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# PASMINCO EXPLORATION

## OCEANA RL8809 JV
## ANNUAL REPORT

SEPTEMBER 1993 – AUGUST 1994

MINES
FILE REF. RL8809
-3 OCT 1994
DOC. REF.
SEE FOLIO 128

AUTHOR: MS Saxon

DATE: September 1994

REPORT No.: T94-9

SUBMITTED TO: Regional Exploration Manager – Tasmania

DISTRIBUTION: Mineral Resources Tasmania – Hobart

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– Perth

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BURNIE
SEPTEMBER 1994

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**SUMMARY**

Exploration conducted on the Oceana RL 8809 Joint Venture during the period from September 1993 to August 1994 has consisted of a review of mineralisation styles and host lithologies of the Oceana deposit, and evaluation of data collected by previous exploration.

Potential for massive base metal mineralisation has been identified both in the immediate area of the Oceana orebody, and elsewhere on the licence.

Total exploration costs for the twelve months ending August 1994 were $23 890, bring total expenditure on the Retention Licence since its inception to $262 713.

# 1 INTRODUCTION

Retention Licence 8809 (Oceana) covers 5km$^2$, and is located 1km south of Zeehan in western Tasmania (see Figure 1). Title to the tenement is held by Arimco Mining Pty Limited. Pasminco Australia Ltd hold a Joint Venture agreement with Australian Resources to evaluate the mineral potential of the licence area.

This report covers the period from September 1993 to August 1994. Work conducted during this period included:

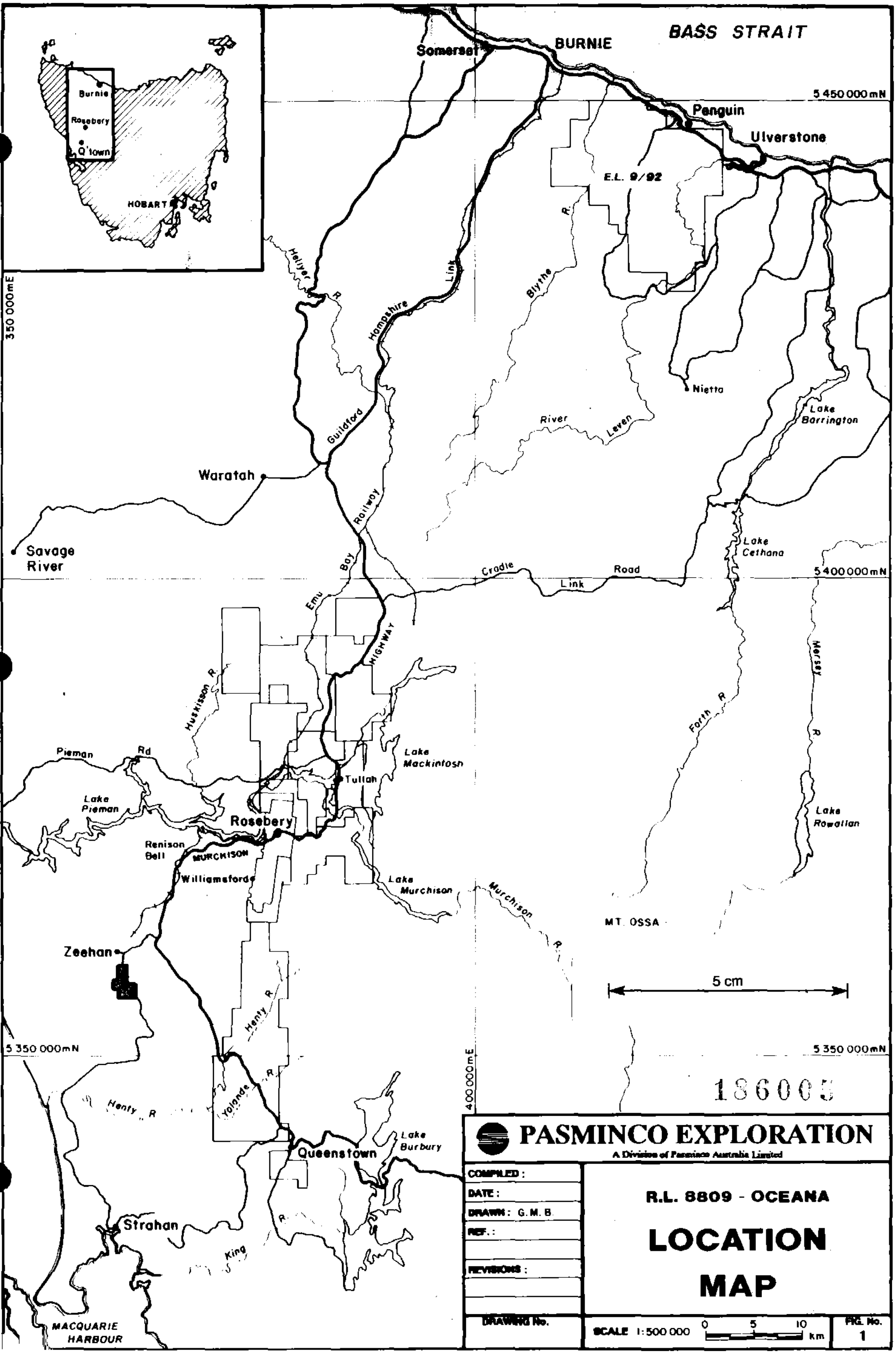
- evaluation and assessment of existing data;
- incorporation of geochemical data into the database;
- and the relogging of existing drillcore;

Access to the Oceana RL is easily gained by the Zeehan to Strahan road. The Gordon Limestone, which hosts mineralisation, is deeply weathered and forms a marshy valley between steep ridges of Moina Sandstone and Zeehan Conglomerate to the west, and Crotty Quartzite to the east.

The Oceana orebody is located in the central portion of the RL, and is comprised of two mineralisation styles: a northern crosscutting epigenetic body, and a southern stratabound lens. The indicated resource for the orebody is:

| | tonnes | Pb% | Zn% | Ag g/t |
|---|---|---|---|---|
| 3550–3700GN (crosscutting) | 2 297 000 | 7.1 | 2.5 | 48 |
| 3350–3440GN (stratabound) | 188 000 | 12.0 | 4.0 | 89 |
| **TOTAL** | **2 485 000** | **7.5** | **2.6** | **51** |

Vegetation cover is sparse, dominated by button grass and banksia on the ridges, button grass and gorse in the marshy valley, and dense tea tree scrub along the creeks.

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# PASMINCO EXPLORATION

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| DRAWING No. | |

**R.L. 8809 - OCEANA**

# LOCATION MAP

SCALE 1:500 000 (0 5 10 km)

FIG. No. 1

## 2 TENURE

Retention Licence 8809 (Oceana) was granted to Cyprus Gold Australia Corporation (Cyprus) on 14 October 1988 for a period of two years. The licence was retained as a result of exploration on Exploration Licence 4/78, which was relinquished on 14 July 1988.

Title to RL 8809 was transferred to Hudspeth and Company Pty. Ltd. on 23 October 1990, and was subsequently transferred to Arimco Mining Pty Limited on 24 August 1991 following a certified change of company name.

Pasminco Australia Limited entered negotiations with Hudspeth in late 1990 to permit evaluation of the base metal potential of the licence area. A Joint Venture Agreement was ratified on 14 May 1992. Under the terms of the Joint Venture, Pasminco Exploration, a division of Pasminco Australia Limited, would manage and operate the Joint Venture while earning equity. Pasminco have the right to earn a 65% interest in the tenement by spending $2 million within 9 years, with $1 million being in the first 5 years.

The licence covers an area of 5.5km$^2$ (see Schedule in Appendix 1). This area excludes a total 1.1km$^2$ that is enclosed by the following Mine Leases: 9M/91, 10M/91 and 4W/77, held by Pasminco Australia Limited, and 39M/77 held by JNR Enraught – Mooney (see Figure 2). Lease 10M/01 is subject to a joint agreement with Dragon Resources whereby they hold the surface rights to retreat the old Zeehan smelter dumps. Also excluded is 0.2km$^2$ of Crown Reserves.

Negotiations are currently in progress with a third group, Porthill Resources Limited, to form a joint venture over the immediate area of the Oceana Mine. Porthill are interested in developing the shallow (open–cuttable) resource in this area and are proposing an exploration program to evaluate this potential.

The land tenure of RL 8809 comprises unallocated Crown Land designated as Multiple Use Forest Land and Private Property. In addition, part of the area is on the interim list of the Register of the National Estate as part of the Zeehan Smelters Geological monuments (see Figure 2).

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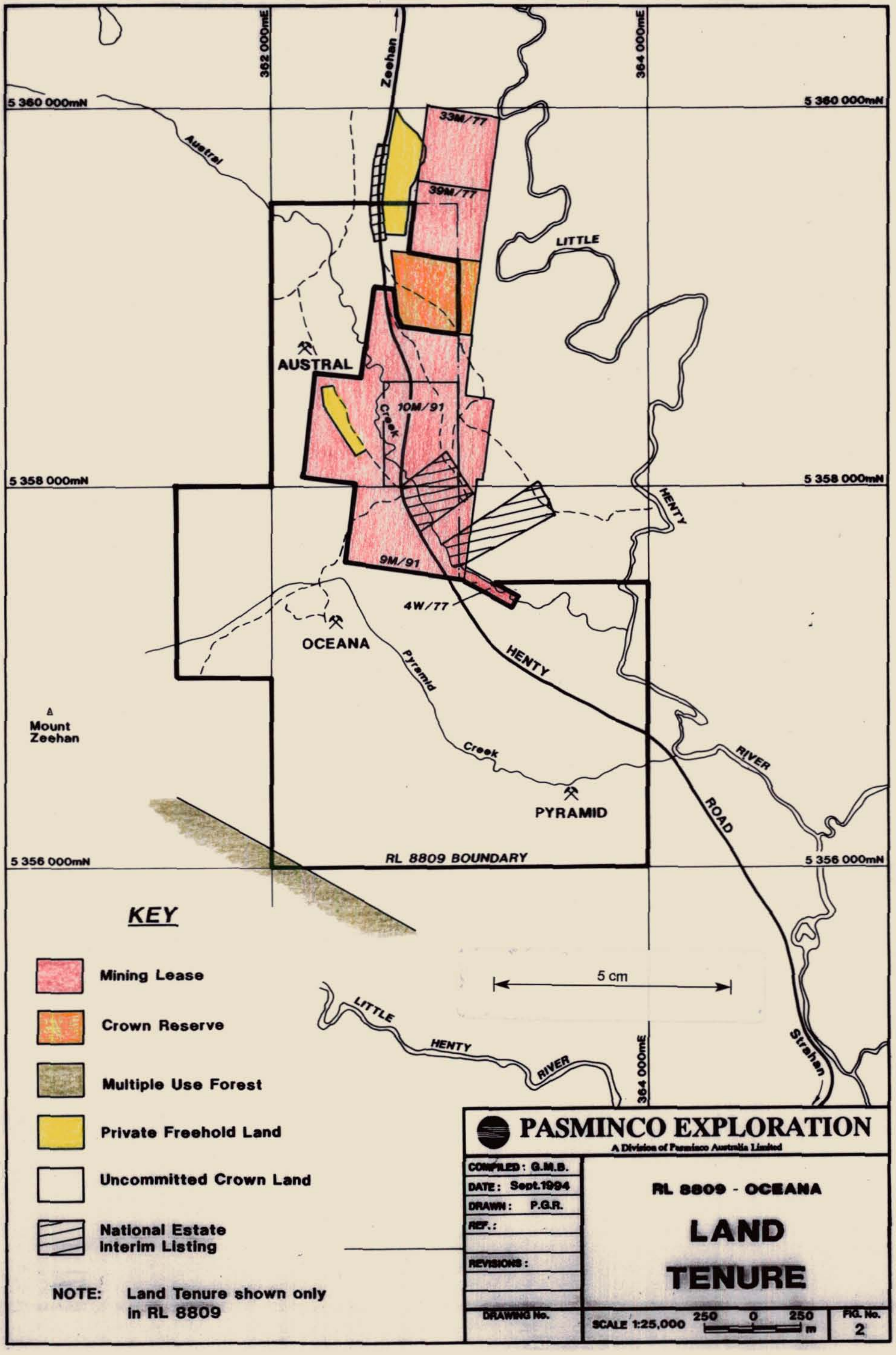

362 000mE
364 000mE
5 360 000mN
5 358 000mN
5 356 000mN
Zeehan
Austral
33M/77
39M/77
LITTLE
AUSTRAL
10M/91
Creek
HENTY
9M/91
4W/77
OCEANA
Pyramid
HENTY
Mount Zeehan
Creek
RIVER
PYRAMID
ROAD
RL 8809 BOUNDARY
5 cm
LITTLE
HENTY
RIVER
Strahan
KEY
Mining Lease
Crown Reserve
Multiple Use Forest
Private Freehold Land
Uncommitted Crown Land
National Estate Interim Listing
NOTE: Land Tenure shown only in RL 8809
PASMINCO EXPLORATION
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COMPILED : G.M.B.
DATE : Sept.1994
DRAWN : P.G.R.
REF. :
REVISIONS :
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RL 8809 - OCEANA
LAND TENURE
SCALE 1:25,000
250 0 250 m
FIG. No. 2

# 3 PREVIOUS EXPLORATION & MINING

Comprehensive accounts of past prospecting and mining activities in the Zeehan area including the Oceana RL have been given in Taylor (1983) and Jones (1988). Jones (op cit) also presents a good summary of the more recent exploration undertaken by Amoco/Cyprus during 1978–88 within EL 4/78.

The earliest report of mining activity at Oceana dates from 1890 when small scale trenching was undertaken. During the following 3 years the Oceana Silver Mining Co. extracted approximately 1000t at 39% Pb and 14.5 oz/t Ag. A further 517t of lead ore was mined between 1896–99 by Oceana Pty Ltd. No further significant production from the Oceana mine occurred until 1954 when Zeehan Mines Pty Ltd (a joint venture between North Broken Hill and Broken Hill South) reopened the old workings, following a successful exploration drilling program. Zeehan Mines extracted a total of 128 177t at 11.6% Pb and 4.79 oz/t Ag up to 1960 when the mine again closed. This phase of activity is summarised by Curtis (1981).

The Cyprus exploration program focussed on carbonate hosted Pb–Zn–Ag mineralisation within EL 4/78. During the 10 years of licence tenure, the area was geologically mapped, sampled using track mounted power auger, extensively costeaned, surveyed with IP, EM, gravity and magnetics, and tested by 25 diamond drillholes for a total of 6690m. Work was completed both by Cyprus/Amoco and EZ following the establishment of a Joint Venture covering the licence during 1983. Activity within the area covered by RL 8809 was minimal after 1984, as EZ focussed activity on other sections of the licence.

Significant untested potential for Oceana–style mineralisation was also recognised over several other prospects, including Oceana South, Austral and Pyramid, where the amount of drilling is low. Pertinent results of post–1978 exploration are given in Section 5.

Since RL 8809 was granted, Hudspeth have not undertaken any significant work, citing the prevailing unfavourable mineral economics associated with the ore resource outlined above. Pasminco has completed on aeromagnetic survey, ground magnetic and gravity surveys and drilled 2 diamond holes since joint venture inception.

# 4 GEOLOGY

## 4.1 Regional Geology

The regional geological setting of the Zeehan area is well described in Blissett (1962), Taylor (1983) and Jones (1988).

The Oceana deposit is hosted by the Ordovician-Early Silurian Gordon Group, a limestone dominated sequence which overlies the Late Cambrian-Ordovician Denison Group, and underlies the Silurian-Devonian Eldon Group (Figure 3). Although Group contacts may be locally disconformable, there do not appear to be major structural breaks through the sequence.

Underlying the Denison Group are: the Cambrian Dundas Group, a mixed sedimentary and volcanic sequence; the Eo-Cambrian Crimson Creek Formation of deep marine mudstones and turbidites; and Proterozoic Oonah Formation quartzite and shale (Figure 4). To the northwest of the Oceana area the Devonian Heemskirk Granite crops out, the intrusion of this body attributed to the production of widespread Sn and Pb-Ag-Zn mineralisation in the Zeehan field. The Heemskirk Granite is modelled to ridge east-northeast in the subsurface (Leaman and Richardson, 1989), and to occur at approximately 2km depth below the Oceana Mine.

The Oonah Formation has recently been interpreted (Findlay and Brown, 1992) as a thin overthrust sheet of possible Tabberaberan age. Thin skinned Devonian thrusting provides the possibility of shallow depth masked mineralisation in a variety of host formations in the Zeehan area.

## 4.2 Local Geology

Limestone of the Gordon Group is the target sequence within the Oceana RL, and extends from the north to the south of the licence. The Gordon Limestone dips steeply to the east, is approximately 350m in thickness, and has been disrupted by a series of northeast-southwest and northwest-southeast trending brittle faults. The largest of these is the Oceana Fault which has produced 700m of apparent dextral offset of the Ordovician sequence. Stratigraphic study by

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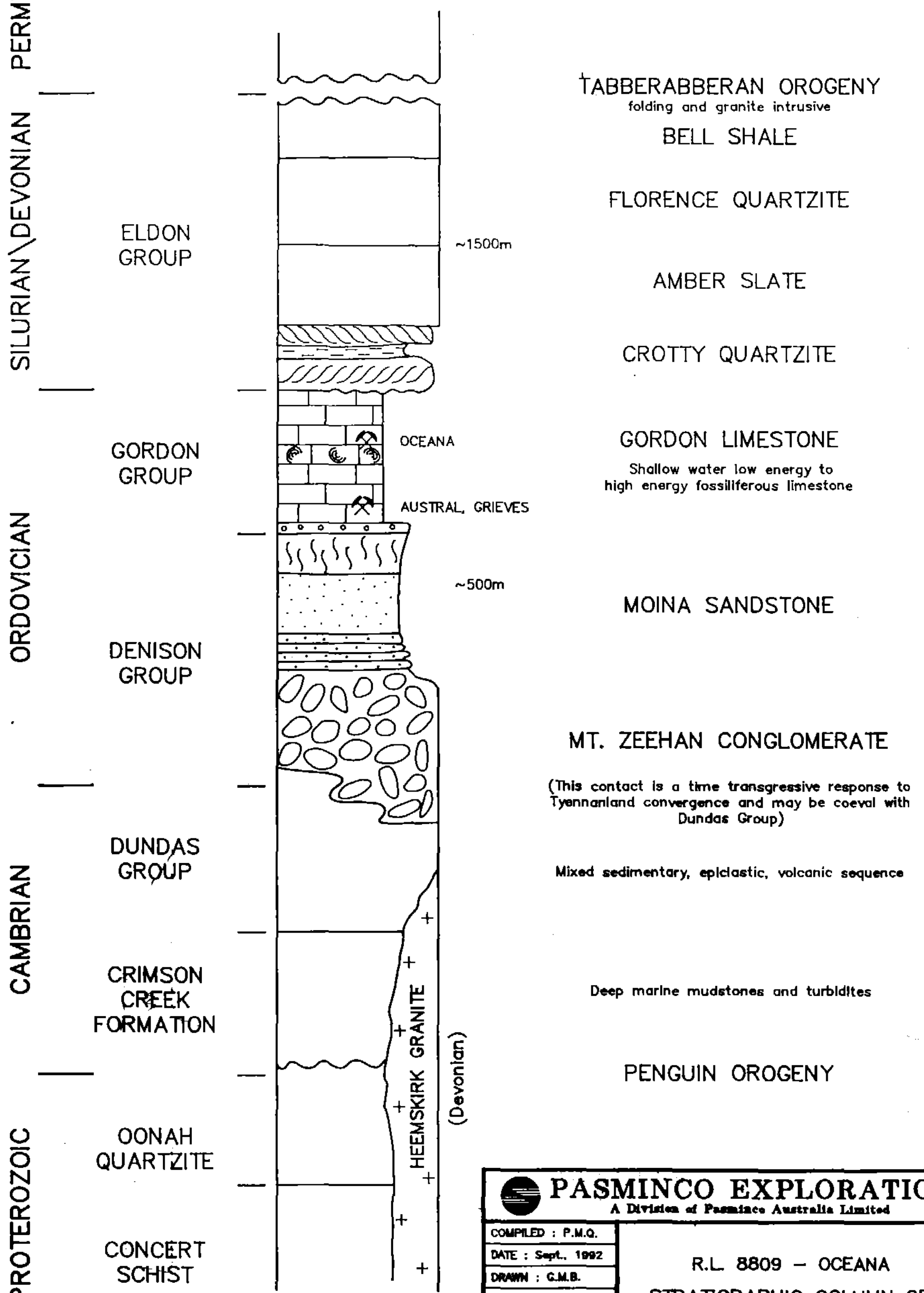


**PASMINCO EXPLORATION**
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| | |
|---|---|
| COMPILED : P.M.Q. | R.L. 8809 – OCEANA |
| DATE : Sept., 1992 | STRATIGRAPHIC COLUMN OF |
| DRAWN : G.M.B. | **GORDON LIMESTONE** |
| REFERENCE : | **REGIONAL CONTEXT** |
| REVISIONS : M.S.S. | |
| Modified Sept., 1994 | |
| DRAWING No. SC_GLST | SCALE |
| FIG. No. 4 | |

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Pasminco shows that the sequence from the Mt Zeehan Conglomerate through Moina Sandstone to the top of the Gordon Limestone, and possibly including the Crotty Quartzite is conformable. Stratigraphy of the limestone is summarised in Quayle (1993) (see Figure 5). The Gordon Limestone at Oceana is reasonably homogeneous throughout, and displays variation in sedimentary facies that indicate cycling of low energy and high energy shallow water environments. All facies were deposited within photic and oxic zones, and typically above storm wave base.

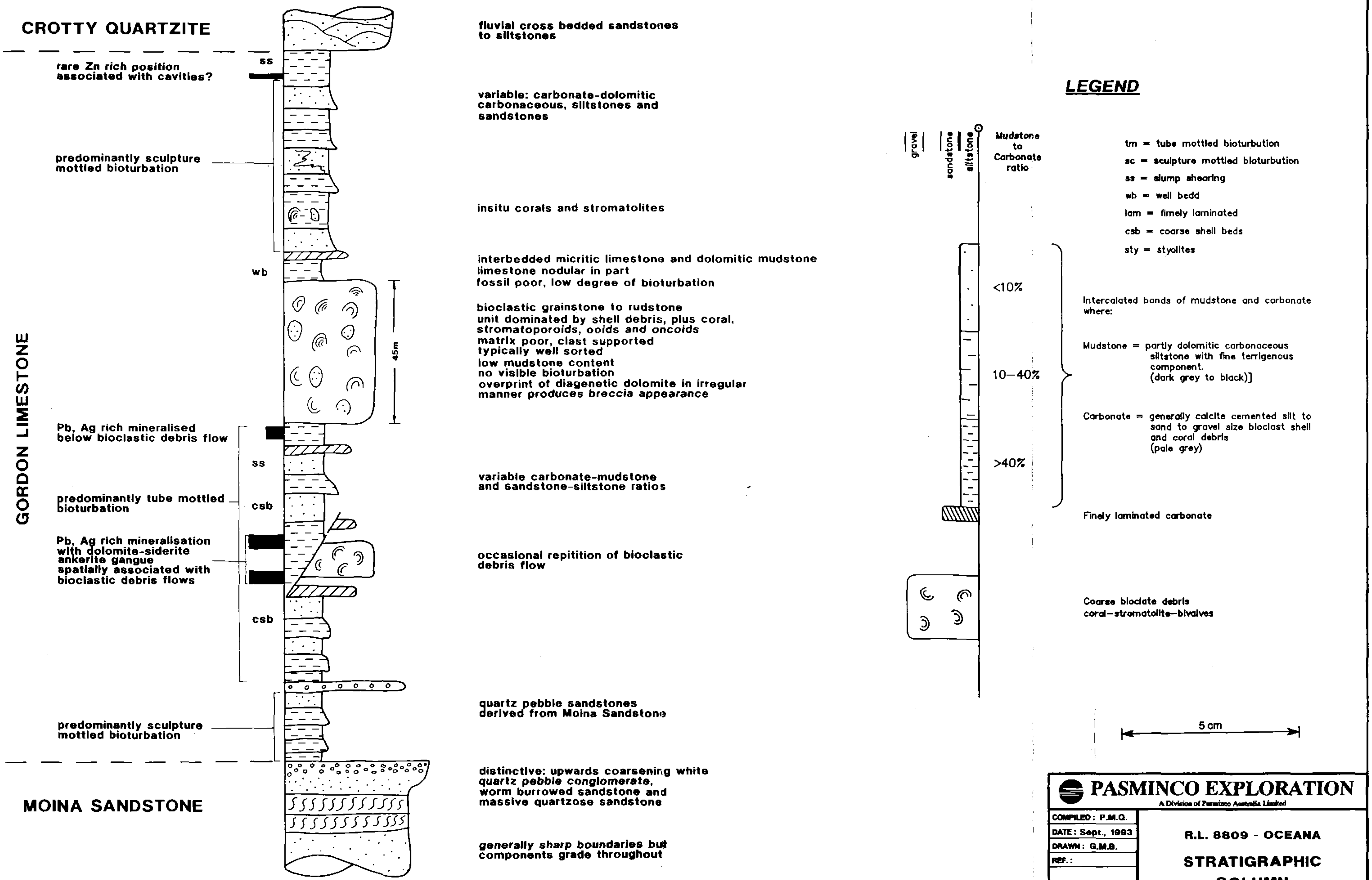
### 4.2.1 SEDIMENTOLOGY OF THE GORDON LIMESTONE AT OCEANA

Drillholes ZT-80-4, ZT-80-7, ZT-80-5 and ZT-80-3 have been reviewed and relogged by the author (Figures 6,7), applying a depositional facies approach, modifying that of Neudert (1992). Cyprus/EZ logs must be used with caution due to lightweight lithological descriptions and mis-identification of units. Overprint of dolomite has resulted in a complex array of textures due to the overlap of depositional and post-depositional processes. Facies and depositional conditions of the Gordon Limestone have been distinguished on the basis of (i) stratification structures, (ii) amount of clastic (argillaceous, quartzose) mudstone, (iii) grain size and type of carbonate clasts, (iv) presence or absence of matrix (degree of winnowing) (v) type and life environment of bioclasts present, and (vi) style and intensity of bioturbation.

Based on these criteria, the following depositional system specific lithologies have been defined, with corresponding depositional environment:

1. Micritic to silty carbonate with 5–40% interbedded clastic mudstone: homogeneous semi-massive carbonate with occasional shelly fossils and regular interbeds of dolomitic clastic mudstone. Common bioturbation of mudstone laminae producing contortion and mixing of sediment; stylotization has produced irregular bed contacts where bioturbation is absent. Rare fossil concentration in lags as wackestone/grainstone, infrequently graded.

Low energy medium depth water deposits, minor storm wave influence, slow sedimentation rate.

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| COMPILED: P.M.Q. | R.L. 8809 - OCEANA |
| DATE: Sept., 1993 | STRATIGRAPHIC COLUMN GORDON LIMESTONE |
| DRAWN: G.M.B. | |
| REF.: | |
| REVISIONS: M.S.S. Modified Sept, 1994 | |
| DRAWING No. | SCALE |
| FIG. No. 5 | |

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2. Wackestone with interbedded clastic mudstone: poorly winnowed carbonate consisting of isolated shelly bioclasts in calcsilt or micritic matrix. Common interbeds of dolomitic clastic mudstone. Low to moderate degree of internal grading. Common bioturbation.

Shallow sheltered lagoon, deposition below wave base. Organism diversity suggests open circulation. Minor suspension current influence.

3. Grainstone to rudstone: important unit due to association with mineralisation. Clean, well sorted, matrix poor unit comprised of shelly and coralline debris to 80mm in size, pellets, oncoids and rare ooids. Typically ungraded, however variation in dominant clast size is common. Clastic mudstone rare to absent. Lithology misidentified by Cyprus/EZ as slump breccia due to irregular dolomite overprint. No bound clasts to suggest derivation from reef, and no lithified clasts to indicate shedding from growth fault.

High degree of sorting, low percentage of matrix, and accumulation of non-reefal organisms precludes reefal debris flow unit as indicated by Neudert (1992). Occasional oncoids and ooids and bioclast abrasion indicates shallow water high energy environment. Probable sandbank origin barring shallow water on landward side. Inferred that such a units are lensoidal in three dimensions.

4. Limestone nodules supported by clastic mudstone: elongate to lensoidal nodules of micritic limestone supported by dolomitic clastic mudstone which comprises 30–70% of unit. Nodules display sharp stylotized sides and gradational ends. Unit typically fossil poor and invariably unbioturbated.

Origin of nodular limestone is unclear, however inferred to be deepest water sedimentary environment present due to lack of bioturbation. More abundant clastic mudstone in this unit suggests terrigenous material may be channelled off platform.

5. Parallel–laminated carbonate: carbonate–clastic mudstone interlayered on mm to cm scale. Rare thin units, bioturbated in part. Similar texture developed by stylotization (stylolaminate).

6. Terrigenous sand and gravel: although fine-grained terrigenous material is present as clastic mudstone throughout sequence, rare facies developed that are quartz-pebble rich and similar in composition to Moina Sandstone (see ZT-82-12, 133.8-136.0m).

### 4.2.2 DIAGENETIC DOLOMITIZATION

Irregular dolomitization of limestone has resulted in a series of complex textures. Dolomite content of lithologies controls core colour (making core weather to pale-mid brown), however dolomite has overprinted a range of primary textures, and therefore colour is no indicator of primary lithology (main error made by Cyprus/EZ).

*Diagenetic dolomitization is controlled by primary porosity and carbonate grain size. Significant* dolomitization has occurred as follows:

1. Clastic mudstone: clastic mudstone is invariably dolomitic (to 50%), comprised of isolated dolomite grains in argillaceous and quartz-silt matrix. Etching shows dolomite crystals to be subhedral, <0.1mm size, and pre-date weak cleavage. Dolomite growth is impeded by the presence of clay.
2. *Bioturbation: burrowing activity increases the average grain size and porosity of substrate,* therefore promoting dolomitization. Produces blotchy texture of clean sculpture mottled carbonate. Dolomite grains are euhedral, commonly interlocking, and 0.1-0.4mm in size.
3. Grainstone to rudstone: coarse clean carbonate units are invariably irregularly dolomitized, imparting a breccia appearance to unetched surfaces. Etching shows dolomite to be replacing both matrix and clasts in an unconstrained manner. Grains are commonly interlocking, again 0.1-0.4mm in size, and appear to vary in intensity through unit on the basis of primary porosity.

## 4.3 Mineralisation at Oceana

The Oceana deposit is comprised of two mineralisation styles. The area north of the mine fault, adjacent to the Oceana fault, which is described as coarsely crystalline 'epigenetic' mineralisation; and that to the south of the mine fault described by Cyprus/EZ as stratabound syndiagenetic mineralisation. Only the stratabound mineralisation has been reviewed by the author due to disintegration of the core which intersected the epigenetic mineralisation, and greater untested potential associated with the stratabound style.

Base metal mineralisation is present at the very top and very base of a distinctive but not unique grainstone to rudstone unit as described above. Adjacent overlying and underlying lithologies are micritic limestone/clastic mudstone units as per type 1 above. The best intersection within this zone to date is 11m at 12% Pb, 4% Zn and 89 g/t Ag (ZT-80-4). Galena and sphalerite with minor pyrite comprise sulphide mineralogy. Intersections of the mineralised horizons indicate unpredictable variation in grade and width of ore lenses over short distances (see Figure 7).

Alteration associated with mineralisation forms a distinct halo with sharp uphole and downhole contacts. Siderite is dominant and intense, with minor ankerite and calcite reported. Siderite altered but unmineralised zones have not been intersected, indicating a very close alteration/mineralisation relationship. Three styles of siderite are visible in hand specimen: (i) fine to medium interlocking grains, (ii) coarse interlocking grains, and (iii) irregular veins. Styles (i) and (ii) display similar associations to the relationship between diagenetic dolomite and limestone in unmineralised grainstone, implying that dolomitization predated sideritization, and the sideritization phase was replacive, rather than open space fill. No bioclastic texture has been observed within siderite altered zones. Dolomite clasts have also been observed hosted by a siderite matrix. Galena-sphalerite has preferentially replaced siderite, although replacement of limestone also occurred. Textures include sphalerite pseudomorphing crystalline siderite, void filling between siderite crystals, and near complete replacement of siderite by mineralisation, preserving small siderite clumps. Galena-sphalerite mineralisation is inferred to be synchronous, however galena veining of sphalerite is evidence of the continued mobility of galena. Later stage calcite veining cross cuts mineralisation.

Fine grained pyrite is common throughout the sequence, associated with clastic mudstone, dolomite, and often replacing part or all of fossil fragments.

The above textural evidence and strong stratigraphic control indicates the southern mineralisation at Oceana is predominantly carbonate replacive, and replacement occurred after diagenetic

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dolomitization. Mineralisation was not exhaled as suggested by Cyprus/EZ, as such mineralisation could not have survived high-energy oxygenated conditions, as demonstrated by the host rock. No evidence exists for slump breccias shed from an active fault, as cited by Cyprus/EZ to support a classic Irish style of mineralisation. No evidence exists for the absolute age of replacement, excepting a Cambrian/Ordovician Pb-isotope signature determined by Cyprus. The Oceana Fault or fault precursor does appear important to the localisation of mineralisation.

The two lenses of stratabound mineralisation at Oceana occur at the two facies boundaries which mark the most significant changes to sedimentary environments, and at the upper and lower margins of a unit interpreted to have high primary porosity. This relationship highlights the importance of primary porosity for fluid penetration into the carbonate, with sulphide precipitation caused by chemical contrast at the boundaries of the porous facies. The chemical contrast is speculated to be an increase in sulphur or carbon content to drive reduction. Porosity development in the northern Oceana mineralisation appears tectonically instead of stratigraphically controlled, accounting for contrasting textures.

Both the sedimentary sequence and the lithological control on mineralisation at Oceana closely resembles that described from Irish carbonate hosted orebodies. Hitzman and Large (1986) provide the following description: 'At Navan, and other deposits hosted by the clastic and carbonate rocks of the Navan Group, mineralisation 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 mineralisation 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 result of this lithological control is the formation of stratabound, and rarely stratiform, zones of mineralisation.' Ore textures at Oceana do not correlate with those of Navan.

Whether an Irish-style mode of genesis is appropriate for Oceana or not, ore body geometry displays sedimentological control for both styles of mineralisation.

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## 4.4 Indicated Resource at Oceana

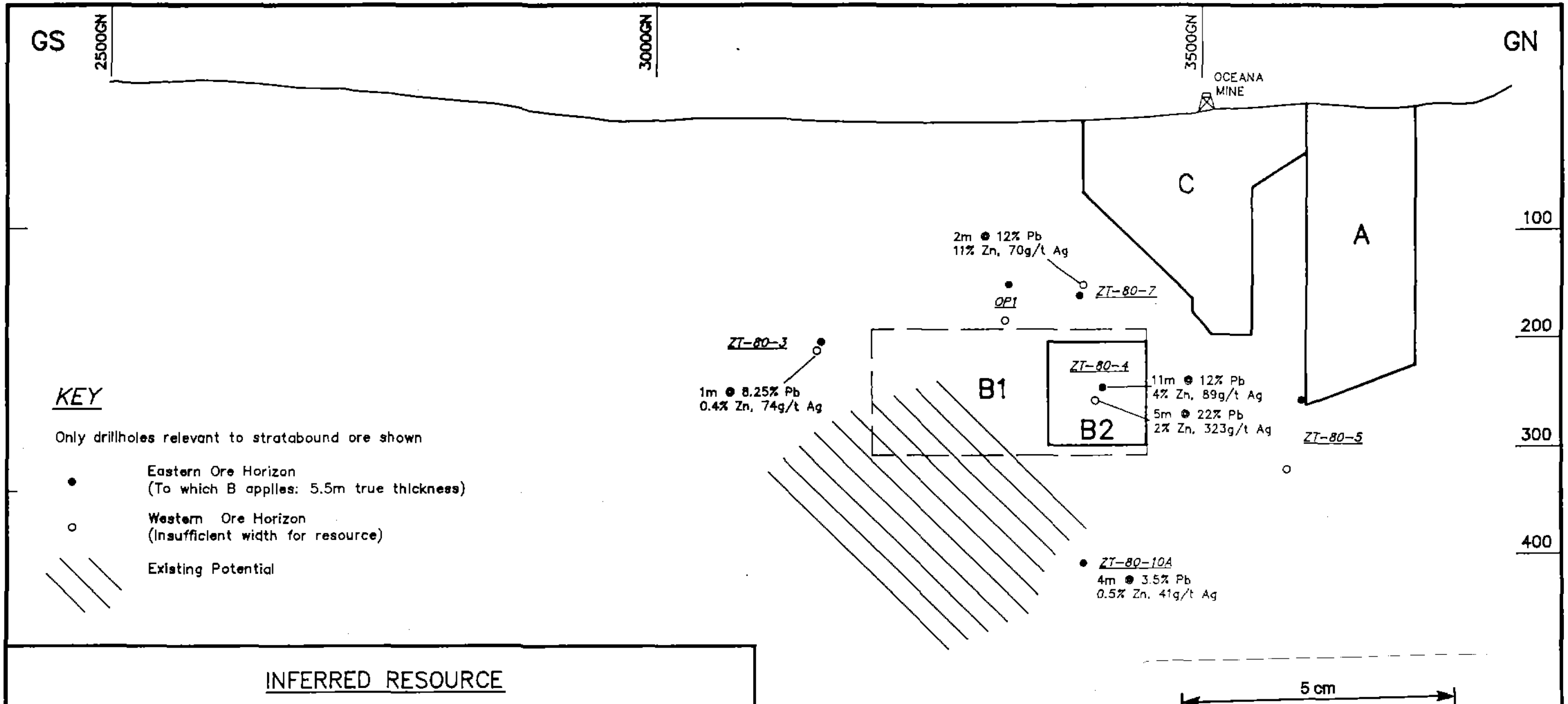
An indicated resource of 750 000 tonnes at 12% Pb, 4% Zn and 89 g/t Ag was calculated by EZ (Taylor, 1983) for the eastern lens of stratabound mineralisation. Dimensions and inferred continuity of the ore block corresponding to this tonnage are unrealistic, as indicated by further drilling (OP2). The eastern lens is of ore grade and thickness in ZT-80-4, and mineralised in ZT-82-10A. An ore lens centred on the ZT-80-4 intersection, extending 45m up dip, 50m down dip, 50m south and 40m north, with a width of 5.5m and ore density of 4.0 tonnes/$m^3$ provides an indicated resource of 188 000 tonnes at 12% Pb, 4% Zn and 89 g/t Ag (see Figure 8). The total indicated resource of Oceana is therefore 2 485 000 tonnes at 7.5% Pb, 2.6 Zn and 51 g/t Ag.

## 4.5 Potential at Oceana and Recommendations

The epigenetic mineralisation zone remains untested below 250m, however due to very difficult ground conditions and high Pb/Zn ratio, this block remains a low priority for further drilling.

The stratabound zones are locally zinc rich (to 11% in ZT-80-7), and potential exists for an increase in thickness and continuity of both east and west mineralised horizons along strike and down dip. Mineralisation intersected in, and mined from, area 'C' (Figure 8), and exposed in costeans 3450N and 3500N is predominantly south of the mine fault and may be of stratabound type. The relationship of this ore to that intersected in ZT-80-4 may indicate a steep southerly plunging ore shoot geometry. A shallow intersection (150m) of the host horizons on section 3470N is required to test ore shoot geometry and style of shallow mineralisation.

Further extensions of the Oceana stratabound mineralisation must be first tested by drilling on section with OP2 (3300N), to intersect the target horizon at approximately 300m depth (100m from both OP2 and ZT-80-4 intersections).




## INFERRED RESOURCE

*Using SG = 4 Cut off = 5% Pb + Zn*

| | | *tonnes* | *Pb %* | *Zn %* | *Ag g/t* |
|---|---|---|---|---|---|
| A | CYPRUS 1988 | 2,297,000 | 7.1 | 2.5 | 48 |
| B1 | EZ 1983 | 750,000 | 12 | 4 | 89 |
| B2 | PASMINCO 1994 | 188,000 | 12 | 4 | 89 |
| | TOTAL (1994) | 2,485,000 | 7.5 | 2.6 | 51 |
| C | PRODUCTION AND DETAILED PRE-1960 DRILLING | | | | |

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PASMINCO EXPLORATION
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COMPILED : P.M.Q.
DATE : Oct., 1992
DRAWN : G.M.B.
REFERENCE :
REVISIONS : M.S.S.
Modified Sept., 1994

RL8809 – OCEANA
LOCATION OF
INFERRED RESOURCE
AND POTENTIAL

DRAWING No. 5_RESPOT
SCALE 1:5000 0 100 m
FIG. No. 8

# 5 POTENTIAL OF OTHER PROSPECT AREAS AND RECOMMENDATIONS

The following section reviews exploration potential and maturity on RL 8809 outside the immediate Oceana Mine area.

## 5.1 General

Exploration on RL 8809 is reasonably mature, and has been based on the Austral, Oceana and Pyramid grids. The following data sets are available from the licence area:

Geology: Factual surface and interpretive geology maps produced on the basis of outcrop, mapping of costeans and drillhole data are available at 1:2500 and 1:10 000.
Intensity of weathering and paucity of outcrop of the Gordon Limestone limit the usefulness of geology maps. Lithological descriptions of outcrop show little relationship to fresh carbonate in core.

Geochemistry: The RL has been variably covered by B/C horizon soil geochemistry with analyses for Pb, Zn, Ag, Hg (1979); and track mounted Jacko auger sampling at 25x100m spacing (1980–83), to an average 5m depth. A small Wacker sampling campaign was limited to the Pyramid grid (1985). Numerous costeans have been dug along strike and channel sampled at 1m or 2m intervals.

Intense weathering again limits the usefulness of the data. Bedrock sampling has not occurred consistently with auger methods, as indicated by a low degree of correlation between costean and auger data. Wacker and costean sampling appear to have produced the most consistent geochemical trends. A comparison of costean and drillhole data to determine weathering modification of mineralisation is not valid due to the depth of intersections relative to the variation of the orebody.

Gravity: Detailed data was collected by Amoco (1981) on the Oceana, Austral and Pyramid grids, however locations are poorly constrained. Further data was collected by Pasminco (1992) and interpreted by Leaman Geophysics.

The interpretation has shown limited correlation of gravity with known mineralisation, and only modest correlation with lithology. Significant problems result from variable depths to weathering, and the lack of density control on some units. Leaman (1993) indicated that these problems are sufficient to prevent gravity from being a valid tool for drillhole targeting, as evidenced by the lack of success by Amoco and Pasminco in testing gravity generated drill targets.

Magnetics: RL 8809 was surveyed in part by ground magnetics and aeromagnetics by Amoco, and again with ground magnetics and aeromagnetics by Pasminco (1991-92). Mineralisation in core found to be significantly more magnetic than the host rock. An interpretation was completed by Leaman Geophysics.

The aeromagnetic data set is strongly influenced by cultural features, however some structural offset can be interpreted. No ore related signatures were recognised. Ground magnetic data does provide a positive anomaly correlating with Oceana mineralisation, plus anomalies correlating to limestone/sandstone contacts due to oxidation. Ground magnetics may be applied to drillhole targeting.

EM/IP: A number of phases of electrical geophysics were completed by Amoco over the Oceana mineralisation, and other parts of the RL. IP delineated widespread pyrite in the host rocks, but failed to recognise massive mineralisation, whilst EM provided inconclusive results, detecting mineralisation in some areas and not in others. Physical property tests carried out on mineralised core by Geoterrex indicated poor to nil conductivities over short distances.

Electrical geophysics does not appear to be ideally suited to the detection of the target mineralisation.

## 5.2 Oceana Grid

The Oceana grid extends for 1.5km along strike, and aside from Oceana, covers the South Oceana mineralisation.

Drilling: 46 holes have been drilled on the Oceana grid by Zeehan Mines (29), Amoco (15) and Pasminco (2), of which 44 have been collared between 3350 GN and 3700 GN, and targeted at extensions of the Oceana mineralisation. The remaining holes include ZT-80-3, which intersected minor Oceana-type mineralisation, and OP1, drilled in the South Oceana area, which failed to test the target horizon due to faulting.

Potential: The low degree of drill testing on the Oceana grid south of 3350 GN provides hope for the discovery of new mineralisation, either in an Oceana-equivalent stratigraphic position, or in other permeable carbonate facies. High porosity units are repeated within the local stratigraphy of the Oceana Mine that are as equally prospective as the host grainstone-rudstone unit of the stratabound ore. The Moina Sandstone-Gordon Limestone contact has not been tested by drilling anywhere on the Oceana grid, despite known mineralisation at Grieves and Austral Valley occurring in this stratigraphic position, and remains a priority target despite the potential for deep weathering along the formational boundary. Recently confirmed overthrusting of the Moina Sandstone over Gordon Limestone (OP1) introduces the potential for mineralisation in the southern section of the Oceana grid with no surface expression, including Austral/Grieves- style mineralisation without deep weathering.

Magnetic/gravity targets have been generated and drilled, whilst others remain untested, however the lack of success with these techniques limits their future application. Available geochemistry can not be treated with confidence, and resampling with air core may provide new and redefine existing anomalies.

Recommendations:

1. Grid based aircore drilling in southern section of the grid;
2. Extend understanding of mineralisation control;
3. Correlate OP1 with Oceana mine stratigraphy;
4. Diamond drilling of targets generated;

## 5.3 Austral Valley Grid

A number of prospect areas are present within the Austral Valley, which is situated to the north side of the Oceana Fault. The Austral Valley Mine is described by Blisset (1962), who estimates 862 tons galena, 100 tons sphalerite, and 9 tons pyrite was extracted over a 5 year period. The Austral Flux Quarry occurs along strike from the Mine, and was exploited for ferromanganiferous gossan used as flux in the Zeehan Smelters.

Drilling: 7 shallow vertical holes were drilled by Zeehan Mines in the immediate area of the Austral Valley Mine/Flux Quarry. Significant mineralisation was intersected at shallow depth. 11 holes were drilled by Amoco along approximately 1.3km strike length, 4 targeted at known mineralisation at the Austral Valley Mine/Flux Quarry, the remainder at geochemical (costean/auger)/gravity targets. Best results were returned from ZT–81A–6 in the Flux Quarry area (3m @ 9.5% Pb, 6.6% Zn).

Two separate stratigraphic positions were targeted by Amoco drilling. The Austral Valley Mine/Flux Quarry mineralisation is hosted by an interbedded claystone/siltstone/ironstone sequence at the contact of the Gordon Limestone and Moina Sandstone. Weathering has penetrated to a depth of greater than 250m along the formational contact. The remainder of the holes intersected a limestone–dolomite dominated sequence lithologically very similar to the Oceana prospect, with rare vein and breccia style mineralisation.

Prospectivity: Drilling in the Austral Valley Mine area has located, but not fully explored a base metal resource at the Gordon Limestone–Moina Sandstone contact. Despite this, the known Austral Valley mineralisation appears unattractive, due to the deep and variable oxidation along the formation boundary that has caused base metal grades and mineralogy to be unpredictable. Both on surface and at depth, galena/sphalerite mineralisation occurs adjacent to highly anomalous haematitic ironstone.

Drill holes elsewhere in the Austral Valley have intersected Oceana–type shallow water low to high energy carbonates with only minor associated tectonically controlled mineralisation. No carbonate replacive mineralisation has been intersected on the north side of the Oceana Fault, however this carbonate sequence remains prospective for massive Oceana–type mineralisation. There is no sedimentological evidence for the Oceana Fault precursor being a Gordon Limestone age growth fault, suggesting there is no basis for asymmetric mineralisation about the fault, if mineralisation is deemed to be early in origin. On the strength of existing geochemical data sets, the favoured targets have been drilled, however the validity of these data sets is questioned. A number of areas remain untested by drilling, however geochemical and/or structural data is required to define new targets.

Recommendations:

1. Relogging of existing core to establish lithological correlation with Oceana;
2. Remapping of significant outcrop to confirm presence of mapped structures;
3. Grid based aircore drilling in un-drilled areas;
4. Collection and interpretation of ground magnetic data;
5. Diamond drilling of targets generated by this program.

### 5.4 Pyramid Grid

The Pyramid grid occurs to the southeast of the Oceana Mine, and is an area of numerous small, shallow workings. Mining activities from this locality are largely unreported, with King (1962) describing Pyramid as another *'insignificant or fruitless mining operation'*.

Drilling: 7 shallow Winkie holes were drilled at geochemical targets. All holes fall outside the eastern boundary of RL 8809. Core recovery was very poor, little mineralisation intersected.

Prospectivity: The Pyramid area was targeted late in the Amoco/EZ exploration campaign on EL 4/78, and consequently was not properly tested by drilling, despite encouraging costean results (6m @ 7.18% Pb, 2.13% Zn). Wacker sampling has provided results that appear consistent, and reporting suggests that bedrock was sampled at most localities, therefore further geochemical sampling in this area does not appear warranted. Over-thrusting of the Moina Sandstone onto the Gordon Limestone may be significant in this area (as per further north), providing potential for masked mineralisation down sequence from that recorded at the Pyramid Mine. The stratigraphic relationship of this mineralisation with respect to Oceana is unknown. Some potential exists for mineralisation to be zinc dominant.

186024



Recommendations:

1. Field mapping to determine likelihood of thrust faulting;
2. Profile interpretation of gravity/magnetic data to determine likelihood of thrust faulting;
3. Diamond drill test down dip extent of mineralisation in costean. Deeper drilling of masked targets if thrust fault is present.

## 6 CONCLUSIONS

The sedimentology of the Gordon Limestone, plus the features controlling the mineralisation style of the Oceana deposit have been reviewed, as has available data covering prior exploration on RL 8809. This review will form the basis for further exploration activity on the licence.

The Oceana deposit remains open at depth and in part to the south, however the lead dominance over zinc limits the potential for attractive targets. The Pyramid and Austral areas both present valid exploration targets for ongoing exploration.

186026



## 7 ENVIRONMENTAL DISTURBANCE AND REHABILITATION

No environmental disturbance took place during 1993–94, with all site access achieved by existing tracks.

No significant rehabilitation was completed during the year. Warning signs and fencing was erected in the vicinity of the Oceana Mine by both Pasminco and Mineral Resources Tasmania.

## 8 EXPENDITURE

| | |
|---|---|
| Personnel | 12 291 |
| Travel & Accommodation | 701 |
| Geological Consultants | 0 |
| Geochemical Consultants & Assays | 0 |
| Geophysical Surveys & Consultants | 500 |
| Other Consultants | 74 |
| Drilling | 166 |
| Stores & Supplies | 740 |
| Vehicles Plant & Equipment | 1 081 |
| Land | 800 |
| Computing | 373 |
| Office | 4 992 |
| Administration Fee | 2 172 |
| **TOTAL** | **23 890** |

186028



## 9 KEYWORDS AND LOCATION

LEAD, SILVER, ZINC, LIMESTONE, DOLOMITE, FACIES MARINE SHALLOW, FAULT, CARBONATE HOSTED TYPE, DISCORDANT, MASSIVE, STRATABOUND, ORDOVICIAN, DATA REVIEW, ORE POTENTIAL.

QUEENSTOWN SK5505
TENEMENT: RL 8809 OCEANA JV
ZEEHAN, OCEANA, AUSTRAL

## 10 REFERENCES

Blisset, A.H. 1962. One mile geological map series. K/55-5-50. Zeehan. Explanatory Rep. Geol. Surv. Tas.

Blisset, A.H. & Gulline, A.B., 1962. One mile geological map series. K/55-5-50. Zeehan. Department of Mines, Tasmania.

Curtis, R., 1981. *Review of Oceana Mine area, Zeehan, Tasmania.* Unpubl. Amoco Rept.

Findlay, R.H., & Brown, A.V., 1992. The 10th Legion Thrust, Zeehan District: Distribution, interpretation and regional economic significance. Division of Mines and Mineral Resources - Report 1992/02.

Hitzman, M.W., & Large, D.L., 1986. A review and classification of the Irish carbonate-hosted base metal deposits. In Andrew, C.J., Crowe, R.W.A., Findlay, S., Pennell, W.M., and Pyne, J.F. (eds), Geology and Genesis of Mineral Deposits in Ireland, Irish Assoc. of Economic Geologists, Dublin, Ireland. pp 217-238.

Jones, P.A., 1988. *Geological Report Retention Licence Application* Oceana - Austral, Zeehan Tasmania. Unpubl. Cyprus Rept. No. 574, May 1988.

Leaman, D.E. & Richardson, R.G., 1989. The granites of west and north-west Tasmania - a geophysical interpretation. Bull. geol. Surv. Tasm. 66.

Leaman, D.E., 1993. Further Evaluation, gravity and magnetic data, RL 8809. Unpubl. Pasminco Exploration Rept.

Neudert, M.K. 1992. A sedimentological survey of the Ordovician host sediments to Oceana mineralisation, Tasmania. Unpubl. Pasminco Exploration Rept.

Quayle, P.M., 1992. RL 8809 Oceana JV - Annual Report for 12 months to September 1992. Pasminco Exploration Report No. T92-14.

---., 1993. RL 8809 Oceana JV - Annual Report for 12 months to September 1992. Pasminco Exploration Report No. T93-13.

Taylor, S., 1983. Review of Amoco Exploration of Gordon Limestone in EL 4/78 and Assessment of Pb-Zn Potential of the Gordon Limestone in West-Central Tasmania. Unpublished EZ Report, March 1983.

186030

# APPENDICES

186031

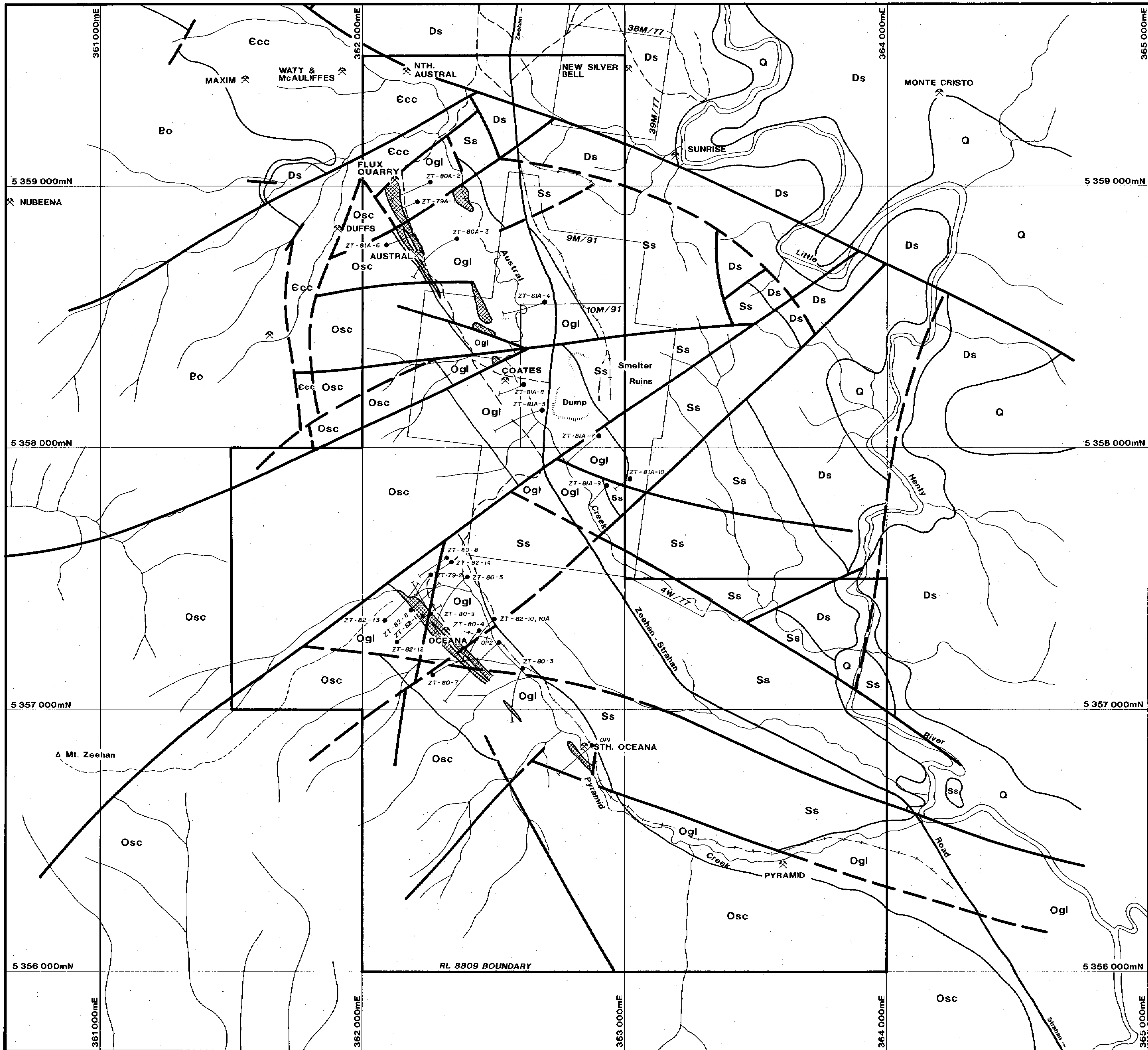
# APPENDIX 1

# SCHEDULE RL8809

**SCHEDULE RL8809**

Commencing at a south west corner of the area whose grid co-ordinates are 362 000 metres E. 5 356 000 metres N. thence grid north to 5 357 000 metres N. grid west to 361 500 metres E. again grid north to 5 358 000 metres N. grid east to 362 000 metres E. aforesaid again grid north to 5 359 500 metres N. again grid east to 363 000 metres E. grid south to 5 357 500 metres N. again grid east to 364 000 metres E. again grid south to 5 356 000 metres N. thence again grid west to the point of commencement.

# FIGURES




## LEGEND

**QUATERNARY**

| | |
|---|---|
| Q | Alluvium, talus |

**DEVONIAN**

| | |
|---|---|
| Ds | Bell Shale, Florence Quartzite |

**SILURIAN**

| | |
|---|---|
| Ss | Austral Creek Siltstone, Keel Quartzite, Amber Slate, Crotty Quartzite |

**ORDOVICIAN**

| | |
|---|---|
| Ogl | Gordon-Limestone<br>Ironstone |
| Osc | Moina Sandstone<br>Mt. Zeehan Conglomerate |

**CAMBRIAN**

| | |
|---|---|
| Ccc | Crimson Creek Formation |

**PROTEROZOIC**

| | |
|---|---|
| Po | Oonah Quartzite, Slate<br>Minor Volcanics |

Geology after Cyprus 1980

94-3637

GN TN MN

Grid Convergence 1.0°

Grid/Mag 12.0°

**PASMINCO EXPLORATION**

A Division of Pasminco Australia Limited

| | |
|---|---|
| COMPILED : | |
| DATE : Oct, 1991 | |
| DRAWN : G.M.B. | |
| REF: | |
| REVISIONS : M.S.S. | |
| DDH's Added | |
| Sept., 1994 | |
| DRAWING No. | |

**RL 8809 - OCEANA**

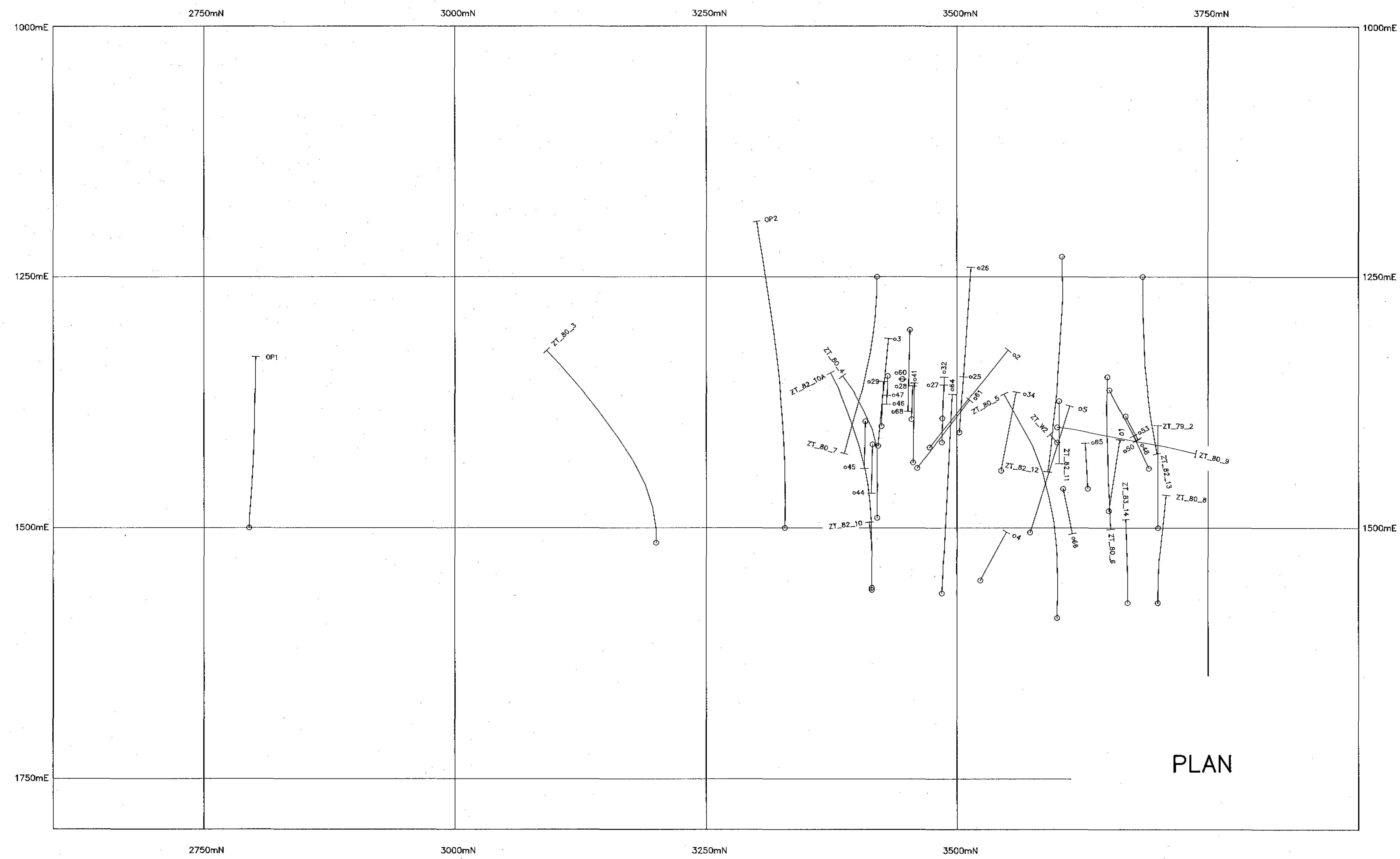
186034

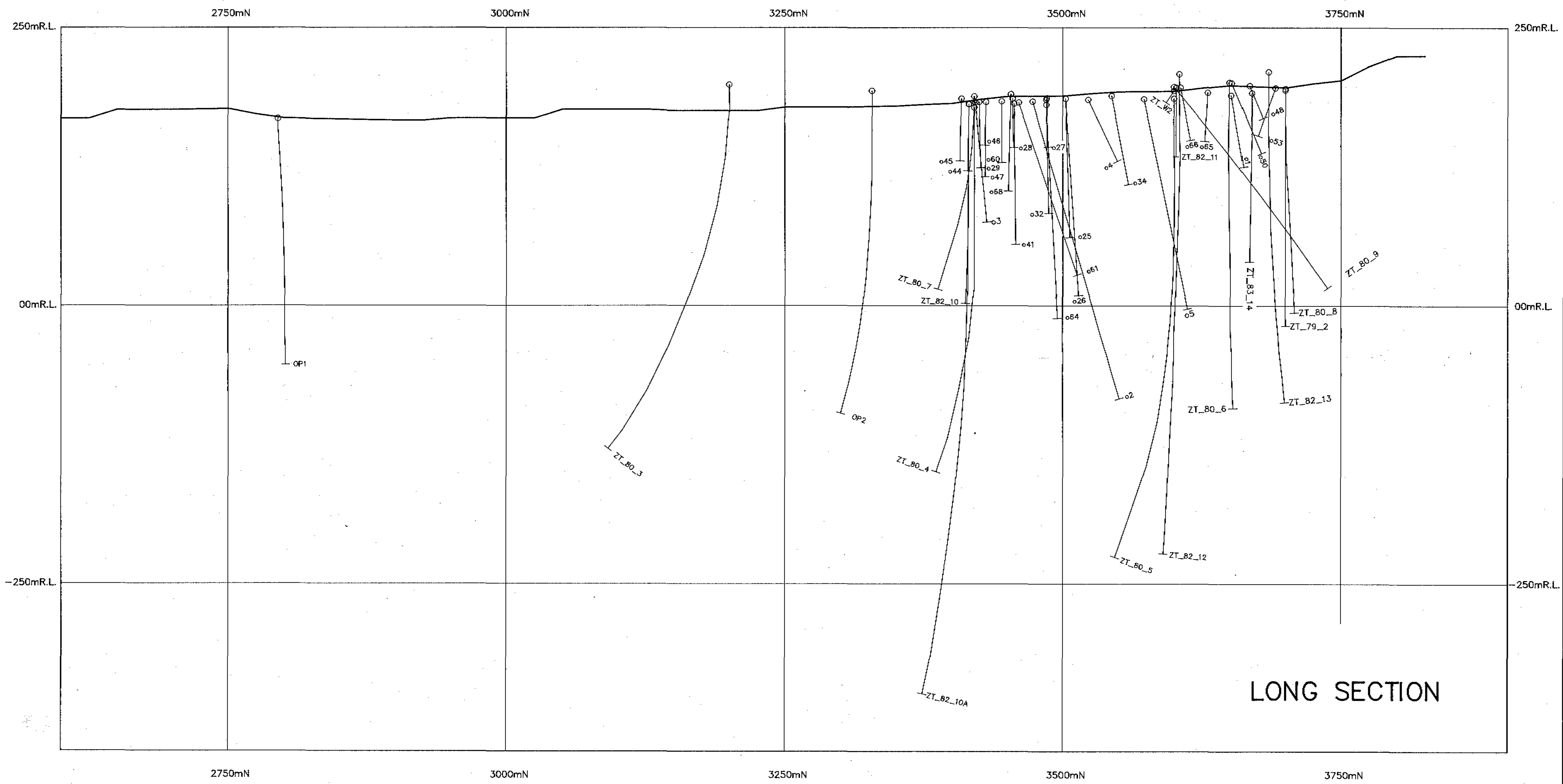
# GEOLOGY

5 cm

SCALE 1:10,000 — 200 0 200 metres

FIG. No. 3



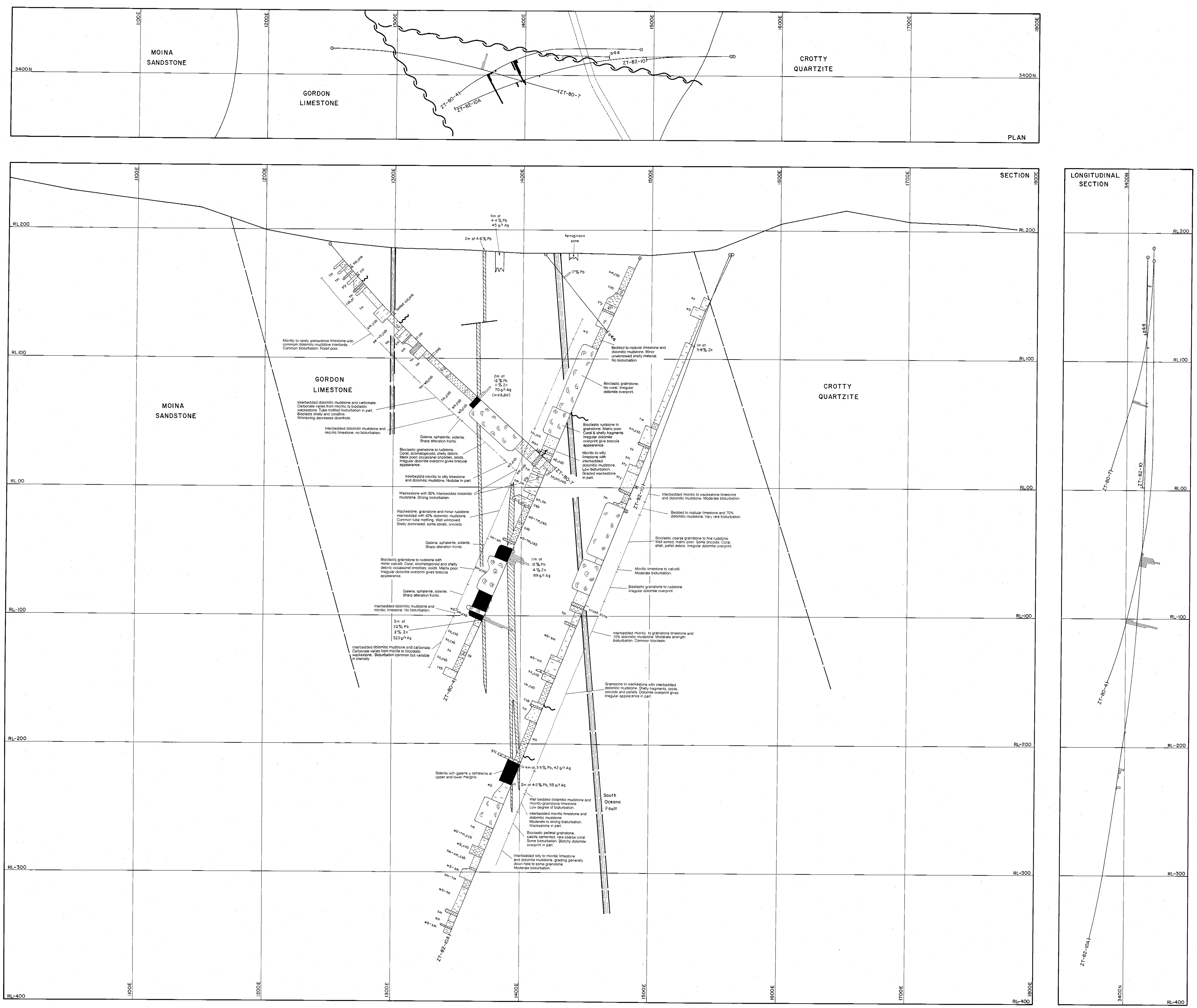



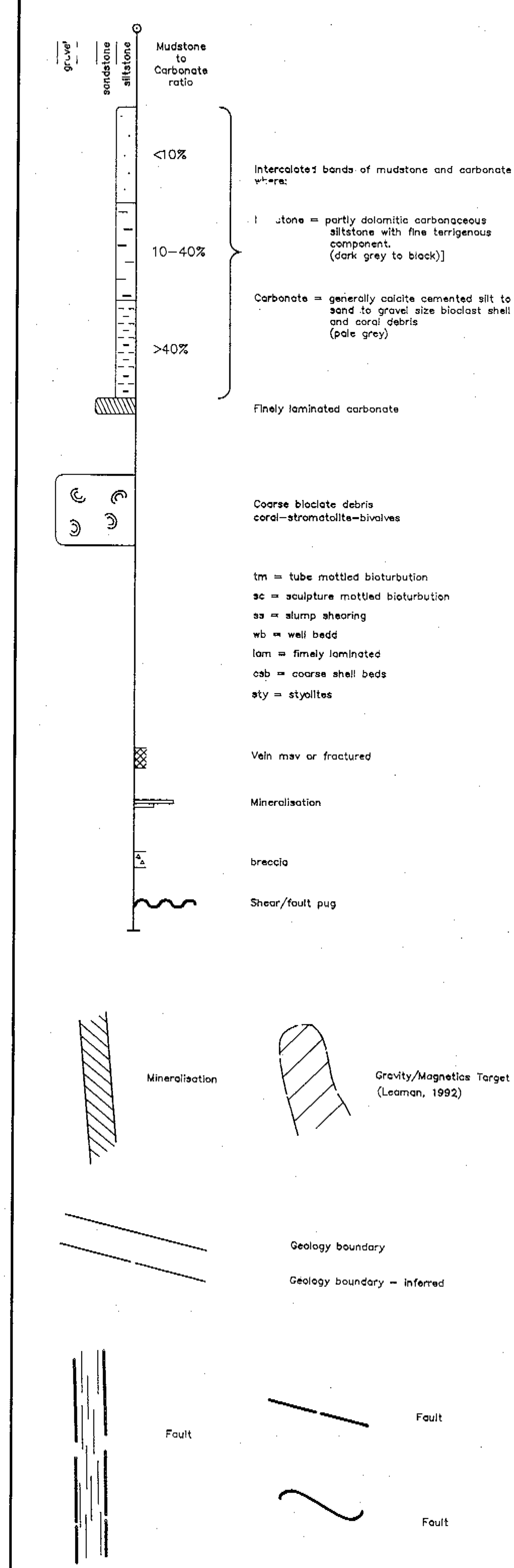

94-3837

5 cm

**PASMINCO EXPLORATION**
A Division of Pasminco Australia Limited

| | |
|---|---|
| COMPILED : P.M.Q. | RL8809 – OCEANA 186035 |
| DATE : Oct., 1992 | OCEANA GRID |
| DRAWN : G.M.B. | DDH LOCATIONS |
| REFERENCE : | PLAN VIEW AND |
| REVISIONS : P.M.Q. Sept., 1993 | LONG SECTION |
| DRAWING No. OGDDHPLS | SCALE 1:2500 0 50 100 m — FIG. No. 6 |




94-3637

5cm

**PASMINCO EXPLORATION**

A Division of Pasminco Australia Limited

186036

| | |
|---|---|
| COMPILED : P.M.Q. | |
| DATE : 10.10.92 | R.L.8809 - OCEANA |
| DRAWN : N.D.W.S. | **GEOLOGY** |
| REF. : | |
| REVISIONS : M.S.S. | **SECTION AT 3400N** |
| Modified Sept., 1994 | |
| DRAWING No. | SCALE 1:1,000 — 0 20 40 m — FIG. No. 7 |