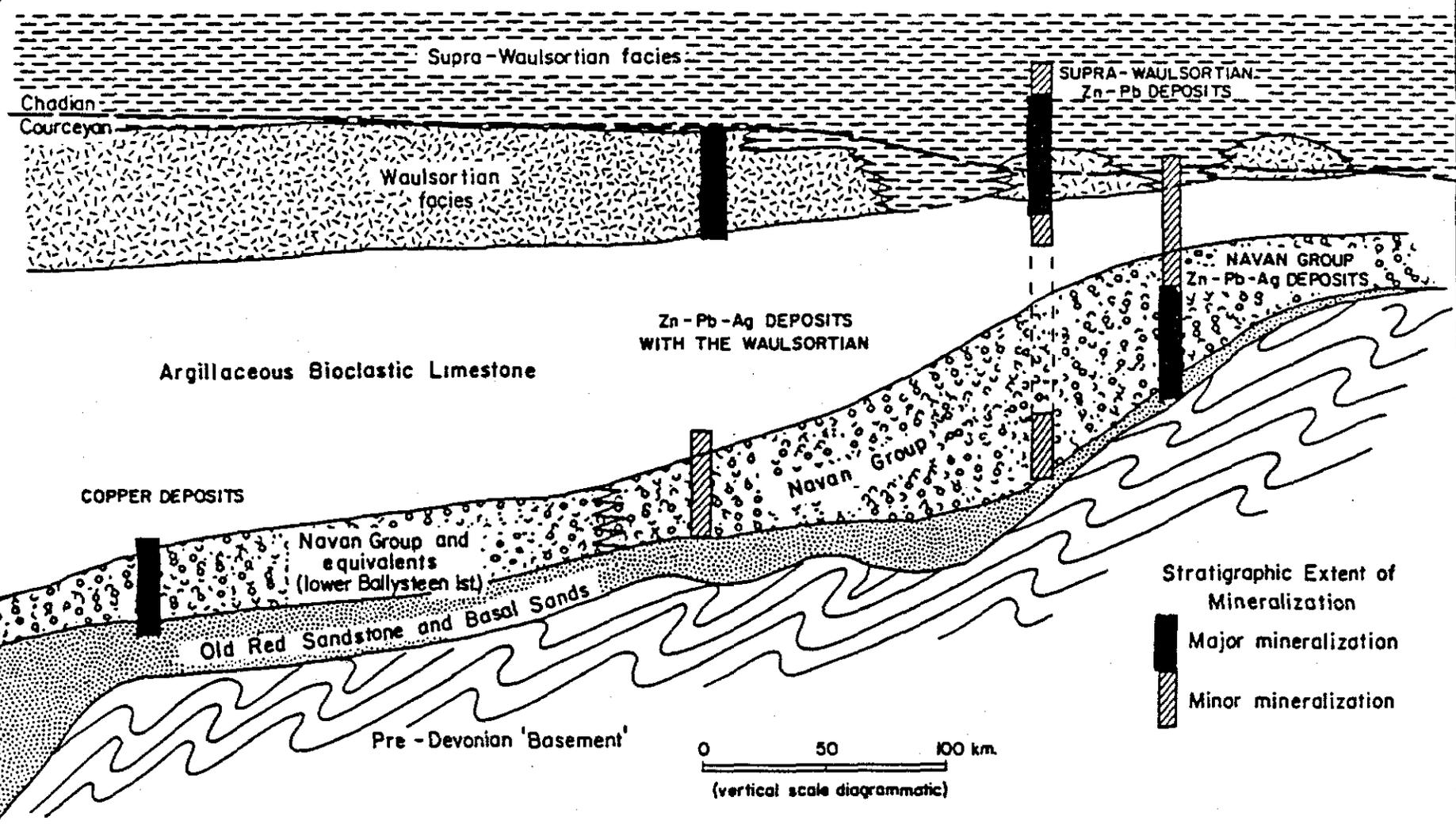


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Southern
Ireland

Central
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Midlands



GENERALIZED STRATIGRAPHY AND STRATIGRAPHIC EXTENT OF MINERALIZATION,
IRISH LOWER CARBONIFEROUS.

FIG 2.

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DESCRIPTION OF THE PROPERTY AND OWNERSHIP.

EL 47/71 is situated at Zeehan on the West Coast of Tasmania. It has an area of 36 square kilometres and is jointly owned by Gippsland Oil and Minerals and Aberfoyle Exploration. The licence has been renewed for 12 months to the 21 December 1986 and expires on the 21 December 1987.

The licence is served by both bitumen and all weather dirt roads, with a good vehicular track commencing from Zeehan, north into the centre of the gridded area.

REGIONAL GEOLOGY.

The geology of the Zeehan area is manifest by the large Heemskirk Granite intrusion occurring to the west of an area of folded and faulted Proterozoic to Devonian sediments. The Onah Quartzite consisting of an unfossiliferous contorted micaceous quartzite and slate sequence are the oldest sediments exposed to the north and west of Zeehan. These rocks are succeeded by further siliclastic sediments and basic volcanics which are considered to be either of Proterozoic age or part of the Success Creek phase of early Cambrian age. Overlying the Success Creek Formation is a sequence of argillites, greywackes and tuffs representative of the Crimson Creek Formation of lower to Middle Cambrian age and the Dundas Group of Middle to Upper Cambrian age.

The Proterozoic and Cambrian strata were deposited in a north-south trending trough abutted by the Rocky Cape Geanticline to the north west and the Tyennan Geanticline in the central highlands.

After major faulting and uplifting an intergeanticlinal depression was formed into which the Junee Group sediments were deposited. These included the basal Ordovician Mount Zeehan Conglomerates, succeeded disconformably by the Moina Sandstone. With the onset of regional subsidence shallow water deposition of the Gordon Limestone sequence commenced. This Unit is comprised of shales, siltstones, limestones and dolomites and were deposited in a generally shallow water shelf environment. After minor uplift the Gordon Limestone was succeeded disconformably by the Eldon Group of Silurian to Lower Devonian age siliclastic sediments.

The Tabberaberan orogeny produced NNW and NW folds and major WNW trending faults which have been slightly modified by Post Permian epeiorogenic block faulting (Blisset 1962). In proximity to the town the major faults are the Balstrup Fault, a sinistral transcurrent fracture with a normal component along the east side of the Austral Valley, and the Dispatch Fault, a sinistral transcurrent fault which curves from an EW trend east of Zeehan to a NNW trend north of the town.

More recent studies using K-Ar and Rb-Sr age determinations show a previously unrecognised widespread thermal event occurring into the middle Ordovician which involved considerable fluid circulation (Adams et al 1985).

HISTORY AND PREVIOUS EXPLORATION.

Regional.

The Zeehan Ag-Pb mining field dates back to 1882 when traces of gold and argentiferous galena were discovered near the present location of the Zeehan Post Office.

The field was progressively developed until 1898, involving the participation of 159 companies and syndicates and the exploration of some 200 lodes. A gradual decline occurred during the first decade of this century due to the depletion of near surface ore and the lack of capital to finance deeper exploration and exploitation.

With the sharp decline in production the smelter closed down and virtually all large scale mining ceased in the area. The bulk of ore produced from the Zeehan field was extracted from the Proterozoic and Cambrian strata with only 3.1% being won from the Ordovician Gordon Limestone. As the Proterozoic - Cambrian deposits were high in silver, most of the production was concentrated there, rather than in the limestone, which have much lower silver values and higher production costs due to poor ground conditions and water inflows.

From 1919 until the present production was restricted to small scale tributing operations in the upper levels of abandoned mines and minor extractions from reopened workings at the Nike and Swansea Mines.

Systematic exploration of the area was conducted during the late forties by a joint venture of North Broken Hill and Broken Hill South - called Zeehan Explorations. In the period 1946 - 1951 they concentrated their efforts on diamond drill investigations of carbonate hosted mineralization within the Gordon Limestone. At their instigation, the BMR conducted Gravity and Electrical surveys in 1947/48 and again in 1954. Some of the gravity anomalies defined were found to be due to large accumulations of siderite. The electrical survey results were also disappointing as they failed to give a significant response over known mineralization at the Oceana Mine (Langron 1966).

Due to promising results from the initial drilling program at the Oceana the decision was taken to proceed with production. Some 128,177 tons at 11.6% Pb and 4.79 oz Ag/t were produced over the period 1954 to 1960 closing due to a combination of declining metal prices and excessive water inflows.

Further more cursory activity in the area was conducted during the period 1970 to 1972. Here Tenneco Australia Inc. initiated SP, EM, IP and Gravity as well as Turair surveys over the majority of the limestone sequence.

In 1978 Cyprus Minerals (formerly Amoco Minerals) Aust. Co. initiated a major exploration programme designed to investigate the lead-zinc potential of the Limestone. This programme is still under way.

Dispatch - Crown Area.

Tasmanian Crown (Appendix 4. Enclosure 1.)

Workings situated north of Zeehan on the eastern slope of Montana Hill, occurred on both sides of the NNW trending Despatch Fault in Oonah Quartzite and slate and Gordon Limestone (Blisset 1962). The ore was described by Montgomery (1895) as fissure veins containing galena and sphalerite in a siderite gangue, striking between NW and NE. Trenching in 1880 was followed by shaft sinking in 1894 to a depth of 80 metres with levels being opened up at 30 and 52 metres. Total production from this development and another small scale venture in 1934-1938, is estimated at 167 tons of concentrates yielding 113 tons Pb and 15738 oz Ag.

In the period 1946-1951 Zeehan Exploration drilled 2 holes (DDH 87 and 89 - Appendix 6 Enclosure 8) both of which intersected wide zones of siderite 'lode' material with minor Pb - Zn mineralization. Hole 87 was abandoned in poor ground prior to reaching its target.

The BMR conducted extensive geophysical surveys over the belt of limestone north of Zeehan using electrical and magnetic methods. An anomalous zone was delineated adjacent to the Crown workings and was subsequently diamond drilled (Enclosure 8. Appendix 2). Testing confirmed that the zone is associated with sulphide mineralization but owing to difficult drilling conditions no estimate of grade was obtained.

Despatch Mine (Appendix 1. Enclosure 1.)

The main shaft was sunk in 1891 in limestone adjacent to the major NNW trending Despatch Fault but was abandoned due to excessive water after being exploited to a depth of 24 metres. Extraction was subsequently limited to small scale surface extraction of galena for which no details are recorded. The ore was described as three large parallel lodes striking 30°W of N and dipping west (Waller 1904).

In the period 1946 - 1951 Zeehan Exploration drilled 4 holes (DDH 6,8,10,11 - Enclosure 8 Appendix 6), none of which intersected pay ore. However, no adequate assays were conducted and poor core recoveries were experienced through the majority of the target zones.

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The BMR in 1947-48 conducted geophysical surveys over a number of limestone areas including that containing the Despatch Mine. No anomalous zones were delineated.

Town Limestone Area (Appendix 3).

Loftus Hills (1950) conducted a literature search for most of the workings within the Gordon Limestone with one summary-Rotunda, being devoted to workings in and around Zeehan.

He reports that two seams of galena having a strike of N 25 W and controlled by the strike of the limestone stratification (bedding?) were reported from the north-east crosscut at the 12 metre level in the King extended N° 1 shaft.

He also states that sampling of the pugh material from the cutting on Main Street over 160', using 6' sample intervals and a 3" channel produced values which ranged from trace to 26.6% Pb, Nil to 10.5% Zn and trace to 89.5 ozs Ag. (Aberfoyle sample N° 355285 - 0.2% Pb, 0.1% Zn, 7 g/t Ag - Enclosure 6). However, resampling of the face using 3' sample intervals and 1' high channels produced values ranging only to 10% Pb and 7.7 oz Ag. The average Pb content was 2.65% Pb against 8.4% Pb of the first sampling.

Kemp's Working (Appendix 5)

Loftus Hills makes a brief note on workings located 1½ miles north of the Zeehan Post Office. The workings were originally floated as the Silver Crown Extended in 1888, however, an attempt to sink a shaft failed due to water. In 1907 the Kemp Bros. completed treching and commenced to shaft a large expanse of limonite cap but were beaten by water and also by high zinc values. These workings are thought to be located beneath the present Zeehan water supply reservoir.

030

MINERALIZATION

The Zeehan Sn - Ag - Pb - Zn mineral field has often been quoted in standard textbooks on economic geology as a classical example of magmatic hydrothermal zoning related to the major Heemskirk granite intrusion. Both and Williams (1968) showed that the zoning, from west to east, is displayed principally in the gangue mineralogy. It changes from pyrite dominated to siderite dominated together with a decline in the FeS content from west to east. (Both et al 1969). The only distortion of the zonation is the Queen Hill area where anomalous characteristics of abundant tin mineralization (stannite, cassiterite), occurrence of wolframite and bismuthinite, relatively high FeS contents of sphalerites and variable siderite or pyrite gangue which Both attributed to the effects of a separate granite intrusion underlying the area.

The validity of applying the magmatic hydrothermal model to the whole mineral field has recently been questioned by Cyprus (Amoco) and more recently by EZI in Joint Venture with Cyprus with respect to the limestone sequence. An Irish type model has been put forward as a possible alternative to previous models generally evoking fissure veining associated with the Tabberaberan orogeny and associated granite intrusives.

031
WORK CONDUCTED

N. Poltock was contracted by Aberfoyle Exploration to conduct bedrock sampling surveys over the Despatch - Crown grid from lines 3150N to 5100N. A total of 261 "Whacker" samples (Enclosure 2) were taken at 25 metre spacings along 19 lines spaced at 100 metres intervals and dispatched to Analabs initially for analysis for Pb, Zn, Ag and later for the additional elements Cu, Mn and Ba.

The interval 3220N to 3510N was not sampled due to the presence of the Zeehan Caravan Park.

Geology.

Mr. J. Sise of Aberfoyle Exploration split off a small fraction of the bedrock chips for Phil Jones and Associates to geologically log (Table 1). The results from the logging enabled a detailed geological map (Enclosure 1) to be compiled in association with surface mapping of the limited outcrops.

The Oonah Quartzites were identified by their high carbonaceous and micaceous (phyllitic) contents and their generally black or dark grey colouration. The limestones and dolomites were readily defined by their effervescence as well as their light to dark grey colours and associated calcite and/or dolomite veining. The Crotty Quartzite is identified by the abundance of fine to coarse grained quartz arenites and yellow to cream occasionally arenaceous siltstones. Possible Moina Formation sediments occur from lines 4800N to 5200N in faulted contact with the Oonah Quartzite and also possibly with the Gordon Limestone. These rocks are comprised of grits, siltstones and minor arenaceous rocks.

Major faults are manifest where dislocations of strata have been observed (Crown, Target and Kemp's Faults) as well as from data gained from the 'whacker' sampling (Despatch Fault). Ironstones are observed coincident with the Despatch fault kink and the Tasmanian Crown workings.

An isopleth map (Enclosure 7) was produced from depths obtained from the 'whaker' sampling program and used to help define areas of deep weathering - due possibly to faulting. The Crotty Quartzite disconformable contact is also deeply weathered which may indicate selective weathering along the more porous and permeable quartzite contact or may be due to possible minor erosion and weathering during a minor period of emergence or near emergence prior to the deposition of the overlying quartzites.

032

975033

TABLE 1: CHIP SAMPLE DESCRIPTIONS.

SAMPLE N°	GEOLOGICAL UNIT	DESCRIPTION	EFFERV- ESENCE	SULPHIDES
LN 5100N				
355666	OONAH Fm	CW Dark grey, massive siltstone	NIL	NIL
667	MOINA QUARTZITE	CW Dark brown, poorly sorted quartz arenaceous ferruginous siltstone.	"	"
668	"	HW - CW, Yellow brown, possibly calcite veined silty quartz arenite.	"	"
669	"	HW Pale yellow, fine grained, weakly ferruginous silty quartz sandstone.	"	"
670	"	CW Dark grey sugary textured, phyllite carbonaceous fine sandstone	"	"
671	GORDON LIMESTONE	HW - CW Grey massive argillaceous limestone, minor sparry calcite filled voids.	Strong	"
LN 5000N				
355286	OONAH Fm	Dark Brown, fawn, quartzose, hematitic silty sandstone.	NIL	NIL
287	MOINA QUARTZITE	Cream - fawn, weakly ferruginous poorly cemented quartzose sandstone	"	"
288	"	HW Orange - cream, hematitic quartz sandstone.	"	"
289	"	CW Grey brown, massive siltstone.	"	"
290	GORDON LIMESTONE	HW Light grey white, possibly bedded limestone with minor thin laminae of black argillaceous dolomite	Strong	"
291	CROTTY QUARTZITE	HW Weakly bedded carbonaceous siltstone with minor white dolomite as small void infillings.	NIL	"
292	"	HW Dark Grey weakly bedded, weakly limonite stained pyritic, carbonaceous, siltstone.	"	Pyrite
636	MOINA QUARTZITE	HW Fawn grey medium grained poorly sorted quartz arenite, ferruginous and silty matrixed.	"	NIL
664	"	CW Laminar dark grey brown, phyllitic shales with minor quartz veining.	"	"
665	"	CW Dark grey micaceous carbonaceous, silty claystone.	"	"

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975034

LN 4900N

355402	OONAH Fm	CW Mottled yellow white silty claystone.	NIL	NIL
403	"	CW Grey green, micaceous siltstone.	"	"
404	MOINA QUARTZITE	HW Brown siltstones and fine grained quartz sandstones, weakly ferruginous	"	"
405	"	CW Dark brown, muddy fine grained quartz sandstone / siltstone	"	"
406	"	CW Grey, micaceous very fine grained well sorted siltstone.	"	"
407	"	CW Dark grey micaceous medium grained carbonaceous, siltstone.	"	"
408	GORDON LIMESTONE	CW Grey, weakly dolomite, calcite veined bedded limestone	Mod-Stong	"
409	CROTTY QUARTZITE	HW-CW, Dark grey carbonaceous, calcite veined (silicified) siltstone.	NIL	"
410	"	HW-CW Dark grey micaceous siltstone.	"	"

LN 4800N

355293	MOINA QUARTZITE	MW, Light grey - white, well sorted, fine grained, well rounded quartz sandstone.	"	"
294	"	CW, Dark grey, highly carbonaceous siltstone.	"	"
295	"	Brown - cream, hematite stained, quartz sandstone and creamy fawn sandy siltstones.	"	"
269	"	Dark - black, very pyritic (=10%), very fine grained carbonaceous siltstone.	"	Very Pyrite
297	"	Brown hematite stained, quartz, fine sandstone.	"	NIL

LN 4700N

255411	OONAH Fm	CW, Pale yellow - cream siltstone.	"	"
412	"	CW, Black highly carbonaceous ferruginous stained shale.	"	Minor Pyrite
413	"	HW, Grey phyllitic carbonaceous interbedded shale/siltstone.	"	"
414	"	CW, cream, sericitic, weakly pebbly siltstone.	"	"
415	GORDON LIMESTONE	CW, light grey weakly bedded minor quartz arenaceous limestone.	Strong	Trace Pyrite.
416	"	CW light grey -cream, calcite veined, limestone.	"	NIL
417	"	CW Grey interbedded limestone, minor black dolomite, trace calcite veinleting.	"	"

034

975035

LN 4700N cont.

418	CROTTY QUARTZITE	CW, Dark grey, sugary textured, phyllitic, carbonaceous fine sandstone.	"	"
419	"	CW Dark grey, massive, textureless micaceous siltstone.	"	"
420	"	CW Fawn, pale yellow silty claystones.	"	"

LN 4600N

355318	OONAH Fm	HW-CW, Grey speckled white pyritic, sheared, carbonaceous siltstone.	NIL	Pyrite
317	"	CW, Black, weakly pyritic very carbonaceous siltstone.	"	"
316	"	CW, Dark grey, very pyritic, carbonaceous dolomitic siltstones	Weak	"
315	"	CW, Dark grey-black, pyritic, carbonaceous siltstone.	NIL	"
314	"	MW-HW light grey cleaved Shaley siltstone.	"	NIL
313	"	MW-HW Fawn, slumpy textured fine grained siltstone.	"	"
312	"	HW Fawn grey, cleaved, siltstone with quartz veining.	"	"
289	"	HW Mottled grey brown hematite stained, quartz veined, pyritic (trace) massive siltstone.	"	Trace Pyrite.
299	"	HW Grey, weakly pyritic (very fine grained) weakly vughy siltstone.	"	Minor
300	"	CW, Grey, pyritic dolomitic siltstone, possibly sheared.	Very Weak	Pyrite
301	"	HW - CW Dark grey very pyritic carbonaceous siltstone.	NIL	Very Pyritic
302	"	HW - CW Dark grey, carbonaceous dolomitic Siltstone.	Very Weak	NIL
303	GORDON LIMESTONE	CW, Grey, minor white, argillaceous limestone, minor quartz arenaceous limestone with large coarsely crystalline calcite clots.	Strong	"
304	"	HW - CW, Grey very argillaceous limestone with minor quartz arenaceous limestone.	"	"
305	"	CW, Grey, argillaceous limestone.	"	"

LN 4600N cont..

306	GORDON LIMESTONE	White, very crystalline, twinned calcite vein, with minor limestone fragments.	"	"
307	"	HW - CW, Dark grey massive, argillaceous limestone.	"	"
308	"	HW - CW, Grey interbedded limestone and black argillaceous dolomite, minor calcite veining.	"	"
309	CROTTY QUARTZITE	CW, Grey carbonaceous siltstone.	NIL	"
310	"	HW - CW, Grey to dark grey, trace pyrite carbonaceous siltstone.	"	Trace Pyrite
311	"	HW - CW, Brown fine to medium grained, hematite stained quartz arenite, minor manganese staining.	"	NIL

LN 4500N

355646	OONAH Fm	HW, Grey mottled cream, sideritized siltstone siderite veined?	NIL	NIL
647	"	CW, Light grey - cream massive siltstone.	"	"
648	"	HW, light grey, micaceous, weakly calcareous quartz siltstones	Weak	"
649	GORDON LIMESTONE	CW, Grey argillaceous limestone	Weak moderate	"
650	"	CW, Grey calcite veined, weakly bedded limestone.	Strong	"
651	"	CW, Grey weakly calcite veined, interbedded limestone minor dolomite.	"	"
652	"	CW, Dark grey argillaceous limestone.	"	"
653	"	CW, Grey, microcrystalline, weakly silty limestone.	"	"
654	"	CW, Mottled white - brown, extensively calcite veined limestone.	"	"
655	"	CW, Dark grey, disrupted laminar, calcite veined limestone.	"	"
656	"	CW, Grey, massive, calcite veined limestone.	"	"
657	"	CW, Dark grey, argillaceous, coarse grained dolomite.	Strong Moderate	"
658	"	CW, Grey laminar? weakly argillaceous, limestone	Strong	"
659	"	CW, Dark grey, very argillaceous, weakly dolomitic limestone with minor calcite veining	"	"
660	"	CW, Light grey, bleached, limestone.	Moderate	"

036

975037

LN 4500N cont.

661	CROTTY QUARTZITE	HW, Brown, interbedded siltstone and fine quartz sandstones.	NIL	"
662	"	CW, White - cream, very fine grained clayey sandstones and siltstones.	"	"

LN 4400N

355342	OONAH Fm	HW - CW, White - light grey, pyritic fine quartz sandstone siltstone.	NIL	Pyrite
341	"	Grey speckled white, hematite stained, sheared? quartzite and fine grained siltstone.	"	NIL
340	"	CW, Dark grey, very pyritic (very fine grained) massive dolomitic siltstone.	"	Pyrite
339	"	HW - CW, Grey, finely laminar dolomitic siltstone.	"	NIL
338	"	HW - CW, Dark grey, very pyritic (fine grained blebby) dolomitic very carbonaceous siltstone, appears quite massive.	"	Pyrite
337	"	MW - HW, Grey, bedded, carbonaceous dolomitic (sparry) siltstone.	"	NIL
319	"	HW - CW, Grey, weakly bedded, carbonaceous, dolomitic siltstone with micaceous sheen, minor clots of sparry dolomite.	Very Weak	"
320	OONAH Fm	HW - CW, Dark grey, massive dolomitic carbonaceous and micaceous siltstone, minor pyrite.	NIL	Pyrite
321	GORDON LIMESTONE	Light grey, speckled white very calcareous fine quartz sandstone, quartz grains subrounded to rounded.	Strong	NIL
322	"	HW - CW, Light grey, argillaceous massive limestone.	"	"
323	"	HW - CW, Light grey, argillaceous limestone.	"	"
324	"	MW - HW, Grey weakly bedded silty limestone minor black argillaceous dolomite laminae, abundant sparry calcite.	"	"
325	"	MW - HW Grey argillaceous weakly dolomitic limestone minor calcite veining?	Moderate	"
326	"	HW - CW, Light grey, quartz arenaceous limestone, abundant sparry calcite.	Strong	"
327	"	MW - HW Dark grey-brown, argillaceous massive dolomite.	Moderate	"

037

975038

LN 4400N cont.

355328	GORDON LIMESTONE	CW Light grey massive finely crystalline limestone with minor thin laminae of black argillaceous dolomite.	Strong	"
329	"	HW - CW, Light grey argillaceous fine grained limestone, minor calcite veining.	"	"
330	"	CW, Grey argillaceous limestone, minor large fragments of twinned calcite - veining.	"	"
331	"	HW, Grey very calcareous quartz arenite, quartz grains rounded.	Moderate	"
332	"	CW, Grey weakly interbedded fine sandy limestone and minor argillaceous dolomite, quartz grains subrounded.	Strong	"
333	"	CW, Grey massive argillaceous limestone.	"	"
334	"	CW, Grey, massive very argillaceous limestone.	"	"
335	"	CW, Grey speckled white, very fine grained laminar limestone with dark grey to black argillaceous dolomite laminae as well as grey argillaceous limestone laminae 0.01mm in width.	"	"
336	"	CW Brown - red heavily iron oxide stained quartz fine sandstone, quartz grains sub rounded to angular.	NIL	"

LN 4300N

355630	OONAH Fm	CW Grey interbedded micaceous siltstone and minor black carbonaceous siltstones.	NIL	NIL
631	GORDON LIMESTONE	CW Grey argillaceous, weakly calcite veined limestone minor calcarenite.	Strong	"
632	"	CW, light grey mottled calcite veined limestone with minor carbonaceous dolomite lamelle.	"	"
633	"	HW - CW Grey microcrystalline to fine grained limestone.	"	"
634	"	CW Grey, limestone with siderite lined vugh	"	"
635	"	CW Grey textureless massive limestone.	"	"
636	"	CW Light grey extensively calcite veined limestone.	"	"
637	"	CW Grey calcite veined interbedded limestone minor dolomite.	"	"
638	"	CW Grey argillaceous limestone.	Moderate	"
639	"	CW, Light grey massive limestone.	Strong	"
640	"	HW - CW Grey argillaceous limestone.	Moderate	"

038

975039

LN 4300N cont.

355641	GORDON LIMESTONE	HW - CW Dark grey, argillaceous carbonaceous dolomite.	Weak	"
642	"	CW Grey calcite veined interbedded limestone carbonaceous dolomite.	Strong	"
643	CROTTY QUARTZITE	CW Micaceous black to dark grey siltstones.	NIL	"
644	"	HW - CW Dark brown, massive to laminar siltstones.	"	"
645	"	HW White - cream fine grained well sorted and rounded quartz sandstone.	"	"

LN 4200N

355343	OONAH Fm	HW - CW Yellow-beige weakly iron stained fine quartz sandstone.	"	"
344	"	HW - CW Fawn-beige weakly iron stained saccaroidal textured quartz fine sandstone/siltstone.	"	"
345	"	MW - HW Fawn-grey brown iron oxide stained silicified quartz siltstone.	"	"
346	"	CW Dark grey massive dolomitic carbonaceous siltstone.	"	"
347	"	CW Grey finely laminar siltstone with phyllitic sheen to rock.	"	"
348	"	HW - CW Dark grey black very carbonaceous massive dolomitic siltstone, phyllitic sheen to rock.	"	"
349	GORDON LIMESTONE	MW-HW Dark grey, weakly pervasively dolomitized argillaceous limestone, minor calcite veining.	Moderate	"
350	"	MW-HW Grey interbedded limestone and dark grey to black laminar argillaceous, carbonaceous dolomite cut by calcite veinlets with minor limonite staining.	Strong	Nil
351	"	CW Light grey argillaceous limestone, minor calcite veining (sparry).	"	"
352	RECENT	Grey fawn, hematite stained quartz sand/silts.	NIL	"
353	GORDON LIMESTONE	CW Grey interbedded limestone and argillaceous limestone.	Strong	"
354	"	CW Grey argillaceous limestone.	"	"
355	"	CW Light grey-speckled white limestone with minor argillaceous dolomite, sparry calcite veined.	"	"

355356	GORDON LIMESTONE	MW-HW Light grey massive limestone/fine calcarenite with minor bands of orange dolomitic siltstone, numerous fine calcite veinlets, minor siderite blebs and accretions.	"	"
357	"	CW Light grey argillaceous limestone, minor calcite veining.	"	"
358	"	HW-CW Light grey interbedded slump textured limestone and darker grey argillaceous dolomite.	"	"
359	"	HW Light grey-grey massive crystalline argillaceous limestone, minor calcite veining.	"	"
360	"	MW-HW Light grey massive limestone with minor zones showing sparry recrystallization of micritic matrix.	"	"
361	"	CW Black carbonaceous (phyllitic sheen) dolomitic siltstone, massive, rare fine quartz grains.	NIL	"
363	"	HW-CW Mottled brown grey hematite stained siltstone - also vitreous coaly material.	"	"
363	"	MW White saccaroidal fine grained quartz arenite.	"	"
LN 4100N				
355611	OONAH Fm	CW Fawn-grey mottled micaceous siltstone.	"	"
612	"	CW Dark grey-black argillaceous phyllitic shale siltstone.	"	"
613	GORDON LIMESTONE	CW Grey silty limestone.	Strong	"
614	"	HW Grey massive textureless limestone.	"	"
615	"	CW Light grey cream limestone.	"	"
616	"	CW Grey argillaceous weakly carbonaceous limestone.	"	"
617	"	HW Grey siliceous very fine grained siltstone	Very Weak	"
618	"	HW Dark grey dolomitic argillaceous limestone.	Moderate	"
619	"	CW Grey textures weakly argillaceous limestone.	"	"
620	"	CW Light grey calcite veined interbedded dolomite/limestone	Strong	NIL
621	"	CW Light grey calcite veined limestone.	"	Pyrite
622	"	HW-CW Dark grey argillaceous dolomite.	Moderate	NIL
623	"	CW Mottled orange grey cream sideritic dolomite/limestone.	Strong	"

355624	GORDON LIMESTONE	CW Light grey cream weakly ferruginous limestone.	Moderate Strong	"
625	"	HW-CW Grey massive weakly carbonaceous, argillaceous limestone.	Strong	"
626	"	HW Grey calcite veinletted weakly dolomitized limestone.	Weak Moderate	"
627	"	HW-CW Grey interbedded argillaceous limestone minor dolomite.	Strong	Pyrite
628	CROTTY QUARTZITE	CW light grey cream phyllitic siltstone.	NIL	NIL
629	"	HW fawn cream brown fine grained well sorted quartz sandstone.	NIL	"
LN 4000N				
355380	OONAH Fm	MW-HW Fawn brown, massive fine siltstone with minor rounded quartz grains, hematite stained.	"	"
364	"	Speckled grey-white, very laminar dolomitic siltstone with cream kaolinitic laminae, minor siderite.	"	"
635	"	CW Grey massive dolomitic siltstone with minor fine grained dolomitic arenites, minor fawn siltstone clasts present.	"	"
366	"	HW Dark grey massive dolomitic siltstone with minor very fine grained veinlet pyrite.	"	Pyrite
367	"	HW-CW Dark grey weakly laminar to massive dolomitic siltstone, phyllitic sheen.	"	NIL
368	"	CW Black to dark grey finely laminar very carbonaceous phyllitic argillaceous shale, minor siderite vugh fillings.	"	"
369	"	CW Dark grey dolomitic weakly conbonaceous siltstone, phyllitic, minor quartz aggregates.	"	"
370	GORDON LIMESTONE	CW Grey weakly interbedded limestones and argillaceous dolomite, minor sparry calcite veinletting.	Strong	"
371	"	MW-HW Grey massive fossiliferous (bryzoan fragments) bioclastic limestone.	"	"
372	"	MW-HW Grey to light grey massive finely crystalline limestone, calcite veined.	"	"
373	"	HW-CW Grey limestone and minor black to dark grey carbonaceous dolomite.	"	"

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975042

LN 4000N

355374	GORDON LIMESTONE	CW Light grey limestone with very minor black carbonaceous dolomite.	Strong	NIL
375	"	CW Light grey calcite veined limestone.	"	"
376	"	CW Dark grey silty limestone containing abundant sparry translucent calcite.	"	"
377	"	HW Dark grey speckled white partially dolomitized carbonaceous limestone.	"	"
378	CROTTY QUARTZITE	HW-CW Dark grey-black carbonaceous dolomitic siltstone.	NIL	"
379	"	CW Cream fawn orange micaceous finely laminar siltstones, minor goerthite staining.	"	"

LN 3900N

355596	OONAH Fm	CW Black carbonaceous, phyllitic siltstone/claystone.	NIL	"
597	"	CW Mottled cream grey phyllitic shale and fine grained quartz sandstone.	"	"
598	GORDON LIMESTONE	CW Dark grey massive argillaceous limestone.	Moderate Strong	"
599	"	HW-CW Dark grey massive calcite veinleted argillaceous limestone, minor carbonaceous filled stylolites.	Strong	"
600	"	CW Grey microcrystalline and fine grained limestone.	"	"
601	"	CW Light grey calcareous muddy limestone/calcarenite, possible honey brown sphalerite?	"	Sphalerite
602	"	HW-CW Grey, pyritic, calcite veined carbonaceous limestone minor sphalerite?	"	Pyrite Sphalerite
603	"	CW Light grey mottled limestone.	"	NIL
604	"	CW Dark grey weakly layered argillaceous limestone.	"	"
605	"	CW Grey, micaceous, limestone with minor dolomite lamellae.	"	"
606	"	CW Grey weakly interbedded limestone-dolomite.	"	"
607	"	HW-CW Dark grey very argillaceous dolomitic limestone.	Moderate Strong	"
608	"	CW Grey cream calcite veined massive to weakly bedded limestone.	Strong	"
609	"	HW Grey, slightly ferruginous calcarenite minor limestone.	"	"
610	"	HW Grey-cream heavily siderite veinleted silicified limestone.	Weak	"

LN 3800N

355381	OONAH Fm	CW Grey-buff brown massive siltstone.	NIL	NIL
382	"	HW Dark grey carbonaceous phyllitic siltstone.	"	"
383	GORDON LIMESTONE	HW Black to dark grey carbonaceous dolomite.	Very Weak	Trace Pyrite
384	"	CW Light grey sparry limestone cut by white calcite veinlets.	Strong	nil
586	"	CW Light grey limestone.	"	"
587	"	CW Dark grey weakly bedded argillaceous weakly dolomitic limestone.	Moderate Strong	"
588	"	HW-CW Grey massive textureless argillaceous limestone.	Strong	"
589	"	CW Grey argillaceous calcarenite.	"	"
590	"	CW Grey weakly carbonaceous argillaceous limestone.	"	"
591	"	CW Grey weakly carbonaceous argillaceous limestone.	"	"
592	"	HW Dark grey calcite veined argillaceous weakly dolomitic limestone.	"	"
593	CROTTY QUARTZITE	HW-CW Dark grey dolomitic argillite, phyllitic sheen.	Moderate	"
594	"	CW Grey, trace siderite stylolitized calcareous siltstone.	Weak	Trace Pyrite.
593	"	CW light grey interbedded microcrystalline and fine grained calcareous siltstones.	Weak Moderate	NIL

LN 3700N

355575	OONAH Fm	CW Fawn brown massive siltstone, phyllitic sheen.	NIL	NIL
576	GORDON LIMESTONE	HW Grey calcite veined, trace siderite, limestone.	Strong	"
577	"	CW Light fawn grey-cream microcrystalline limestone.	"	"
578	"	HW-CW Mottled white limestone, minor orange fragments.	"	"
579	"	CW Grey, calcite veined silty limestone.	"	"
580	"	CW Grey textureless limestone, minor dolomite clots.	"	"
581	"	CW Fawn grey calcarenite containing detrital carbonate.	"	Trace Pyrite
582	"	CW Dark grey interbedded calcarenite dolomite.	"	"
583	"	HW Mottled grey cream moderately calcite veined silty limestone.	Moderate	"

LN 3700N cont

355584	CROTTY QUARTZITE	CW Cream micaceous quartz siltstone.	NIL	"
585	"	CW Cream-light grey calcareous calcite veined quartz siltstone.	Weak	"

LN 3600N

355385	OONAH Fm	CW Cream-yellow phyllitic shale containing minor clasts of hard massive brown quartzite.	NIL	NIL
386	GORDON LIMESTONE	CW Cream-grey calcareous quartz arenite, fine to medium grained, minor reddish brown sphalerite.	Moderate	Trace Sphalerite
387	"	CW Grey limestone minor sparry calcite veining, moderately silty.	Strong	NIL
388	"	CW Light grey limestone with minor carbonaceous dolomite and possible minor siderite veining.	"	"
389	"	CW Light grey finely crystalline limestone.	"	"
570	"	CW Grey, lead mineralized siderite calcite veined silty limestone.	"	Galena
571	"	CW Grey silty limestone.	"	Pyrite
572	"	CW Light grey silty limestone, minor carbonaceous lamellae.	"	NIL
573	CROTTY QUARTZITE	HW Amber brown to dark brown fine grained quartz sandstone.	NIL	"
574	"	HW-CW Fawn brown well sorted fine grained quartz sandstone.		

LN 3510N

355559	GORDON LIMESTONE	CW Light grey microcrystalline limestone.	Strong	"
560	"	CW Light grey white limestone cut by sparry calcite and trace siderite.	"	"
561	"	CW Grey limestone minor carbonaceous dolomite lamellae minor calcite veining.	"	"
562	"	CW Light grey - white medium to coarse grained calcarenite minor orange staining (limonite)	"	"
563	"	CW Grey limestone containing detrital carbonate grains.	"	"
564	"	CW Grey - dark grey silty limestone trace carbonaceous clots.	"	"
565	"	CW Dark grey carbonaceous argillaceous dolomite	Moderate Strong	"

LN 3510N cont.

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355566	GORDON LIMESTONE	CW Grey sparry calcite veined limestone.	Strong	"
567	"	CW Light grey cream argillaceous limestone.	Moderate	"
568	"	CW Light grey weakly calcite veined limestone	Weak Moderate	"
569	CROTTY QUARTZITE.	CW Amber brown phyllitic silty claystone.	NIL	"
LN 3220N				
355390	GORDON LIMESTONE	HW Light grey coarse crystalline sparry limestone/calcareous, moderately leached	Strong	NIL
391	"	HW Light grey massive limestone finely crystalline minor calcite veined.	"	"
392	"	HW Light grey limestone cut by minor calcite vein, minor carbonaceous dolomite.	"	"
393	"	HW Dark grey calcareous cemented carbonaceous dolomite, possible minor bioclastic fragments.	Moderate	"
394	"	CW Light grey silty limestone, minor thin calcite veinlets.	Strong	"
395	"	CW Light grey arenaceous silty limestone with minor quartz grains to 0.75gm, some limonite stained, minor carbonaceous dolomite.	"	"
396	"	HW-CW Grey calcite veined carbonaceous silty limestone.	"	"
397	"	MW Dark interbedded grey carbonaceous dolomite and grey limestone.	"	"
398	"	CW Light grey - grey puggy calcareous clays, minor calcite? veining.	"	"
399	"	MW Light grey sparry crystalline limestone, minor calcite veining.	Moderate	"
400	"	MW Light grey weakly bioclastic (shelly, oolites) sparry limestone minor limonite straining.	Weak	"
401	CROTTY QUARTZITE.	HW Light grey leached calcareous siltstone.	"	"

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LN 3150N

355546	OONAH Fm	CW Grey micaceous siltstone.	NIL	NIL
547	"	HW Grey calcareous? fine grained sandstone/ siltstone.	Weak	"
548	GORDON LIMESTONE	CW Grey sandy limestone with minor calcite veining.	Strong	"
549	"	CW Light grey finely micaceous limestone.	"	"
550	"	HW-CW Grey calcite veined limestone minor carbonaceous lamellae.	"	"
551	"	CW Dark grey weakly calcite veined argillaceous limestone.	"	"
552	"	MW-HW Light grey massive microcrystalline limestone.	"	"
553	"	HW-CW Light grey silty limestone.	"	"
554	"	CW Grey limestone minor carbonaceous lamellae.	"	"
555	"	CW Dark grey micaceous silty dolomite.	Moderate	"
556	"	CW Dark grey micaceous silty dolomite.	"	"
557	"	CW Light grey quartz arenaceous calcarenite/ limestone.	Moderate	"
558	GROTTY QUARTZITE	CW Grey calcareous siltstone, minor calcite veining.	"	"

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Geochemistry.

Hand contoured geochemical plans for Pb, Zn and Ag were produced at a scale of 1:2500 and are presented as Enclosures 3, 4, and 5.

The disconformable contact between the Crotty Quartzite and the Gordon Limestone may also have been the locus for minor lead-zinc mineralization brought on by minor tectonism creating considerable fluid movement during the upper Ordovician (Adams et al 1985). Lead values to 0.12% and zinc to 2.5% occur adjacent to or beneath the Crotty Quartzite from lines 3220N to 5000N. (Enclosures 3 & 4.)

Correspondingly the western portion of the gridded area hosts a major lead-zinc anomaly which lies coincident with the Despatch Fault zone. Here values range up to 1.0% Pb and 2.2% Zn and are probable due to major fissure veining in the Proterozoic rocks.

Further geochemical anomalies were delineated within the limestone two of which have dimensions of 250 x 150 metres (zone 1 3500N - 3750N) and 300 x 100 metres (zones 2 3850N - 4150N). Both these zones lie adjacent to major fault zones and zone 1 lies some 100 metres north of the Despatch workings. The zone 1 anomaly is also associated with arenaceous limestone possibly indicating a more permeable host rock for hydrothermal fluids to deposit their metals.

A third geochemical zone lying due north of the Crown workings and assaying up to 0.8% Pb and 2.2% Zn was tested by the BMR in 1954 (testing a coincident geochemical and geophysical response-no data on BMR holes).

It should also be noted that the anomalous geochemistry is not closed off south of line 3150N. The South Despatch workings which contain appreciable zinc - lead mineralization, with associated dolomite/siderite alteration lies only some 30 metres south of line 3150N and is evidenced on this line by values of 0.16% and 0.13% Zn.

Loftus Hills states in his Rotunda report that further workings occur within the town limestones i.e King Extended and that they may have exploited bedded sulphides.

Minor rock chip sampling surveys were conducted by Aberfoyle and P. Jones and associates close to known workings including the Tasmanian crown and Despatch workings (Enclosure 6). The results showed that the limestones are indeed highly anomalous with respect to lead and zinc and that the alteration (mainly dolomite and siderite) styles are quite strong.

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EXPLORATION POTENTIAL.

The tenement is considered to have excellent potential for hosting an Irish style SEDEX lead-zinc deposit associated with possibly the more arenaceous and or bioclastic carbonate sequence within the Gordon Limestone and lying adjacent to possible major structural zones (hydrothermal conduits).



P.A. JONES,
February, 1986.

APPENDIX 1

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RECORD No. 1966/163

ZEEHAN GEOPHYSICAL
SURVEYS,
TASMANIA 1947 - 1948

by

W.J. LANGRON

The information contained in this report has been obtained by the Department of National Development as part of the policy of the Commonwealth Government to assist in the exploration and development of mineral resources. It may not be published in any form or use in a company prospectus or statement without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

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FOREWORD

The surveys described in this Record were made in 1947 and 1948 and, although a draft report was written shortly after the surveys were completed, for various reasons it was not issued. However, the results of the surveys were made available to the lease holder.

The report is now issued, with minor alterations, in order to place the findings of the survey permanently on record.

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SUMMARY

Geophysical surveys were made by the Bureau of Mineral Resources in the Oceana, Silver King/Silver Bell, Town Limestone, and Austral areas of the Zeehan silver-lead mining field, on behalf of Zeehan Explorations. The purpose of the surveys was to detect and, if possible, to delineate bodies of massive galena, which are known to exist in parts of the field. The gravity method was adopted, as this was considered to be the most likely method of detecting the dense galena in the less-dense country rock. Tests were also made using the magnetic, self-potential, electromagnetic, and potential ratio methods.

In the Oceana area, several gravity anomalies were found, which are associated with known mineralisation. Testing of these showed that they are due mainly to the presence of siderite. Testing of other local anomalies in the Oceana area failed to reveal any associated mineralisation.

Several minor anomalies, which may be due to mineralisation, were found in the other areas, but, as far as is known, no testing of these has been carried out.

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1. INTRODUCTION

Early in 1947 the Bureau of Mineral Resources (BMR) received an application from Zeehan Explorations for a geophysical survey to be made in the Zeehan (Tasmania) silver-lead mining field. At that time the company was investigating occurrences of galena in limestone in the Zeehan area and some diamond-drilling had been completed for that purpose. Considerable difficulties had been experienced in these drilling operations owing to the presence of soft 'pug' and caverns in the limestone. The areas being prospected are largely covered by recent glacial deposits and consequently little useful guidance for drilling could be obtained from geological surveys.

In presenting the case for a geophysical survey, the company drew attention to the proved existence, in the Oceana area, of a vein of solid galena 14 feet wide at a vertical depth of 380 feet, and enquired concerning the possibility of using gravity meters to detect deposits of that nature. Several other limestone areas in the Zeehan field were to be closely examined and, if satisfactory results were obtained by the use of gravity methods in the Oceana area, there would be scope for the use of gravity methods in the other areas. Attention was also drawn to the Silver King/Silver Bell area (which is not a limestone area), where the company was engaged in prospecting by drilling.

The problem was examined from a theoretical viewpoint and it was shown that bodies of massive galena of the type known to exist in the Oceana area would, if they occurred at sufficiently shallow depth, produce measurable gravity anomalies. It also seemed likely that other methods might be applicable and the BMR agreed to carry out geophysical surveys in the Oceana and other areas.

The necessary pegging of traverses was done by the company. Field work extended from 2nd July to 12th December 1947 and from 20th January to 5th May 1948. The author was engaged on the survey for the entire period. J.E. Webb (geophysicist) was present for a large proportion of the time and L.A. Richardson paid two supervisory visits to the party. M.G. Allen and J. Colville (university undergraduates) and W. Foskett (Broken Hill South Ltd) joined the party for varying periods during 1948.

The location of the areas surveyed by geophysical methods is shown in Plate 1.

2. GEOPHYSICAL METHODS

Gravity method

A Heiland gravity meter No. 53 was used in the Oceana, Silver King, and Town Limestone areas. In the early work at Oceana a small barometric correction was included in the reductions because of a leak in the compensator drum of the gravity meter; repairs to the drum were carried out subsequently. The standard drift, free air, Bouguer, and latitude corrections were applied to the field readings. A slight variation in calibration factor occurred during the course of the work but generally the makers factor of 0.089 milligals per scale division was used in the reductions. An assumed rock density of 2.5 g/cm³ was included in the Bouguer correction factor applied in all areas.

The gravity meter had to be carried by hand over rough tracks from the roads to the areas surveyed and along the traverses.

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As a result, the instrument received numerous small shocks, which adversely affected its performance. Furthermore, weather conditions were at most times extremely bad owing to heavy rain and high wind. It is difficult to specify a figure, as a measure of precision for the results, that would apply to the whole survey, but a study of the misclosures in the Oceana and Town Limestone areas shows that the average misclosure is of the order of 0.05 milligal.

Magnetic method

The instrument used during the survey was a Watts Vertical Force Variometer with a sensitivity of 29.1 gammas per scale division. Variations in the vertical component of the Earth's magnetic field were measured and the presence of local anomalies established. The magnetic method was used in the Oceana and Silver King areas and along some selected traverses in the Town Limestone area.

Electrical methods

Electromagnetic, potential ratio, self-potential, and equipotential methods of survey were used in the Oceana area. Potential ratio tests were made over part of the Silver King/Silver Bell area and in the Austral area. Resistivity surveys were made in the Austral area and some tests were made with this method on an outcropping lode formation in the Town Limestone area. Self-potential surveys were also made in the Town Limestone area.

3. DESCRIPTION OF AREAS AND RESULTS OF SURVEYS

Oceana area

Description of the area. The Oceana area, situated approximately three miles south of Zeehan, is surrounded by prominent hills a few hundred feet high, which contain sandstone and conglomerate beds. The area of low relief inside the cordon of hills forms the Oceana area of interest and is believed to consist essentially of limestone, covered in part by glacial deposits and swamp. At the northern end of the valley, the limestone is bounded by a major fault, which has probably played a prominent part in the mineralisation that exists nearby.

Information regarding the known mineralisation is available from old mining records and from the results of diamond-drilling operations carried out by Zeehan Explorations.

The information from mine records is not very complete, but reveals that galena ore of good grade was mined at the 40-ft and 80-ft levels. The position of the workings is shown in Plate 2.

The diamond-drilling carried out by Zeehan Explorations revealed wide mineralisation in DDH Nos. 1 and 2 at the positions shown in Plate 2. DDH No. 1 intersected a zone of mineralisation 40 feet wide at a vertical depth of 100 feet. The zone was very low in silver and lead content and contained a high percentage of ferruginous material. The mineralised zone intersected by DDH No. 2 was about 14 feet wide at a depth of 380 feet, and consisted of high-grade galena ore. DDH No. 3 intersected a band of very low-grade mineralisation a few feet wide at a depth of 180 feet.

Density determinations made on drill cores from DDH Nos. 1 and 2 gave the following results:

Limestone	2.7 g/cm ³
Mineralised portion;	
DDH No. 1	3.3 g/cm ³
DDH No. 2	5.2 g/cm ³

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Gravity survey. The survey was commenced with traverses over the area of known mineralisation and later was extended to cover almost the whole of the valley. The survey was extended a few hundred feet to the west without difficulty, but because of the steep terrain, extension in other directions was impracticable.

The gravity results, corrected for free air and Bouguer effects are shown as profiles in Plate 3. Features of the results include:

- (1) A regional trend, in the form of a decrease in gravity values, from the central part of the area to traverse 10N.
- (2) A decrease in gravity values at the eastern end of most traverses.
- (3) Local gravity maxima.

The first two of these features are probably topographical effects due to the hills that adjoin the area along its northern and eastern limits. No attempt has been made to calculate these effects as no accurate contour plans were available. Terrain corrections were calculated for a few stations in the central part of the area but were found to be negligible.

The local gravity maxima are the features of main interest in the results because they could be due to mineralised bodies of density greater than that of the limestone. This supposition is supported by the fact that anomalies of this kind occur where mineralisation is known to exist.

To show the essential features of these anomalies it is necessary to remove the regional and topographic effects from the results. As a first attempt to do this, the profiles were taken separately and a 'normal' profile drawn by inspection, as shown in Plate 3. The local anomalies were measured from these 'normal' profiles along each traverse, and the results obtained were used to prepare the gravity contour lines shown in Plate 2. This treatment is considered to be satisfactory as a first step in delineating the form and distribution of the local anomalies. It is possible that some of these anomalies are due to variations in the thickness of the glacial material that covers part of the area; however, little information is available concerning the nature of such variations.

The outstanding features in the contour pattern are the central anomaly and the northern anomaly. Mineralisation is known to exist at a few places along the axes of both anomalies and it is considered likely that the distribution of these anomalies is directly related to the distribution of the principal mineralisation occurrences in those parts of the area.

An analysis of the anomalies was made by the method outlined by Hedstrom (1940), using a graticule prepared by W.D. Keating of the BMR. This analysis indicated that, if mineralised bodies are responsible for the anomalies, such bodies would be found at relatively shallow depth and would have substantial widths. Recommendations were made for testing the central anomaly at a vertical depth of 100 feet at positions 1, 2, and 3 as shown in Plate 2.

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This information was supplied to the company on 13th September 1948, and test drilling was subsequently carried out. The results, together with the results of other test drilling, are described in Section 4 of this report.

The form of the anomaly centred at position 5 is such that if it were due to a mineralised body, the body would be spherical or plug-like in shape. Recommendations were made to the company that the site of this anomaly and of the ones numbered 6 to 11 should be examined geologically, with the aid of costeaning if necessary, for signs of mineralisation. If mineralisation were found, it was considered that deeper testing would be warranted.

Magnetic survey. The area between traverses 9N and 3S was surveyed magnetically, using a Watts Vertical Force Variometer. The results are shown in the form of profiles and contours in Plate 5.

On traverses 9N, 8N, 7N, and 6N, an anomaly of low intensity, but with good definition, was found, and is probably related to the mineralisation intersected in DDH No. 1. The position of the anomaly agrees closely with that of the northern gravity anomaly. The mineralisation referred to above contains an appreciable amount of ferruginous material, and tests made on the drill core showed that the material is slightly magnetic. Specimens of mineralised drill core from DDH Nos. 1 and 2 were submitted to CSIRO for mineragraphic examination. The results are given in CSIRO Mineragraphic Report No. 390. It appears likely that the slight magnetisation detected in the material from DDH No. 1 is due to iron carbonate.

The anomaly centred at 3W on traverses 2N, 1N, and 00 is probably related to the known mineralisation that is assumed to be responsible for the gravity anomaly there. However, whereas the gravity anomaly persists to traverse 3S, no magnetic anomaly is present in corresponding positions on traverses 1S, 2S, or 3S. It is not clear whether the anomaly at 1S/6E is due to an extension of the feature responsible for the anomalies referred to above or to a separate feature. A survey along traverse 4S would help to clarify the position.

The anomalies on traverses 4N and 3N at 6E are prominent features of the results, but it is possible that they are due to a buried pump column in the old main shaft nearby. No corresponding gravity anomalies are present.

Self-potential survey. This survey extended from traverse 10N to traverse 3S. The results are shown in the form of profiles in Plate 6.

The profiles are very irregular, owing largely to shallow-seated effects. The negative centre at 00/4W is almost certainly due to the mineralisation known to exist there. The site is near a gossan outcrop, which is well exposed in Fox's open cut. As no other anomalies are present along the line of this known mineralisation, it is probable that, in the region of Fox's open cut, the pyrite content of the mineralisation is greater than elsewhere, because this mineral is commonly found to contribute more to the self-potential effect than do other minerals.

There is no negative centre associated with the known mineralisation at the northern occurrence or elsewhere in the area surveyed. There are certain semi-regional features that may be related to geological conditions, but their interpretation in terms of geology is very uncertain.

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Equipotential survey. Plate 7 shows the distribution of a.c. equipotential (E.P.) lines in the central part of the area. The electrodes for the E.P. layout were at 15N/16W and 20S/16W. A weak indication was obtained from the known mineralisation of the central zone. This indication suggests that the body responsible extends from traverse 2N to traverse 00 and possibly to traverse 1½S. An anomaly of smaller dimensions and rather indefinite form indicates the presence of a conductive zone extending from 3S/6E to 4S/7E. The pronounced swing in the E.P. lines near traverse 4N is probably the normal behaviour of E.P. lines as one electrode is approached.

Electromagnetic survey. The area between 9N and 4S was surveyed by this method, with the primary cable along the 16W line. Real and imaginary vertical and horizontal components were measured. No anomalies were found that could be attributed to mineralisation, known or unknown.

Potential ratio survey. This method was used on all traverses, the near electrode being at 18W on various traverse lines. Electrode spacing was 50 feet. The results are shown in Plate 8 in the form of potential gradient profiles. As the known mineralisation does not produce definite anomalies, it is apparent that the results are of little use as an aid to the search for new occurrences. Certain features, such as the broad trough (i.e. the zone of relatively low resistivity) on traverses 7N, 6N, 5N, and 4N, and the relatively high gradients at the eastern end of traverses 11S, 12S, and 13S, may be related to geological conditions.

Silver King/Silver Bell area

Description of the area. The Silver King mine, near Zeehan railway station, was one of the earliest producers in the Zeehan field. Plate 9 shows the Silver King area, some of the mine workings, and the geophysical grid. The mineralisation occurs in a steeply-dipping fracture zone, the enclosing rocks being shales and sandstones. The fracture containing the main lode has been proved by mine workings to be continuous over a length of 750 feet. It is believed that its limits are determined by cross-faults, but no workings exist at the position of these faults to substantiate this belief. The main lode has been worked at the 105-ft, 175-ft and 245-ft levels. The lode material is siliceous and contains galena with subordinate sphalerite. Detailed records giving dimensions of the orebodies mined are not available, but the portions of the lode that have been stoped are apparently those carrying the concentrations of galena. The stopes are up to 300 feet in length and it appears likely that the average width of the rich ore mined was less than 2 feet. It is known, however, that the mineralisation in the lode channel is up to 20 feet wide in certain parts. The west crosscut at the 105-ft level intersected three lodges (Nos. 2, 3, and 4), the positions of which are shown in Plate 9. No. 2 lode is 3 feet wide and contains much sphalerite, No. 3 lode is 7 feet wide, and No. 4 lode is 2 feet 6 inches wide.

At the Silver Bell mine, the most important orebody (that worked by Fahey) was stoped over a length of 500 feet and contained bunches of galena 14 feet wide. Mining commenced on a gossan outcrop, which was replaced at a depth of 30 feet by solid galena, 4 feet wide. This lode continued downwards, with diminishing grade, for a further 60 feet. The southern end of the lode is terminated by a cross-fault. Plate 12 shows the position of the principal shafts and of Fahey's lode.

Gravity survey. The gravity results are shown in the form of profiles in Plate 10. The area surveyed included the Silver King centre and extended 500 feet to the north and 1500 feet to the south of the

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Silver King shaft, but because of streams and swamps, parts of certain traverses were not surveyed. The South King and Silver Bell centres were not surveyed by the gravity method. Traverse 11N was extended to 40W to cover the vicinity of the lodes intersected in the west cross-cut from the Silver King shaft.

The anomaly of about 0.15 milligals centred at 15N/1E could possibly be due to an orebody. As no corresponding anomalies occur on the adjoining traverses, the length of any such body would probably be less than 100 feet. Traverses 1N and 1S show increasing gravity between 8W and 2W and this could also be due to the presence of an orebody. Because of swampy ground, gravity readings could not be obtained along traverse 00 or the eastern part of traverse 1S. The gravity picture is therefore incomplete, but the results suggest that a more detailed survey, at a time when ground conditions are favourable, might worth-while in this part of the area. On traverse 11N, no gravity anomalies were obtained from the lodes intersected in the west cross-cut at the 105-ft level.

Magnetic survey. Magnetic vertical force profiles along traverses 16N and 6N are shown in Plate 11. The numerous and irregular disturbances are undoubtedly due to iron debris and houses, but in most other parts the magnetic values are particularly uniform. The only feature believed to be of interest is the weak anomaly at 7N/8E and 6N/10E. The anomaly is not very well defined and additional work would be needed for clarification. It is possible that the anomaly is due to a slightly magnetic body at 6N/10E striking towards 7N/8E.

Self-potential survey. Measurements were made along traverse 15N from 11E to 14W and along traverse 11N from 00 to 40W. The results are shown in Plate 11. The profiles are very irregular and no well-defined anomalies are present. The negative values at 3E and 4E on traverse 15N could possibly represent a negative centre of small magnitude, but this is of interest only because it lies on or near the continuation of the line of strike of the Silver King lode channel. The possible existence of mineralisation at 15N/1E, where a small gravity anomaly exists, was not confirmed. The lodes intersected in the 105-ft level west crosscut produced no self-potential anomalies along traverse 11N.

Potential ratio survey. This method was used on the Silver Bell area only, where seven traverses were surveyed between 23S and 35S. The results obtained are shown in Plate 13 in the form of profiles of potential gradient. It is considered that the only feature of possible interest in the results is the slight difference between the average magnitude of the gradients over certain parts of the area. This difference is best shown on traverse 31S, and a possible interpretation of this feature is that the rocks along this traverse from 8E to 20E are more resistive than those from 8E to 20W. Extending this interpretation to the other traverses, corresponding points are obtained where the difference in potential gradient is most marked; the position of many of these points is very doubtful. The line formed by joining the points is shown in Plate 12.

Town Limestone area

Description of the area. The Town Limestone area, the position of which is shown in Plate 1, is fairly flat and soil-covered. Further to the north, the limestone country becomes swampy. A prominent sandstone ridge lies to the east of the limestone, and Argent Flat, an area

of slates and sandstone, lies to the west.

Minor occurrences of mineralisation have been found at several places in the area and exploration to a depth of 80 feet has taken place in the Despatch shaft. The position of the geophysical traverses is shown in Plate 14. Prior to the geophysical survey, exploration by the company included several diamond-drill holes and costeans, but no important mineralisation had been found. The diamond-drilling conditions were bad and core recovery was poor.

Gravity survey. The results of the gravity survey are shown as profiles in Plate 15. The principal feature of the results is the strong regional increase in gravity towards the south-west. This persists over the whole of the area surveyed and for a distance of 3300 feet on traverse 6N, which was extended to the south-west across Argent Flat. This feature is no doubt due to some geological condition of major proportions, such as the distribution of denser rock material at depth, and a gravity survey of a large part of the Zeehan field would be needed to determine the nature of this trend. It is possible that the results of such a survey would be of value in connection with the mineralisation distribution on a regional scale.

Anomalies that would be produced by orebodies of the Oceana type would, if present, be superimposed on the regional effect. It is clear from Plate 15, that no such anomalies exist. Some small anomalies are present, such as the one centred at 15N/37W; this anomaly could be due to a shallow-seated orebody of small dimensions.

Self-potential survey. Some tests were made on a few traverses, but the work was not very extensive and the results are of little interest.

Resistivity survey. Some tests were made along a traverse that crossed a mineralised zone exposed by costeans near the Grand Hotel. This zone, approximately 8 feet wide, occurs at the junction of sandstone and tuff, and contains scattered masses of solid galena and much iron oxide down to the exposed depth of 6 feet. The tests consisted of standard four-electrode (Wenner) determinations of resistivity, using electrode separations of 5 feet, 10 feet, 20 feet and 30 feet, at intervals of 25 feet along the traverse. No anomaly was obtained that could be related to the mineralised zone. The resistivity of both the sandstones and tuffs was found to be of the order of 10,000 ohm-cm.

Austral area

Description of the area. Plate 16 shows the area surveyed and the position of the workings, and also includes the principal geophysical results. The flux quarries contain iron oxide deposits of irregular form. The mine workings further south operated on silver-lead occurrences distributed irregularly throughout a 'black pug' formation of substantial width. The company's geologists believe that this formation might contain enough lead and silver to be of interest as a low-grade mining proposition and attempts were made to determine the boundaries of the mineralisation. Because of poor ground conditions, diamond-drilling near the flux quarries, from both sides, failed to prove the boundaries. The area was therefore proposed for geophysical investigation. As an additional means of exploration, the company later completed several long costeans across the area and assays were made along these. The results of these assays have been made available to

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 the BMR. The 'black pug' formation is believed to occur in limestone near the contact between limestone and quartzite, which occurs adjacent to the workings on the south-western side. The limestone forms an area of low relief and mostly swampy ground on the north-eastern side of the roadway, and the quartzite forms a prominent area of high ground.

Resistivity survey. Resistivity tests, using a constant electrode separation of 25 feet, were made along traverses 5 and 6. The results (Plate 16) show that the resistivity values over the limestone on traverse 5 are fairly constant at about 20,000 ohm-cm. The higher resistivity values west of 13W are probably due to quartzite in situ or quartzite detritus. The limestone/quartzite contact on traverse 5 may be placed at about 14W, on the basis of these results, or further west if there is a substantial thickness of quartzite detritus present on the sloping ground in this vicinity. The contact is not so well defined on traverse 6. On the evidence obtained from the resistivity tests along traverses 5 and 6, it was considered that it might be possible to locate the position of the limestone/quartzite contact by electrical survey, but it was thought unlikely that the boundaries of the 'black pug' could be determined. As the next step in the investigation, it was decided to survey the area by the potential ratio method.

At a later stage in the survey, some detailed resistivity measurements were made along trench 10A; the results of these are included in Plate 16. The principal feature of these results is a zone of relatively low resistivity, about 10 feet wide, centred at 50W. The centre of the zone is 76 feet from the edge of the road. The assay plan for this costean shows good lead values between 86 and 96 feet from the edge of the road. Negligible lead values were obtained from the zone of low resistivity.

Potential ratio survey. All traverses were surveyed by this method, using 50-ft electrode spacing. The potential gradient profiles are shown in Plate 16.

The troughs on these profiles are due to zones of relatively low resistivity. On the plan of the area, the axes of the troughs form two lines, one extending from traverse 5 to traverse 15 and passing through the mine workings, and the other extending from traverse 1 to traverse 6 and passing through the flux quarry area. Examination of the assay plan for the costeans fails to reveal a consistent relationship between the position of these lines and the high lead assays. It is possible, nevertheless, that the relationship is better at depths greater than those of the costeans, and if so, these potential ratio results may be a useful guide for further exploration.

It is considered that the trough centred at 15E on traverse 3 should be tested for mineralisation. If favourable results are obtained there, additional potential ratio surveys would be justified.

4. TESTING OF SURVEY RESULTS

In accordance with the recommendations submitted to the company on 13th September 1948, the central gravity anomaly on the Oceana area was tested by drilling, at the anomaly centres 1, 2, and 3 (Plate 2). Holes were drilled from the east side and intersected each anomaly zone at a vertical depth of about 100 feet. Favourable results were obtained at anomaly centres 1 and 2 but not at centre 3. The density values and assay results of the drill cores are tabulated below.

DDH No. 27 (anomaly centre 1)

Collar at 1N/28 feet west (geophysical co-ordinates). Hole depressed 53 degrees in direction 217° (magnetic).

<u>Sample depth (ft)</u>	<u>Pb (%)</u>	<u>Density (g/cm³)</u>
87-90	1.2	3.8
90-93	5.7	3.8
93-96	4.5	3.5
96-99	15.2	4.0
99-102	3.6	3.7
102-104	5.3	3.7 Ave. density
104-110	2.6	3.9 = 3.7
110-113	6.2	3.7 Hor. width
113-115	1.2	3.3 = 32 ft
115-118	18.0	4.0
118-120	9.4	3.7
120-123	3.6	3.6
123-126	1.7	3.6
126-129	4.6	3.7
129-134	4.8	3.7
134-139	2.7	3.8
139-141	11.4	3.8
141-145	9.3	3.9

DDH No. 28 (anomaly centre 2)

Collar at 00/23 feet west (geophysical co-ordinates). Hole depressed 53 degrees in direction 217° (magnetic).

<u>Sample depth (ft)</u>	<u>Pb (%)</u>	<u>Density (g/cm³)</u>
41-50 $\frac{1}{2}$	-	2.5
50 $\frac{1}{2}$ -52 $\frac{1}{2}$	31.0	4.5) Ave. density = 3.6
52 $\frac{1}{2}$ -58 $\frac{1}{2}$	not assayed	3.6) Hor. width = 11 ft
58 $\frac{1}{2}$ -69	not assayed	3.5)
69-83	-	2.6
83-87	6.3	3.6)
87-91	2.0	3.5)
91-94	0.9	3.5)
94-102	1.7	3.6) Ave. density = 3.6
102-109	Nil	3.2) Hor. width = 25 ft
109-112 $\frac{1}{2}$	25.8	4.2)
112 $\frac{1}{2}$ -117	9.1	3.8)
117-120	35.4	4.2)
120-123	6.2	3.3)
125	not assayed	3.4)
130	not assayed	3.0)

DDH No. 29 (anomaly centre 3)

Collar at 1S/4 feet west (geophysical co-ordinates). Hole depressed 53 degrees in direction 217° (magnetic).

<u>Sample depth (ft)</u>	<u>Density (g/cm³)</u>
15	2.1
50	2.8
80	2.6
110	2.7
115	2.7 Ave. density = 2.7
120	2.8
135	2.6
145	2.7
160	2.8
165	2.7
180	2.8
195	2.7
225	2.7
240	2.8

The sections in Plate 4 show the drilling results in relation to the gravity profiles.

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Comparison of the densities and lead assay values shows that in practically all instances the amount of galena present is not sufficient to account for the high density values, assuming that the remainder of the mineralised formation is limestone of density 2.7 g/cm^3 . This was pointed out to the company and check assays were made on certain samples from DDH Nos. 27 and 28. As the second set of assay results was substantially the same as the earlier ones, the investigations were taken further by the company, and iron, lime, and manganese determinations were made on four samples from DDH 27, with the following results:

Sample depth (ft)	%Pb	%Zn	%Fe	%Mn	%CaO	%CO ₂	Density (g/cm ³)
87-90	1.2	0.2	30.5	9.9	0.9	40.7	3.8
123-126	1.7	0.2	31.8	8.9	0.5		3.6
134-139	2.7	0.2	31.0	8.3	2.1		3.8
141-145	9.3	1.6	29.7	8.3	0.7		3.9

These results led to the conclusion that the high density of the material was due largely to the presence of siderite (density 3.83 to 3.88 g/cm^3) and rhodochrosite (density 3.45 to 3.60 g/cm^3).

The discovery is important from the geophysical aspect because it means that the gravity anomalies at Oceana are related more to the distribution of the carbonates mentioned than to galena, which is much less abundant. However, as the carbonates are often associated with galena, and are a feature of mineralisation zones at Zeehan, it is likely that their discovery will aid the search for galena.

It is clear from the above results that dense bodies of substantial width are present at shallow depth at anomaly centres 1 and 2 but not at the position drilled at centre 3.

At the time the recommendation was made for testing, it was realised that the drill hole proposed for the testing of anomaly centre 3 would be close to the assumed position of the old DDH No. 3, which intersected only a small amount of low-grade ore. However, it had been suggested by company personnel that the old DDH No. 3 might have been deflected, and it was therefore decided to recommend testing at anomaly centre 3 similar to that recommended at centres 1 and 2. When the results of DDH No. 29 became available, a closer examination was made of the measured gravity profile along traverse 1S. Attention was paid to the slight evidence suggesting that the body responsible for the anomaly has a westerly dip; this led to a recommendation for drilling from the west side to test at a vertical depth of 80 feet. This was accepted by the company and DDH No. 46 was drilled from the position 78 feet south/161 feet west (geophysical co-ordinates) in the direction 37° (magnetic) and depressed at 54° . The topography was not convenient for drilling on traverse 1S. The results from this drill hole are given below:

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Sample depth (ft)		Pb (%)	Ag (oz)	Zn (%)
0 - 81	Hard grey limestone	-	-	-
81 - 82	Low grade ore	2.6	0.3	0.1
82 - 83	Low grade ore	0.6	0.3	0.1
83 - 85	Calcitic Limestone	4.8	1.6	0.1
85 - 88	Calcitic Limestone	Nil	0.8	Nil
88 - 92	Calcitic Limestone	Nil	Nil	Nil
92 - 96	Calcitic Limestone	Nil	Nil	Nil
96 - 98	Calcitic Limestone	Nil	Nil	Nil
98 - 99	Dense grey rock	4.7	0.8	0.2
	No reaction to HCl			
99½ - 101	Dense grey rock	0.9	Nil	0.1
	No reaction to HCl			
101 - 157	Hard grey limestone			

Density values of cores from this drill hole were not determined. However, it is clear that the drill has intersected a mineralised zone between 81 and 101 feet and it is possible that dense material, containing siderite, extends beyond these limits.

Analysis of the gravity profile along traverse 18 suggests that the dense body responsible for the anomaly might be of limited depth extent. It was, therefore, recommended that another hole should be drilled from the same site as DDH No. 46 to test at greater depth. Accordingly, DDH No. 47 was drilled at the position 78 feet south/163 feet west (geophysical co-ordinates) in the direction 37° (magnetic) and depressed at 74°. The results from this drill hole are given below:

Sample depth (ft)		Pb (%)	Ag (oz)	Zn (%)
0 - 167	Limestone			
167- 172	Grey Ls. High Density	0.6	0.4	0.3
172-173½	Grey Ls. High Density	5.9	1.4	Nil
173½-175	Grey Ls. High Density	0.4	Nil	Nil
175-177	Grey Ls. High Density	1.4	0.5	0.6
177-180	Grey Ls. High Density	Nil	Nil	Nil
180-182	Grey Ls. High Density	3.2	0.4	Nil
182-185	Grey Ls. High Density	2.1	0.4	Nil
185-232	Hard grey siliceous Ls.			

These results suggest that the dense body in this position has a true width of 5 feet as compared with 12 feet in DDH No. 46.

It will be seen from Plate 4 that the mineralised body intersected in DDH No. 47, which is 20 feet to the north of the section line, was not intersected in DDH Nos. 3 and 29, which are on the section line. This suggests that, within the spacing of 20 feet, the bottom of the mineralised body has risen to a point above DDH No. 29 or has ended completely within that 20 feet. The latter seems unlikely in view of the geophysical evidence available.

A further recommendation was made to test along traverse 23 at a vertical depth of 75 feet below the position of the anomaly axis; it is understood that a hole was drilled in this position, but no results are available.

In accordance with recommendations made to the company, a costean was placed across anomaly centre 5, but showed no evidence of mineralisation. The company subsequently tested this anomaly by drilling DDH No. 44 at 1½S/54 feet east (geophysical co-ordinates) in the

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but no dense body was revealed. Density measurements were made of samples from this drill hole.

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The company then drilled DDH No. 45 at 153 feet south/20 feet east (geophysical co-ordinates) in the direction 37° (magnetic) and depressed at 50° (Plate 4). Drilling was stopped at 241 feet, to which depth no mineralisation had been found; it was pointed out to the company that if no dense body were found at a depth of 100 feet, there was no reason, on geophysical grounds, for testing at a greater depth. Density measurements on samples from DDH No. 45 revealed that a zone of porous rock of density about 1.7 g/cm^3 is present between 29 feet and 90 feet. It is possible that this material has contributed towards the low gravity values between the central anomaly and anomaly centre No. 5. These low values might serve to accentuate the anomaly at centre 5 on one side, and the terrain effects might accentuate it on the other side. In the same way, the southern part of the central anomaly would also be accentuated. The position of this porous rock is shown in Plate 4.

Recommendations were submitted for testing the northern anomaly at centre 4 and an attempt was made to drill from the north side. This failed, because of bad ground, and another attempt was made to drill from the south side, but this also failed.

As stated earlier, a general recommendation was made for preliminary shallow testing of the local anomalies 6 to 11 by costeans, pits, or shallow boring. Because of manpower difficulties, the company was unable to arrange for such work and decided to test the anomalies by drilling. This was carried out at depths ranging from 75 feet to 100 feet but no mineralised bodies were found. It is probable, therefore, that these anomalies are due to variations in the thickness of glacial deposits or other geological irregularities, and in some cases partly to terrain effects.

5. CONCLUSIONS

In the geophysical surveys at Zeehan, attention was concentrated on the use of the gravity method. The problem, namely the detection of relatively small, dense bodies in limestone, was one which needed the utmost accuracy in the field measurements, because only small anomalies were expected. Operating conditions were poor, owing to the severe climate and the need for man-handling the gravity meter into the areas and along the traverses. In the Oceana area, the gravity meter had to be carried by hand for distances of up to three-quarters of a mile from the nearest road.

The principal scene of operations was the Oceana area, where well-defined gravity anomalies were found to be associated with known centres of mineralisation. Testing of the central anomaly revealed the existence of dense bodies responsible for the anomaly at centres 1 and 2 and near to centre 3. Testing was also carried out at the southern end of this anomaly but no results were available at the time of writing this report. Testing of the northern anomaly failed because of unsuitable drilling conditions. It is likely that the configuration of the central and northern anomalies will provide useful evidence concerning the distribution of the upper parts of the mineralised bodies in this region, and should be a useful guide for future exploration.

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All other local anomalies were tested by drilling, but no mineralised bodies were revealed and, as far as is known, no other dense bodies were found that could account for the anomalies. It is therefore considered that these anomalies are probably due to such features as variations in thickness of overburden, terrain effects, or geological discontinuities within the limestone.

The investigation of the mineralised zones showed that the anomalies measured are due largely to the presence of siderite, and as this is a common constituent of mineralised zones in the Zeehan area, it can be expected to play an important part in any future gravity survey.

The gravity surveys in the Silver King and Town Limestone areas revealed no anomalies of interest.

The electrical surveys at Oceana failed to give distinct indications over the known mineralisation and elsewhere. This suggests that the galena distribution within the mineralised bodies is spasmodic and does not form continuous conductors of substantial length. Siderite is not a good electrical conductor. The electrical surveys elsewhere were more in the nature of tests and the results were not very promising. However, there appears to be scope for the use of electrical methods in other areas at Zeehan, particularly in the areas of strong relief, which are not suitable for the type of gravity survey necessary.

Up to the time of writing, there is no evidence of the existence of magnetic minerals such as pyrrhotite and magnetite in association with the mineralised bodies at Zeehan. It is likely, however, that some of the iron carbonates are slightly magnetic and it is possible, therefore, that the magnetic method may be of use in tracing the mineralised zones.

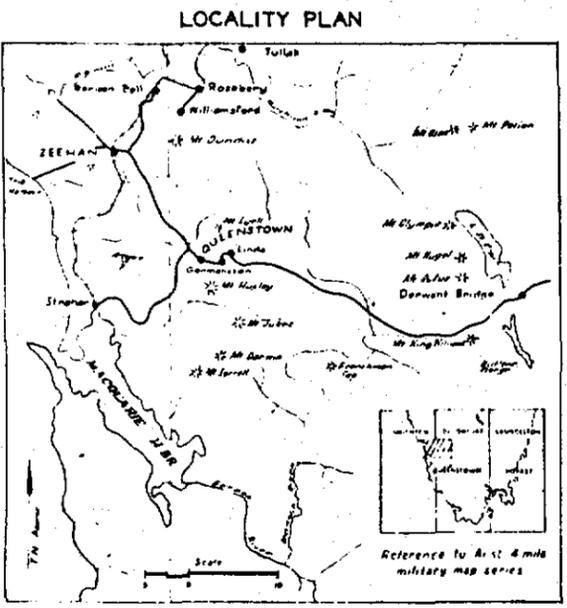
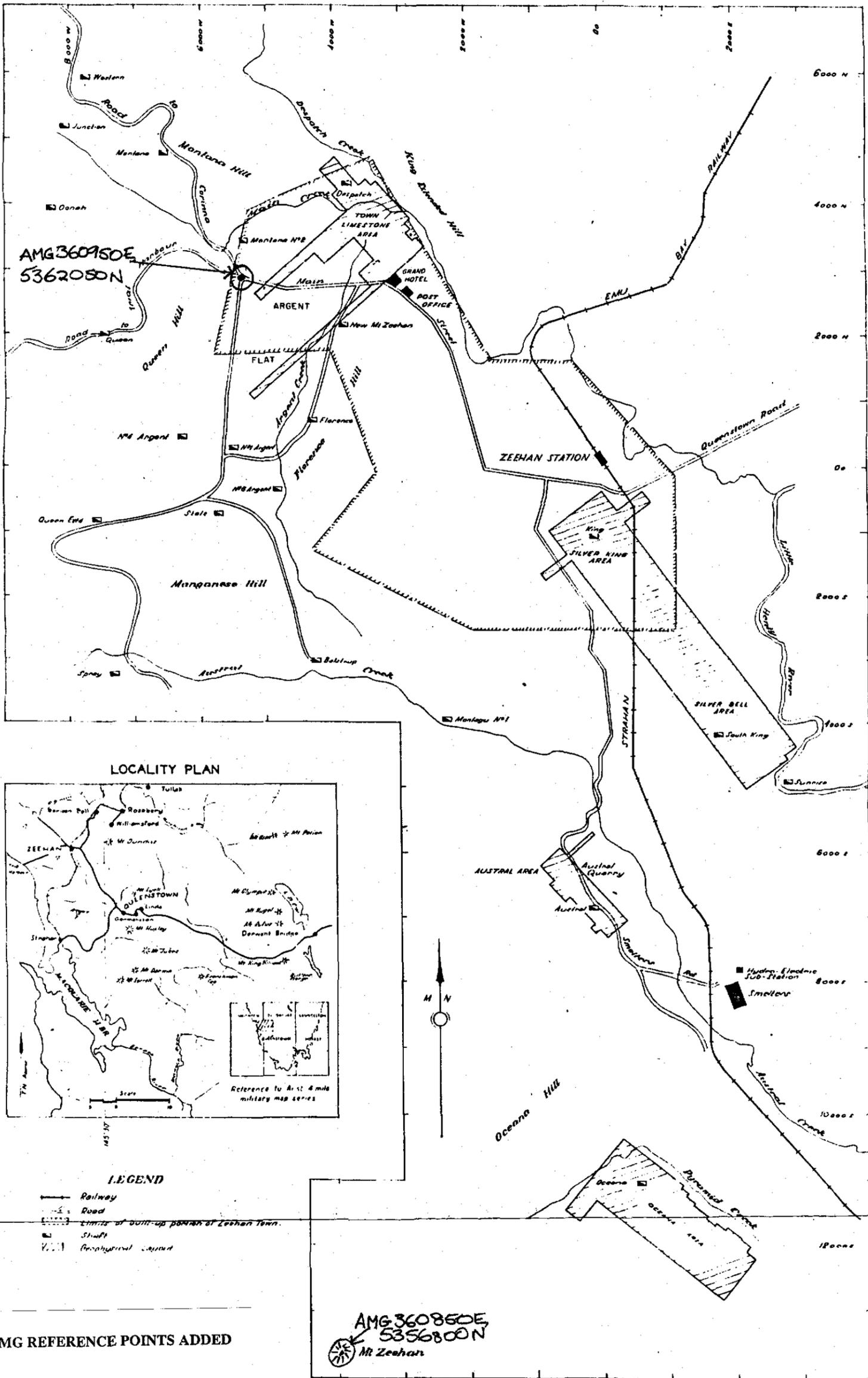
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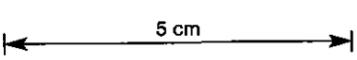
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- LEGEND**
- +—+— Railway
 - Road
 - Shaded areas of built-up portions of Zeehan town.
 - Shaft
 - Geophysical survey

AMG REFERENCE POINTS ADDED

AMG 360850E
5356800N
Mr Zeehan

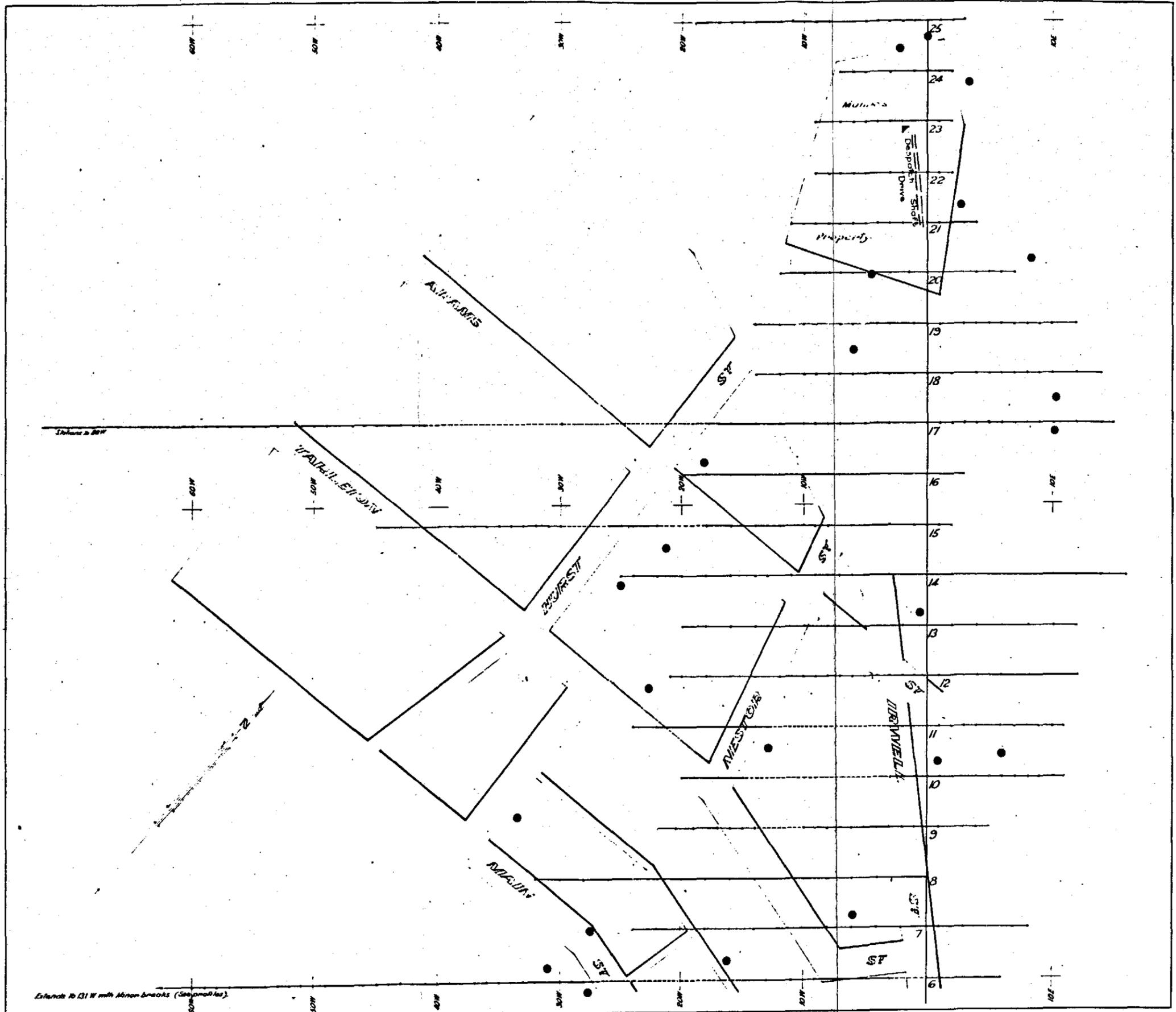


GEOPHYSICAL SURVEY AT ZEEHAN, TASMANIA
LOCALITY PLAN
 SHOWING
 GEOPHYSICAL SURVEYS

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5 cm

GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES GEOLOGY & GEOPHYSICS.

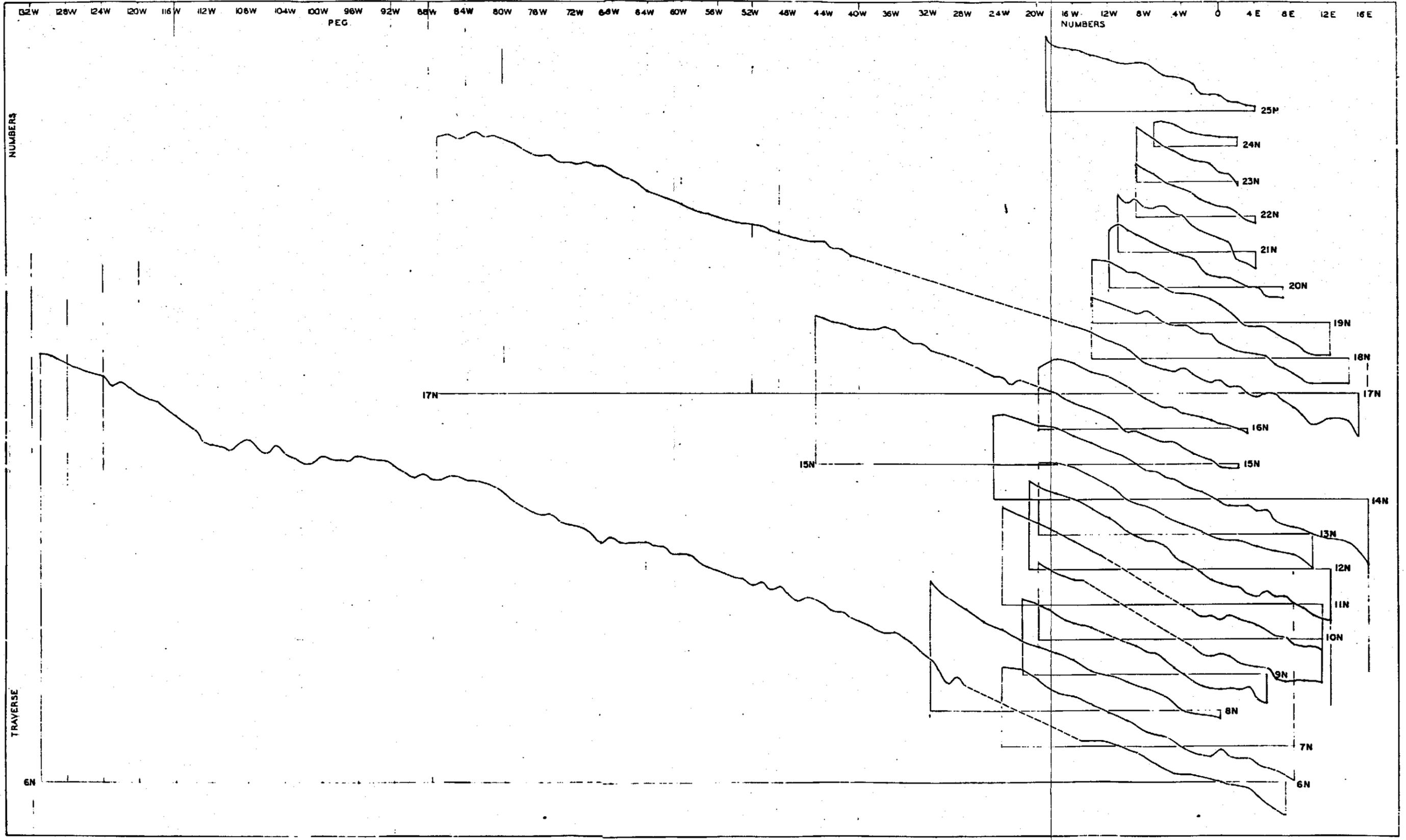
ZEEHAN GEOPHYSICAL SURVEY

TOWN LIMESTONE AREA

LOCATION OF TRAVERSES

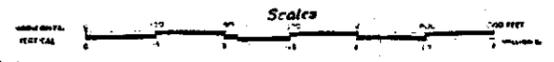
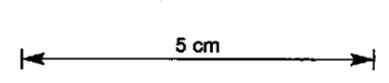
Position of mineralisation traces; occurrences shown thus: •

Scale 0 100 200 300 400 FEET.



GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES GEOLOGY & GEOPHYSICS.

ZEEHAN GEOPHYSICAL SURVEY
TOWN LIMESTONE AREA.
GRAVITY PROFILES



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APPENDIX 2

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RECORD No. 1965/138

ZEEHAN GEOPHYSICAL SURVEY,

TASMANIA 1954

by

J. DALY

The information contained in this report has been obtained by the Department of National Development as part of the policy of the Commonwealth Government to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus or statement without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

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Plate 8. Cross-section through DDH No. 2, Limestone area	(K55/B5-79)

SUMMARY

An extensive geophysical survey using electrical and magnetic methods was made in the Zeehan area during 1954. The results were made available to the interested company, but no final report was issued. The results are presented in the present record.

Numerous strong anomalies were obtained, indicating that geophysical surveys can be of great assistance in prospecting the Zeehan mineral field. Three anomalous zones that appear to be of particular interest were located at and south of the Onah mine.

An anomalous zone in an area of limestone outcrop was located north of Zeehan. Testing confirmed that this zone is associated with sulphide mineralisation, but owing to very difficult drilling conditions, no estimate of grade was obtained.

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1. INTRODUCTION

At the request of the Montana Silver Lead Company N.L., the Bureau made an extensive geophysical survey in the Zeehan area during 1954. The work was under the supervision of Dr. O. Keunecke. The results were made available to the company, and a certain amount of exploration was done on the basis of them, but a final report on the survey was not issued.

For several reasons, publication of the report in its original form would not be warranted: the interested company is no longer in existence; since the date of the survey, a comprehensive report on the geology and mineral resources of the Zeehan field by Blissett (1962) has appeared, which may be considered as superseding previous accounts; certain parts of the survey area have been examined geologically and geophysically in more detail by other companies.

The purpose of this Record is to place on record the results of the survey, so that they may be available to any company proposing further exploration in the survey area.

2. THE ZEEHAN MINERAL FIELD

The Zeehan quadrangle, as described by Blissett (1962), contains a variety of types of mineralisation, including the tin fields of Renison Bell and Haemskirk, the Cuni copper-nickel field, and the Dundas and Zeehan silver-lead fields. In the immediate neighbourhood of Zeehan, production has been practically confined to silver-lead ore.

The Zeehan field was a major producer of lead and silver, mainly from relatively short shoots of extremely rich ore, up to about 1920; since then the old workings have been abandoned, except for occasional small-scale tributing operations. Between 1950 and 1959, two mines operated: the Oceana mine, a large-scale operation by Zeehan standards, but mining ore of lower grade; and the Montana Silver Lead Company mine, which was only a small producer. (To avoid confusion, it should be noted that the workings of the Montana Silver Lead Company are quite distinct from the workings of the Zeehan Montana mine, which was one of the main producers in the early days of Zeehan).

The orebodies occur mainly in the Onah Quartzite and Slate, of late Precambrian and possibly early Cambrian age. Some orebodies occur in limestone. The whole field is an area of great structural complexity, much disturbed by small-scale faulting, which has occurred at various times up to the Tertiary. The rich ore-shoots are limited in depth, and practically no ore of economic grade has been found below a depth of 500 feet, with the exception of the stannite lode of the Onah mine, which has been intersected in drill holes at greater depth. Mining has been made difficult and costs high by the geological conditions, particularly the large volumes of ground water that must be handled. Full descriptions of all the mines are given by Blissett (1962).

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3. METHODS USED

The methods used were electromagnetic (Slingram), self-potential, and magnetic. Geochemical samples were taken along traverses that showed electromagnetic anomalies, and were assayed for lead by colorimetric methods.

4. RESULTS

Owing to the irregular shape of the area covered, it has been divided into four separate areas, and the results over each area are shown on separate plates. Plate 1 is a plan of the whole area, showing topographic information and the location of the various sections. The results are shown in Plates 2-6.

5. DISCUSSION OF RESULTS

The results show a number of anomalous zones, which show up most clearly as self-potential anomalies. They are discussed briefly below under the various areas. Later exploration has provided information on the causes of some of the anomalies.

There is one point which may be mentioned in connection with the interpretation of self-potential anomalies in general. The theory of the processes causing such anomalies is very incomplete. Various theories have been suggested by specialists in electrochemical processes, but they appear to be open to objection from the practical view point. However, it has been suggested theoretically, and it is consistent with experience generally, that very large self-potential anomalies should be regarded with suspicion. Empirically, it seems that anomalies of the order of 600 millivolts and upwards are often associated with graphitic mineralisation. Graphite is commonly present in the Zeehan field, and because of this, it is difficult to recommend the testing of some of the large-amplitude anomalies observed.

Montana/Big Ben area

Two main anomalous zones were discovered in this area (Plate 2). One is north-east of the Montana Silver Lead Company mine. It consists of several very large self-potential anomalies, which are associated in some places with weak electromagnetic anomalies. Geochemical testing over some of the anomalies showed either very weak or no anomalies. It seems probable that these anomalies are due to graphite-rich zones and no testing is recommended.

The other zone is west of the Big Ben shaft and contains two long, narrow, self-potential anomalies of moderate amplitude and westerly strike, in contrast to the north-easterly strike of all the lodes known in the area. Electromagnetic and geochemical anomalies are weak.

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The cause of these anomalies is obscure. They would be worthy of some attention by trenching, but the very poor production record of the Big Ben lodes, as given by Blissett (1962), does not encourage any strong recommendation for testing.

Electromagnetic and magnetic anomalies were found over the Montana Silver Lead Company workings, but the results give no reason for expecting the Montana lode to persist in length. Blissett (1962) recommends some testing of the ground between the Montana and Big Ben shafts, but the geophysical results do not suggest any targets in this area. However, the survey did not cover this portion of the ground in detail.

Barnett/Quigley area

This area (Plate 3) contains several very strong self-potential anomalies. They are generally associated with electromagnetic anomalies, some of which are very strong. Geochemical anomalies are generally weak, but in some places the lead values may be significant.

Blissett (1962) records that some of the anomalies were tested by trenching, which showed that the anomalies were mainly due to graphite. Information is not available to relate this testing to the anomalies, but, in view of the strength of the self-potential anomalies, the conclusion appears generally reasonable. However, in view of the high lead values encountered in some places, more systematic geochemical investigation may be warranted. Production from Barnetts and Quigleys workings was small.

Oonah/Queen Hill/Argent area

Results for the whole area are shown in Plate 4, and the results for the Queen Hill/Argent area in Plate 5. Three main anomalous zones are present, one associated with the Oonah and Bradshaws lodes, one lying a little to the south of the Queen No. 5 shaft, and one on Queen Hill, associated with Clarkes and Taylors lodes.

The results need not be discussed in detail here, as most of the area was covered by later more-detailed surveys. Reference should be made to the reports on these surveys for recommendations for testing (Gardener, 1964 and Williams, 1965). The Oonah zone has been tested and economic mineralisation was proved to extend to considerable depths. However, attention should be drawn to the zone near the Queen No. 5 shaft, which has not yet been tested. Gardener (1964) has given recommendations for drilling. Blissett (1962) recommended investigation of Clarkes and Taylors lodes, which would test the geophysical anomalies on Queen Hill.

Limestone area

This area (Plate 6) covers low-lying swampy ground, which is characteristic of limestone in the Zeehan area.

The main anomaly in this area appeared as a magnetic anomaly associated with weak self-potential and electromagnetic anomalies and very strong geochemical anomalies. This anomaly was tested by two diamond-drill holes, shown in Plate 6 as DDH No. 1 and DDH No. 2.

Drilling conditions were difficult and core recovery was very poor. Plates 7 and 8 show sections through these drill holes, together with colorimetric assays of sludge samples.

Because of the poor core recovery, the testing cannot be regarded as conclusive, but it supports the possibility that mineralisation of economic grade may be present. However, mining conditions in the limestone are likely to be very difficult, as demonstrated by the very poor core recovery obtained in the drilling.

6. CONCLUSIONS

The general conclusion may be drawn that geophysical surveys can give useful information on the Zeehan mineral field.

In the survey area, three types of anomalies were observed. In the northern part of the area, there are well-defined anomalies which can be attributed with varying degrees of confidence to graphite. The possibility of the graphitic zones containing sulphide mineralisation of economic grade has not been ruled out by the testing that has been done so far.

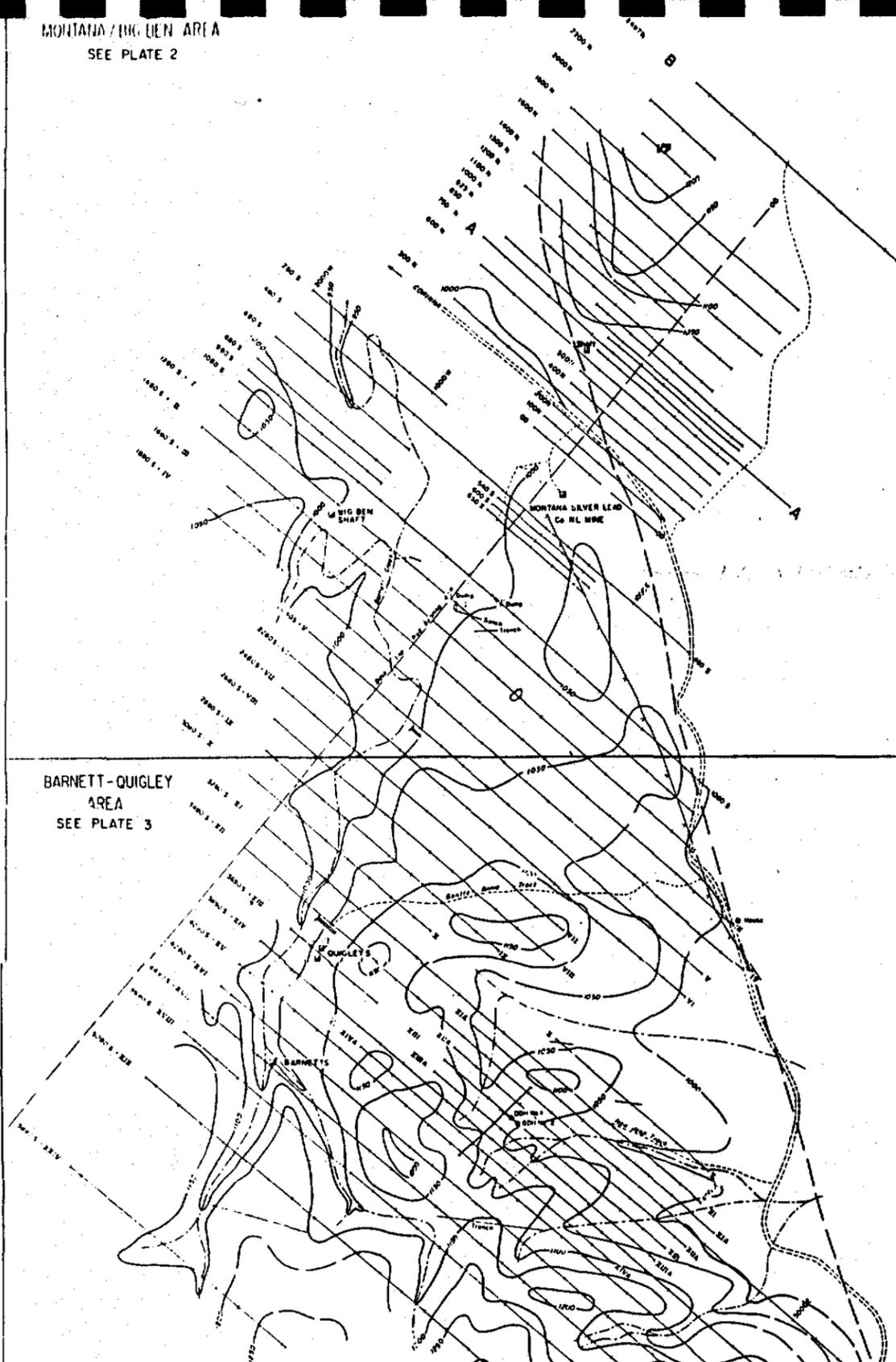
At the southern end, over the Oonah/Queen Hill/Argent area, three well-defined anomalous zones are present. Two of these, at the Oonah mine and in the Queen Hill area, are associated with mineralisation that is known to be of economic grade at the Oonah mine, and may well be so in the Queen Hill area. The third zone, close to the Queen No. 5 shaft, has not been tested, and appears well worthy of investigation.

In the Limestone area, there is an anomaly that is definitely associated with sulphide mineralisation, although testing so far has given no indication of the grade. It seems, however, that mining conditions in this area are likely to be so difficult that further testing is not warranted.

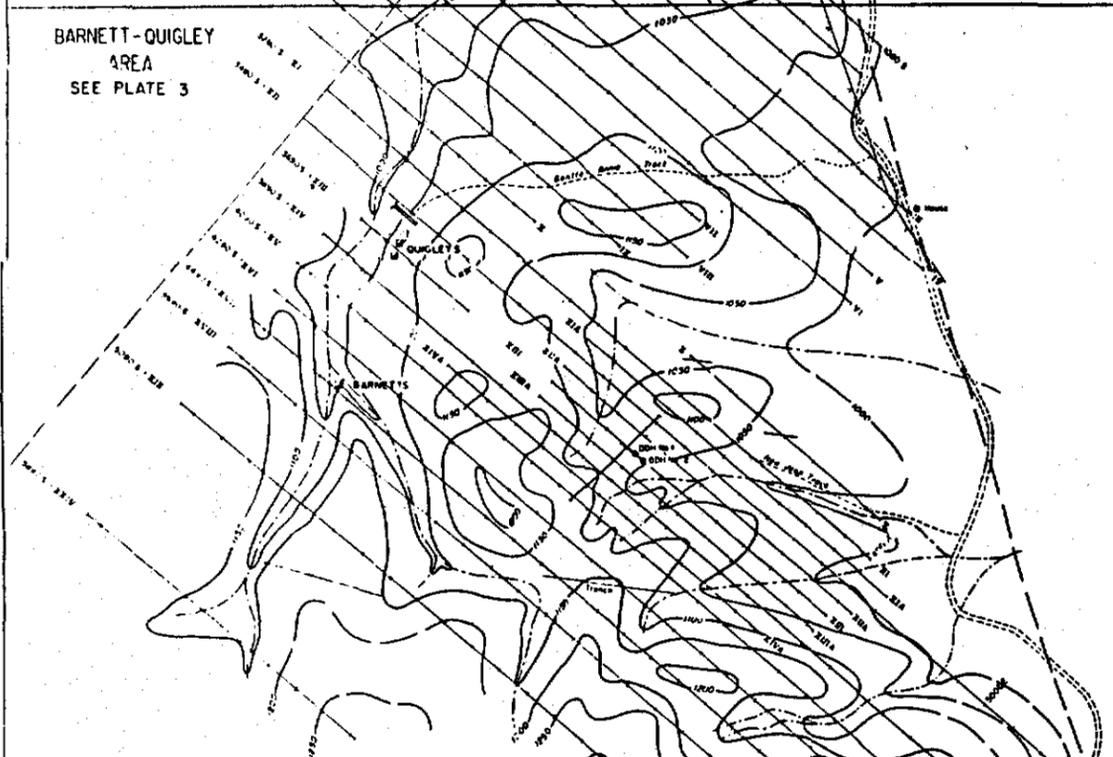
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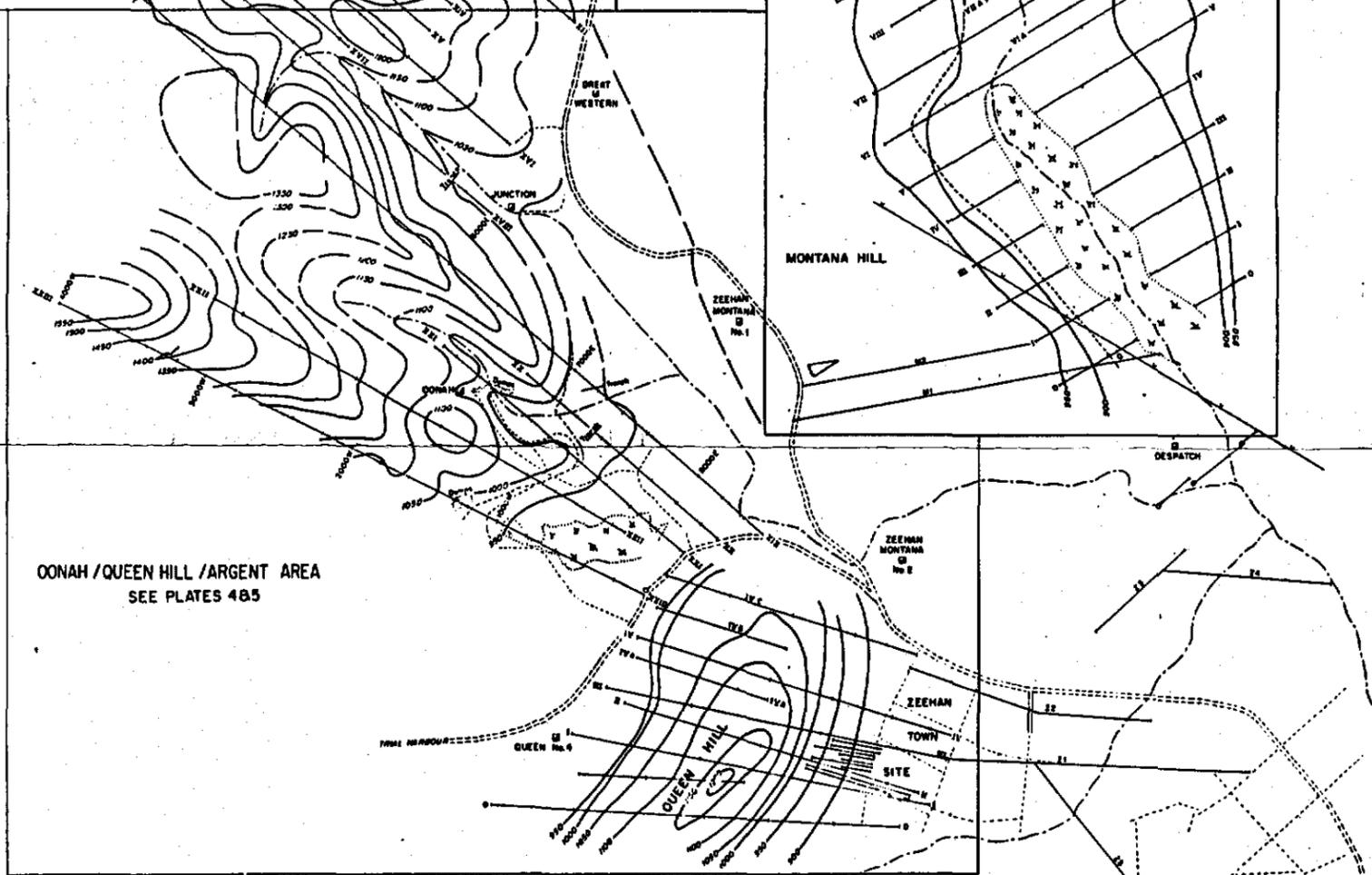
MONTANA / BIG BEN AREA
SEE PLATE 2



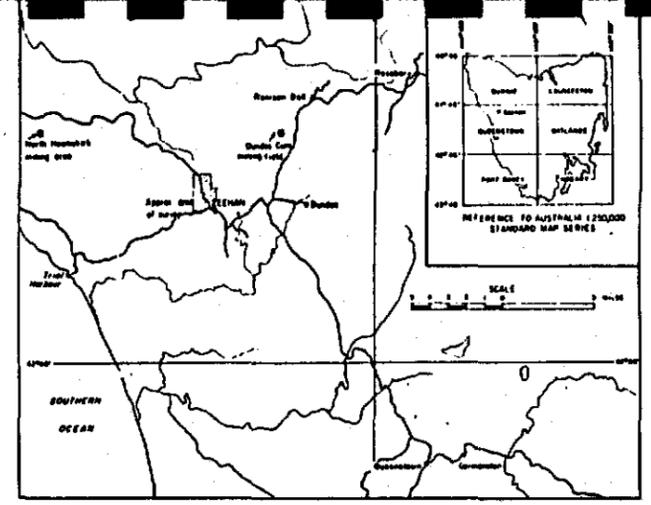
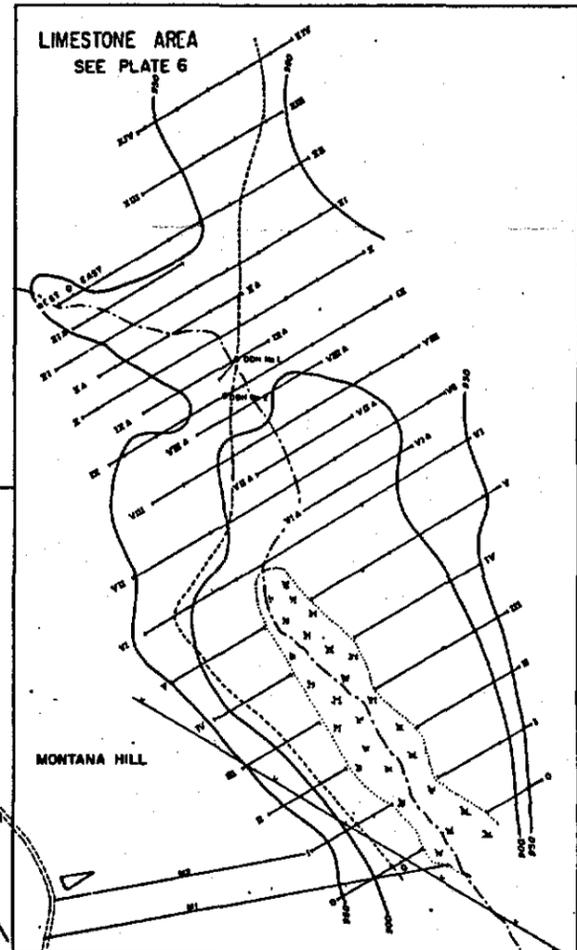
BARNETT - QUIGLEY AREA
SEE PLATE 3



OONAH / QUEEN HILL / ARGENT AREA
SEE PLATES 4 & 5



LIMESTONE AREA
SEE PLATE 6

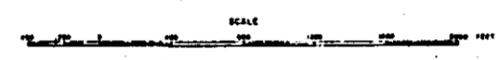


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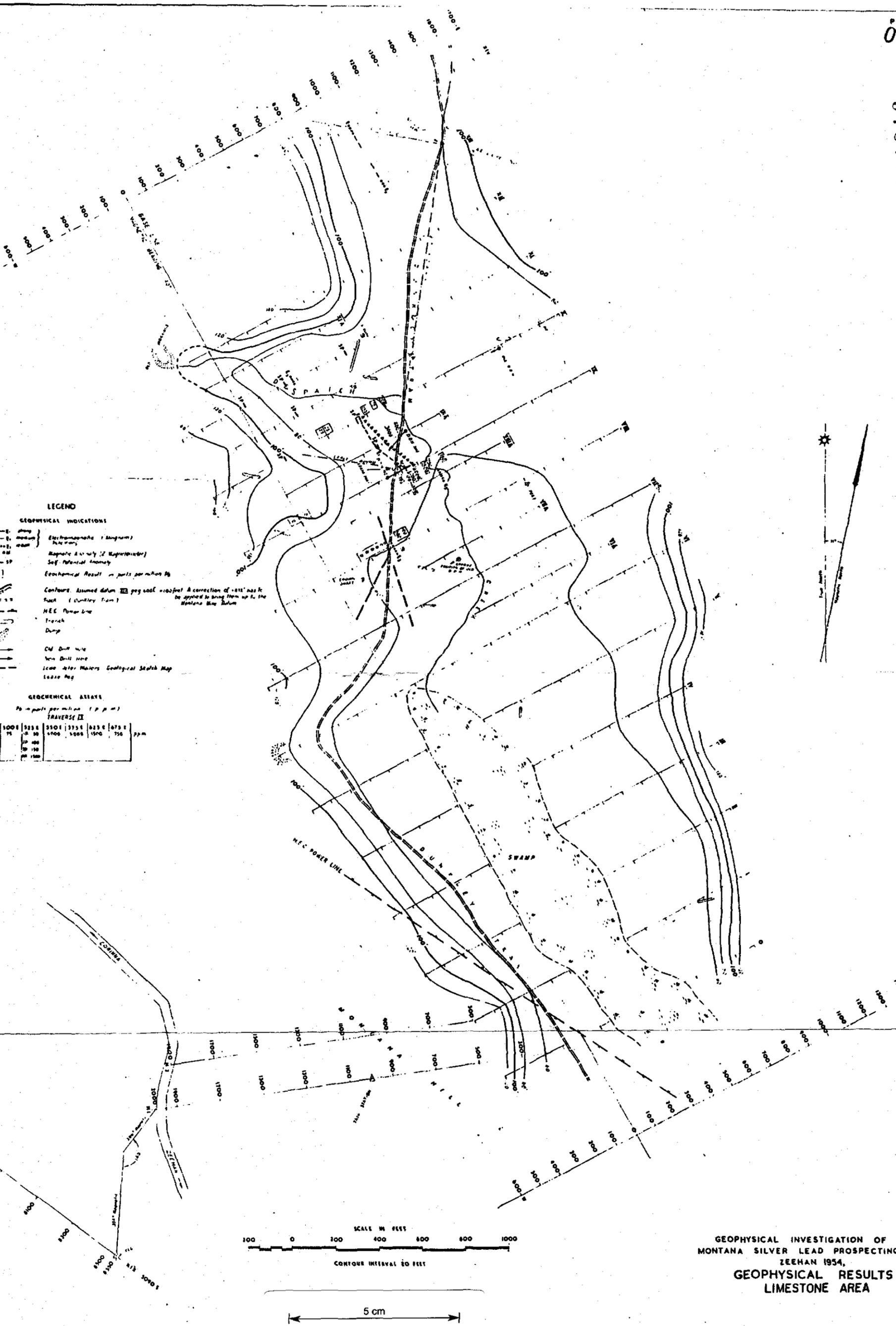
LEGEND

	Geophysical traverse
	Elevation contours (interval 50')
	Swamp
	High tension power line
	Road
	Ditch (old, new)
	Track
	Stream pattern
	Spot (contoured)

GEOPHYSICAL SURVEY ZEEHAN, TASMANIA
1954
LAYOUT OF TRAVERSES, TOPOGRAPHIC CONTOURS,
AND LOCALITY MAP



5 CM



LEGEND

GEOPHYSICAL INDICATIONS

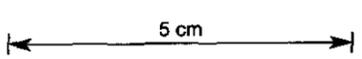
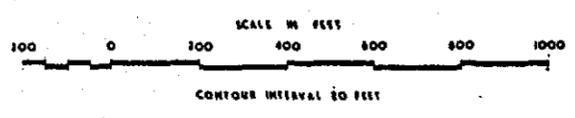
- (dotted) — Electromagnetic (Diagram) Indication
- (dashed) — Magnetic Anomaly (2 Magnetometer)
- (solid) — Self Potential Anomaly
- (dashed) — Geochemical Result in parts per million
- (solid) — Contours. Assumed datum is sea level. A correction of +215' has to be applied to bring them up to the Montana Base Datum (Cortley Tri-1)
- (dashed) — H.E.C. Power Line
- (solid) — Trench
- (dashed) — Dump
- (dotted) — Old Drill Hole
- (solid) — New Drill Hole
- (dashed) — Lead After Makers Geological Sketch Map
- (dotted) — Loose Peg

GEOCHEMICAL ANALYSES

Parts per million (p.p.m.)

TRAVERSE II

1000	525	550	575	625	675
75	100	1500	1000	1500	750
ppm					



GEOPHYSICAL INVESTIGATION OF THE
MONTANA SILVER LEAD PROSPECTING AREA
ZEEHAN 1954.
GEOPHYSICAL RESULTS
LIMESTONE AREA

APPENDIX 3

ROTUNDA.

975081

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3. OUTPUT AND PROFIT.
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 - (b) The Waller Unthrust.
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 - (b) Underground Evidence.
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OLD MINES IN LIMESTONE.ROTUNDA.

- (1) LOCATION AND ACCESS: The mine workings and the ore occurrences embraced under the title of 'Rotunda' are situated in the heart of Zeehan. They are located in Main Street and on either side of that street, with the Post Office as the approximate centre. Access is therefore less than one mile from the Zeehan Railway Station.
- (2) HISTORY: The area involved embraces portion of two of the earliest areas pegged in the Zeehan Field. Section 559M was the 80 acre pegged immediately south of and adjoining the original pioneering Despatch. This section together with section 909M was floated on 10th July, 1888 as the Mount Zeehan Silver Lead Mining Coy.

Section 804-87M was floated on 12th August 1889 as the Silver King Extended Silver Mining Coy. As its name implies it was floated as the area containing the 'northern continuation of the Silver King lode'.

Both companies had a very checkered career and neither accomplished very much.

The Silver King Extended Company was in 1500 shares of £1 each (contributing) the head office being in Launceston. On 11th December, 1890 it was refloated in Melbourne with 60,000 shares of £1 each; 33,000 fully paid to vendors, 27,000 contributing. Work was started early in 1891 but was intermittent. At one stage the miners ceased work because of non-payment of wages. On another occasion the Zeehan and Dundas Herald passed very caustic remarks about this mine 'in the very heart of the town in full sight of visitors' being manned by 'the manager and one helper'. Operations came to an inglorious end in August 1892.

The Mount Zeehan Company started with considerable energy. By the middle of 1890 the Main Shaft was down to 132ft with levels at 60ft and 124 ft and Nos 2 and 3 shafts were down to 80ft. But activity ceased at that point and desultory work only characterises all the later years. On 30th June, 1890 the company had £7,500 at fixed deposit and £618 current account. This was frittered away, until about 1898 the New Mount Zeehan Company arose from the ashes of the original. But again nothing effective was done. In 1900 the Zeehan and Dundas Herald makes some very sarcastic remarks about solid galena being found under buildings facing Main Street, which the Mount Zeehan Coy should have mined years before, but which was by that time, denied them by the resumption of the land for building purposes. (1) Early in 1901 the mine closed down and nothing has been done since.

On the old Silver King Extended ground, however, some very interesting and important work was done at intervals in the years following its inglorious end in 1892. During the first ten years there were a number of important disclosures, but subsequent to that they were infrequent, although continuing into recent years. In these recent years, moreover, similar disclosures have occurred on the old Mount Zeehan ground. The greater number of these disclosures, however, were purely fortuitous and not the result of deliberate mining exploitation.

The name "Rotunda" has been adopted to embrace all the ore occurrences within limestone Block 2 which forms part of the Old King Extended Section and also of Section 659 of the old Mount Zeehan. The mineral bearing black pug is very prominently exposed in Main Street as a high bank out into the Rotunda Hill. Hence the name.

(3) OUTPUT AND PROFIT: The output of the Mount Zeehan

(1) Z. & D. Herald 7.8.1900

3.

Company cannot be included in the yield from the Rotunda because the main workings and most of the output by that Company are located west of the Waller Upthrust in the closely folded older slates, volcanic breccias and tuffs. The output from the limestone portion of 559 was negligible.

Although the Silver King Extended Company sold parcels of ore, which probably did not exceed 100 tons, they made no profit.

In 1898 R. Clarke and party opened up the old King Extended workings, drove a short tunnel from Main Street into the Rotunda Hill, produced about 20 tons of galena and made a little better than wages.

The total production from the Rotunda ore deposit has been of the order of magnitude of only 200 tons.

GEOLOGIC ENVIRONMENT:

(a) The Limestone Bed. In the report "Concise Statement of the Lead-Zinc-Silver-Ore-bodies of Zechan" submitted by the writer in 1946, the limestone of the Rotunda proposition is designated Block 2. It was indicated that the limestone was about 100 feet below the surface immediately east of the Waller Upthrust, being overlain by sandstone. Since then, however, overwhelming evidence has accumulated that there is no overlying sandstone, the limestone lying immediately below the soil and shallow surface detritus. Although in the main, the surface phase is "black pug", solid limestone occurs at the surface at several points. Examples are:- In the trench near the Zechan Rivulet at the East end of Frederick St., in the shaft under the side verandah at the Courthouse, and between the King Extended Main Shaft and Zechan Rivulet shown in a trench dug in 1891 and reported as follows:-

"We have also started cross drains, in one of which we encountered what appears to be a very big body of carbonate of lime similar to that associated with the galena in the Oceana lode". (2)

So far it has not been possible to obtain any indication of the strike of the limestone bed by observation of sedimentary banding or stratification planes. The almost universal black pug and the absence of available openings preclude any possibility of this. However, the orientation of the outcrop, which represents the full width of the limestone bed, is 340° . This probably represents the general strike.

No measurement of dip is at present practicable but the general indication is eastwards at a steep angle.

The width of the outcrop, from the Waller Upthrust to the Zeehan Rivulet which hugs the overlying sandstone, is exactly 1000 feet. This is in strict concordance with the width at the Smelters Limestone Quarry. This lends support to the view that the fine-grained conglomerate masses, outcropping west of the Druid's Hall at the corner of Frederick and Counsel Streets, belong to the Conglomerate Series. The suggestion can thus be ventured that the limestone bed is practically vertical or dipping very steeply eastwards.

(b) The Waller Upthrust: At the corner of Frederick and Counsel Streets it is possible to stand with one foot on Silurian rocks with the other on the old puckered rocks. In other words one can straddle the Waller Upthrust. This 'contact' can be followed in a direction of 343° to cross Main Street under Fairfield's Butchers Shop. The spoil dump of the old Mount Zeehan No. 2 Shaft shows slate and tuff, while that of No. 3 Shaft on the east side of the upthrust line shows limestone and lode material.

These two shafts are 500 feet apart.

The total length of the Waller Upthrust in Block 2, between the Rotunda and the Montana Tear Faults is 1000 feet.

(a) The Tear Fault System: The Rotunda Tear Fault dominates the structural picture of Block 2. Its fault-breccia is exposed to view in Main Street in the cutting in Rotunda Hill. That cutting does not, however, expose the full width of the fault-breccia. The contact in Emma Street of black pug and steeply dipping sandstone probably represents the footwall plane of the fault. But the black pug-brecciated sandstone and shale contact in Smith Street is just as clearly not the fault plane.

If a line be drawn from the Emma Street contact on a bearing of 290° it passes through the end of the black pug in the Fireball edit and the black pug-sandstone contact visible in the cutting just south of the Frederick-Counsel Street corner. Since 290° is within the general bearing range of the tear faults in this part of the Zeehan Field, this line may be taken as indicating the approximate position of the footwall plane of the Rotunda Tear Fault.

If this is correct, it follows that the width of the fault-breccia is 275 feet at the Rotunda Hill. There is nothing unprecedented in such a width, as the fault-breccia of the Montana Tear Fault was proved in the mine workings of the upper levels of the Montana mine to be 200 feet wide.

The location of the Montana Tear Fault is more difficult to fix. The footwall plane is in Tarleton St., near the corner of Hurst Street. Its position eastwards from this point cannot be fixed by evidence of exposures. However, the continuation of the line joining the known position at the Montana to its position near the Tarleton

Street-Hurst Street corner takes it just south of Tarleton Street to just north of the Frederick Street-Irwell Street corner. This is the position shown in accompanying plan.

There is no evidence as to the width of the fault-breccia to the north of this place. But further investigation of this will accompany the study of the next proposition - Block 1 - Despatch.

(d) Meridional Fractures: It seems desirable and appropriate at this juncture to mention with emphasis the old Zeehan fetish of 'lines of lode'. Whenever a new outcrop of ore was discovered, all the wiseacres started to connect it with some other outcrop or outcrops to establish a 'line of lode'. Early experience in the field had established two directions, slightly west of north and slightly east of north - as characterising those lodes opened up for any appreciably continuous length. Probabilities were strained to group outcrops along one or other of these general directions. In the older rock series such attempts were and still are in some cases legitimate and warranted interpretations. But in the limestone any such attempts have resulted in confusion.

In Block 1. there is some evidence that a tendency exists towards mineralisation along certain 'lines'. These will be further investigated, but a similar study in Block 2 has shown no evidence of any control of ore deposition by near-meridional fractures. There is certainly a reference, in the reports of the north-east crosscut at the 40ft level from the King Extended No. 1 Shaft, to the seams of galena having "a strike of N 25° W". But this is most probably controlled by the strike of the limestone stratification bands.

b) THE ORE-BODIES.

(a) Outcrops and Ore Exposures: A detailed study of old records

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and close examination of the land surface have resulted in an impressive array of ore occurrences. These have all been marked on the accompanying plan and are indicated by numbers of the following sub-headings.

(1) Main Street Cutting: This is the largest exposure. The total length of the face in Main, Smith and ~~East~~ Streets is 620 feet. The maximum height of the face is 25 feet. Black pug predominates, but at about the centre of the Main Street face, fragmented and conminuted sandstone prevails over the black pug ground mass.

The whole formation is characterised by veins, bunches, slugs and fine disseminations of galena. Slugs of galena have been picked from it for years by both adults and children. This face has been recently sampled by cutting a channel 4ft. above gutter level. The first samples were taken in 6ft. lengths with a three inch channel. These gave results ranging Pb: trace 26.6%, Zn: 0 - 10.5%, Ag: trace -89.5 ozs.

The outstanding feature of this sampling was the recurrence of a run of high values over a length of about 160 feet in Main Street. Good values were, however, not confined to this section, occasional good assays recurring sporadically in the poorer section. Nevertheless the concentration, combined with such Pb. contents as 26.6% and 22.7% made resampling of this 160 feet section desirable. This was done by stripping the face again and cutting a 5 pound sample from 3ft. long by 1ft. high.

The highest figure for Pb. shown in this sampling was 10.0% and the highest Ag. assay 7.7 ozs. The average Pb. content was 8.65% against 6.4% of the first sampling. The margin is certainly a wide one. It is quite possible that resampling of the remainder would show similar variations in view of the sporadic nature of the occurrences.

The conclusion that emerges is that there is a widely distributed metal content, the exact value of which is only to be determined by bulk sampling on the basis of extraction en masse. The conception of this potential value must be based on the following information in addition to assay results of sampling existing available faces. For example the results in ~~the~~ Street do not coincide with the fact that some tons of clean galena were obtained therefrom.

The origin of the cutting dates back to the time when the Zeehan town was being steadily evolved. Originally Main Street skirted around and over the eastern flank of Rotunda Hill. In 1892 its surface was 10 feet higher than it now is in front of the Council Chambers. About 1895 the roadway was cut down to the present level. J. McDermott remembers this being done. He describes the face of the advancing cut as showing veins and seams of galena over its whole width of black pug. The downward continuation of what was then exposed is now below the existing roadway.

In 1899, progress demanded a footpath and the excavation of it was commenced. The resulting disclosures gave rise to newspaper reports:-

"In cutting down the hill opposite the Primitive Methodist Church, a vein of high grade galena was exposed yesterday. The larger pieces were gathered up and bagged, the contractor remarking that he was sorry that he did not have such a good show on a mining lease." (3)

"That Zeehan is justly entitled to be called a Silver City is fully demonstrated by a glance at the embankment lately cut by the Town Board, to form a footpath opposite the Primitive Methodist Church. From the day the contract was commenced the men have been shovelling clean galena into the drays with the mullock, the ore showing in the face for the whole width of the cutting. With the exception of odd specimens picked out by spectators, no attempt was made to save the commodity, the contractors being anxious to finish the job and had nothing to gain by bagging the ore." (4)

The downward continuation of this exposure is now

3) Z. & D. Herald 12.5.1899.

4) " " " " 30.8.1899.

below the footpath. In several places in the gutter some inches wide of solid galena can be exposed with the pick.

This footpath demonstration had really been foreshadowed in 1898. In that year R. Clarke and party drove an adit from road level into the Rotunda Hill. This adit was obliterated in the footpath excavations, but its western face and one leg of timber are visible alongside the footpath in the cutting. This work attracted attention:-

"It would not perhaps be strictly correct to say that Zeehan is a city with silver-paved streets, but it almost answers that description, seeing that silver-bearing ore is being bagged up from the embankment on one side of Main Street in the centre of the town. The bank through which the street cuts just below Stubbing's Store is composed of a black pug formation which has always been known to carry a little silver and lead in parts, but it has never been supposed until recently that any of the formation exposed was payable. Mr. Clarke, to whom the mineral lease was recently forfeited for non-compliance with the labour clause, seems to hold a different opinion, for after obtaining permission from the Town Board he has commenced taking out a sample parcel from the cutting. Several tons of the decomposed material containing slugs of galena have been broken and bagged and will be sent to the local smelters, and if the results are satisfactory there should be plenty more of the same stuff available." (5)

G. Clarke (son of R. Clarke) states that the total amount of galena obtained 'filled two railway trucks.' (6) The adit was only about 10 feet in length. The footpath story is further confirmed by Mrs McCurk, an old lady of over 70, who remembers walking on exposed galena before the footpath was asphalted.

Round the corner in Emma Street the black pug yielded some bags of ore from a small cuddy:-

"A vein of galena was met with yesterday in the cutting in Emma Street. Mr. Clarke who holds the King Extended ground, has secured several bags of fair grade ore." (7)

- (5) Z. & D. Herald 31.12.1898.
 (6) Personal communication.
 (7) Z. & D. Herald 26.5.1900.

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"The tributors on the King Extended are winning a little ore from the drive in Emma Street. The ore body appears to be going strong underfoot and will be sunk on after a few more feet of driving." (8)

(2) McCill Brown's: This is the building block at the north-west corner of the Main Street-Smith Street intersection. When excavating the foundations for the building, now non-existent, galena was exposed. Nine years later the downward continuation of this ore was found at the 60 ft. level of the King Extended workings:-

"A reminder of early Zeehan days was brought to light yesterday by a party engaged tributing the old King Extended block, who, after cleaning out the prospecting shaft opposite McCill Brown's premises started driving in a north-westerly direction, and after a few feet of driving, met with a promising vein of galena. This lode was exposed some nine years ago whilst building operations were in progress but was covered up, as at that time ground was more valuable than galena, and the shoot remained unworked. At the time the discovery was first made attention was drawn to it in our mining column, the comment being made that the town was literally built on silver, which earned for Zeehan the cognomen of the "Silver City". The tributors up to cutting this lode have met with poor success, though they have been put to considerable expense and labour prospecting at a depth the big formation exposed from Smith Street to Emma Street and they will deserve a return for their plucky efforts." (9)

- (3) East Firebell: A number of holes sunk for foundation posts on the block along Druids Lane from the latter's junction with Smith Street, disclosed galena in black pug.
- (4) Druids Lane: In Druids Lane, just half-way between Smith and Frederick Streets, in digging a hole recently for an electric power post, there was disclosed a vein of galena some inches wide in black pug.
- (5) Firebell Shaft: This is a shaft in the flat just north of the firebell tower which was sunk to a shallow depth in more recent years. It is known that some galena veins were encountered, but sampling of the dump gave a nil result for Pb. and Zn. but showed 0.2 oz. Ag.
- (6) Firebell Adit Located 100 ft. west of the Firebell

Shaft, this edit was driven westwards into the hill for a distance not now measurable but probably about 50ft. It is reported that some hand-picked galena was obtained. The dump consists of black pug with slugs of galena. Sampling showed: Pb 2.6% Zn. 0.0% Ag. 0.4 ozs.

- (7) Martin's Yard: Behind the Druid's Hall, the Martin brothers disclosed galena in several holes sunk for bed-plates for sheds. These exposures occurred over an east-west width of 50 feet. A shaft was sunk in about the centre of this width to a depth of about 10 feet. It was 5' x 5' and showed veins, bunches and disseminations of galena associated with siderite over the full width. In this occurrence the intensity of mineralisation reduces the black pug to a subordinate component.
- (8) Moyle's Garage. In making the excavation for the petrol tank a vein of galena was exposed in one corner. After sinking through ironstone cement, gritty white sand continued to the bottom except in one corner where black pug with the galena vein was exposed.
- (9) Academy: The record of this occurrence is as follows:-
 "Mr. Eddy, the manager of the New Mount Zeehan mine, met with a promising lode yesterday at the rear of the Academy, which is being sunk on. Beneath a gossan capping a foot of galena was showing, contained in a black pug and decomposed mass, through which fine galena is disseminated. At a depth of 5ft. the ore body is reduced in size, but fair sized slugs of clean galena were met with through the formation. An assay taken of the galena gave Pb. 78.0, Ag.60 oz. An assay is now being made of the gossan and black pug." (10).
- (10) Club Hotel: When excavating for the foundation of the back brick steps of this hotel solid galena was disclosed. No more information is available other than the simple fact being common knowledge.
- (11) Altcar St.: There is an area in this vicinity, measuring roughly 300 square feet, covered with what is clearly spoil from a shaft or trenches in black pug containing slugs of galena and silicified limestone carrying galena and sphalerite.

(12) East Frederick Street: The last mentioned occurrence may be associated with work reported by the King Extended Coy in 1891 as "we have extended costean pit north-west portion of property four chains crosscutting." (11) Whether this is so or not, it is quite certain that some trenching and pit sinking was carried out on what is now the south side of Frederick Street near the Zeehan Rivulet. The records state:-

"We have also started to bring up a costean pit from the creek, on the north end of the property to crosscut lode." (12)

"Put in shot. opened out on 36ft lode. Galena over 80 oz. silver." (13)

"Purchased a McCombs water lifter; it will enable men to raise a large quantity of payable ore from eastern lode on flat. Storm water recently very heavy, but the water lifter will deal with it. Lode formation in the eastern section proved 36ft. wide; heavily charged with flux. Assays ranged from Pb. 35-82, Ag. 33-85 ozs." (14)

This area has recently been retrenched and the old workings and spoil dumps partially exposed. Again it is black pug with bunches and slugs of galena and silicified limestone carrying both galena and sphalerite. The exceptionally heavy rains have prevented completion of this work to the sampling stage. Completion is awaiting portable pump.

(13) Irwell Street: Galena was cut in the gutter on the west side of Irwell St. alongside E. J. Moyle's residence. An appreciable area in this vicinity is covered by ferruginous material which in the main is clearly bog-iron. But recent observations show that true gossan outcrops are scattered within the bog-iron and are very apt to escape identification. This Irwell Street occurrence of galena is one example; others are the Club Hotel, Academy and Altcar Street occurrences.

(11) Z. & D. Herald 3.8.1891

(12) Z. & D. Herald 27.7.1891

(13) Z. & D. Herald 25.6.1892

(14) Z. & D. Herald 7.7.1892.

- (14) Central Hotel: This Hotel was originally known as Donovans. Initially a wooden building it was burnt down in 1900 and was rebuilt in brick. The necessary foundation excavations provided an important exposure:-

"The big gossan-capped lode that runs from the back of the Gaiety Theatre across Main Street was uncovered again yesterday in cutting the foundation for the front wall of Donovan's Hotel. Some fine-grained galena was broken out but unfortunately for the interests of the shareholders in the New Mount Zeehan mine, the lode is in private property and they are not likely to materially benefit by the fact that the lode they should have worked 10 years ago, and did not, is still there, and apparently improving every time it is exhumed for the benefit of the curious public, the majority of whom, though living on a mining field see our staple industry in a natural state for the first time." (15)

"In excavating for the foundations for Donovan's new brick Hotel, the continuation of the big lode formation coursing from the back of the Post office was uncovered again yesterday. The formation carrying promising looking gossan and bunches of clean galena, is showing for some 10ft. wide, and would gladden the heart of any mine manager whose ground was free from the resumption clauses of the Mining Act." (16)

- (15) Bookmakers Club: A hole recently sunk in the back yard of this establishment disclosed galena in black pug.
- (16) Blackwood Tree: A small shaft sunk in the early days within 50 feet of the Waller Upthrust behind the old Victoria Hotel showed slugs of galena in black pug.
- (17) Marsh's Timber Yard: A gossan outcrop was trenched and a hole sunk to a depth of 20 feet. It showed the full width of the shaft in good milline ore with one foot of high grade zinc ore on the east side.
- "Nowadays discoveries are mostly made by people making alterations to their premises, digging postholes, and so on, which bottom on lode material. The latest find is in Marsh's timber yard, behind the Victoria Hotel, where some gossan has been sunk on 7ft. and now carries nice seams of galena." (17)

(15) E. & D. Herald 7.8.1900
 (16) " " " 21.8.1900
 (17) " " " 29.3.1904

"The new lode on the Zeehan Neward claim struck in Marsh's timber yard, behind the Victoria Hotel has been traced for a distance of 250 feet and is showing 8 inches of good ore." (18)

"Kirkwoods lode in the New Zeehan behind the Victoria Hotel is opening up very well so far. It has been sunk on 12ft., and shows a formation 4ft. wide, with 9 inches of firsts. So far it has produced 2 tons of firsts." (19)

"Kirkwoods lode behind the Victoria Hotel appears to be going strong to a depth of 20 ft. The galena vein maintains its width and there is a band of zinc blende on the other wall clean enough to bag." (20)

- (18) A.E.A. Lane. An outcrop alongside this lane has been trenched. It shows a nice body of lead-zinc ore.
- (19) Kerrigans Hotel. An outcrop hidden for years under this hotel, but exposed when it was burnt down, has been trenched.
- (20) Victoria Hotel Cellar. This cellar was sunk in 1891 in ore and black pug. The Victoria Hotel was built over it, but it is now again exposed, the building having been pulled down. The scattered spoil dump shows typical galena slugs, galena and manganese calcite, and black pug. This is only a few feet from the southern footpath in Main Street opposite the old Commercial Bank building.
- (21) Butchers Shop: At the curb of the footpath on the north side of Main Street a few feet east of Fairfield's Butchers Shop, a power pole hole showed galena in black pug.
- (22) Court House Footpath: In the early period of developing Main Street a very large tree stump had to be grubbed from in front of the Police Reserve. The cavity showed lumps of galena in black pug.

(18) Z. & D. Herald 29.3.1904
 (19) " " " " 8.4.1904
 (20) " " " " 13.4.1904

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- (23) Post Office Footpath: Within the last few years in removing a large telegraph pole in front of the Post Office some bags of clean galena were obtained.
- (24) Court House Verandah: Beneath the wide verandah of the Court House there can still be seen the collar of the No. 3 Shaft of the Mount Zeehan Coy. It was sunk to a depth of 50ft and a crosscut driven 120ft under the main street. In the scattered spoil are fragments of limestone and ore. No details of what was disclosed in this shaft are available, but it is referred to as follows:-

"With the object of draining the shaft alongside the police station, the manager with the assistance of tributors intends cleaning up the crosscut driven from the shaft alongside the A.M.A., to drain which a rise is being put up from the main workings. The crosscut will be extended 100 ft. when a connection will be made with the drive going south from No. 3 Shaft. The policy is a good one as a network of leads are known to exist at the rear of the Post Office and Gaiety which could be intersected by crosscutting from the shaft sunk for 75ft by the previous manager. The value of this portion of the mine is unknown at a depth, but good shoots of galena have been met with at different points on the surface, which so far as sunk on, were going strong underfoot." (21)

- (25) Post Office: In the digging of the foundations for the new Post Office in 1900 the writer's father reported the disclosing of galena over the greater part of them. The galena brought as samples were coated with goosun, but apart from this thin veneer, were solid galena. The lumps were from 6 inch diameter downwards.
- (26) Post Office Yard: The quotation under (14) refers to "the formation" arising from the back of the Post Office. Before the present building was erected, postal business was conducted in a small building in what is now the back yard. In digging the holes for the foundation blocks of that original 'shed' two large masses of galena were uncovered. These were placed on the side of the path giving access from Main Street and remained for some years.

This is mentioned by Montgomery in his 1893 report:-

"Towards the north-east angle of 552M six lodes of various sizes, all running about N.N.W have been discovered; one of these crosses the Main Street of Zeehan, in front of the Telegraph Office, and from the top of it 2 $\frac{1}{2}$ feet in width, two large stones, one 2 tons, the other 2 $\frac{1}{2}$ cwt. in weight were taken, containing galena and carbonate of lime.

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- (27) Grand Hotel: In addition to the previously quoted reference to "the big gossan-capped lode that runs from the back of the Gaiety Theatre across Main Street", there is a record of an actual disclosure:-

"An important discovery was made at the rear of the Grand Hotel yesterday by Messrs H. Sherrin and C. Taylor Jar. After sinking a hole three or four feet deep they struck the lode, which gave 6 in. of first class galena and about 3 feet of good concentrating ore." (22)

- (28) South-East Corner: In 1891 the King Extended Coy trenched in this locality and disclosed a lode formation 36ft. wide. It is thus described:-

"Have also had men cutting costeen pit near south boundary, in which we crosscut the lode formation 36ft. wide, composed of gossan, iron pyrites and carbonate of lime with a little quartzite." (23)

- (29) Duncan's Shaft: This exposure is thus referred to:-

"The shaft at the rear of Duncan's is down 26ft., from which level the crosscut is being driven west with encouraging results." (24)

- (b) Underground Evidence: Underground evidence is limited and dates back to the very early history of the field, but is important and significant. This underground work to be now described is confined to the vicinity of the Rotunda cutting and is wholly within the black pug. The mine workings are now quite inaccessible, and information in regard to them can only be obtained from newspaper records and the memories of two old miners - J. McErmott and C. Clarke. Neither Waller nor Twelvrees & Ward make any reference to them.

The first work done was the sinking of No. 1 Shaft, located just near the Gun at the corner of Main and Smith Streets. This shaft was in black pug carrying galena to

17.

44ft. At 40 feet a north-east crosscut was driven a total distance of 68 feet in ore-bearing black pug, except between 33 and 40ft. where white sandstone was met with, which, however, was also mineralised and galena bearing. At 20ft north and south drives were started on good-looking ore and apparently reached 10 and 15 feet respectively from the crosscut. The following records show the progress and disclosures of this work:-

"In the new shaft in the township a depth of 37 feet has been reached in spite of water and loose ground, which has caused considerable trouble. The shaft still continues in lode matter." (25)

"With great exertion the shaft has been sunk to a depth of 40ft and a commencement made to open out eastward across the lode." (26)

"Since the 4th inst. have extended crosscut at the 40ft level in No. 1 Shaft a further distance of 6ft making a total distance of 11ft. The lode formation has been highly mineralised throughout, highly impregnated with iron pyrites, and is of a very promising appearance, but as yet does not show payable ore." (27)

"Since the 11th inst. we have extended crosscut at the 40ft level in No. 1 Shaft, a further distance of 10 ft. from shaft; we have passed through several small veins of galena during the last 3ft of crosscut - ore of a kindlier nature than that previously met with." (28)

"Since 10th inst. we have extended crosscut at 40ft level No. 1 Shaft, 6ft. making total distance of crosscut from shaft 25ft. Still in very kindly lode formation. We have passed through several small veins of galena and gossany iron, assaying very well for silver and lead. Have also had men picking ore and screens for sifting smalls made." (29)

"Since 25th April, we have extended crosscut 3ft making total distance 28ft; still in lode formation which is improving. Started men screening ore, but owing to very wet weather it would not run, so had to suspend it for fine weather." (30)

Have extended crosscut at 40ft level No. 1 Shaft a further distance of 3ft. making total distance from crosscut 31ft. We are still in lode formation of a highly mineralised character impregnated with a little galena, iron pyrites and carbonate of iron. I have had men continuing to the west of No. 1 Shaft, in which we have opened the capping of another lode formation, intersected with small veins of galena of a very rich quality." (31)

(25)	Z. & D. Herald	16.3.1891	(26)	Z. & D. Herald	30.3.1891
(27)	" " "	13.4.1891	(28)	" " "	20.4.1891
(29)	" " "	25.4.1891	(30)	" " "	2.5.1891

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"Since the 16th inst. we have extended crosscut at 40ft level a further distance of 10ft., making total distance of crosscut 41ft. Owing to change in formation we have been able to make better progress during the last week. The lode formation has been intersected by a bar of quartzite and sandstone for a distance of 6ft., highly mineralised, and impregnated with iron pyrites and a little galena. Having passed through this, we are again in lode matter of a much more favourable appearance. Owing to fine weather we have been enabled to finish screening ore and blasting same, and have been entering ore paddock." (32)

"Since the 23rd inst. we have extended crosscut at 40ft. level a further distance of 17ft., making total distance crosscut 58ft. We have passed through some very nice veins of galena intersected with iron pyrites and carbonate of iron. The formation has changed during the last few feet of driving and is again becoming very moist and of a runing nature." (33)

"We have extended crosscut at the 40ft. level a further distance of 6ft., making total distance of crosscut 64ft. Have met with what is apparently the hanging wall. Have started men driving on course of lode at a point 20ft. from shaft, the lode at this point looking very promising, being composed of carbonate of iron, iron pyrites, manganese and highly impregnated with galena throughout." (34)

"It is now some months since the first practical work was commenced on this claim under the management of Mr. Mole. On the western side of Main St. of Zeehan, and almost opposite Mr. Anderson's hotel, continual shifts may have been seen at work pulling water from the shaft that has been sunk on a large formation of sulphide ore. After much perseverance a depth of 44ft. was attained in the shaft which is sunk in loose wet material requiring great attention in the matter of timbering, but which is amply secured. At 40ft. a crosscut has been put in to the north-east for 68ft. through vein matter almost for the entire distance until what is apparently the wall of the distance has been met with. Two short drives have been made on the course of the lode 8 or 10ft. respectively, and these clearly show that the ore shoots have a tendency to pitch to the south-east on the strike of the lode, which is approximately N.25° E. From these workings some very nice sulphide ore has been raised, showing on assay as high as 68 oz. silver per ton." (35)

"We have extended south drive 40ft. level a further distance of 4ft. making total distance from crosscut 15ft. Here the rich shoots of galena met with have dipped underfoot. The north drive we have also extended a further distance of 6ft. making total distance driven 10ft. At this point the galena has taken a north-westerly strike black pug highly impregnated with galena taking its place in the drive." (36)

"We have completed the clearing of main shaft site." (37)

(32)	Z. & D. Herald	23.5.1891	(33)	Z. & D. Herald	30.5.18
(34)	" " "	8.6. "	(35)	" " "	12.6. "
(36)	" " "	19.6. "	(37)	" " "	29.6. "

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concerning this line of lode, but now the machinery is in position there is a chance of it being able to demonstrate to the public that mines exist even in the very centre of the town." (38)

"Recommend putting in short tunnel 40ft.; 25ft. backs can be got dry." (39)

"Manager reports to date putting in new tunnel from level of Main St. west. From the start have had lode formation. Driven 25ft. 6in.; still in ironstone, with indications of more ahead. At 15 ft. crossed formation carrying galena; opened out on it and so far is improving fast." (40)

"King Extended has started work at the old prospect shaft (No. 1 Shaft C.L.H) where a new run of ore has been picked up." (41)

"The Silver King Extended is again deserted." (42)

The story of the King Extended Coy ends at this point. It will have been noted that there is no record of the completion of the west adit from Main St., but it was actually completed to 40ft., the last 30ft. still existing in the cutting. Similarly there is no indication as to how deep the Main Shaft was sunk, but this point is cleared up three years later:-

"The tribute party on the King Extended have now got all preliminaries adjusted, and the little plant is working satisfactorily. The shaft has been baled out and a start made to sink, the present depth being 18ft. It is intended to go to 60ft. before opening out, and while the same class of soft picking ground obtains, the shaft will go down very quickly. According to the work done on surface and in prospecting shafts in former days the party reckon they have a fair chance of intersecting three separate veins of ore by crosscutting west at the 60ft. level." (43)

That party sank the shaft to 60ft. and drove the west cross-out a few feet.

The driving of this crosscut was resumed by a syndicate at the beginning of 1900. From J. McDermott who was a working member of this syndicate it is learnt that seams, veinlets and slugs of galena occurred in the pug for the whole length of this crosscut. They bagged 3 tons of hand-picked galena from this work. They were disappointed, however, in not finding the band of solid galena below No. 1 Shaft as they expected, but got on to a good seam in driving north-

(38)	Z. & D. Herald	27.4.1892	(39)	Z. & D. Herald	4.6.1892
(40)	" " "	" 13.6.1892	(41)	" " "	" 11.7. "
(42)	" " "	" 21.7.1892	(43)	" " "	" 26.9.1895

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usually under McGill Browns. The seams and veins encountered in the west crosscut were a confirmation of the results of surface trenching by the old Company between Main Shaft and No. 1 Shaft.

(6) THE ORE:

(a) Constituent Minerals: Galena varies from coarsely cubical to very fine grained 'steel' facies in massive aggregates or fine disseminations. Sphalerite is prevalent as amber to reddish crystalline aggregates.

Pyrite occurs as fine disseminations in the black pug. Silica is present as the chert-like form of silicified limestone.

Siderite and manganese-siderite are present, but only as constituents accessory to the black pug or chert groundmass.

The silver contents are not in accordance with the long-accepted idea at Zeehan that all galena in limestone was very 'low grade'. It must be emphasised here that the term 'low grade' as used at Zeehan was confined exclusively to the description of the silver: lead ratio. Anything below 0.75oz Ag. per unit of Pb was referred to as 'low grade'.

It is certainly a fact that the galena at the Oceana averages 0.4 oz. Ag. per unit of Pb. The galena of the Rotunda, however, as far as available data would indicate, shows a higher ratio although all of the occurrences are in limestone. The following table sums up the available information:-

Exposure	Assay		Ag:Pb Ratio	Average Ag:Fb. Ratio.
	Pb.%	Ag. ozs		
1.	78	39	0.5	
1.	82	62	0.75	
1.	72	40	0.55	
9.	78	60	0.77	0.78
12.	35	33	0.9	
12.	82	65	1.03	
23.	76	75	0.98	

It may be of course that the silver content has been raised in the oxidized outcrop, but some at least of these assays are of pure galena.

(b) The Ore Types: With one exception the exposures only permit of limited study of the ore-type. Moreover, in that one exception only the oxidized and decomposed portion is exposed. Adequate descriptions of the primary ore is therefore impracticable. Nevertheless a general indication of the ore-types may be given.

Fault-Breccia Type: This is the Astoria Hill occurrence. Angular fragments and masses of sandstone, and shale are in heterogeneous assemblage in a matrix which varies from an amorphous black pug to finely comminuted sandstone admixed with subordinate black pug. Galena occurs through this mass as veins and seams up to several inches in width and as sporadic slugs which vary from several inches to a fraction of an inch in diameter. In addition, fine particles of galena are disseminated throughout the mass including the amorphous black pug.

Black Pug Type: Outside the obvious effect of the Tear Faults there occurs black pug with associated galena. In these cases the black pug represents the 'rotten' phase of limestone which carried galena and almost certainly sphalerite also, as non-siliceous replacements.

Siliceous Replacement Type: Exposures 11 and 12 show this type. However, no more can be said of it than that it is highly developed as fragments in the spoil from the shallow workings, associated with black pug. Such fragments show galena, sphalerite and siderite in a siliceous groundmass similar to that of the ore in the dump at the Austral Main Shaft.

Siderite Type: Exposures (17), (18), (19), and (20) are of this type. Galena, sphalerite and some pyrite occur with associated siderite. They are restricted to

the vicinity of the Weller Upthrust and occur in the older rocks west thereof or in the breccia of the fault zone.

Monzonite Type: This type has been recognized in exposures (20) (24) and (25). It consists of galena and sphalerite in a matrix of monzonite.

- (c) The Concentrations: The total amount of work done on this strand proposition in the past had as its objective the locating of concentrations of galena. The limited scope of actual work was due in the main to the resumption of the area for residential and business purposes. During the most active developmental period of Zeehan the area thus resumed was untouchable for penetration from the surface. In spite of this, the exposures described above include a number which can be classed as concentrations. But each individual exposure is restricted in area and it is therefore not possible to form any adequate conception of their linear extent, although in some cases a measurement can be given of the local width. The compilation of the following table has as a background the conception of ultimately establishing the existence of a large low-grade proposition. Consequently 'good concentrating ore' is regarded for this purpose as a concentration.

No.	Exposure Actual Portion	Width Feet	Degree of Concentration.
1.	{ Surface S. of No. 1 Shaft	6	Galena veins and seconds (44)
	{ Surface 94' W. of Main Shaft	7	Seconds
	{ Opposite Council Chambers	10	Galena veins and seconds
	{ Drive at 40ft level	4	Galena veins and seconds
	{ Drive at 60ft level	4	Galena veins and seconds
	{ Emma Street	2	Seconds

(44) The term 'seconds' is used in the old Zeehan sense as indicating a lead content of 30-55 percent and from which clean galena could be selected by hand picking.

No.	Exposure Actual Portion	Width Feet	Degree of Concentration
2.	McGill Brown's	7	Galena veins and seconds
7.	Martin's Shaft	5	Jigging ore (45)
9.	Behind Academy	5	One foot clean galena and galena slugs.
10.	Club Hotel	4	Six inches clean galena and seconds.
12.	East Frederick St.		
14.	Central Hotel	10	Bunches of galena and seconds
19.	Court House Foot- path	7	Large lumps of galena
22.	Post Office	7	Galena in lumps 6" diam.
23.	Post Office Yard	2.5	Galena in 2 ton and 2½ cwt lumps
24.	Grand Hotel	3.5	Six inches clean galena and 3 ft. seconds

7. MINE WORKINGS:

(a) Adits: There are only two adits extant - that driven westwards from above the footpath into the Rotunda Hill for 30ft. and that driven into the hill in the vicinity of the Firebell tower for a distance of 50ft. Both in black pug.

(b) Trenches: The trenches referred to in the reports of 1891 and 1892 are all obliterated. Recently the East Frederick St. locality has been retrenched and it will be necessary to do the same near the southern boundary to locate the ore reported in that locality.

(c) Shafts: The King Extended Main Shaft was 60ft. deep. It has collapsed and is almost certainly unrecoverable.

No. 1 Shaft sunk to 44ft. has entirely disappeared, having been filled in, and the site is now a footpath.

The shaft under the side verandah of the Court House is apparently 75 feet in depth. The collar is represented by a small depression (5' x 5') carrying water. The only record of this shaft is as follows:-

(45) Zeehan term indicating "bunchy ore" carrying from
25-40% Pb.

"A network of lodes are known to exist at the rear of the Post Office and Gaiety, which could be intersected by crosscutting from the shaft sunk for 75ft. by the previous manager." (46)

No. 3 Shaft of the Mount Zeehan Company was apparently down to 75 feet but is now represented by a depression in the surface. This is the shaft referred to by Twelvrees in his 1900 report as "the Gaiety". Incidentally this is the only reference to Black E ore occurrences by the Haller, Twelvrees & Ward reports. Montgomery in 1893 refers to "six lodes in the north-east angle of 5594" (47) and gives the detail previously quoted as to one of them. But in spite of this they disappeared into oblivion. It is clear that the work done was totally inadequate to justify any delineation of 'line of lode'. It is equally clear, however, that Montgomery was aware of far more ore exposure in this vicinity than those which can justifiably be listed now.

The Blackwood tree Shaft is now only a depression in the ground filled with brick-bats. No information is available as to its depth, but it was quite shallow.

Martin's Shaft sunk in more recent years is 10ft. deep and is open although full of water.

The Firebell Shaft was only a shallow one and is collapsed.

(a) Drives and Crosscuts: The north-east crosscut at the 40ft. level No. 1 shaft is 68 feet in length.

The crosscut from the Main Shaft to below No.1 Shaft at the 50ft level is 240 feet in length.

Driving was also limited. The north drive at the 40ft. level was apparently not more than 10ft and the south drive 15ft. The north drive from No.1 Shaft or rather the end of the west crosscut 50ft. level apparently did not exceed 60 feet.

(46) Z. & D. Herald 24.3.1900

(47) A Montgomery "Report on Progress of Mineral Fields County of Montagu". May, 1893.

(8) DISCUSSION OF POSSIBILITIES:

(a) Significance of Wide Spread of Exposed Ore. There are value repetitions and some appreciable continuity in the formation in Exposure 1. Recent sampling shows that appreciable values occur throughout that portion of it exposed in the Rotunda cutting, and there seems no doubt from the old records that similar or higher values occur throughout the underground workings.

All the other exposures are sporadic. It must be emphasised at this stage that these exposures are fortuitous; they are not the outcome of systematic trenching or other testing. In the latter case they would indicate ore occurrences with blanks between them. But the position we face is that we do not know what is in between.

The area over which the ore occurrences are spread is appreciable. The spacing is variable over that area of spread but it is at present impossible to determine definitely whether such variation is indicative of greater or less continuity, or fortuitous disclosures with no relationship to areas of greater spread of mineralisation.

Montgomery, as previously mentioned, refers to 'six lodes' in the vicinity of the Post Office. He gives to them a N.W. strike and states that one of them had been traced for several chains. But he does not record the data on which those conclusions are based. It is perhaps significant to note that in his 1890 Map he shows a lode at the Post Office continuous with the ore at the Rotunda cutting.

In marked contrast to this interpretation is the reference already given to the 'big gossan-capped lode which runs from the back of the Gaiety Theatre

across Main Street to the Club Hotel.' (48) This direction is almost due west - south and is at an angle of 45° to Montgomery's interpretation.

In contrast to both of the above interpretations is that by Waller in 1900. He connects the lode's outline with the Club Hotel exposure and continues the line well to the east of exposure 84. The strike of this line is 33° , which is approximately the mean of the two previous directions.

Such anomalies suggest that we have here the 'reductio ad absurdum' of the 'line of lode' fetish. Such confusion is the inevitable result of attempts to make 'lines of lodes' out of isolated exposures of an irregularly shaped occurrence of appreciable real extent. It is certainly possible that Montgomery could have been aware of more exposures than those now listed. But they must have been obliterated and forgotten by the time Waller was observing, as he ignores that 'line of lode' entirely. It is informative at the present stage to reproduce Waller's representation of this vicinity:



This shows three 'lines of lode' meeting at No. 1 Shaft with another running along Frederick St. in front of Boyle's Garage. It takes no cognizance of the greater number of exposures now listed.

(48) *E. & D. Herald* 7.8.1900.

But Miller must have had some evidence at least to justify the recording of ore along the 'lines' he delineated. We are therefore led to the conclusion that there must have been some, at some time or other, more exposures than those here listed.

Any attempt to connect all the exposures in 'lines' of local results in 'strays' exposures which could be connected to the main line via cross veins or lodes. An attempt to follow Montgomery in his 'six lodes' assessment can find a range in strike from 300° to 360° , with several 'cross lodes' to incorporate the 'strays'. In any case, however, there seems to be no conception even on this basis, of a mineralised zone in this vicinity, 400 feet in width with numerous recurrences of solid galena plus mineralised black pag. Is it payable if mined in bulk?

There is possible, however, a broader conception than this, when the total exposures are considered in relation to the existence, position and metallogenic function of the Botunda and Pontano Tectonics. This conception will now be indicated as a basis for exploration and testing.

- (b) Possible Outlines of Ore-body: The outline delineated in the accompanying plan has been well considered, but is frankly no more than an intelligent guess. Nevertheless it is put forward as a stimulant to further discussion and systematic testing.

The outline thus hypothecated presents the form of a scalene triangle with the apex at the intersection of Frederick and Counsel Streets. At about the centre of the base a lobe branches off and runs due north to the West Frederick St. exposures.

- (c) Possible Dimensions: Such an outline indicates impressive dimensions. The triangle base is 2000 feet in

length and the height 400 feet. The northern lobe is 600 feet in length by nearly 100 feet in width.

Such dimensions justify the possibility of an economic mining proposition of some sort.

- (9) RECOMMENDATIONS: To prove the feasibility of such a mining proposition it will be necessary to determine the average metal content of the continuous zone within both the block pug and the concentrations. The actual spacing of the latter must have an important bearing on the average metal content. If they are of sufficiently frequent recurrence it will be possible to tolerate even quite barren zones of pug.

Systematic cross-stationing is essential to determine the repetition rate of the concentrations. Concentration of the surface downwards must also be carried out. This latter can best be done by a combination of Test-Hole Borer, Drive-pipe and Churn Drill. The holes should be located on a systematic grid. Preliminary holes spaced throughout the grid could be followed, in the event of favourable results, by completion of all the holes in the closely-spaced grid.

It is further suggested that on the completion of certain of these holes, the Diamond-Drill be brought in to continue the vertical hole at the stage when 'unrotted limestone' has been reached. Alternatively of course the hole could be continued by the Churn Drill if the one secured is adequately equipped for such deeper work.

The testing of the block in depth (below the pug) would be achieved by mining operations from a shaft, or by drilling from a shaft. The drilling or mining would be at a depth indicated by independent observation of the depth of weathering - either in the Rotundi or elsewhere.

APPENDIX 4

OLD MINES IN LINESGLEN.TASMANIAN GROUND.PRELIMINARY STATEMENT.

1. LOCATION.
2. HISTORY.
3. GEOLOGY.
4. EXTENT OF INFORMATION.
5. WORK CONTEMPLATED.

OLD MINES IN LIMESTONE.TASMANIAN CROWN CO.PRELIMINARY STATEMENT.1. LOCATION:

Adjoining Block 1 this limestone belt extends north-westwards therefrom and constitutes what it is proposed to call Blocks A and B. Its length in a north-west direction is approximately 5,600 feet.

It lies to the east of Dunkley's Farm which skirts its western boundary.

2. HISTORY:

Trenching in the swampy ground began in 1890 but water and zinc were a deterrent to further progress. Nevertheless the Tasmanian Crown Company sank a shaft in the older rocks to the west from which they attempted to diamond-drill eastwards into the limestone. This was in 1894.

In 1907 the area became the property of the Zeehan-Montana Company and shallow work by tributors produced appreciable parcels of ore.

Nothing has been done since.

3. GEOLOGY:

The limestone belt starting from the Winks Tear Fault runs about north-west, being thus orientated with a distinctly more westerly trend than Blocks 1 and 2. In the vicinity of the Tasmanian Crown shaft the Crown Tear Fault divides this Block A from Block B the orientation of which is closer to the meridian.

Block B continues to the Clark Tear Fault. Block B thus shows an orientation of approximately 330° as compared with the 313° of Block A.

The Waller Upthrust forms the western boundary of the limestone while the eastern limit is the usual white sandstone series. The width of the limestone bed, although not yet measured, is apparently of the same order of magnitude as usual

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4. EXTENT OF INFORMATION:

Development in Blocks A and B is less than in Blocks 1 and 2. The greater part of the limestone outcrop is untested. Records are meagre even in the south-eastern and north-western portions where work was carried out. But significant information is accumulating as to a wide spread of mineralization including important concentrations.

5. WORK COMPLETED:

The paucity of information relative to that accumulated for Blocks 1, 2, 15, 16 and 19 prevents at present the preparation of reports as comprehensive as those on such blocks. More field work is called for.

In addition, old trenches recently located and surveyed will be drained, cleaned out, deepened if necessary, and sampled.

The area lends itself to preliminary stabbing with the Post-Hole Sorer. It is reported that slugs of galena have been found wherever the black pug has been exposed. This wide area of black pug will thus be submitted to preliminary testing.

A full report will be prepared when this testing and field work have been completed.

APPENDIX 5

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OLD MINES IN LIMESTONE.

KEMP'S.

PRELIMINARY STATEMENT.

1. LOCATION.
2. HISTORY.
3. GEOLOGY.
4. EXTENT OF INFORMATION.
5. WORK CONTEMPLATED.

KEMP'S.

PRELIMINARY STATEMENT.

1. LOCATION:

This limestone belt is situated on Dunkley's Tram 120 chains (1½ miles) north of the Leeban Post Office. It is separated from Block B by a stretch of country 30 chains in length along Dunkley's Tram in which limestone apparently does not outcrop. It is proposed to refer to this latter belt as Block C and to designate Block D the limestone area known as Kemp's.

2. HISTORY:

The area was originally floated as the Silver Crown ~~Extended~~ Company in May 1888. An attempt was made at shaft sinking but was abandoned because of water difficulties.

It lay idle until 1907 when the Kemp brothers carried out trenching and shallow shaft sinking but the combination of water and zinc prevented real progress.

Some renewed attention was paid to it in 1955 when some parcels of zinc ore were obtained from an open cutting on a wide formation in the flat.

3. GEOLOGY:

The area has only received two or three preliminary reconnaissances. The limestone belt is orientated at about 330° and is of the usual width. It is bounded on the south by the North Crown Tear Fault. The northern limit has not been determined.

As so far observed the limestone occurs as the Black Pug phase and carries values in lead and zinc over appreciable widths.

An area some acres in extent is covered with limonite. It was by sinking through this that the Kemps discovered the ore-boles.

4. EXTENT OF INFORMATION:

The original company reported in 1890 the exposure of a body of ore 24 feet in width. Since then very little has

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appeared in print. What has been garnered from various sources can only be effectively interpreted after examination and survey of the workings.

5. WORK CONTEMPLATED:

The old workings have all been overgrown with scrub. This will have to be eliminated by cutting or burning.

Surveying, cleaning out old workings and sampling will follow. The limonite area will not be amenable to post-hole digging, but aside this a preliminary staking by that method will be carried out.

Geological field work will proceed concurrently with the above work. Extra trenching will be decided upon as our observations disclose favourable locations.

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APPENDIX 6

DIAMOND DRILL LOGS ZEEHAN EXPLORATIONS.

CROWN: Holes 87, 89

DESPATCH: Holes 6, 8, 10, 11.

DIAMOND DRILL LOG

Diamond Drill No. 87 No. of Sheets 1 Sheet No. 1
 Location: Tadousac Brook level, Floor _____; _____ feet _____ rail
 Blocks(s), Section _____

Co-ordinates of top of standpipe, or Collar of Hole: _____
 Co-ordinate System _____
 R.L. Top of Standpipe, or Collar _____ Datum _____

Specifications: Bearing of Hole 091° Co-ordinate; _____ Magnetic _____
 Dip of Hole at Collar -60°; Total Depth _____

Machines Used _____
 Diameter of Hole _____; Diameter of Core _____
 Casting: _____ Surveys _____

Performance: Contractor _____; Power Supplied or paid by _____
 Contractor's Price per foot _____
 Total Shifts _____, Hours per Shift (nominal) _____, Speed _____
 Total Cost including Power _____ Cost per foot _____

Object of Hole: To intersect Adams Ave & Chatham & Clark's
side at depth.

Remarks: Hole stopped after encountering in remaining ground.

SUMMARY OF DRILL RESULTS

From	To	Length	Brief Description	% Pb.	Ca. Ag.	% Zn.	Loss
0	45		no core				
45	50		broken cream color				
50	60		hard sil. quartz, cemented with calc.				
			spores of garnets				
60	70		" " "				
70	75		" " "				
75	79		lashed siliceous material, flake Pb				
79	84		" " " " "				
84	91		gray sil. 1.5 splinter Pb broken				
91	101		lashed with rough				
101	104		hardly lashed 1.5 boundary of rough				
			much calcite				
104	114		broken material, mostly calcite				
114	124		lashed " , limestone, calcite				
			Hole stopped in remaining ground.				

SKETCH
SHOWING RELATC.

CORE RECOVERY				SAMPLING AND ASSAY DATA									GEOLOGICAL DESCRIPTION				
To	Run	Core	%	From	To	Length	% Pb	Cu. Ag.	% Zn	Notes	% Pb x Length	Cu. Ag. x Length	% Zn x Length	From	To	Angle Bedding	
														0	15		No core
														15	50		Abundant broken shells calcite
														50	60		Coarse sandstone? Limestone with calc. specks of quartz.
														60	70		
														70	75		
														75	79		Green siliceous material. Shale? calc.
														79	81		
														81	89		Grey siliceous ls. Shale? calc. Brown.
														91	101		- do - greenish sand shale
														101	102		Red, coarse ls. Secondary quartzite high chert content.
														102	112		Broken material, unbedded, calcite
														112	122		Green material. Hard at 112 ft
																	Thin layers in remaining 9 ft

PROGRESS DATA			CORE RECOVERY					SAMPLING AND ASSAY DATA								GEOLOGICAL DESCRIPTION					
Depth	Date	Notes	From	To	Run	Curr	%	From	To	Length	% Pb	Cu. Ag.	% Zn	Notes	% Pb x Length	Cu. Ag. x Length	% Zn x Length	From	To	Angle Bedding	
68	10/1/51	Start	0	11	11	-	-											0	11		No core
130	2/1/59		11	16	5	5	100											11	16		Grey L.S. Calcite stringers
			16	23	7	3'6"	50											16	23		Grey L.S. Calcite stringers
			23	33	10	10	100											23	33		Grey L.S. Calcite stringers
			33	43	10	10	100											33	43		Grey & light grey L.S. chert thin
			43	44	1	1	100											43	44		Light grey L.S.
			44	51	10	10	100											44	51		Grey & light grey L.S. Solid green
			51	59	5	2'6"	90											51	59		Grey L.S. fossiliferous at 56' Dip
			59	66	7	7	100														fracture at 58'
			66	69	3	3	66											66	69		Grey L.S.
			69	77	8	8	100											69	77		Grey & light grey L.S. Broken at 77
			77	78	1	1	100											77	78		Grey L.S. fossiliferous 21' 21'
			78	88	10	10	100											78	88		Grey L.S.
			88	91	3	3	50											88	91		Grey L.S.
			91	97	3	3	100											91	97		Grey & light grey L.S.
			97	106	9	9	100											106	112	75°	Grey L.S. fractured along a bed
			106	112	6	6	100											112	120	78°	Grey L.S.
			112	117	5	5	100											120	130	78°	Grey L.S.
			117	120	3	2'6"	83											130	130		Grey L.S.
			120	130	10	10	100											130	140		Grey L.S.
			130	140	10	10	100											140	150		Grey - dark grey L.S.
			140	150	10	10	100											150	160		Light & grey L.S. Calcite thin.
			150	160	10	10	100											160	166		Light grey & grey L.S. Broken at
			160	172	12	12	100											166	169		Light grey fossiliferous L.S.
			172	180	8	8	100											169	173		Light grey & grey L.S.
			180	186	6	5'6"	89											173	177		Light grey L.S. Partly fossiliferous
			186	187	1	1	100											177	187		Grey fossiliferous L.S. Shaly

STA	CORE RECOVERY					SAMPLING AND ASSAY DATA							GEOLOGICAL DESCRIPTION					
	From	To	Run	Core	%	From	To	Length	% Pb.	Co. Ag.	% Zn.	Notes	% Pb. x Length	Co. Ag. x Length	% Zn. x Length	From	To	Aspic Bedding
	187	196	4	1	77											187	196	Light grey & grey fossiliferous l.S.
	196	201	10	10	100											196	201	Grey l.S.
	197	196	9	9	100											201	206	Grey & dark grey l.S. Some fossil.
	196	201	4	4	100											206	212	Grey l.S.
	201	206	5	5	100											212	222	Grey l.S. cherty calcit.
	206	212	6	5.5	92											222	227	Grey & dark grey l.S. Calcit.
	222	222	10	10	100											227	237	Light grey l.S. Dark grey stringers
	222	224	2	1.6	75											237	247	Grey l.S. Some sh. 247.
	224	227	3	2.6	93											247	257	Dark grey l.S. Calcit. Stringers.
	227	227	10	10	100											257	262	Light grey cherty l.S.
	227	247	11	10	100											262	271	Dark grey l.S. Calcit. Paris
	247	257	10	10	100											271	277	Broken l.S. Brown Calcit. Shales & cherty calcit. mineralization.
	257	262	5	5	100													
	262	271	9	1.5	92											277	282	Light grey l.S. with brown Calcit.
	271	277	2	1.5	62											282	287	Grey l.S. Calcit. Stringers
	277	277	4	1.6	45											287	290	Grey l.S.
	277	284	7	7	100											290	298	Broken cream calcit.
	284	287	3	3	100											298	298	Light grey l.S. Brown Calcit.
	287	290	3	3	100													Partly brown secondary quartz.
	290	291	1	1	100			324 - 325				Grey l.S.				298	302	- do - . Splinter of calcit. Bed.
	291	297	4	4	100			325 - 331				Broken Grey l.S.				302	306	Light grey l.S. Brown Calcit. & stringers.
	297	291	3	3	100			331 - 334				" " "						
	291	292	1	1	100			334 - 340				" " "				306	311	Dark grey l.S. Calcit. Stringers.
	292	296	4	4	100											311	320	Broken light grey l.S. Brown Calcit.
	296	299	3	1.5	45											320	321	Dark grey l.S. cherty brown & shaly 321-323.
	299	314	5	2.5	50													

LOGGING DATA		CORE RECOVERY					SAMPLING AND ASSAY DATA							GEOLOGICAL DESCRIPTION					
Date	Notes	From	To	Run	Core	%	From	To	Length	% Pb	On. Ag.	% Zn	Notes	% Pb x Length	On. Ag. x Length	% Zn x Length	From	To	Angle Bedding
		316	318	4	1'	25											321	325	Gray L.S.
		317	320	3	1.6'	28											325	331	Broken Gray L.S.
		322	324	3	2.5'	18											331	331	Gray L.S. Broken
		326	328	1	6"	50											331	340	Broken Gray L.S.
		328	331	3	2"	22													
		331	331	1	4"	22													
		331	334	3	4"	11													
		332	340	6	9"	12													

PROGRESS DATA			CORE RECOVERY					SAMPLING AND ASSAY DATA								GEOLOGICAL DESCRIPTION					
Depth	Date	Notes	From	To	Run	Core	%	From	To	Length	% Pb	Oz. Ag.	% Zn	Notes	% Pb x Length	Oz. Ag. x Length	% Zn x Length	From	To	Angle Bedding	
14	6/1/67		0	14	14'	6'	29%														
43			14	43	29'	7'	24%														
60	7/1/67		43	60	17'	6'	3%														
99	8/1/67		60	99	39'	1-9"	43%														
100			99	100	1'	1"	5%														
106	8/1/67		100	106	5-6"	7"	103%							Sledge Sample							
110	10/1/67		106	110	4'	16"	33%							Number							
126	15/1/67		110	126	16'	2-4"	4-4%	14	126	112'				65, 71, 72, 2, 73	Ni	Metals					
126	16/1/67		126	145	19'	2-8"	6-5%							74							
165			165	165	20'									75							
190	7/1/67		165	190	25'	5-8"	1-7%							76							
201			190	201	11'	5-9"	3-6%							77							
213	8/1/67		201	213	12'	10-8"	8-9%							78				20'	2-3'	88°	
223			213	223	10'	7-6"	3-9%							79							
244	10/1/67		223	244	12'	1-6"	10-2%							80							
249			244	249	5'	9"	5-3%							81							
266			249	266	17'	6-8"	3-9%							82							
276			266	276	5'	0	0							83							
280			276	280	4'	0	0							84							
285			280	285	5'	0	0							85							
291			285	291	6'	6"	2-4%							86							
301			291	301	10'	4"	3-3%							87							
						10"								88							
			0	301'	301'	49'-4 1/2"	16-4%														

ZEEHAN EXPLORATIONS.

DIAMOND DRILL LOG

Diamond Drill No. 8 No. of Sheets 1 Sheet No. 1

Location: Block 1 Level, Floor, Surface, feet rail.

DESPATCH AVE Block(s), Section

Co-ordinates of top of standpipe, or Collar of Hole:

Co-ordinate System

R.L. Top of Standpipe, or Collar Datum

Specifications: Bearing of Hole Co-ordinate; 045° Magnetic

Dip of Hole at Collar 33°; Total Depth 338'

Machines Used ABZ 2

Diameter of Hole; Diameter of Core EX

Casting: Surveys

Performance: Contractor H. Stokes; Power Supplied or paid by

Contractor's Price per foot

Total Shifts 69 Hours per Shift (nominal) 8 Speed 9.8' / hr

Total Cost including Power Cost per foot

Object of Hole:

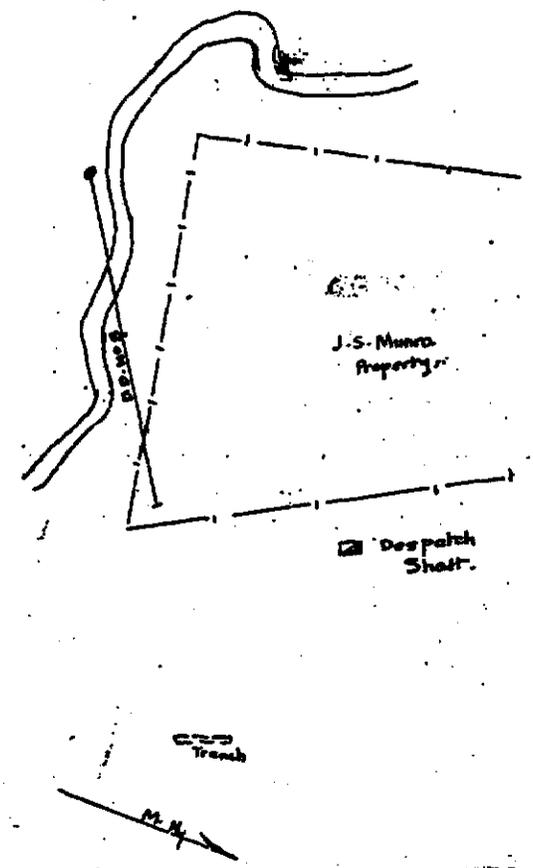
Remarks: 166 completed at 338' 11th Feb. 1957.

Ground dipping and casing.

SUMMARY OF DRILL RESULTS

From	To	Length	Brief Description	% Ph.	Ch. Ag.	% Zn.	Loss
0'	86'	86'	Ls.				
86'	109'	23'	Amalgam Ls.				
109'	118'	9'	Ls.				
118'	140'	22'	Amalgam Ls.		NIL.		
140'	295'	155'	Ls.				
295'	300'	5'	Ls.				
300'	338'	38'	Ls.				

SKETCH OF DRILL HOLE SHOWING RELATION TO NEARBY WORKINGS



Zechar Explorations.

R.L. N: 2673 22

NORTH BROKEN HILL LIMITED

DIAMOND DRILL LOG

Diamond Drill No. 18 No. of Sheets 1 Sheet No. 1

Location: Block 1 Level, Floor Surface feet rail

DESPATCH MINE Blocks(s), Section

Co-ordinates of top of standpipe, or Collar of Hole:

Co-ordinate System

R.L. Top of Standpipe, or Collar Datum

Specifications: Bearing of Hole _____ Co-ordinate; 044° Magnetic

Dip of Hole at Collar 45°; Total Depth 427'

Machines Used BBS1.

Diameter of Hole EX; Diameter of Core _____

Casing: _____ Surveys _____

Performance: Contractor H. Stokes; Power Supplied or paid by _____

Contractor's Price per foot _____

Total Shifts 34 Hours per Shift (nominal) 8 Speed 22"/min

Total Cost including Power _____ Cost per foot _____

Object of Hole: _____

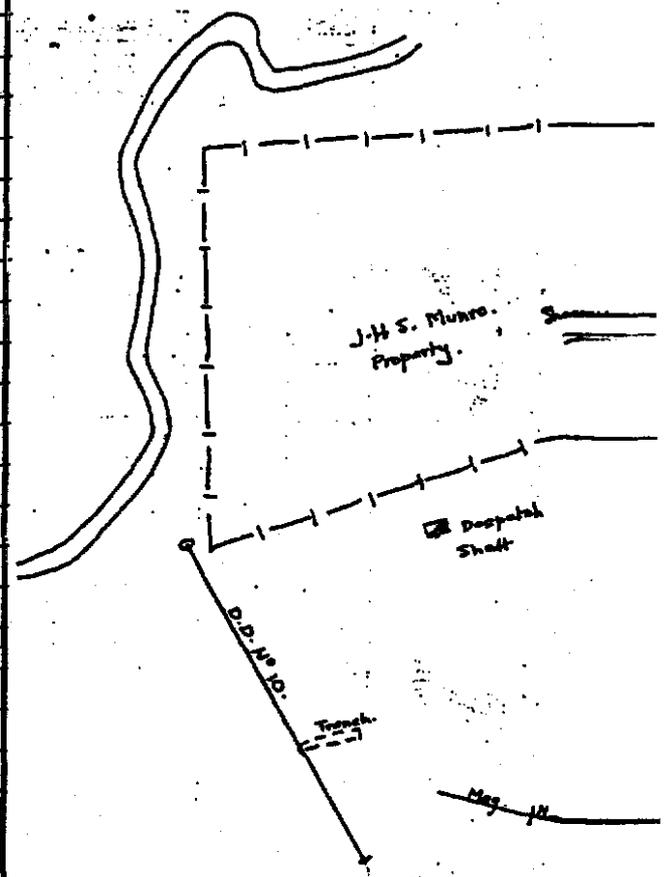
Remarks: Commenced 17/3/47

Completed 4/3/47

SUMMARY OF DRILL RESULTS

From	To	Length	Brief Description	% Pb.	Oz. Ag.	% Zn.	Loss
16	46	30'	Ls.				
46	120	74'	Ls + Black pyg.				
120	185'	65'	Black pyg.				
185'	280'	95'	Ls.				
280'	360'	80'	Ls.		NIL		
360	390	30'	Black Ls + Pyg.				
390	420	30'	11° conc.				
420	427	7'	Ls.				

SKETCH OF DRILL HOLE SHOWING RELATION TO NEARBY WORKINGS



APPENDIX 2

THE FOLLOWING SUMMARY OF EXPENDITURE PERTAINS

TO THE PERIOD NOVEMBER 13, 1984 TO OCTOBER 20, 1986.

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ABERFOYLE EXPLORATION PTY. LTD.

PROJECT COST REPORT

<u>CODE</u>	<u>ACCOUNT DETAIL</u>	<u>VALUE</u>
<u>WP-303 QUEEN HILL E.L. 47</u>		
1401	Geology - Salaries	5,560.00
1403	Geology - Contractors	5,160.00
1404	Geology - Materials	503.02
1405	Geology - Travelling	187.00
1406	Geology - Fuel	145.21
1410	Geology - District Accommodation	225.04
1411	Geology - Freight	91.96
1412	Geology - Vehicle Costs	<u>310.50</u>
Total Geology		12,182.73
1703	Survey - Contractors	2,000.00
Total Survey		<u>2,000.00</u>
2001	Geophysics - Salaries	925.00
2004	Geophysics - Materials	17.50
2006	Geophysics - Fuel	70.99
2012	Geophysics - Vehicle Costs	<u>200.90</u>
Total Geophysics		1,214.39
2601	Geochemistry - Salaries	900.00
2612	Geochemistry - Vehicle Costs	90.00
2621	Geochemistry - Assays	<u>1,251.32</u>
Total Geochemistry		2,241.32
3103	Information Drilling - Contractors	9,526.50
3104	Information Drilling - Materials	1,517.50
3110	Information Drilling - District Acc	297.05
3111	Information Drilling - Freight	5.00
3112	Information Drilling - Vehicle Cost	306.00
3121	Information Drilling - Assays	<u>1,546.99</u>
Total Information Drilling		13,199.04
3201	Target Drilling - Salaries	<u>230.00</u>
Total Target Drilling		230.00
6101	Tenure - Salaries	1,483.00
6108	Tenure - Tenement Costs	<u>5,847.57</u>
Total Tenure		7,330.57

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<u>CODE</u>	<u>ACCOUNT DETAIL</u>	<u>VALUE</u>
6201	Legal - Salaries	<u>765.00</u>
	Total Legal	765.00
7001	Other Services - Salaries	808.00
7003	Other Services - Contractors	243.60
7004	Other Services - Materials	277.00
7007	Other Services - Communications	1,160.99
7010	Other Services - District Accommodation	<u>2,182.62</u>
	Total Other Services	4,672.21
9070	Indirect Costs - Administration	<u>5,580.09</u>
	Total Indirect Costs	5,580.09
		<hr/>
	**Total WP-303 QUEEN HILL E.L. 47	<u>\$49,415.35</u>

JS
4.11.86

975136

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APPENDIX 3

N. POLTOCK FIELD EXPLORATION - WORK SHEETS

Easting	Depth
10	4.8
11	6.4
12	6.2
13	3.7
14	1.8

4600 North line - Cont.

R.

Dark grey w/rock 307
 as above 309
 " " under tan/brown clay s. 309
 " " 30
 Dirty tan/grey c. w/rock? 311

4400 North line

F	8.0
E	1.6
D	6.6
C	3.0
B	6.2
A	3.6
1	1.7
2	12.0
3	14.6
4	7.0
5	3.2
6	2.2
7	20.3
8	9.7
9	15.9
10	1.8
11	1.2
12	1.9
13	1.7
14	2.6
15	13.2
16	10.4
17	9.4
18	2.2

gitty grey w/rock + pyrite under light grey clay 355342
 grey w/rock with brown veining 341
 Dark grey clay w/rock + pyritic veins 340
 grey w/rock 339
 " " with white veining + pyrite 338
 grey w/rock - finely bedded 355337
 light grey finely bedded w/rock + white pebbles 355319
 Dark grey w/rock + pyrite pebbles 370
 grey + white slightly sandy w/rock 321
 grey w/rock with white veining 322
 2 actings - Dark grey w/rock 323
 grey w/rock 324
 grey + white w/rock under 6m deep green like skin 325
 as above 326
 grey w/rock 327
 " white w/rock 329
 " " " 330
 " " " 331
 " " " 332
 " " " 333
 dark grey w/rock 334
 grey w/rock with white pebbles 335
 Sandstone 336

5

4200 North line

Layer	Dpth	Description	Notes
1	8.6	Sandstone	355343
2	3.2	light gray + fawn clays.	344
3	6.2	fawn + gray slightly gritty w/ pebb.	345
4	3.9	Dark grey c. w/ pebb?	346
5	6.0	light + dark grey c. w/ pebb? and	347 black clays.
6	2.2	dusty grey c. w/ pebb?	348
7	2.4	grey w/ pebb with fine white veining.	349
8	16.20	5' at top 5' by 1/2 grey + white fresh w/ pebb.	350
9	2.8	grey w/ pebb with white veining.	351
10	1.2	light grey gritty clays	352
11	1.7	grey w/ pebb	353
12	2.8	dark grey c. w/ pebb + fragments	354
13	4.9	grey + white w/ pebb.	355
14	1.8	" " " "	356
15	1.6	" " " "	357
16	.7	light grey w/ pebb.	358
17	1.8	" " " " + white veining.	359
18	10.8	" " " "	360
19	16.0 + 20.1	2' at top 5' - black slightly gritty clays -	361 - similar to penultimate.
20	9.7	fawn/ tan sandy w/ pebb + muskavite?	362
21	2.0	Sandstone + quartz. gritty grey.	363

4000 North line

A	10.6	fawn/ tan gritty w/ pebb.	355380
1	5.4	dark grey + fawn banded clay w/ pebb?	355364
2	3.2	dusty fawn/ grey c. w/ pebb?	365
3	2.1	" " " "	366
4	1.9	Black clay w/ pebb.	367
5	4.2	" " " "	368
6	12.5	" gritty clays - similar to penultimate	369
7	10.4	grey w/ pebb + white veining.	370
8	5.6	" " " "	371

Reading	Depth	Notes
9	2.6	light grey w/rock 372
10		too wet
11	4.2	grey w/rock 373
12	3.5	2 attempts light grey fresh rock with white veins 374
13	2.4	grey w/rock with white veins 375
14	1.0	grey w/rock 376
15	1.6	2 attempts grey & white w/rock under black clays 377
16	16.5	Dark grey & fragments - 5/rock? 378
17	4.0	tan/brown sandy clay w/rock 379

3800 North line

1	2.3	fawn/tan c. w/rock under dark grey clays 381
2	2.5	Dark grey c. w/rock? - 10% pyrite 382
3	4.8	Black pyritic clays - unable to penetrate 383
4	8.1	grey w/rock + white veins 384

Water too deep to go further EAST

3600 North line

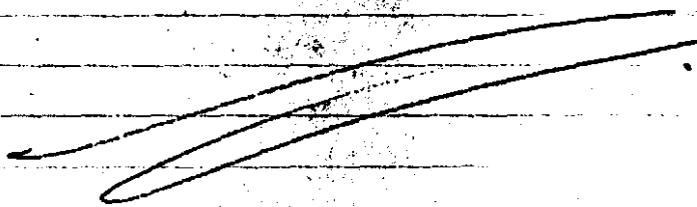
1	11.1	fawn & grey rock fragments 385
2	11.0	as above 386
3	1.8	grey w/rock + white veins 387
4	1-8	fawn & grey c. w/rock 388
5	4.5	grey w/rock with white veins 389

Water too deep to go further EAST

3700 North line (5)

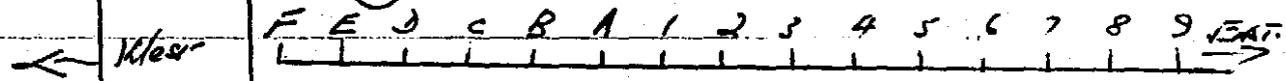
Layer	Depth	Description	Notes
1	3.0	grey w/peck + white veining	355390
2	1.6	light grey w/peck	391
3	1.4	grey w/peck - 50% white	392
4	3.8	Black rock fragments + clays	393
5	3.2	grey w/peck	394
6	2.4	+ white veining	395
7	1.9	dark grey w/peck +	396
8	5.6		397
9	2.0	grey w/peck + white veining	398
10	1.8		399
11	.7	20ft. grey fresh rock near to heavy pro contaminated creek	
12	2.6	light grey sandy w/peck	355401

641.7



NOTE. Letting used as bedings increases to WEST.

eg. 4600 North line



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Zeehan Water Supply Road Drill

4900 North Line.

- 1. 355402 10 2.4 light tan w/pebbles under tan grey clays.
- 2. 355403 10 9.7 light - dark grey w/pebbles - light grey gritty clays.
- 3. 355404 2.0W 10.2 fawn/grey w/pebbles with tan/brown pod.
- 4. 355405 3.6W 9.8 Rusty brown w/pebbles under dirty grey/brown clays.
- 5. 355406 6.0W 11.4 grey clay w/pebbles? - unable to penetrate further.
- 6. 355407 12.0W 26.5 Dark grey c. w/pebbles? - with fragments of pyrite.
- 7. 355408 5W 20.2 grey w/pebbles
- 8. 355409 5W 11.6 khaki/grey w/pebbles under dark grey clays.
- 9. 355410 6W 14.8 Dark grey c. w/pebbles? with tan sandy pod.

4700 North Line.

- 1. 355411 10 2.4 light tan, cream, grey mottled, w/pebbles, sandy.
- 2. 412 3.5 7.7 Black pyritic shales
- 3. 413 - 16.8 2 attempts - grey w/pebbles with quartz & pyritic vein.
- 4. 414 12W 27.6 2 attempts - light grey & white w/pebbles.
- 5. 415 4.5 4.7 grey w/pebbles - slightly gritty.
- 6. 416 15.8W 16.1 - - - white - slightly sandy.
- 7. 417 11.5W 18.0 grey w/pebbles with fine white veining.
- 8. 418 9W 19.9 Black coarse sands - unable to penetrate.
- 9. 419 7.5W 30.4 Black gritty clay w/pebbles?
- 10. 420 4.5W 12.0 fawn/tan sandy w/pebbles.

* 2 attempts either
dropped first sample or broke drill
string

10 - drilled with small hammer.

e.g. 4900 N No. 9. 6W with small hammer
8.8W - hydraulic -

14.8m 19 samples for 272.2m

Core	Depth.	Remarks.
<u>5000</u> ³⁵⁵⁻⁶⁶⁵ 5075E	25.2	(18 H/H) dark grey clay w/rock, under black clay.
-664 5050E	15.7	(9.5 H/H) dirty grey/brown clay, w/rock?
-663 5025E	4.8	2 attempts with hydraulics - fauna & shells?
<u>5100</u> ⁻⁶⁷¹ 5125E	19.8	(8 H/H) grey slightly sandy w/rock.
-670 5100E	27.0	(17 H/H) dark grey sandy w/rock? or sands?
-669 5075E	9.7	(.5 H/H) faunal green sandy w/rock? under green cl.
-668 5050E	17.4	(9 H/H) dark brown w/rock? under tan/brown cl.
-667 5025E	9.4 & 14.8	2 attempts Brown sandy sandy w/rock?
-666 5000E	6.9	(3 H/H) Black shales.
<u>3150</u> ³⁵⁵⁻⁵⁴⁶ 1	18.2	(11 H/H) dark grey slightly sandy w/rock!
-547 2	9.8	(4 H/H) grey w/rock.
-548 3	2.4	
-549 4	2.6	
-550 5	2.2	white oerina.
-551 6	3.7	
-552 7	1.8	light grey + white w/rock.
-553 8	14.5	grey w/rock with white oerina.
-554 9	4.6	2 attempts (1 H/H) grey w/rock.
-555 10	2.4	grey w/rock with white oerina.
-556 11	8.8	2 attempts grey w/rock, with white oerina.
-557 12	8-2.2	3 attempts grey slightly sandy w/rock.
-558 13	2.2 ^{216.7}	grey slightly sandy w/rock.

Co. cords.	Depth.	Remarks.
3700N 2	9.8	grey - white w/rock
-575 1	17.3	(7 H/H) light fawn c. w/rock, with pink ^{fragment} green
355-570		
3600N 6	6.6	grey w/rock with fawn veins & thin yellow upper side
-571 7	6.5	grey sandy w/rock with white veins.
-572 8	19.0	(10 H/H) grey slightly sandy w/rock.
-573 9	1.8	fawn to dark brown sandy w/rock.
-574 10	5.7	fawn clayey w/rock under brown sandy clay
35569		
3500N 10	4.1	fawn clayey w/rock.
-568 9	9.6	grey slightly sandy w/rock.
-567 8	3.8	grey slightly sandy w/rock with fine light fawn veins
-566 7	1.6	grey w/rock with white veins.
-565 6	1.8	grey w/rock.
-564 5	4.5	- slightly sandy, w/rock.
-562 4	4.2	- - - - - under grey. & s.
-563 6	4.8	(8 H/H) grey w/rock - re sampled with H/H.
-562 3	16.4	(7 H/H) grey.
-560 2	11.2	(7 H/H) light grey w/rock under cream / tan clay
355-559	4.8	(1 H/H) light grey w/rock.

<u>Cods.</u>	<u>Depth.</u>	<u>Remarks.</u>
3900 ⁵⁹⁷ 2	11.6	(8 H/H) fawn/brown slightly sandy w/rock under black clay
596 1	6.8	(4 H/H) Black clayey w/rock with pebbles.
3800 ⁵⁸⁶ 5	4.9	light grey w/rock with white veining
-587 6	2.7	Dark grey w/rock.
-588 7	1.8	grey w/rock.
-589 8	7.4	" " " with white veining.
-590 9	4.5	" " " " " " "
-591 10	2.8	" " " " " " "
-592 11	3.7	dark grey gritty w/rock.
-693 12	5.6	grey w/rock.
-594 13	15.7	(6 H/H) grey sandy w/rock.
-595 14	26.2	grey w/rock fragments.
3700 ⁵⁸⁵ 11	13.5	(9 H/H) grey clays? unable to penetrate.
584 10	26.5	(12 H/H) grey w/rock with darker grey veins
-583 9	3.7	grey w/rock.
-582 8	1.6	" " " " " " "
-581 7	1.8	2 attempt - grey w/rock with white veining
-580 6	3.0	grey w/rock with fine white veining.
-579 5	2.8	grey w/rock.
-578 4	5.0	grey w/rock with fine veining & fawn part.
-577 3	4.2	light grey slightly sandy w/rock with pebbles, white & fawn mottling.

Coords	Depth	Remarks
4500N 12	1.6	grey w/rock
-623 13	8-1.7	3 attempts dark grey w/rock - white veining.
-624 14	1.2	fawn c. w/rocks
-625 15	.8	grey w/rock
-626 16	1.7	grey, slightly sandy, w/rock
-627 17	12.5	(4 H/H) grey w/rock
-628 18	15.5	(8 H/H) light grey c. lumpy w/rock
-629 19	1.0	Sandstone
3900N 15	17.0	(9 H/H) grey w/rock with fawn veining
-609 14	12.7	(7 H/H) grey w/rock with white veining + pod of fawn clgs
-608 13	2.8	grey & white w/rocks
-607 12	2.7	grey w/rock
-606 11	4.8	dark grey slightly gritty w/rock
-605 10	6.0	grey w/rock with white veining
-604 9	3.7	dark grey slightly sandy w/rock with many fine white veins
-603 8	4.2	grey w/rock with white & fawn veining
-602 7	3.6	gritty grey w/rock with fawn veining
-601 6	2.8	grey w/rock with white veining
-600 5	6.7	
5994	13.0	dark grey w/rock with white veining
-598 3	10.8	(6 H/H) dark grey w/rock

<u>Coords</u>	<u>Depth.</u>	<u>Remarks.</u>
4200-64011	1.4	grey rock.
-639 10	4.2	grey, slightly sandy rock
-638 9	3.7	grey rock
-637 8	6.0	(-5 H/A) grey rock with white pod.
-636 7	2.7	light grey & white rock
-635 6	1.8	grey rock under 1st type cor.
-634 5	1.4 & 1.5	2 attempts grey slightly sandy rock
-633 4	1.8 & 1.8	grey rock
-632 3	3.7	grey & white rock near old dump
-631 2	26.0	grey rock with white veining.
-630 1	5.0	grey rock ~ on road.
4 floor -611	12.7	faint grey gritty rock.
-612 2	7.6	Dark grey gritty rock.
-613 3	10.0	rock with fine white veining
-614 4	3.7	grey rock
-615 5	9.6	off white & cream clay rock
-616 6	6.3	grey rock
-617 7	6.0	
-618 8	3.4	
-619 9	2.6	
-620 10	2.9	grey rock with fine white veining
-621 11	1.7	grey & white rock.

126 holes for 954.2 m (avg 7.6) cont 16.2/m

<u>Cords</u>	<u>Depth.</u>	<u>Remarks.</u>
4500N 9-646	4.5	grey - white w/ ink - on rock.
-647 10	23-2	(4.2 H/H) grey, slightly sandy, w/ ink
-648 11	9-8	(3.8 H/H) grey w/ ink
-649 12	21.0	(10 H/H) grey, slightly yellow w/ ink ^{conspicuous} with slight
-650 13	20.6	(11.6 H/H) grey w/ ink with white veins
-651 14	2.0	grey w/ ink
-652 15	1.0	
-653 16	1.2	
-654 17	4.6	white - grey w/ ink with fawn sand.
-655 18	10 & 14	2 att. pts - dark grey w/ ink, with white veins
-656 19	1.7	grey w/ ink
-657 20	19.2	(2.7 H/H) grey, slightly sandy w/ ink
-658 21	19.0	(14.5 H/H) grey w/ ink with white prod.
-659 22	9.4	(5.4 H/H) dark grey w/ ink
660 23	17.2	(12.2 H/H) light grey, slightly sandy w/ ink + ^{veins} _{cracks}
-661 24	6.2	(4 H/H) Dark grey w/ ink, under fawn clayey ground
-662 25	4.8	(1 H/H) Sandstone?
4300N 16	2.7	(1.2 H/H) Sandstone?
-644 15	2.6	(.6 H/H) dirty khaki / grey clay w/ ink ^{black clay} under
-643 14	18.2	(10.7 H/H) Near black sandy clay with r. fragments
-642 13	5.8	grey - white w/ ink
-641 12	1.0	

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975149

APPENDIX 4

ASSAY RESULTS

ANALABS

975150

Phone (09) 458 7999

A Division of Macdonald Hamilton & Co. Pty. Ltd.
52 Murray Road, Welshpool, W.A. 6106

Telex AA92560

ANALYTICAL REPORT No. 23.3 08 3253

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

Aberfoyle Exploration Pty Ltd
PO Box 952
Burnie
Tasmania 7320

ORDER No.	PROJECT
6047	
DATE RECEIVED	RESULTS REQUIRED
4.9.85	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
	6/9/85	3	116

REF ID	SAMPLE NUMBERS	PRE-TREATMENT							ANALYSIS		
		DRY	CRUSH	SPLIT	PUL-VERISE	SEIVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
RO	355286-401	1	2		3				Pb Zn Ag		101

RESULTS TO

As Above

RESULTS TO

REMARKS

*Yachan
Gordon Timoshina
Wacka Camps.*

STATE OF SAMPLES	ANALYSIS — PREPARATION	ANALYSIS — METHOD
whole core	perchloric acid A1	atomic absorption AAS
split core	hydrochloric acid A2	x-ray fluorescence XRF
cutting	nitric acid A3	spectrophotometry SPEC
rock	aqua regia A4	colorimetry COL
slip	nitric-perchloric A5	chromatography CHR
water	HF mixture A6	titration ITN
tissue	HF under pressure A7	other chemicals means CHEM
beach sediment	fusion A8	miscellaneous MISC
heavy mineral		fluorescence FLUOR
		inductively coupled plasma ICP

AUTHORISED OFFICER *M. Buckley*

150

ANALABS

A division of MacDonnell Hamilton & Co. Pty. Ltd.

975151

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

		23.3 08 3253			6.9.85		6047		1 OF 5	
TUBE No.	SAMPLE No.	Zn	Pg	Pb	ARTING	EASTING			DEPTH (m)	
1	355286	1850	0.5	370	5000	5000			2.6	
2	355287	30	x	25	"	5025			4.0	
3	355288	10	x	10	"	5050			10.0	
4	355289	890	x	55	"	5075			10.5	
5	355290	65	x	30	"	5000			24.4	
6	355291	1200	0.5	225	"	5125			18.4	
7	355292	3850	1.0	360	"	5150			10.5	
8	355293	10	x	10	4800	1			0.9	
9	355294	170	x	80	"	2			6.4	
10	355295	10	x	40	"	3			9.8	
11	355296	1100	0.5	125	"	4			6.8	
12	355297	x	0.5	275	"	5			1.6	
13	355298	2.2%	5.0	8000	4600	1			1.2	
14	355299	45	x	60	"	2			2.6	
15	355300	65	0.5	170	"	3			2.7	
16	355301	20	0.5	70	"	4			2.9	
17	355302	1.1%	3.0	2050	"	5			11.7	
18	355303	160	1.0	55	"	6			46.4	
19	355304	130	x	40	"	7			1.4	
20	355305	145	0.5	35	"	8			1.0	
21	355306	55	x	25	"	9			1.6	
22	355307	130	x	25	"	10			4.8	
23	355308	100	x	35	"	11			6.4	
24	355309	610	x	580	"	12			6.2	
25	355310	1450	x	200	"	13			8.7	

Results in ppm unless otherwise specified

T = element present; but concentration too low to measure

X = element concentration is below detection limit

- = element not determined

AUTHORISED OFFICER

M. Hardy

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ANALABS

A division of MacDonnell Hamilton & Co. Pty. Ltd.

975152

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

23.3 08 3253

6.9.85

6047

2 OF 5

TUBE No.	SAMPLE No.	Zn	Pb	Ag	Mercurials	EASTINS	DEPTH (m)
1	355311	2.5%	150	2.5	4600	14	1.8
2	355312	2600	15	x	"	A	5.6
3	355313	4200	590	0.5	"	B	1.5
4	355314	3400	230	x	"	C	4.6
5	355315	110	115	x	"	D	3.0
6	355316	105	690	x	"	E	1.9
7	355317	45	35	0.5	"	F	3.9
8	355318	75	30	x	"	G	1.9
9	355319	205	245	0.5	4400	1	1.7
10	355320	1450	70	x	"	2	12.0
11	355321	25	25	x	"	3	14.6
12	355322	245	105	x	"	4	7.0
13	355323	175	40	x	"	5	3.2
14	355324	225	60	1.0	"	6	2.2
15	355325	760	85	1.5	"	7	20.3
16	355326	170	210	x	"	8	8.7
17	355327	205	25	x	"	9	15.9
18	355328	75	35	x	"	10	1.8
19	355329	55	25	x	"	11	1.2
20	355330	55	15	x	"	12	1.9
21	355331	360	80	x	"	13	1.7
22	355332	95	20	x	"	14	2.6
23	355333	55	20	x	"	15	13.2
24	355334	1200	200	x	"	16	10.4
25	355335	90	15	x	"	17	9.4

Results in ppm unless otherwise specified
 T = element present; but concentration too low to measure
 X = element concentration is below detection limit
 - = element not determined

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M. R. [Signature]

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ANALABS

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975153

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

		23.3 08 3253			6.9.85		6047		3 ^{OF} 5	
TUBE No.	SAMPLE No.	Zn	Pb	Pb	WESTINGS	EASTINGS	DEPTH(m)			
1	355336	5	x	15	4400	18	2.2			
2	355337	30	1.0	70	"	1	3.6			
3	355338	460	0.5	270	"	8	6.2			
4	355339	165	0.5	20	"	C	3.0			
5	355340	500	x	95	"	D	6.6			
6	355341	5	1.0	20	"	E	1.6			
7	355342	510	x	45	"	F	8.0			
8	355343	2850	x	60	4200	1	8.6			
9	355344	670	0.5	60	"	2	3.2			
10	355345	1450	x	75	"	3	6.2			
11	355346	2600	1.5	650	"	4	3.9			
12	355347	8000	5.0	2100	"	5	6.0			
13	355348	365	x	135	"	6	2.2			
14	355349	130	x	40	"	7	2.4			
15	355350	60	0.5	40	"	8	2.0			
16	355351	95	x	30	"	9	2.8			
17	355352	185	1.5	135	"	10	1.2			
18	355353	70	x	65	"	11	1.7			
19	355354	305	x	80	"	12	2.8			
20	355355	460	x	135	"	13	4.9			
21	355356	730	0.5	860	"	14	0.8			
22	355357	260	x	70	"	15	1.6			
23	355358	255	x	285	"	16	0.7			
24	355359	510	x	45	"	17	1.8			
25	355360	180	x	10	"	18	10.8			

Results in ppm unless otherwise specified
 T = element present; but concentration too low to measure
 X = element concentration is below detection limit
 - = element not determined

AUTHORISED OFFICER *M. Barclay*

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975154

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

		23.3 08 3253			6.9.85		6047		4 OF 5	
TUBE No.	SAMPLE No.	Zn	Pb		NEUTRONS		EASTING		DEPTH (m)	
1	355361	5500	4.0	1200	4200		19		20.1	
2	355362	5100	1.0	95	"		20		9.7	
3	355363	30	0.5	15	"		21		2.0	
4	355364	2500	0.5	270	4000		1		5.4	
5	355365	3050	1.0	460	"		2		3.2	
6	355366	1550	x	45	"		3		2.1	
7	355367	510	x	120	"		4		1.9	
8	355368	550	x	75	"		5		4.2	
9	355369	270	0.5	55	"		6		12.5	
10	355370	20	x	10	"		7		10.4	
11	355371	630	1.5	100	"		8		5.6	
12	355372	1450	1.5	345	"		9		2.6	
13	355373	1300	x	105	"		11		4.2	
14	355374	910	x	70	"		12		3.5	
15	355375	145	x	50	"		13		2.4	
16	355376	300	1.5	95	"		14		1.0	
17	355377	360	x	45	"		15		1.6	
18	355378	90	x	25	"		16		16.5	
19	355379	10	x	70	"		17		4.0	
20	355380	2850	x	1900	"		A		10.6	
21	355381	1200	x	45	3800		1		2.3	
22	355382	1900	1.5	465	"		2		2.5	
23	355383	390	x	70	"		3		4.8	
24	355384	145	x	25	"		4		8.1	
25	355385	3600	1.5	630	3600		1		11.1	

Results in ppm unless otherwise specified

T = element present; but concentration too low to measure

X = element concentration is below detection limit

- = element not determined

AUTHORISED OFFICER

A. Family

154

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A Division of MacDonald Hamilton & Co. Pty. Ltd.

975155

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

23.3 08 3253

6.9.85

6047

5 OF 5

TUBE No.	SAMPLE No.	Zn	Ag	Pb		NOBANS		FASTINS		DEPTH (m)
1	355386	4250	1.0	1.0%		3600		2		11.0
2	355387	1050	x	385		"		3		1.8
3	355388	665	0.5	220		"		4		1.8
4	355389	250	x	150		"		5		4.5
5	355390	245	x	125		3200		1		3.0
6	355391	240	x	60		"		2		1.6
7	355392	1200	1.0	375		"		3		1.4
8	355393	2150	x	345		"		4		3.8
9	355394	100	x	50		"		5		3.2
10	355395	80	0.5	65		"		6		2.4
11	355396	40	x	40		"		7		1.9
12	355397	85	x	30		"		8		5.6
13	355398	150	0.5	65		"		9		2.0
14	355399	270	x	110		"		10		1.8
15	355400	135	x	50		"		11		0.7
16	355401	520	0.5	90		"		12		2.6
17										
18										
19										
20										
21										
22										
23	DETECTION	5	0.5	5						
24	DIGESTION									
25	METHOD	101	101	101						

Results in ppm unless otherwise specified
 T = element present; but concentration too low to measure
 X = element concentration is below detection limit
 — = element not determined

AUTHORISED OFFICER

M. Barclay

975156

Phone (09) 458 7999

LA 6106

Telex AA92560

ANALYTICAL REPORT No. 23.3 08 3232

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

Aberfoyle Exploration Pty Ltd
PO Box 952
Burnie
Tasmania 7320

ORDER No.	PROJECT
9092	3030 2621
DATE RECEIVED	RESULTS REQUIRED
23.8.85	URGENT

No. OF PAGES OF RESULTS	DATE REPORTED	NO. OF COPIES	TOTAL No. OF SAMPLES
	26/1/85	3	6

REF ID	SAMPLE NUMBER	PRE-TREATMENT				ANALYSIS		
		1	2	3	4	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
RO	355280-85	1	2			Cu Pb Zn Ag		101/4

RESULTS TO

As Above

RESULTS TO

[Blank area]

REMARKS

STATE OF SAMPLES	ANALYSIS	ANALYSIS - METHOD
whole core	WC	atomic absorption
split core	SC	x-ray fluorescence
cutting	CU	spectrophotometry
tail	Ro	calorimetry
sediment	SO	chromatography
water	PU	titration
heavy mineral	WA	other chemical means
	TI	miscellaneous
	SS	fluorescence
	HM	inductively coupled plasma
		ICP

AUTHORISED OFFICER

[Signature]

156

SAMPLE PREFIX

23.3 88 3232

26.8.85

9092

PAGE

1 OF 1

TUBEN No.	SAMPLE No.	Cu					Pb	Mo		
1	355280	495	25%	23.3	160	166	1.00%	16.9	DESPATCH	1
2	355281	35	750	-	X	-	780	-	"	2
3	355282	15	7200	-	5.5	-	3750	-	"	3
4	355283	500	25%	24.8	165	164	9200	22.8	"	4
5	355284	30	3500	-	100	122	7.52%	7.46	CROWN	1
6	355285	5	950	-	7.0	-	2150	-	ZEBIAN	6.4000
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	5	5	25	0.5	2	5	25		
24	DIGESTION									
25	METHOD	101	101	104	101	104	101	104		

Results in ppm unless otherwise specified
 T = element present; but concentration too low to measure
 X = element concentration is below detection limit
 - = element not determined

AUTHORISED OFFICER *A. Howley*

157

ANALABS

975158

Phone (09) 458 7999

A division of MacDonald Hamilton & Co. Pty. Ltd.
52 Murray Road, Welshpool, W.A. 6106

Telex AA92560

ANALYTICAL REPORT No. 23.3 08 3329

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

Aberfoyle Exploration Pty Ltd
PO Box 952
Burnie
Tasmania 7320

ORDER No.	PROJECT
6085	
DATE RECEIVED	RESULTS REQUIRED
16.10.85	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
		3	19

REF. NO.	SAMPLE NUMBERS	PRE-TREATMENT						ANALYSIS			
		DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
RO	355402-355420	1	2		3				Pb Zn Ag		101

RESULTS TO	As Above
RESULTS TO	

REMARKS

*Queen Hill
Gordon Lindsay
Wacka*

*4900 N
4700 N*

STATE OF SAMPLES	ANALYSIS — PREPARATION	ANALYSIS — METHOD
whole core WC	perchloric acid A1	atomic absorption AAS
split core SC	hydrochloric acid A2	x-ray fluorescence XRF
cutting CU	nitric acid A3	spectrophotometry SPEC
slack RO	aqua regia A4	colorimetry COL
tail SO	nitric-perchloric A5	chromatography CHR
pulp PU	HF mixture A6	titration TTN
water WA	HF under pressure A7	other chemicals means CHEM
tissue TI	fusion A8	miscellaneous MISC
beam sediment SS		fluorescence FLUOR
heavy mineral HM		inductively coupled plasma ICP

AUTHORISED OFFICER *R. [Signature]*

158

ANALABS

A Division of MacDonal Hamilton & Co. Pty. Ltd.

975159

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

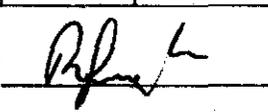
PAGE

					23.3 08 3329	22.10.85	6085	1 OF 1	
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UBE No.	SAMPLE No.	Pb	Zn	Pg		NORTHINGS	EASTINGS		DEPTH.
1	355402	15	130	x		4900	1		2.4
2	355403	20	230	x		"	2		9.7
3	355404	175	880	0.5		"	3		10.2
4	355405	100	1300	1.0		"	4		9.8
5	355406	50	95	x		"	5		11.4
6	355407	70	300	x		"	6		26.5
7	355408	55	195	x		"	7		20.2
8	355409	240	6500	x		"	8		11.6
9	355410	80	280	x		"	9		14.8
10	355411	275	5	x		4700	1		2.4
11	355412	375	1300	x		"	2		7.7
12	355413	70	1350	0.5		"	3		16.8
13	355414	20	55	x		"	4		27.6
14	355415	30	135	x		"	5		4.7
15	355416	20	30	x		"	6		16.1
16	355417	165	1100	x		"	7		18.0
17	355418	5	390	x		"	8		19.9
18	355419	95	1250	x		"	9		20.4
19	355420	80	35	0.5		"	10		12.0
20									
21									
22									
23	DETECTION	5	5	0.5					
24	DIGESTION								
25	METHOD	101	101	101					

Results in ppm unless otherwise specified
 T = element present; but concentration too low to measure
 X = element concentration is below detection limit
 - = element not determined

AUTHORISED OFFICER



159

ANALABS

A division of MacDonell Hamilton & Co. Pty. Ltd.
52 Murray Road, Welshpool, W.A. 6106

Phone (09) 458 7999

975160

07 NOV REC'D

Telex AA92560

ANALYTICAL REPORT No. 23.3 08 3350

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

Aberfoyle Exploration Pty Ltd
PO Box 952
Burnie
Tasmania 7320

ORDER No.	PROJECT
6096	
DATE RECEIVED	RESULTS REQUIRED
31.10.85	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
		3	8

SAMPLE NO.	SAMPLE NUMBERS	PRE-TREATMENT							ANALYSIS		
		DRY	CRUSH	SPLIT	PULVERISE	SEIVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
RO	355421-428	1	2		3				Cu Pb Zn Ag MN Ba		101 401

As Above
Att. Richard de Bomford

RESULTS TO

RESULTS TO

REMARKS

*Rock chip by
Phil Jones.
Gorda Limestone
Zeehan.*

STATE OF SAMPLES	ANALYSIS — PREPARATION	ANALYSIS — METHOD
whole core WC	perchloric acid A1	atomic absorption AAS
split core SC	hydrochloric acid A2	x-ray fluorescence XRF
cutting CU	nitric acid A3	spectrophotometry SPEC
rock Ro	aqua regia A4	colorimetry COL
soil SO	nitric-perchloric A5	chromatography CHR
pulp PU	HF mixture A6	titration TTN
water WA	HF under pressure A7	other chemicals means CHEM
tissue TI	fusion A8	miscellaneous MISC
slam sediment SS		fluorescence FLUOR
heavy mineral HM		inductively coupled plasma ICP

AUTHORISED OFFICER *[Signature]*

160

ANALYSIS
ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

23.3 08 3350

6.11.85

6096

1 OF 1

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Mn	Ba			
1	355421	975*	2.64%*	15.5%*	103*	8500	89	SOUTH	CROWN	
2	355422	1325*	8.94%*	13.2%*	258*	8950	20		CROWN	
3	355423	10	115	415	0.5	1.50%	285	EAST	CROWN	
4	355424	10	105	400	x	9050	207	EAST	CROWN	
5	355425	5	1800	605	2.0	9700	116	NORTH	EAST	CROWN
6	355426	10	3.39%*	0.50%*	20*	7.25%	37	NORTH	EAST	CROWN
7	355427	5	385	400	0.5	1.85%	1890	DESPATCH		
8	355428	650*	3.80%*	29.6%*	68 *	7400	23	DESPATCH.		
9										
10										
11										
12										
13										
14										
15										
16	Note * samples assayed by method 104 det. 25ppm for Cu Pb Zn, 2ppm for Ag									
17										
18										
19										
20										
21										
22										
23	DETECTION	5	5	5	0.5	5	10			
24	DIGESTION									
25	METHOD	101	101	101	101	101	401			

Results in ppm unless otherwise specified
 Y = element present but concentration too low to measure
 X = element concentration is below detection limit
 - = element not determined

AUTHORISED OFFICER

[Signature]



COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

Head Office and
Central Laboratory
305 South Road,
Mile End South,
Sth. Aust. 5031.
Tel: (08) 43 5722
Telex: AA89323



NATA REGISTERED No. 1526

COM852211

OUR REF.: 9638

YOUR REF.:

Mr. Colin Bay
Aberfoyle Services Pty Ltd
39 River Road
WIVENHOE

TAS 7320

December 13, 1985

Dear Colin

RE: JOB COM852211

Enclosed are the assays for the samples delivered to our
Laboratory on December 4, 1985

Yours Sincerely,
COMLABS PTY LTD

per :

c.c.: Aberfoyle Exp.

No. of copies : 1

Report Length 6 pages



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ANALYTICAL REPORT

JOB COM852211

O/N : 9638

SAMPLE	Cu	Pb	Zn	Ag	Mn	Ba
355546	14	970	2800	2	9700	155
355547	14	310	870	1	2800	55
355548	9	185	320	1	1050	25
355549	12	85	170	1	460	120
355550	6	130	320	<1	590	45
355551	10	140	840	<1	5900	100
355552	7	42	24	<1	260	25
355553	7	470	1700	<1	1.81%	65
355554	5	32	65	<1	350	30
355555	6	150	1600	<1	6300	160
355556	4	155	1350	<1	6900	65
355557	6	125	350	<1	640	30
355558	7	200	85	1	490	20
355559	8	200	430	<1	1400	65
355560	6	820	1800	1	6100	40
355561	6	1800	800	2	2900	90
355562	16	390	1750	2	4500	125
355563	6	175	2150	1	1.40%	10
355564	5	320	560	<1	490	35
355565	6	150	320	1	700	45
355566	5	50	230	<1	2300	30
355567	6	150	740	<1	1450	20
355568	5	100	200	<1	450	20
355569	10	115	10	<1	18	230
355570	12	5.00%	8100	40	3.35%	45
UNITS	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1 AAS1A	AAS1	AAS3	AAS2 AAS2A	XRF1


ANALYTICAL REPORT

JOB COM852211

O/N : 9638

SAMPLE	Cu	Pb	Zn	Ag	Mn	Ba
355571	5	38	130	<1	680	30
355572	8	65	160	<1	350	50
355573	125	50	340	<1	14	45
355574	30	30	660	<1	16	320
355575	14	1050	7000	4	12.8%	110
355576	12	500	720	1	1.29%	50
355577	8	210	2050	1	1.51%	30
355578	26	1150	2250	4	3100	35
355579	7	210	770	<1	2400	15
355580	9	46	230	<1	830	65
355581	7	70	46	<1	280	40
355582	7	160	720	<1	1300	25
355583	9	250	390	<1	860	30
355584	34	155	1000	1	16	290
355585	6	85	610	<1	1050	10
355586	5	165	530	<1	410	<10
355587	6	350	710	<1	840	45
355588	5	240	90	<1	250	40
355589	10	195	780	<1	145	45
355590	9	12	48	<1	410	155
355591	8	22	420	<1	960	135
355592	6	390	8300	<1	3850	55
355593	12	28	110	<1	680	135
355594	9	310	1900	<1	1150	65
355595	6	95	110	<1	400	25
UNITS	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS1	AAS3	AAS2 AAS2A	XRF1

**ANALYTICAL REPORT**

JOB COM852211

O/N : 9638

SAMPLE	Cu	Pb	Zn	Ag	Mn	Ba
355596	22	90	430	<1	38	175
355597	18	260	1900	<1	18	210
355598	10	14	10	<1	920	100
355599	10	20	22	<1	290	100
355600	8	8	24	<1	185	45
355601	7	26	175	<1	650	45
355602	20	3300	3.55%	2	3.65%	35
355603	7	28	140	<1	230	20
355604	6	26	130	<1	190	30
355605	10	12	60	<1	240	185
355606	8	16	26	<1	200	95
355607	18	48	135	<1	230	360
355608	10	24	135	<1	165	80
355609	8	50	420	<1	1800	55
355610	8	160	1500	<1	2000	15
355611	10	550	5050	<1	2.40%	65
355612	18	80	280	<1	18	125
355613	10	30	540	<1	430	90
355614	12	85	540	<1	380	45
355615	24	40	210	<1	2750	150
355616	9	22	20	<1	240	30
355617	16	105	230	<1	55	100
355618	10	105	220	<1	660	80
355619	9	34	230	<1	220	40
355620	8	260	890	<1	1100	30
UNITS	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS1 AAS1A	AAS3	AAS2 AAS2A	XRF1



ANALYTICAL REPORT

JOB COM852211
O/N : 9638

SAMPLE	Cu	Pb	Zn	Ag	Mn	Ba
355621	8	310	1800	<1	3100	115
355622	7	55	3250	<1	6250	55
355623	8	320	2750	<1	3050	20
355624	14	100	320	<1	290	210
355625	14	38	175	<1	320	220
355626	7	6	28	<1	730	45
355627	8	20	95	<1	240	95
355628	26	350	730	<1	16	250
355629	5	10	5	<1	8	115
355630	180	90	40	<1	8	200
355631	12	130	1700	1	5450	90
355632	10	50	320	1	3600	55
355633	18	30	44	<1	860	130
355634	22	420	960	3	6400	115
355635	14	65	330	1	5300	105
355636	2	20	46	<1	280	<10
355637	3	160	1250	<1	4150	30
355638	5	60	360	<1	2.20%	25
355639	7	34	75	<1	530	65
355640	9	14	18	<1	360	220
355641	14	20	34	<1	75	350
355642	5	10	24	<1	105	100
355643	16	100	1350	<1	26	300
355644	1000	600	960	<1	8	330
355645	4	4	4	<1	8	95
UNITS	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS1	AAS3	AAS2 AAS2A	XRF1



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ANALYTICAL REPORT

JOB COM852211

O/N : 9638

SAMPLE	Cu	Pb	Zn	Ag	Mn	Ba
355646	6	3700	5150	3	8.60%	35
355647	18	38	250	<1	55	220
355648	7	30	115	<1	5550	45
355649	4	22	190	<1	7300	60
355650	8	16	100	<1	2400	80
355651	7	18	18	<1	300	60
355652	6	36	320	<1	250	50
355653	4	10	46	<1	95	10
355654	7	30	590	<1	230	30
355655	10	22	100	<1	1100	45
355656	3	14	60	<1	90	10
355657	5	450	2650	<1	1800	30
355658	8	34	42	<1	370	160
355659	9	115	1400	<1	490	110
355660	6	30	330	<1	900	10
355661	9	50	710	<1	10	70
355662	8	105	5	<1	4	135
355663	4	4	4	<1	12	30
355664	32	105	185	<1	30	210
355665	26	115	570	<1	32	180
355666	8	70	430	<1	10	135
355667	5	14	36	<1	6	15
355668	10	55	14	<1	10	85
355669	5	6	6	<1	8	50
355670	10	20	95	<1	<4	60
UNITS	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS1	AAS3	AAS2 AAS2A	XRF1



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JOB COM852211
O/N : 9638

ANALYTICAL REPORT

SAMPLE	Cu	Pb	Zn	Ag	Mn	Ba
355671	6	26	70	<1	680	40
UNITS	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS1	AAS3	AAS2	XRF1

Sample Nos

LINE	3150N	(1 to 13)	355546 - 558
LINE	3500N	(1 to 10)	355559 - 569
LINE	3600N	(6 to 10)	355570 - 574
LINE	3700N	(1 to 11)	355575 - 585
LINE	3800N	(5 to 14)	355586 - 595
LINE	3900N	(1 to 15)	355596 - 610
LINE	4100N	(1 to 19)	355611 - 629
LINE	4300N	(1 to 16)	355630 - 645
LINE	4500N	(9 to 25)	355646 - 355662
LINE	5000N	(5025E to 5075E)	355663 - 665
LINE	5100N	(5000E to 5125E)	355666 - 671
		=	
LINE	4700N	(1 to 10)	355411 - 355420)
LINE	4900N	(1 to 9)	355402 - 355410)

975170

169

APPENDIX 5

REPORT TO ABERFOYLE EXPLORATION PTY. LTD. ON THE SIGNIFICANCE
OF LEAD ISOTOPIC COMPOSITIONS OF SAMPLES FROM THE QUEEN HILL
LICENCE, WESTERN TASMANIA. G.R. CARR, NOVEMBER 25, 1985.

SIROTOPE**CONFIDENTIAL****CSIRO****Division of Mineralogy and Geochemistry
Sydney Laboratory**Delhi Road, North Ryde
P.O. Box 136, North Ryde, NSW, Australia 2113
Int'l. Phone: 61-2-887 8712, 61-2-887 8713
Telex: MINRE AA 25817**REPORT****TO****ABERFOYLE EXPLORATION PTY LTD****ON****THE SIGNIFICANCE OF LEAD ISOTOPIC COMPOSITIONS****OF****SAMPLES FROM THE QUEEN HILL LICENCE, WESTERN TASMANIA****GRAHAM R. CARR
25/11/85**

1. AIMS OF STUDY

The aim of the study was to determine whether sulfide-rich rocks from the Gordon Limestone near Zeehan in Western Tasmania have the Pb isotopic characteristics of syn-sedimentary mineralization such as Oceana (also hosted within the Gordon Limestone) or of younger epigenetic vein mineralization which is common in the region.

2. SAMPLES

Six sulfide-rich dump samples containing between 900ppm and 22.8% Pb were provided by John Sise. The samples were taken from the Crown and Despatch dumps, located on the Gordon Limestone.

3. TARGET

The target isotopic signatures in the area are the Oceana deposit which occurs in the Ordovician Gordon Limestone, and the Cambrian massive sulfide deposits which have similar isotopic compositions.

4. METHODS

The pulverized whole-rock samples were digested in a 7N nitric acid + 7N hydrochloric acid solution prior to ion exchange and electroplating onto Pt electrodes. The samples were analysed on an ISOMASS 54E solid source thermal ionization mass spectrometer in fully automated mode. Precision estimates representing 2 standard deviations about the mean of over 700 analyses of standards are shown in the top left hand corner of the figures presented below.

5. RESULTS

The results are presented in Table 1 and Figures 1 and 2. The data plot as homogeneous clusters on both diagrams (total

variation is <0.3% for all ratios), but have significantly higher $^{206}\text{Pb}/^{204}\text{Pb}$ and $^{208}\text{Pb}/^{204}\text{Pb}$ ratios than the target Oceana, Rosebery and Hellyer signatures (i.e. they are more "radiogenic"). The isotopic ratios compare closely with those for Devonian vein systems at Queen Hill and the Spray Mine, analysed previously for Aberfoyle.

6. DISCUSSION AND CONCLUSIONS

The differences in isotopic composition between these samples and the target Cambrian and Ordovician deposits indicates that they were formed during different mineralizing events. The results suggest that these dump samples are genetically related to nearby Devonian vein systems. Thus on the basis of Pb isotopes, the prospect is given a low priority for further exploration (that is, if the samples analysed are considered by the field geologists to be representative of the mineralization present on the Licence).

7. FOLLOW UP

As there is some doubt as to the origin of some of the dump material, it is advisable that check analyses be run from the bedrock sampling program.

TABLE 1. Pb ISOTOPE RESULTS FOR SAMPLES FROM THE QUEEN HILL LICENCE.

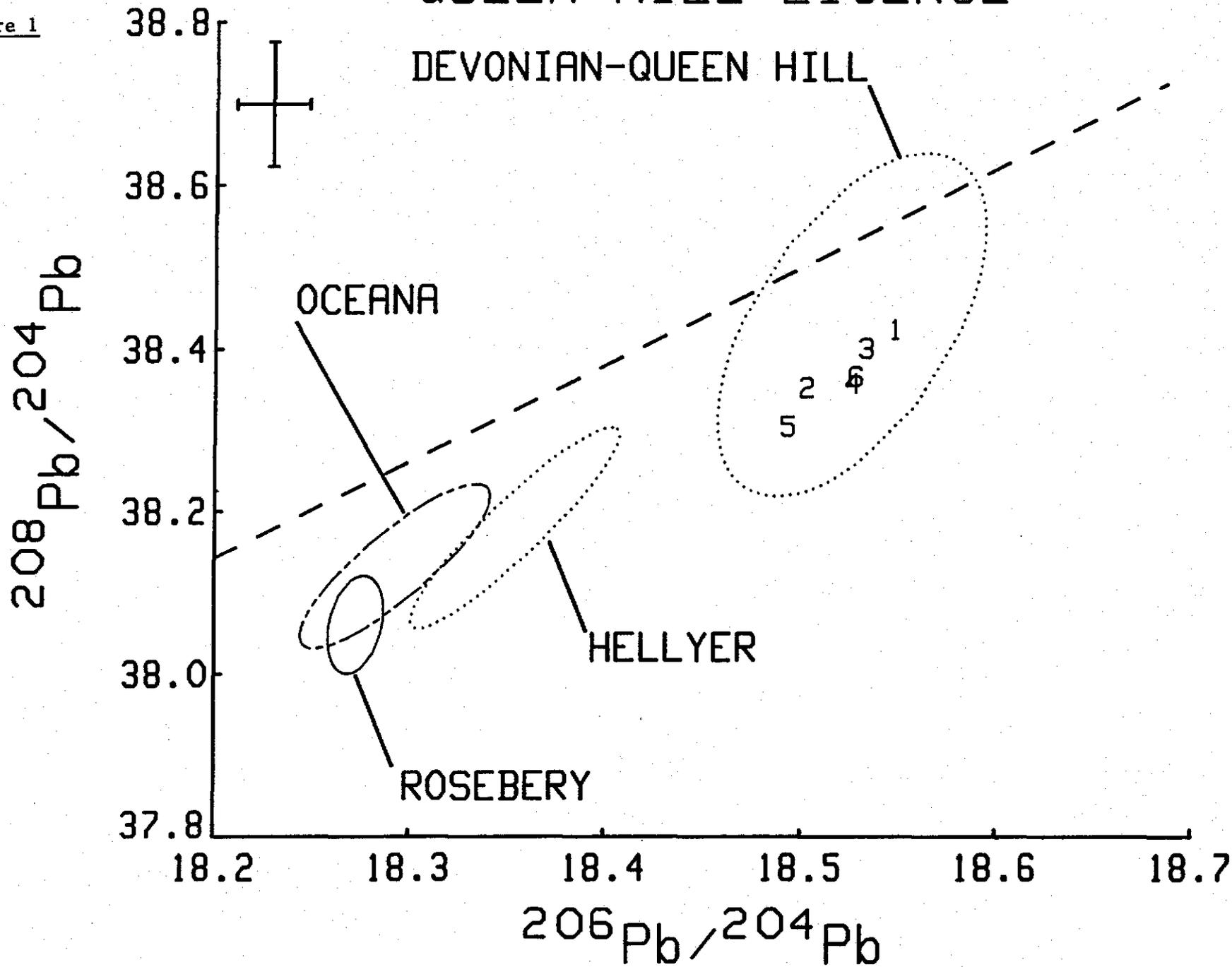
Sample	$\frac{208 \text{ Pb}}{206 \text{ Pb}}$	$\frac{207 \text{ Pb}}{206 \text{ Pb}}$	$\frac{206 \text{ Pb}}{204 \text{ Pb}}$	$\frac{207 \text{ Pb}}{204 \text{ Pb}}$	$\frac{208 \text{ Pb}}{204 \text{ Pb}}$	Pb (ppm)
1 355280	2.0717	0.8421	18.547	15.620	38.424	169,000
2 355283	2.0728	0.8440	18.503	15.616	38.353	228,000
3 355284	2.0720	0.8430	18.533	15.623	38.401	74,600
4 355298	2.0704	0.8422	18.526	15.603	38.357	8,000
5 355302	2.0713	0.8429	18.493	15.587	38.304	2,000
6 355356	2.0707	0.8427	18.528	15.613	38.366	900

Sample No prefixes are used in graphing.

	Pb	Zn	Ag.
355 280 : DESPATCH MINE JUMP	16.9%	23.3%	166 g/t
355 283 : " " "	22.8%	24.8%	184 "
355 284 : CROWN " "	7.46%	0.35%	122 "
355 298 : GRIT SAMPLE, SEE PLANS	0.8%	2.2%	5 g/t
355 302 : " "	0.2%	1.1%	3 "
355 356 : " "	0.09%	0.07%	0.5 "

QUEEN HILL LICENCE

Figure 1



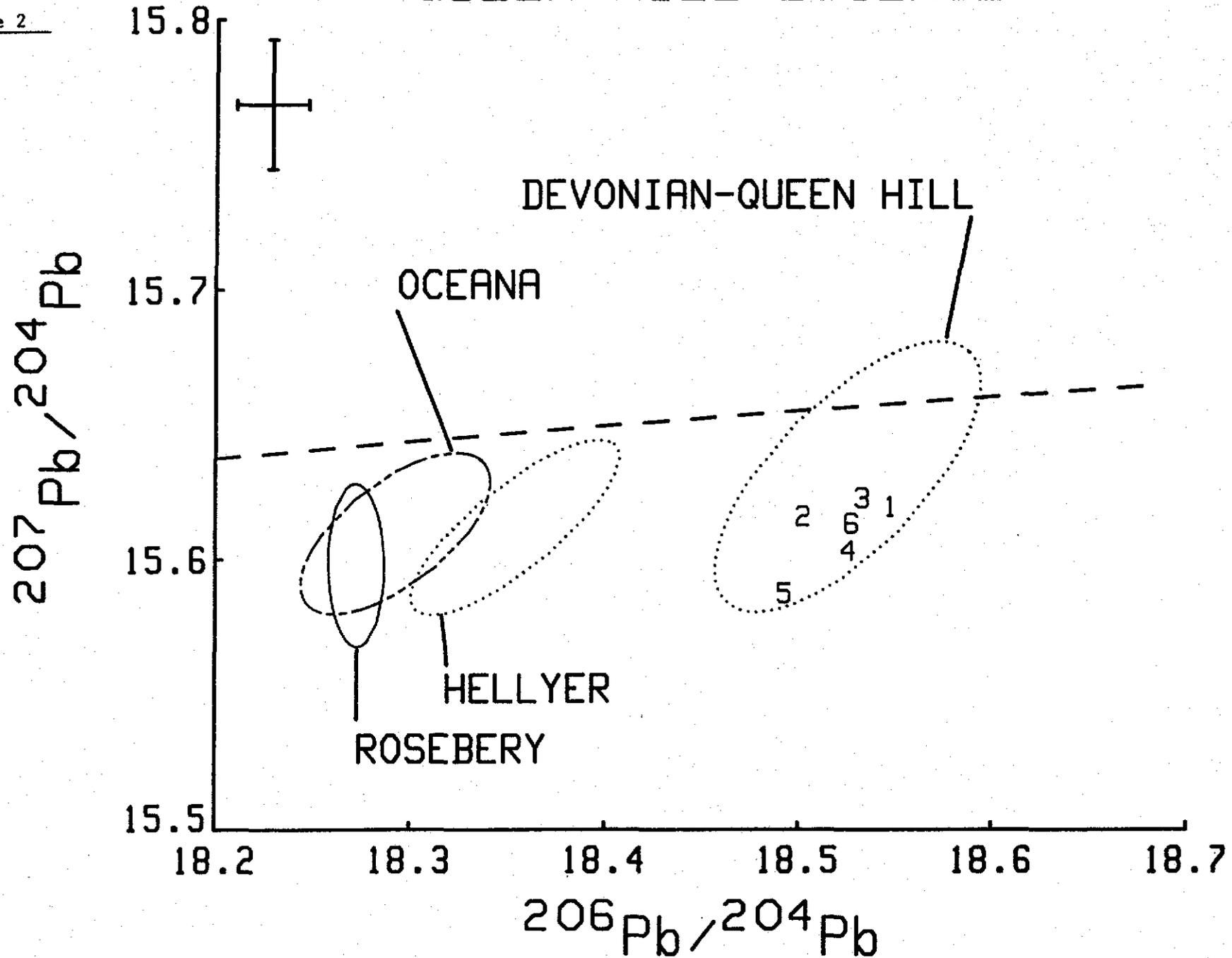
174

975175

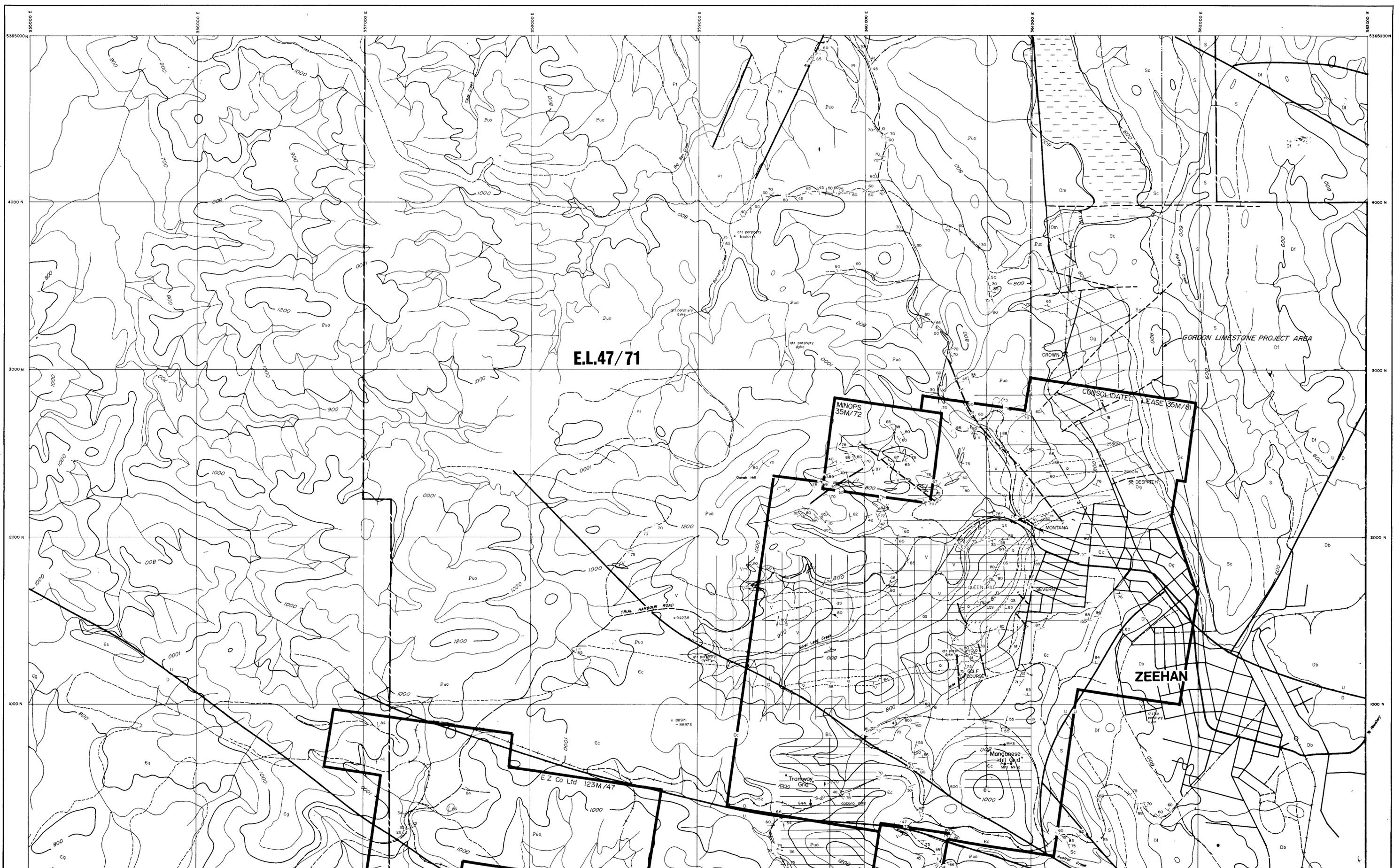
QUEEN HILL LICENCE

Figure 2

175



975176



E.L.47/71

MINOPS 35M/72

CONSOLIDATED LEASE 35M/81

E.Z. Co Ltd 123M/47

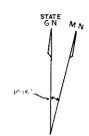
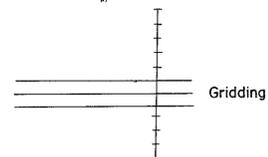
J.D. CLARK 49M/75

ZEEHAN

GORDON LIMESTONE PROJECT AREA

- PERMIAN Pr Zeehan Glacial Formation
- DEVONIAN Db Bell Shale
- Df Florence Quartzite
- SILURIAN Sc Cratty Quartzite
- ORDOVICIAN Og Gordon Limestone
- CAMBRIAN Ec Crimson Creek Formation

- PROTEROZOIC OONAH FORMATION (Puo)
- M Montana Beds
- OS Quartzite & black shale
- LOS Quartzite & lt grey shale
- Q Quartzite
- V Volcanics
- Cg Gabbro
- Es Serpentine

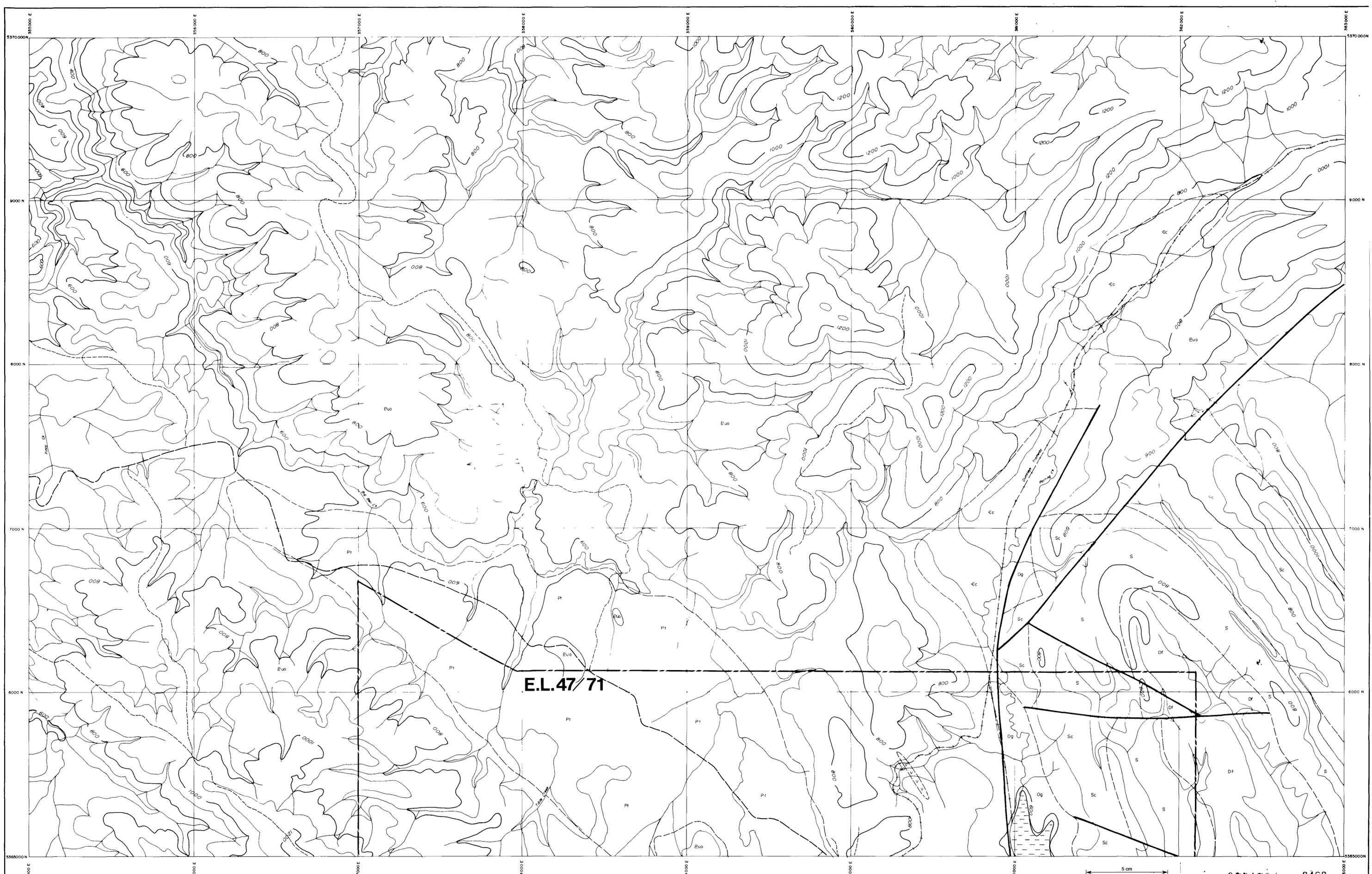


Contour interval 100 feet

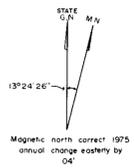
347/370	355/370	363/370
347/365	355/365	363/365
347/360	355/360	363/360

975177 **385E 3482**

Aberfoyle Exploration Pty. Ltd. 86-1600		
Geology: AE	NORTH WEST TASMANIA	Location code: K55/5/50
Drawn: AE	QUEEN HILL, E.L. 47/71	Date: Feb 1978
Traced: RKY/JJB/RJE	GEOLOGICAL MAP	Scale: 1:10,000
Checked:		Plate No: QH 86 A
Revised by: JRS Date: 29/4/86		

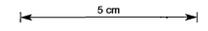


E.L. 47/71



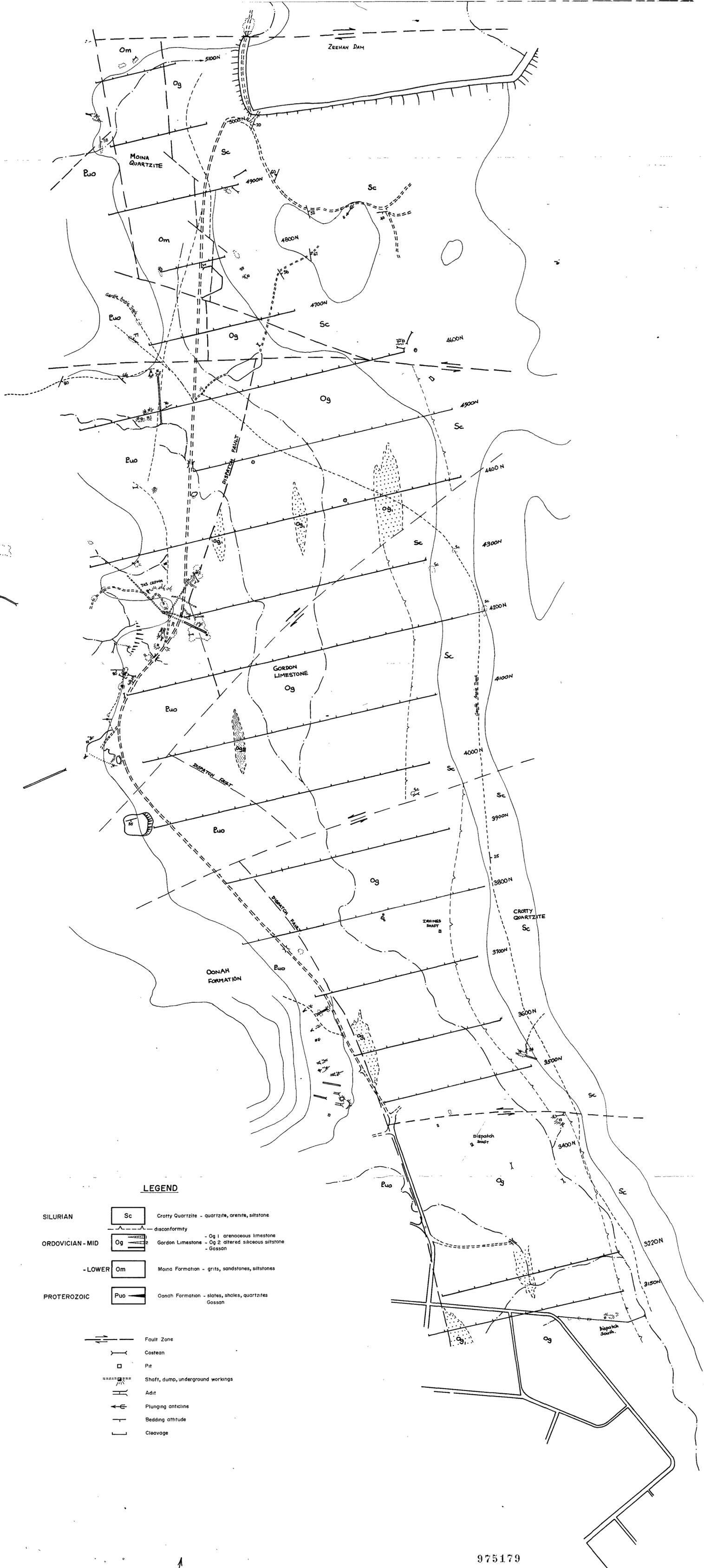
Contour interval 100 feet
For geological legend
see Plate QH 88

347/370	355/370	363/370
347/365	355/365	363/365
347/360	355/360	363/360



975178 3483

		Location code	K55/5/50
		Date	Feb 1978
Geology AE Drawn AE Traced JJB Checked Revised by RJE Date 3/12/85		NORTH WEST TASMANIA QUEEN HILL, E L. 47/71 Scale 1:10,000 Plate No QH 86 B	
GEOLOGICAL MAP			



LEGEND

- SILURIAN**
 - Sc Crotty Quartzite - quartzite, arenite, siltstone
 - - - - - disconformity
 - ORDOVICIAN - MID**
 - Og 1 Gordon Limestone - Og 1 arenaceous limestone
 - Og 2 Gordon Limestone - Og 2 altered siliceous siltstone
 - - - - - Gossan
 - LOWER**
 - Om Moina Formation - grits, sandstones, siltstones
 - PROTEROZOIC**
 - Puo Oonah Formation - slates, shales, quartzites
 - - - - - Gossan
-
- Fault Zone
 - Costean
 - Pit
 - ==== Shaft, dump, underground workings
 - Adit
 - ← Plunging anticline
 - Bedding attitude
 - Cleavage

975179

5 cm

3484

Aberfoyle Resources Limited		
EXPLORATION DIVISION		
Drawn: R. Jones	NORTH WEST TASMANIA	Location code: K55/5/50
Traced:	PART QUEEN HILL EL47/71 - ZEEHAN	Date: May 1986
Checked:	DETAILED GEOLOGY	Scale: 1:2500
Revised by: Date:		Plate No: QH 234/A

86-2686

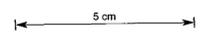


LEGEND

- SILURIAN**
 - Sc Crofty Quartzite - quartzite, arenite, siltstone
 - ORDOVICIAN - MID**
 - Og Gordon Limestone - Og 1 arenaceous limestone
- Og 2 altered siliceous siltstone
- Gossan
 - LOWER**
 - Om Maina Formation - grits, sandstones, siltstones
 - PROTEROZOIC**
 - Puo Oonah Formation - slates, shales, quartzites
- Gossan
-
- Fault Zone
 - Costean
 - Pit
 - ==== Shaft, dump, underground workings
 - Adit
 - Plunging anticline
 - Bedding attitude
 - [— Cleavage



975180



3485

Aberfoyle Resources Limited		
EXPLORATION DIVISION		
NORTH WEST TASMANIA		
PART QUEEN HILL EL47/71 - ZEEHAN		
SAMPLE LOCATIONS		
Drawn: P Jones	Location code: K55/5/50	Date: May 1966
Traced:	Scale: 1:2500	Plate No: QH 234/B
Checked:		
Revised by: Date		



LEGEND

- SILURIAN** Sc Crotty Quartzite - quartzite, arenite, siltstone
- disconformity
- ORDOVICIAN - MID** Og 1 arenaceous limestone
Og 2 Gordon Limestone - Og 2 altered siliceous siltstone
Gossan
- LOWER** Om Mona Formation - grits, sandstones, siltstones
- PROTEROZOIC** Puo Oonah Formation - slates, shales, quartzites
Gossan
- Fault Zone
- Costean
- Pit
- Shaft, dump, underground workings
- Adit
- Plunging anticline
- Bedding attitude
- Cleavage

CONTOUR INTERVALS

- V 150
- V 300
- V 600
- V 1200

975181

5 cm

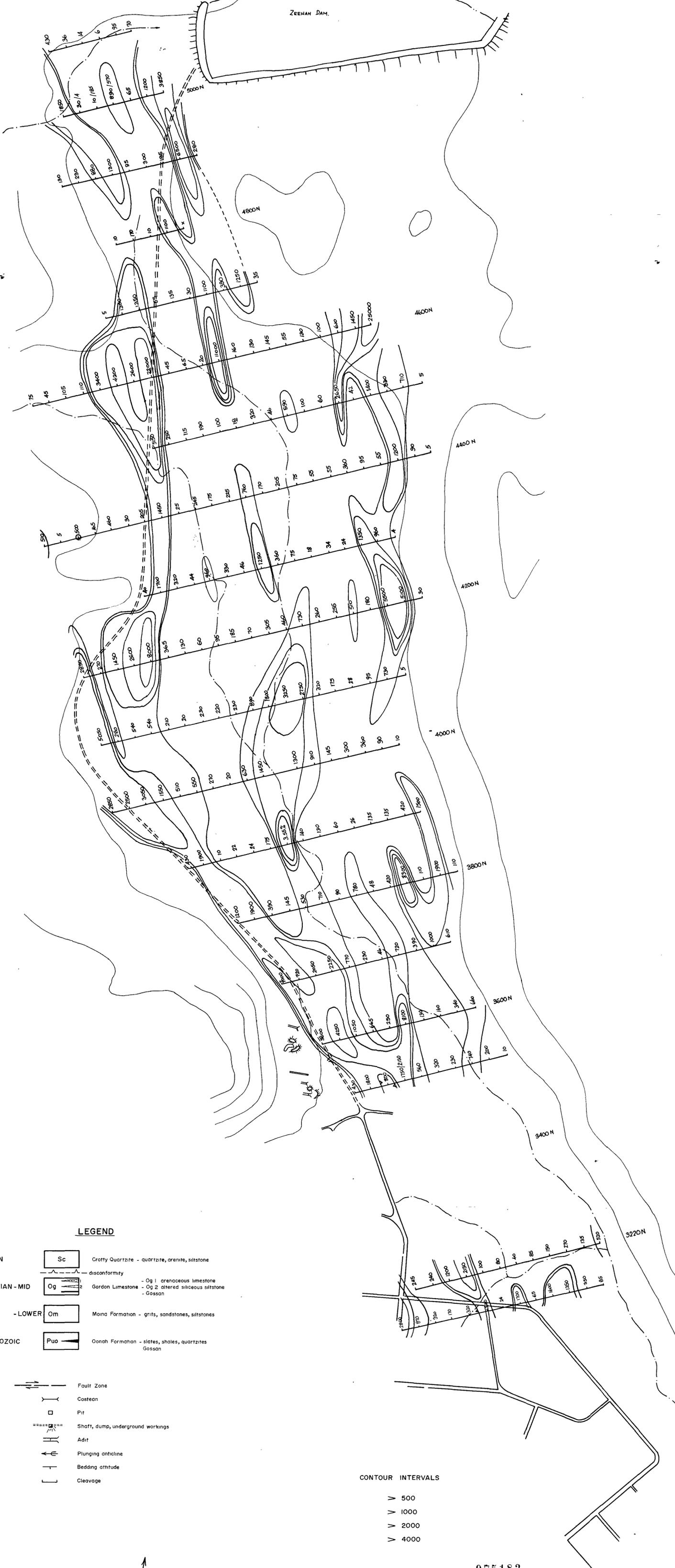
3486

Aberfoyle Resources Limited
EXPLORATION DIVISION

Drawn: P Jones	NORTH WEST TASMANIA PART QUEEN HILL EL47/71-ZEEHAN	Location code K55/5/50
Traced:		Date May 1986
Checked:		Scale 1:2500
Revised by: Date	LEAD GEOCHEM.	Plate No QH 234/C

36-2656

ZEEHAN DAM.



LEGEND

- SILURIAN**
 - Sc** Crofty Quartzite - quartzite, arenite, siltstone
 - disconformity
 - ORDOVICIAN - MID**
 - Og** Gordon Limestone - Og 1 arenaceous limestone
- Og 2 altered siliceous siltstone
- Gossan
 - LOWER**
 - Om** Moina Formation - grits, sandstones, siltstones
 - PROTEROZOIC**
 - Puo** Oonah Formation - slates, shales, quartzites
Gossan
-
- Fault Zone
 - Costean
 - Pit
 - Shaft, dump, underground workings
 - Adit
 - Plunging anticline
 - Bedding attitude
 - Cleavage

CONTOUR INTERVALS

- V 500
- V 1000
- V 2000
- V 4000

975182

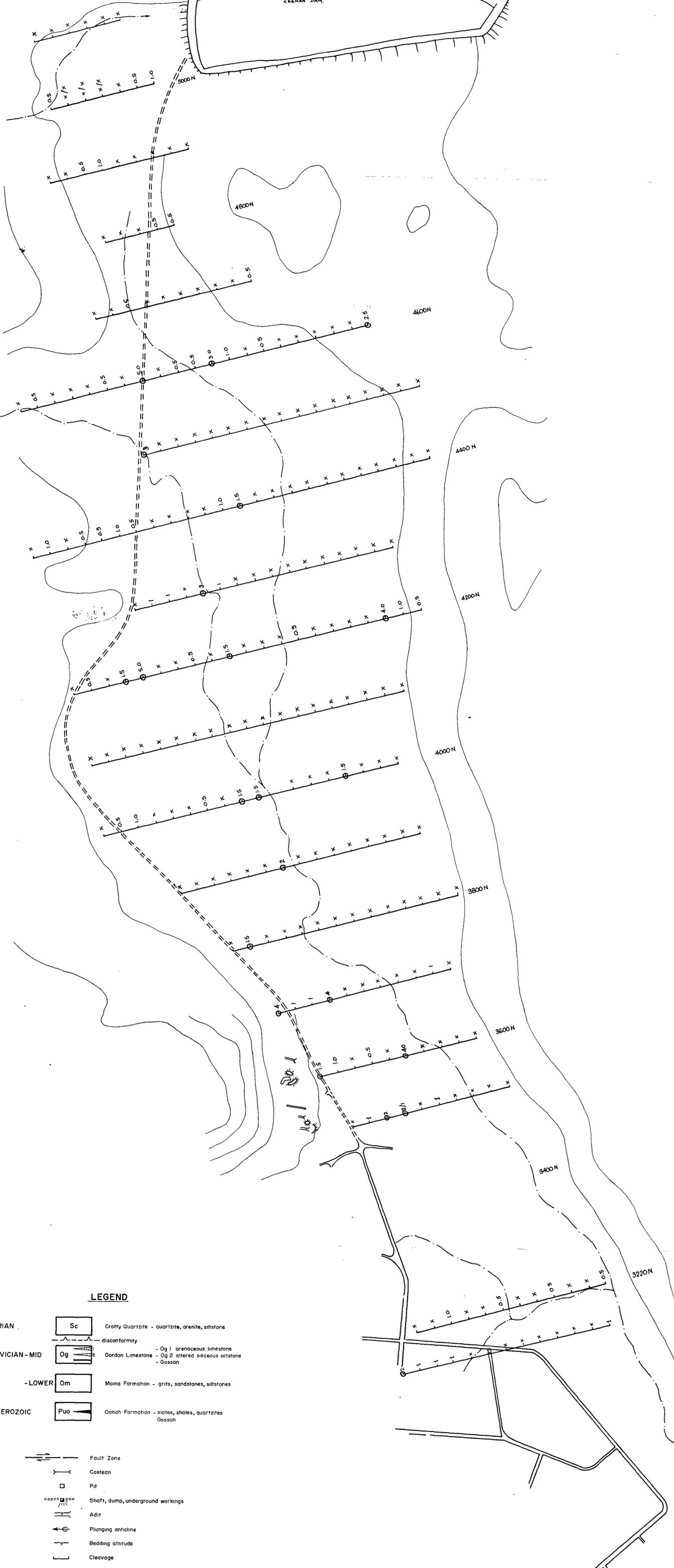
5 cm

3487

Aberfoyle Resources Limited		
EXPLORATION DIVISION		
NORTH WEST TASMANIA		
PART QUEEN HILL EL.47/71-ZEEHAN		
ZINC GEOCHEM.		
Drawn P Jones	Location code K55/5/50	Date May 1986
Traced.	Scale 1:2500	Plate No QH 234/D
Checked		
Revised by. Date		

86-2606

ZEEHAN DAM.



LEGEND

- SILURIAN**
 - Sc** Crotty Quartzite - quartzite, arenite, siltstone
 - ORDOVICIAN - MID**
 - disconformity
 - Og** Gordon Limestone - Og 1 arenaceous limestone
- Og 2 altered siliceous siltstone
- Gossan
 - LOWER**
 - Om** Maina Formation - grits, sandstones, siltstones
 - PROTEROZOIC**
 - Puo** Oonah Formation - slates, shales, quartzites
Gossan
-
- Fault Zone
 - Costean
 - Pit
 - Shaft, dump, underground workings
 - Adit
 - Plunging anticline
 - Bedding attitude
 - Cleavage

CONTOUR INTERVAL 1.5 g/t



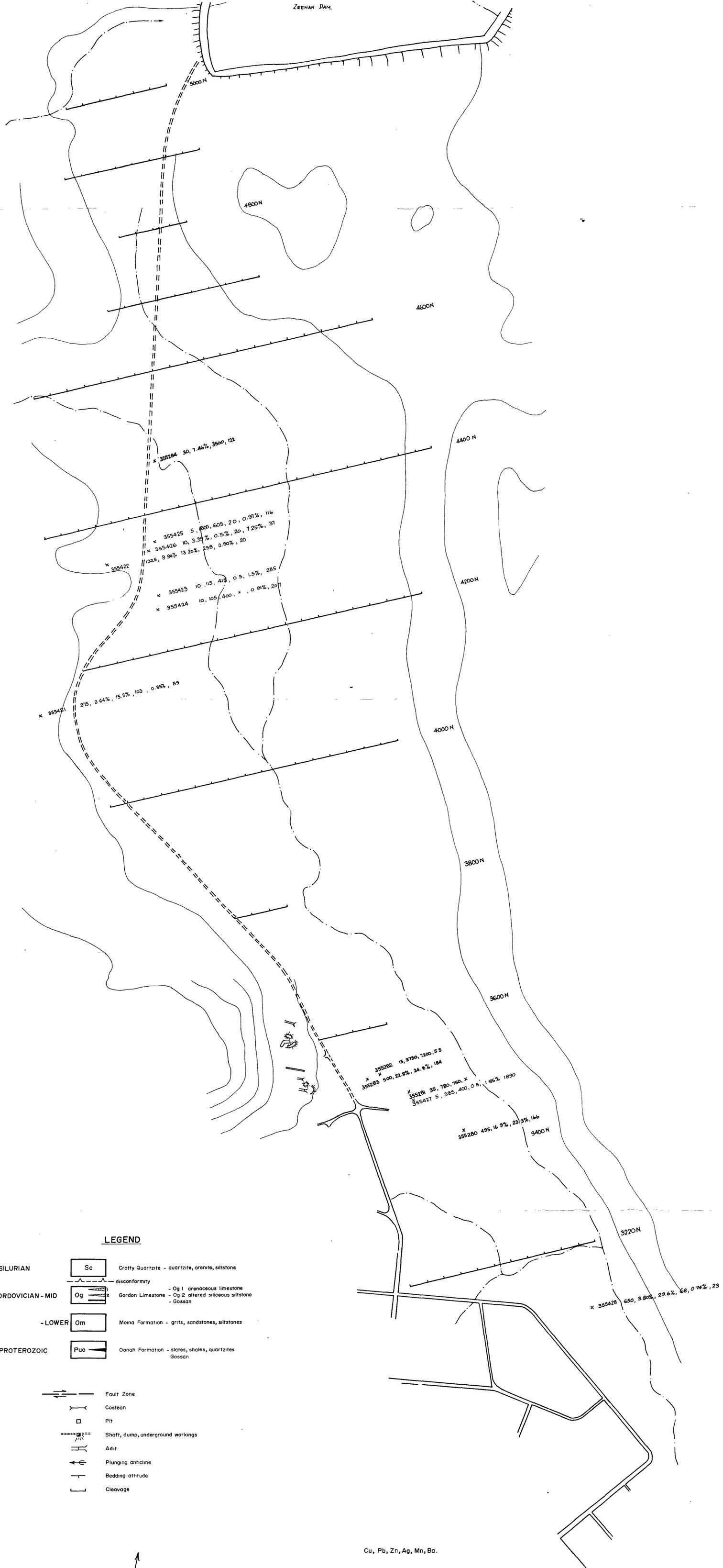
975183

5 cm

86-2606

3438

Aberfoyle Resources Limited		
EXPLORATION DIVISION		
NORTH WEST TASMANIA		
PART QUEEN HILL EL47/71-ZEEHAN		
SILVER GEOCHEM.		
Drawn P Jones	Location code K55/5/50	Date May 1986
Traced	Scale 1: 2500	Plate No QH 234/E
Checked		
Revised by Date		



LEGEND

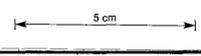
- SILURIAN**
- Sc Crotty Quartzite - quartzite, arenite, siltstone
- ORDOVICIAN - MID**
- Og 1 arenaceous limestone
 - Og 2 Gordon Limestone - Og 2 altered siliceous siltstone - Gossan
- LOWER**
- Om Maina Formation - grits, sandstones, siltstones
- PROTEROZOIC**
- Puo Oonah Formation - slates, shales, quartzites Gossan
- Structural Symbols:**
- Fault Zone
 - Coastline
 - Pit
 - Shaft, dump, underground workings
 - Adit
 - Plunging anticline
 - Bedding attitude
 - Cleavage

Cu, Pb, Zn, Ag, Mn, Ba.



975184

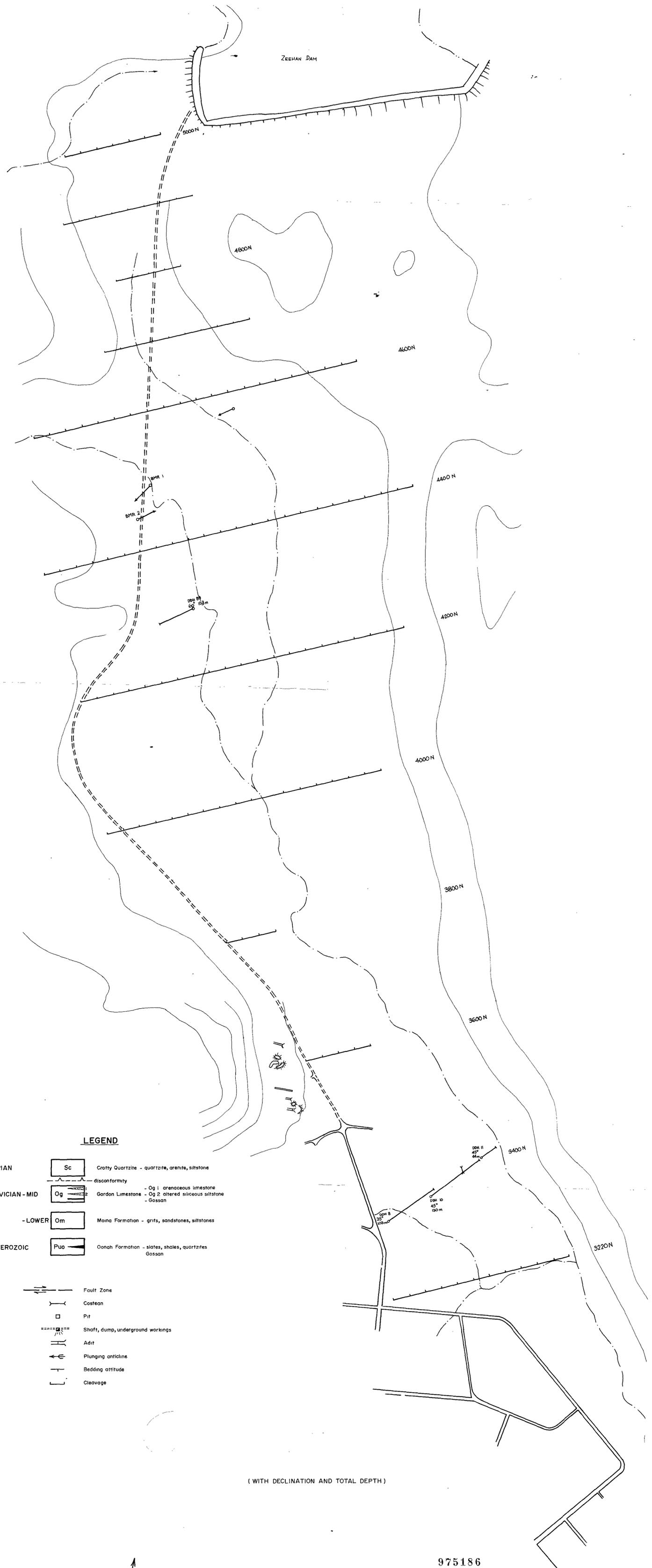
355285 5, 2180, 950, 7



36-2406

3489

Aberfoyle Resources Limited EXPLORATION DIVISION		
Drawn: P. Jones	NORTH WEST TASMANIA	Location code: K55/5/50
Traced:	PART QUEEN HILL EL47/71-ZEEHAN	Date: May 1986
Checked:	ROCK CHIP LOCATIONS & RESULTS	Scale: 1:2500
Revised by: Date		Plate No: QH 234/F



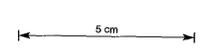
LEGEND

- SILURIAN**
 - Sc Crotty Quartzite - quartzite, arenite, siltstone
 - PRODOVICIAN - MID**
 - disconformity
 - Og Gordon Limestone - Og 1 arenaceous limestone
- Og 2 altered siliceous siltstone
- Gossan
 - LOWER**
 - Om Maina Formation - grfts, sandstones, siltstones
 - PROTEROZOIC**
 - Puo Oonah Formation - slates, shales, quartzites
Gossan
-
- Fault Zone
 - Costean
 - Pit
 - Shaft, dump, underground workings
 - Adit
 - Plunging anticline
 - Bedding attitude
 - Cleavage

(WITH DECLINATION AND TOTAL DEPTH)



975186



3491

Aberfoyle Resources Limited		
EXPLORATION DIVISION		
NORTH WEST TASMANIA		
PART QUEEN HILL EL47/71-ZEEHAN		
PREVIOUS DDH LOCATIONS		
Drawn: P. Jones	Location code: K55/5/50	Date: May 1986
Traced:	Scale: 1:2500	Plate No: QH 234/H
Checked:		
Revised by: Date		

86-2680