N.T. GOVERNMENT - DEPARTMENT OF MINES & ENERGY

Mines Division

N.T. GEOLOGICAL SURVEY GS 79/

GEOLOGICAL INVESTIGATIONS AT THE MOLYHIL SCHEELITE MINE, CENTRAL AUSTRALIA

Huckita 1:250 000 Sheet Area - SF/53-11

by

D. BARRACLOUGH

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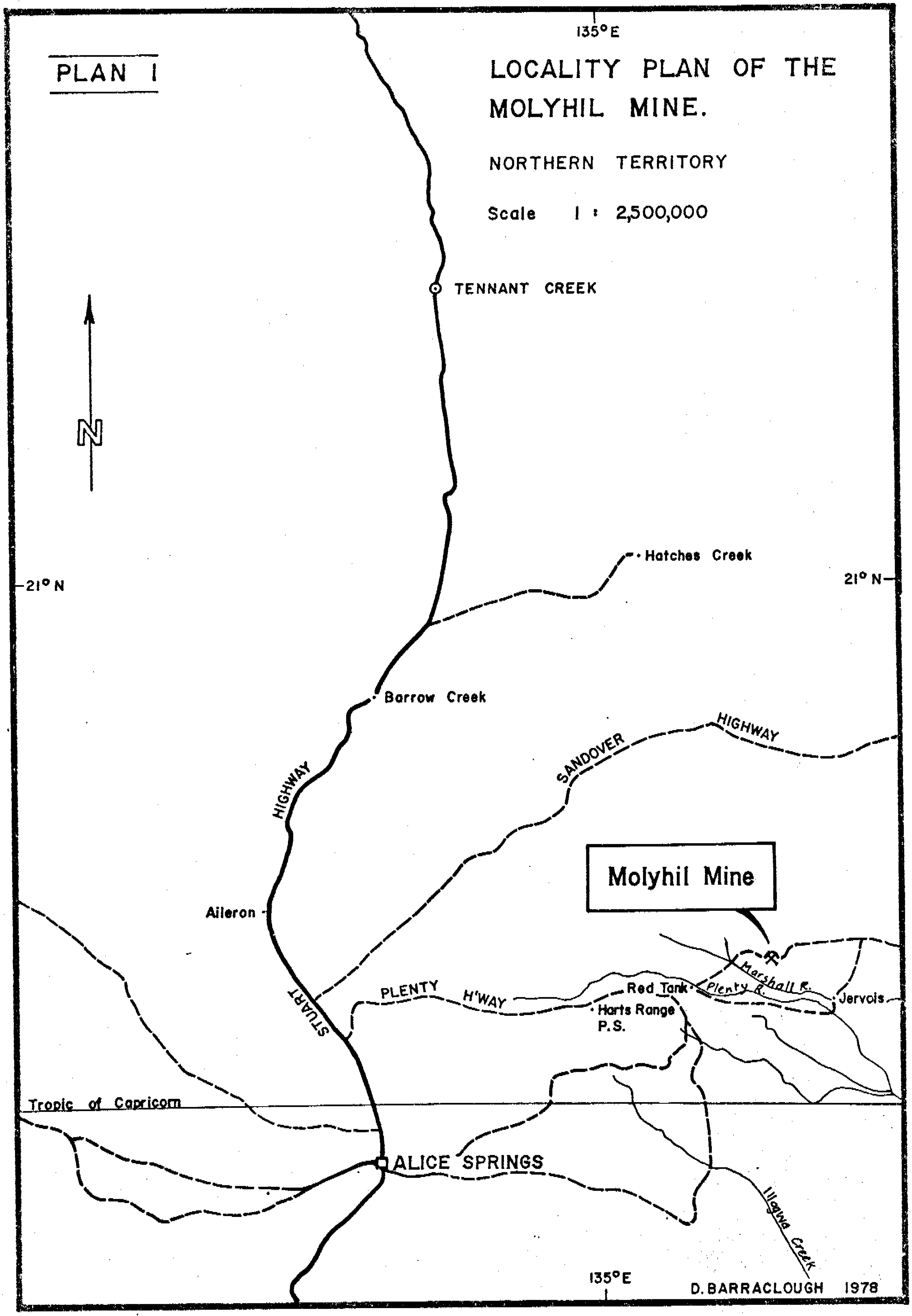

PLAN I
LOCALITY PLAN OF THE
MOLYHIL MINE.
NORTHERN TERRITORY
Scale 1 : 2,500,000
135°E
TENNANT CREEK
N
Hatches Creek
21° N
21° N
Barrow Creek
SANDOVER
HIGHWAY
HIGHWAY
Molyhil Mine
Aileron
STUART
PLENTY
H'WAY
Red Tank
Plenty R.
Marshall R.
Jervois
Harts Range
P.S.
Tropic of Capricorn
ALICE SPRINGS
Illogwa Creek
135°E
D. BARRACLOUGH 1978

SUMMARY

The Molyhil scheelite mine in Central Australia is located in a 6.5 km long sliver of undeformed rock within a major fault system which separates metamorphic rocks from an area of granite. Metamorphic rocks within the sliver are intruded and, in part, metasomatized by Lower Proterozoic Jinka Granite to form new mineral assemblages enriched in iron, sulphur, molybdenum and tungsten.

Between 1974, when the mine began operating and the end of 1976, when the operations were temporarily suspended, about 20 000 tonnes of ore had been mined and 80 tonnes of concentrate produced from the open-cut ore body.

Geological mapping and diamond drilling have indicated probable ore reserves of 100 000 tonnes of 0.4% WO_3 and a further 600 000 tonnes of (estimated) 0.2% WO_3. A fault cutting the ore body was intersected at depth and a short section of mineralized skarn was recovered below the fault. This intersection showed that a potential for further mineralization exists at depth below the fault.

Scheelite is associated with strong iron enrichment (magnetite, pyrite and iron-rich calc-silicates); the strongest iron enrichment occurs in a lensoidal zone centred at the open-cut, thirty metres from the hanging-wall granite.

LOCATION

Molyhil is approximately 225 kilometres east-northeast of Alice Springs and is reached via the Stuart Highway, the Plenty Highway and a dry-weather track. (Plan 1).

INTRODUCTION

In 1976, the known ore-body at Molyhil had been glory-holed to its limits of economy and safety. The mine owners, Fama Mines Pty. Ltd., percussion drilled around the ore-body and showed that it extended at depth but they had failed to show any lateral extension of the ore-body. The company then sought the advice of the Mines Branch on possible methods of mining the known ore body and asked for assistance in locating further mineralization. After a preliminary examination of the area, officers of the Branch concluded that a magnetomer survey and geological mapping would give optimum results in locating possible extensions of the ore-body. Advice on mining methods was consequent upon the results of this work

This report gives details of the results of the geological investigation.

MINING HISTORY AND PRODUCTION

Scheelite was discovered at Molyhil in 1971 by ground prospecting with ultra-violet lamps. Mining started in 1974 when several pegmatite veins and associated scheelite-bearing skarns were exposed around Molyhil. The mineralization was patchy but one lens of scheelite weighing about a ton was uncovered in an area of coarsely crystalline scapolite. (Plan 7).

Yellow-fluorescing molybdite and small pods of ferberite were later discovered 800 metres east of Molyhil. A small open-cut was developed here but by 1976 it had reached its limits of economy and safety and so mining was suspended. Mining resumed in 1977 when an extension to the known ore-body had been outlined by a magnetometer survey.

In the earliest development, at Molyhil itself, rich veins were gouged by hand. Later a jaw-crusher, a mill and a Wilfley table were installed and lower grade ore from the open-cut was treated. With the suspension of mining at the open-cut in 1976, ore from the White Violet Mine, 35 kilometres east of Molyhil, was being treated.

About 20 000 tonnes of ore had been mined from the open-cut and an unknown but small quantity of ore had been mined at White Violet up to 1976. A total of about 100 tonnes of scheelite concentrate had been produced between 1974 and 1976.

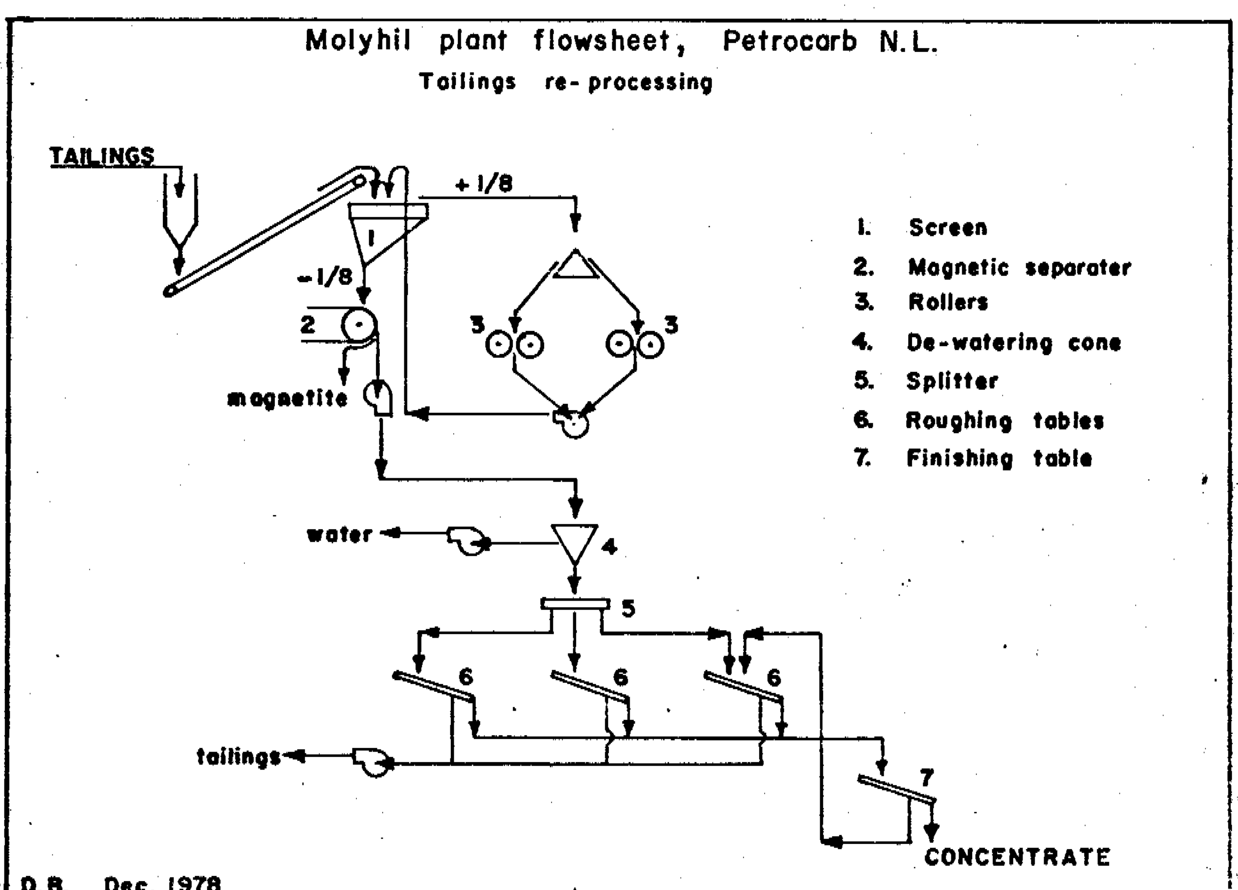
Fama Mines Pty. Ltd. converted four Mineral Claims to eight Mineral Leases in 1977 and during the following year the Mineral Leases, the plant and equipment were transferred to Petrocarb N.L.

ORE TREATMENT

In the flow scheme devised by Fama Mines ore was passed through a primary crusher at the open-cut and trucked 1 kilometre to the mill where it was crushed again to about - 8 mesh. The ore was passed over Wilfley tables and then ground to approximately - 60 mesh in a rod mill, screened and retabled. Magnetic deflectors were employed midway and at the end of the circuit.

The mill was able to treat up to 20 tonnes of ore per hour and produce up to 10 kilogrames of 80-90% scheelite concentrate per hour. Lesser scheelite fines, associated molybdenite, chalcopyrite, pyrite and magnetite were taken out in the tailings.

Towards the end of 1978 Petrocarb N.L. were treating the tailings and recovering a proportion of the scheelite fines. About 5 tonnes of tailings were being treated per hour to recover about 11 kilograms of 40% scheelite concentrate. Petrocarb N.L. are planning to add a floatation unit to the circuit to recover molybdenite.



GEOLOGICAL MAPPING

Three scales were used:

a "regional" scale of 1:25 000 for the area between the Marshall River and Grant Bluff. (Plan 2,) using an enlarged black and white air photograph,

a "local" scale of 1:2 000 for the area of the eight Mineral Leases (plan 3), using a combined grid, compass and tape method,

and a "detailed" scale of 1:200 for selected areas within the Mineral Leases using a tape and supplementary pegs.

REGIONAL STRATIGRAPHY

Precambrian

The oldest rocks exposed, those of the Precambrian Arunta Block, are steeply dipping and folded sedimentary rocks which have been regionally metamorphosed to upper amphibolite facies. The sequence is composed of two bodies of gneiss, one of granitic composition and one of pelitic composition and is correlated with the Harts Range Group of Joklik (1955). Two of the various units mapped by Joklik are recognised in the low hills between Molyhil Creek and the Marshall River; the Bruna Gneiss (porphyroblastic felsic gneiss) and the Irindina Gneiss (garnet-biotite-quartz-feldspar gneiss with subsidiary amphibolite).

Interbedded calc-silicate gneiss and marble cropping out near Molyhil Creek (Plan 3) and isolated outcrops of calc-silicate gneiss and marble a few kilometres south-west of Molyhil (Plan 2) are assigned to the Naringa Calcareous Quartzite, a member of the Irindina Gneiss. At Molyhil gneiss and marble are intruded by Lower Proterozoic Jinka Granite and are altered to skarns and calc-silicate rocks with new mineral assemblages. Diopsidic quartzite and diopsidic quartzo-felspathic gneiss mapped near the open-cut (Plans 4 and 5) are largely unaltered by the intrusive granite.

The Lower Proterozoic Jinka Granite is a pink, coarse-grained, generally slightly gneissic biotite-quartz-feldspar granite in which the biotite shows slight alteration to chlorite. The granite is metasomatized where it is in contact with skarns in the Molyhil area.

The Jinka Granite has a Rb-Sr muscovite age of 1840 m.y. (Wilson and others, 1960) and a Rb-Sr total rock and mineral isochron age of 1690 m.y. (Riley, 1968). Granites (including the Jinka Granite) which intrude metamorphic rocks on the southern margin of the Georgina Basin have an average K-Ar date of 1440 m.y. (Hurley et.al., 1961). However, Shaw and Stewart (1976) note that K-Ar mineral dates from a wide area in the Arunta Block are reset by various amounts.

Post-Carpentarian to Lower Cambrian

The Arunta Block is unconformably overlain by a deformed but unmetamorphosed succession of sedimentary rocks which underlie and form part of the south-western sequence of the Georgina Basin. Rocks of the Adelaidean Elyuah and Grant Bluff Formations, and of the Lower Cambrian Mount Baldwin Formation crop out in the Molyhil district.

At an exposure north of Molyhil (grid ref. 5122N 5190E, Plan 3) a thin bed of conglomerate is present at the unconformity between the Jinka

Granite and the younger Adelaidean sequence. The conglomerate is succeeded by about 160 metres of siltstone and fine sandstone, 6 metres of medium to coarse cross-bedded sandstone (the aquifer for Molyhil Mine;) (see Figure 2, Page 14) and about 100 metres of siltstone, gypsiferous siltstone, dolomitic siltstone and minor brown dolomite. These rocks are mapped as Grant Bluff Formation by Smith (1963), but the sequence here is much thicker than is recorded elsewhere in the Huckitta 1:250 000 Sheet area.

?Tertiary and Quaternary

A thin sequence of flat-lying conglomerate, silcrete and clay unconformably overlies the Arunta Block at Mt. Sainthill. The sequence may be an erosional remanant of a once-extensive Tertiary covery.

LOCAL GEOLOGY

Marble, calc-silicate gneiss, quartzo felspathic gneiss and quartzite of the Naringa Calcareous Quartzite are intruded by Jinka Granite and in some cases altered to calc-silicate skarns and hornfels. Crenulated bands of marble and grossularite-pyroxene gneiss cropping out between Molyhil and Molyhil Creek, and quartzo-felspathic gneiss at the open-cut are unaltered or partly altered by the granite. These remnant beds are parallel to the bands of altered rock and are useful marker bands.

Three types of metasomatic rocks are recognised at the open-cut: granitoid endoskarns, unmineralized calc-silicate exoskarns and 'ore-zone' calc-silicate exoskarns. The granitoid endoskarn is metasomatized Jinka Granite, a grey, coarse grained, often foliated rock containing grey-pink microcline, cloudy quartz, silver-grey altered biotite (?muscovite), serpentinized pyroxene and rare pyrite, molybdenite, magnetite and scheelite.

Unmineralized calc-silicate exoskarns, known as 'banded' hornfels and 'mixed' hornfels are light-coloured and separate the granitoid from the dark-coloured ore-zone calc-silicates. "Banded" hornfels consists of bands of diopsidic pyroxene (with accessory garnet, quartz, biotite and epidote) and bands of garnet (with accessory pyroxene, quartz, biotite and epidote). The hornfels contains minor magnetite and pyrite, rare molybdenite but little, if any scheelite. "Mixed" hornfels is a melange of garnet, pyroxene, epidote and calcite. It contains only rare amounts of magnetite and sulphide.

Both types of hornfels contain andradite - and grossular - garnet. It is noted that when grossular-garnet is present (often in bands of grossular garnet-quartz-biotite), magnetite and sulphide are rare and scheelite is absent.

The 'ore-zone' calc-silicate exoskarns are iron-rich and dark-coloured, and are easily distinguished from the lighter-coloured unmineralized calc-silicates. The 'ore-zone' rocks contain a high proportion of magnetite, pyrite and iron-rich minerals such as andradite-garnet, actinolite and ferro-amphibole. Strong magnetite-pyrite mineralization occurs with lens-shaped distribution thirty metres from the hanging-wall granite, centred at the open-cut.

Hematite-pyroxene-garnet rocks containing minor scheelite and molybdenite which crop out to the north of the open-cut, may be an 'oxidised' equivalent of the 'ore-zone' calc-silicates. These rocks occur in the same stratigraphic position as the 'ore-zone' calc-silicates in relation to the granite contact and also contain a band of magnetite skarn thirty metres from the hanging wall granite

STRUCTURE

Regional

The dominant structural feature is the Delny - Mt. Sainthill Fault System. The Fault System extends west-northwestwards across the Arunta Block from the Tarlton Fault, through the Molyhil district to the Woolanga Lineament. Near Molyhil, the system is about 5 kilometres wide and separates metamorphic rocks to the south from a region of granite to the north. The Fault System consists of zones of deformed rocks commonly half a kilometre wide, but near Mt. Sainthill they are about 2 kilometres wide (Plan 2). Within these deformed zones are slivers of undeformed rock; Molyhil is located in a wedge-shaped sliver (the Molyhil Wedge) 6.5 km long and more than 1 km wide.

Dips on the deformed rocks are steep and fault traces are curvilinear, features which suggest that later movements on the fault have a predominant vertical component. Warren (1978) suggests that the cumulative effect of movement is north-side up and without significant transcurrent component. If this is the case, rocks within the Fault System have probably undergone various amounts of uplift.

The Molyhil Wedge, containing Molyhil mine (Plan 2), should, by the above hypothesis, be thrust-faulted by north over south movement from an original position within the Elyuah Syncline. However, for an alternative hypothesis, the Wedge may be transcurrently faulted, as an undeformed raft within a braided fault system, some 20 kilometres from the fault-bounded southern end of the Elyuah Syncline.

Local

The area between Molyhil and Molyhil Creek contains several outcrops of crenulated marble and calc-silicate gneiss. These outcrops are thought to record some features of the basement structure prior to granite intrusion and seem to be part of a southerly plunging antiform, intruded by granite and faulted on the eastern Limb. (Plan 3).

In the open-cut area, the en echelon outcrops of calcsilicate rock and the stratigraphic similarity of two of these outcrops suggests a similar style of folding to the Molyhil area and suggests that these rocks may be part of a similar antiform.

Faults mapped at the open-cut generally have a displacement of only a few metres but fault F1 may have a displacement of several metres. Fault F1 is accompanied by a zone of brecciation three metres wide and shearing effects a further one or two metres on each side of the breccia zone. The breccia is filled with coarsely crystalline fluorite, barite, calcite and quartz and crops out to the north of the open-cut (Plans 3, 4 and 6). It dips about 50° to the south but intersections of F1 in drill holes MDDH3 and MDDH8 show that F1 dips less steeply with an increase in depth (Cross-section 3).

DIAMOND DRILLING

Eight diamond drill holes, 6 at the open-cut and two at Molyhil total 742.3 metres. The locations of the drill holes, the depths and the description of the core are given in an appendix.

Drill holes MDDH1, 2, 4 and 8 are graphically described in Cross-section 3; drill holes MDDH8 and 5 are described in Cross-section 1 and drill holes MDDH6 and 7, under Molyhil, are described in Cross-section 4.

The ore zones of MDDH1, MDDH2 and part of MDDH4 are in NQ core whilst the ore-zones of MDDH8 and the remainder of MDDH4 are in BQ core.

Analytical results are given in an appendix.

MDDH1 (Open-cut area)

Inclination - 45°; total drilled 70.0 metres.

Target: mineralization under the open-cut associated with a strong magnetic anomaly (see Plate 2.)

Result: the drill intersected 14 metres of weakly mineralized calc-silicates and 20 metres of mineralized 'ore-zone' calc-silicates at depths between 16 and 34 metres, almost directly below the open-cut. In a strong-sulphide zone, 7 metres of 0.24% copper were intersected.

Assay: averaged 0.43% WO_3 and 0,15% Mo over 19 metres between drill-core depths 38 and 61 metres.

Selected best assays:	%WO_3	%Mo	Width
	2.71	0.16	1 m
	1.94	0.11	1 m
	1.47	0.31	1 m
	1.08	1.23	1 m

MDDH2 (Open-cut area)

Inclination - 45°; total drilled 87.0 metres.

Target: a southerly extension of the mineralization at the open-cut as indicated by a magnetometer survey (see Plate 2.)

Result: the hole intersected 32 metres of weakly mineralized 'ore-zone' calc-silicates at depths between 32 and 58 metres.

Assay: averaged 0.2% WO_3 and 0.1% Mo over a true width of 28 metres.

Selected best assays:	%WO_3	%Mo	Width
	0.25	-	0.8 m
	0.23	-	0.7 m
	-	0.35	0.35 m
	-	0.3	0.8 m

Comment: Prior to diamond drilling the area was stripped to reveal about 8 metres of weakly mineralized calc-silicates and 20 metres of mineralized 'ore-zone' calc-silicates visually estimated to contain about 0.3-0.4% scheelite.

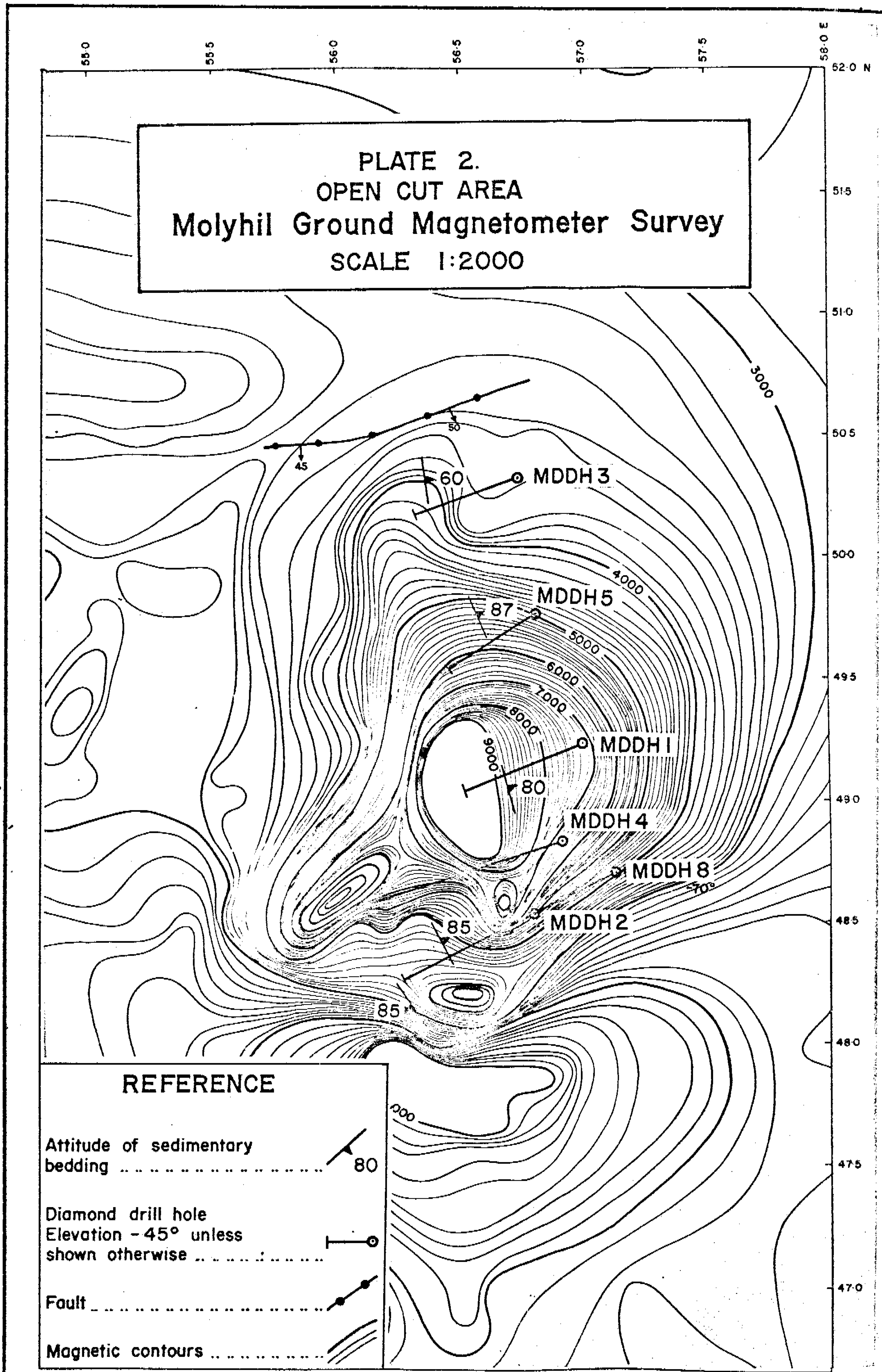


PLATE 2.
OPEN CUT AREA
Molyhil Ground Magnetometer Survey
SCALE 1:2000
55.0
55.5
56.0
56.5
57.0
57.5
58.0 E
52.0 N
51.5
51.0
50.5
50.0
49.5
49.0
48.5
48.0
47.5
47.0
3000
4000
5000
6000
7000
8000
9000
MDDH 3
MDDH 5
MDDH 1
MDDH 4
MDDH 8
MDDH 2
60
87
80
85
85
70°
50
45
REFERENCE
Attitude of sedimentary bedding
80
Diamond drill hole Elevation -45° unless shown otherwise
Fault
Magnetic contours

MDDH3 (North of open-cut)

Inclination - 45°; total drilled 62.3 metres.

Target: weakly mineralized andradite - pyroxene rocks; scapolite skarn associated with pegmatic veining; fault F1, assumed to occur at down-hole depths between 40 and 60 metres.

Results: the hole intersected 16 metres of andradite - pyroxene rocks containing rare molybdenite and scheelite. No scheelite or molybdenite was recognised in any other calc-silicate rocks. Fault F1 was intersected at a down-hole depth of 43 (true depth of 30 metres).

Assay: no core was assayed due to lack of mineralization.

Comment: the intersected of fault F1 at 43 metres indicated a dip on the fault plane of 41° (mapped at 50°, see Plan 4). F1 was therefore assumed to dip below the open-cut at an angle of about 40°.

MDDH4 (Open-cut area)

Inclination - 45°; total drilled 117.4 metres.

Target: possible mineralization at depth, between MDDH1 and MDDH2.

Result: 'ore-zone' calc-silicates of similar thicknesses and 1 lithologies to the 'ore-zone' calc-silicates in MDDH2, were intersected between down-hole depths of 60 and 100 metres, (the comparison is shown in Plate 1).

Assay: no assay results are yet available due to mechanical problems but the grade is estimated at 0.1-0.2% WO_3 and 0.1% Mo over a true width of 32 metres.

MDDH5 (North of open-cut)

Inclination - 45°; total drilled 59.4 metres.

Target: possible mineralization below an outcrop of unmineralized calc-silicate rocks in an area of granite.

Result: about 20 metres of unmineralized granite and 40 metres of generally unmineralized calc-silicate rocks were drilled. Rare molybdenite and minor pyrite were recognised in 'two-garnet' hornfels at a down-hole depth of about 50 metres. A trace of scheelite was noted within a shear in granite at a true depth of 4 metres.

Assay: no core was assayed due to rare mineralization.

Comment: the mineral assemblage of the calc-silicates intersected appears not to be associated with scheelite and molybdenite mineralization.

MDDH6 ('Molyhil')

Inclination - 45°; total drilled 76.3 metres

Target: weakly mineralized, massive andradite - calcite hornfels and skarn; patchy scheelite mineralization associated with scapolite - epidote - amphibole skarn marginal to intrusive pegmatite.

Result: the hole intersected unmineralized granite and granitic rocks.

Comment: the calc-silicate rocks appear to be a weather-resistant cap over granite and have little extent at depth (Cross-section 4).

MDDH7 ('Molyhil')

Inclination - 45°; total depth 62.9 metres.

Target: as for MDDH6; a second attempt to intersect calc-silicate rocks below 'Molyhil'.

Result: no scheelite or molybdenite was recognised in calc-silicate rocks or granite.

Comment: the mineral assemblage of some of the calc-silicate units appears to change down dip.

MDDH8 (Open-cut area)

Inclination - 70°; total depth 207 metres.

Target: mineralization at a depth of 150 metres; fault F1 assumed to cut the mineralization at 180 metres (down-hole depth of 190 metres).

Results: the drill intersected upper units 1, 2 and 3 of the 'ore-zone' calc-silicates before intersecting fault F1 at a depth of 96 metres (down-hole depth of 105 metres). Below F1, lower units 10, 11 and 12 were intersected to a depth of 126 metres (down-hole depth of 146 metres).

Assay: no assay results are yet available due to mechanical problems but the grade of the lower units is estimated at 0.1% WO_3 and 0.1% Mo.

Comment: It is assumed that the 'ore-zone' calc-silicates reach the upper surface of fault F1 in the open-cut area; drill-hole MDDH8 indicates that the 'ore-zone' calc-silicates occur below F1 and that the mineralization is 'open-ended' at depth.

ORE RESERVES

Grade

The difficulty in assessing the potential of the open-cut ore body is one of establishing grade. Diamond drilling may give a higher or lower estimate of grade than the more reliable but labour intensive technique of close-spaced point sampling. Point sampling provides the best estimate of the near-surface mineralization but is less reliable at depth especially when changes in mineral assemblage of the host rocks are known to occur.

A final assessment of grade comes when measurements of tonnages of ore mined and concentrates produced, and assays of concentrates and tailings are known.

Incomplete production figures given by Fama Mines are as follows:

Production: Total of 100 tonnes of scheelite concentrate. Possibly 10 - 20 tonnes produced from 'Molyhil', the area north of the open-cut and the White Violet mine; 80 - 90 tonnes produced from the open-cut.

Recovery: 80% (L. Johannsen, pers. comm.)

Final concentrate: 80-90% scheelite of 80% WO_3

Estimated tonnage of ore mined from open-cut: 15-20 000 tonnes

Calculation: 15-20 000 tonnes of ore contained $(80/90)\times\frac{100}{80}\times\frac{(80/90)}{100}$ =

80-101 tonnes of scheelite = 64-81 tonnes WO_3, i.e. the grade is 0.32-0.54% WO_3.
The assay average for the 20 metre ore-zone in drill hole MDDH1 under the open-cut is 0,43% WO_3.

Tonnage

Tonnage has been calculated in three blocks (Plan 6) in which the 'ore-zone' calc-silicates of each is assumed to extend at depth to fault F1. The total strike length of the blocks of calc-silicates is defined by geological mapping and extends from the granite contact at the northern end of the open-cut to the southern end of the new open-cut. (Plans 5 & 6). The length of each block is defined by the influence of the respective diamond drill holes. The width of the blocks is defined by the width of the 'ore-zone' calc-silicates, units 8-12 in MDDH1, and units 3-12 in MDDH2 and MDDH4.

The grade of Block MDDH1 is taken as the calculated average (and assay average) of 0.43% WO_3; the grade of Blocks MDDH2 and MDDH4, (difficult to ascertain from three drill holes) is estimated at 0.2% WO_3.

NOTE: the visually estimated grades of the 'ore-zone' calc-silicates from MDDH1 and MDDH2 were 0.5% and 0.2% scheelite i.e. 0.4% and 0.16% WO_3 respectively (assay average: 0.43% and 0.2%). The average specific gravity of the ore-zone calc-silicates from figures provided by Anaconda Aust. Inc. (See appendix) is 3.3 gm/cc.

BLOCK MDDH1

Assumed strike length of 25 metres; true width calculated from drill hole MDDH1 of 20 metres; average depth of fault F1 of 78 metres (Cross-section 3).

25x20x78x3.3 = 128 700 tonnes less the amount already mined (20 000 tonnes) = 110 000 tons of 0.4% WO_3.

BLOCK MDDH4

Assumed strike length of 30 metres; a calculated true width of 30 metres and an average depth to fault F1 of 90 metres.

30x30x90x3.3 = 267 000 tonnes less an amount equivalent to the volume of granite near the surface (say 17 000 tonnes) = 250 000 tonnes of ?0.2% WO_3.

BLOCK MDDH2

Assumed strike length of 37.5 metres; a calculated true width of 28 metres and an average depth to fault F1 of 98 metres.

37.5x28x98x3.3 = 339 570 tonnes of ?0.2% WO_3.

Geological mapping and diamond drilling indicate probable ore reserves of 110 000 tonnes of 0.4% WO_3 and a further 600 000 tonnes of (estimated) 0.2% WO_3. Further potential clearly exists below fault F1 but cannot be assessed without deeper drilling.

MINERALIZATION

At Molyhil scheelite occurs in areas of coarsely crystalline scapolite and epidote adjacent to granite and pegmatite, and it occurs with molybdenite in massive calc-silicate skarn. At the open-cut scheelite also occurs in scapolitized granitoid and in the 'ore-zone' calc-silicate skarns.

The 'ore-zone' calc-silicates (units 3-12 in Plan 5, Cross-section 2, Plate 1) contain various proportions of andradite, grossularite, pyroxene, ferro-amphibole, epidote, scapolite, quartz, calcite, magnetite, sulphides and scheelite. Scheelite is not confined to any one unit in the ore-zone and does not seem to bear any predictable relationship with the proportions of any one of the calc-silicate minerals, magnetite, quartz or sulphide. However, the strongest scheelite mineralization is associated with the strongest magnetite and pyrite mineralization at about 30 metres from the hanging wall granite. The drill hole intersections are summarized below:

(from south to north)

Drill hole	MDDH2	0.5 m massive pyrite breccia, 1.5 m massive magnetite.
	MDDH8	0.5 m massive magnetite, 1.1 m strong magnetite + quartz.
	MDDH4	1.5 m strong magnetite.
	MDDH1	(and open-cut) 1 m massive magnetite, 4 m strong magnetite, 2 m strong pyrite.
	MDDH5	0.8 m strong magnetite + quartz.
	MDDH3	0.4 m epidote skarn with the only magnetite in the core.

It can be seen that the heaviest concentration of magnetite and pyrite is in drill hole MDDH1 where there is also a higher proportion of ferro-amphibole and scheelite than in the other diamond drill holes. However, the ore-zone in MDDH1 is about 2/3 the width of the ore-zones in MDDH2 and 4 and this observation leads to the suggestion that there has been a concentration of iron-rich minerals (or fluids) into a narrower zone or smaller volume of rock at the open-cut.

Supergene enrichment

A scheelite enriched zone not more than a few metres thick occurs in slightly-weathered calc-silicate rocks below one metre of leached, well-weathered rocks. Blocks of scheelite (one weighing about a ton was recovered) and lenses of massive ferberite containing crystals of scheelite are found in this zone. Scheelite is reported in joints at or near the water table within granitic rock (MDDH1).

In the enriched zone, scheelite fluoresces white or cream under ultra-violet light denoting a low molybdenum content and cream-fluorescing scheelite often encloses yellow-fluorescing scheelite in this zone. Below the enriched zone, in the unweathered rock, scheelite fluoresces with a yellow colour denoting an appreciable molybdenum content.

It is suggested that leaching removes molybdenum from the scheelite and deposits almost-pure scheelite in the enriched zone. Molybdenum remains close to the surface as yellow-fluorescing molybdite (L. Johannsen, pers. comm.).

GENESIS

The Molyhil scheelite deposits possess many characteristics usually ascribed to contact metasomatic and skarn deposits elsewhere. These features include a common association of minerals, the presence of a large siliceous plutonic intrusive and the presence of favourable calcareous host rocks. In the Molyhil area the calcareous rocks include marble, calc-silicate gneiss, amphibolite and semi-pelitic gneiss.

There were probably two stages in the evolution of the Molyhil scheelite deposits. The first was a contact metamorphic stage in which the meta-sedimentary rocks were hornfelsed and fractured by the intrusive granite. Alkaline fluids may have been formed at this stage by possible remobilization of marble. The second stage was metasomatic when an acid aqueous phase released from the granite through fractures reacted with the metasedimentary rocks and alkaline solutions to form skarns, felspar, mica, amphibole, scheelite and fluorite.

In the second stage, the metasedimentary rocks provided CaO, Al_2O_3, Fe_2O_3 and CO_2 while the granite provided an aqueous phase rich in alkali halides, SiO_2, H_2O and elements tungsten, molybdenum, copper, iron and sulphur in the metasomatic reactions. In this stage three events are thought to have occurred. In the first event tremolite, garnet, scapolite, microcline and scheelite were formed with the depositon of molybdenite and uraninite (Fander, 1977). Iron metasomatism occurred in the second event and introduced actinolite, epidote ferro-hastingsite, allanite, pyrite, chalcopyrite and magnetite (Fander, 1977). Faulting and deposition of fluorite, barite, calcite and quartz in the fault breccia occurred in the third event which post-dated earlier mineralization.

The first event was a reaction between an acidic aqueous phase (of the intrusive granite) and calcareous metamorphic rocks. Alkali halides in the aqueous phase formed microcline & biotite in a granitoid endoskarn, silica reacted with marble (probably dolomitic in part) to form various calc-silicates and thereby released carbondioxide which reacted with alkali halides and silica to form scapolite and escaped through fractures and shears. Tungstic acid reacted with marble to form scheelite.

In the second event, the acidic aqueous phase containing an unknown amount of iron in solution, probably dissolved further quantities of iron from the metamorphic rocks (see overleaf). In finely balanced weakly reducing, alkaline conditions, magnetite and pyrite were deposited in a lensoidal zone centred on the open-cut. Optimum conditions for deposition of massive magnetite and strong pyrite mineralization occurred 30 metres from the intrusive granite (Plans 4 and 5, Cross-sections 1 and 2, Plate 1). Eh, pH and partial pressure of sulphur were probably close to the stability field boundaries of magnetite and pyrite, however, the partial pressure of carbon dioxide was too low for siderite to form.

The massive magnetite skarns developed a strong remanent magnetism, consistent with cooling through the Curie point, therefore the introduction of iron was a high temperature event.

To the north of the open-cut calc-silicate skarns considered to be equivalent to the 'ore-zone calc-silicates' contain hematite and pyrite. The Eh and pH conditions were probably within the hematite and pyrite stability fields and outside the stability fields of magnetite and siderite. These conditions were probably oxidizing and acidic which inhibited the deposition of scheelite.

Large (1971) showed that iron had been absorbed from adjacent sediments by skarns at Bold Head. At Molyhil the original metamorphic rocks contained iron (calc-silicate gneiss, biotite schist and amphibolite) but there were no highly ferruginous rocks to provide large quantities of iron to the skarns. Although there has been no detailed work, iron seems to have been removed from the Jinka Granite to the exoskarns. A cursory examination of the rocks showed that the adjacent granitoid and granite were depleted in iron when compared to granite several kilometres away.

REGIONAL PROSPECTS

Granite plutons of similar mineralogy and with a similar age of emplacement to the Jinka Granite, crop out in a possible 50 kilometre - wide "belt" stretching from the Marshall River, northwestwards to the Hanson River, through Molyhil and Barrow Creek. Within the "belt" are many small occurrences of tungsten, tin, tantalum and copper minerals many of which appear to be associated with faults or shears. Some of these faults are splays off the Delny - Mt. Sainthill Fault System (Warren, 1978), a possible control on the emplacement of the Jinka Granite at Molyhil.

The potential for mineralization may be restricted to areas of faulting within the "belt" and the potential of scheelite mineralization may further be restricted to areas of Precambrian calcareous rock intruded by the granite plutons.

Locally, two areas warrant attention:

1 to the north of Molyhil at the unconformity between Post-Carpentarian rocks and Jinka Granite from where the sliver containing Molyhil may be thrust faulted:

2 to the east of Molyhil in the Mt. Baldwin area from where the sliver may be transcurrently faulted.

WATER BORE

A supplementary or replacement bore was sited a few metres north-east of an operating bore at Molyhil (see Plan 3). The hole, WB1, was drilled to intersect medium sandstone at a depth between 30 and 40 metres but was abandoned, after repeated collapses of loose sand and silt, at 26 metres. A second hole, WB2, was sited 10 metres north-east of WB1 but drilling was terminated at about 46 metres when loose sand and silt made drilling difficult. The hole was cased by Fama Mines and pump-tested for two hours at a rate of 5 000 litres per hour. The drawn-down was about 5½ metres from a depth of 9 metres. Recovery took 15 minutes.

The position of the hole and the recovery rates were considered to be satisfactory by Fama Mines.

WATER-BORE DRILLED AT MOLYHIL FOR FAMA MINES

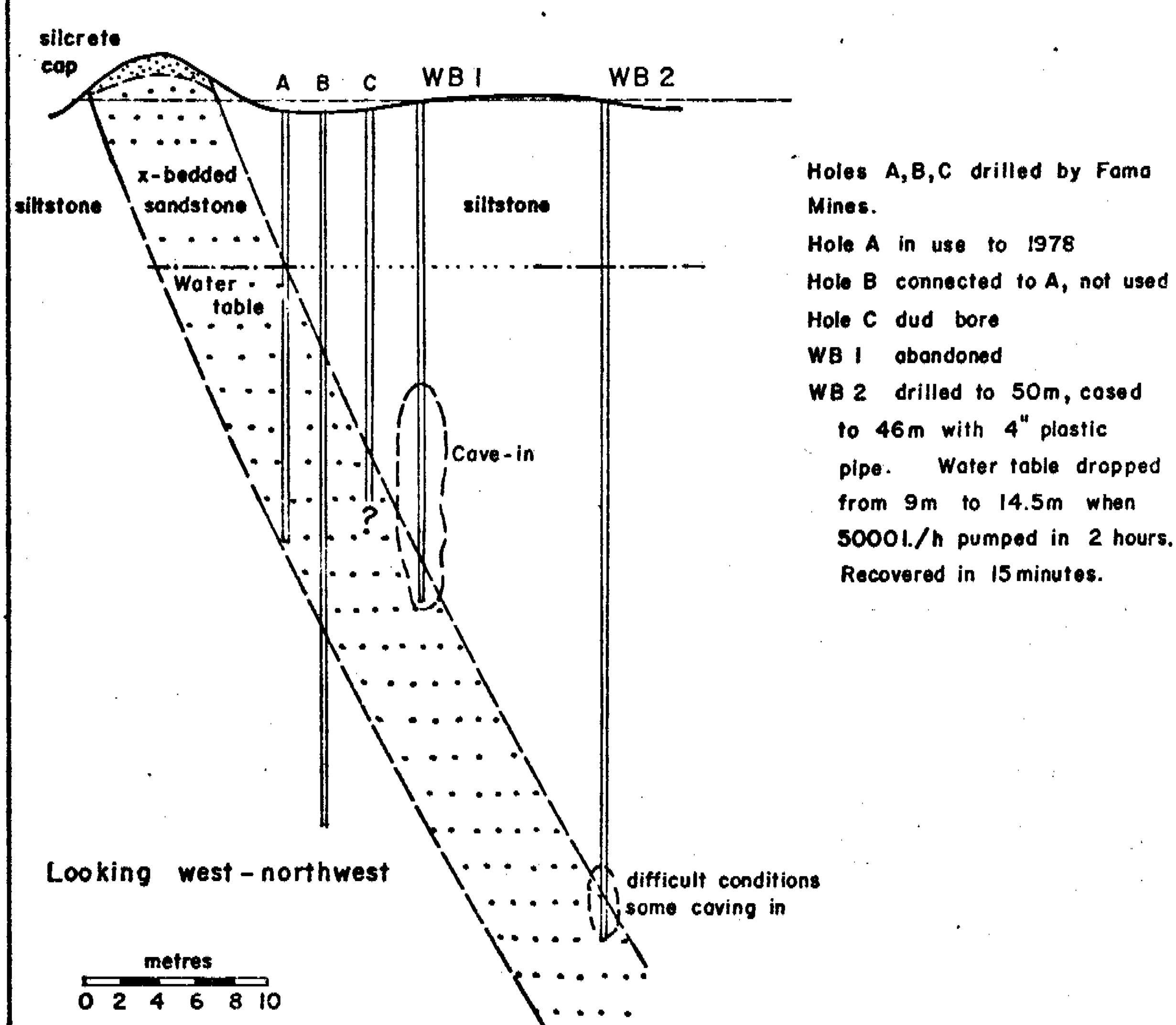


FIGURE 2 DB 1978

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APPENDIX 1

Explanation of abbreviations in following diamond-drill logs:

amp	amphibole	fls	feldspar			mag	magnetite
and	andradite	gar	garnet			py	pyrite
bio	biotite	gross	grossularite			pyx	pyroxene
chl	chlorite	hem	hematite			qz	quartz
epi	epidote	hnfls	hornfels			scap	scapolite
		>	greater than			≫	much greater than

Explanation of the grade of mineralization:

Magnetite:	Weak	0 - 10%
	Moderate (abbrev. mod.)	10 - 40%
	Strong	40 - 75%
	Very Strong	75 - 90%
	Massive	90 -100%
Sulphide:	Rare	0 - 1%
	Weak	1 - 5%
	Moderate	5 - 40%
	Strong	40 - 75%
	Very Strong	75 - 90%
	Massive	90 - 100%

APPENDIX 1

DIAMOND-DRILL CORE LOGS

MDDH1: 4925.8N 5699.2E Inclination - 45° Total drilled 70.0 metres.

DRILLING	DESCRIPTION
0 - 10.1 drilled 10.1 recovered 4.5	Foliated granitic rock potash felspar > qz > amp >> biotite. Some areas are scapolitized. 8.9 - 9.1 metres: narrow breccia with minor scheelite 8.7 metre foliation = 55 to 60° to core axis.
10.1 - 11.1 drilled 1.0 recovered 0.9	Granite: Weak foliation in places. potash felspar > qz >biotite >chlorite >> magnetite, epidote. Some scapolite at end of section.
11.1 - 11.6 drilled 0.5	Foliated granitic rock: slightly weathered. Some magnetite and scapolite at 11.4 metres Foliation = 65 - 70° to core axis.
11.6 - 11.9 drilled 0.3	Scapolite Subsidiary granite, magnetite, biotite, qz Minor scheelite.
11.9 - 13.6 drilled 1.7	Banded hornfels Qz - Fls - pyroxene - garnet - magnetite Scapolitized at top of section Average intersection angle 70° to core axis
13.6 - 18.2 drilled 4.6	Granite and granitic rock At 15.5 - 15.7 metres is a shear and breccia with carbonate veining; cutting core axis at 30°
18.2 - 21.0 drilled 2.8	Pyroxene hornfels pyroxene >> ? felspar > garnet > epidote Minor sulphide and carbonate At 19.5m banding = 50° to core axis 20.5m = 55°
21.0 - 22.9 drilled 1.9	Banded hornfels and pegmatite Bands of i) garnet > qz >biotite ii) pyroxene > Fls > garnet
22.9 - 28.0 drilled 5.1	Banded hornfels Pyroxene - rich bands predominate over garnet-rich bands. Weak sulphides. Some scapolite.

Pyx > amphibole > andradite > qz
> calcite. Between 23.9 - 24.8
is a dark coloured band: amphibole >
pyx > qz., calcite, pyrite, molybdenite
and scheelite.
Scheelite spots at 24.3 and 26.6
metres, a small vein at 24.6 metres
At 23.5m banding = 57° to core axis
24.6 52°
25.6 50°
28.0 60°

28.0 - 37.3

<u>Banded hornfels</u>
Garnet-rich hornfels predominate over
pyroxene-rich hornfels. Rare molybdenite
Weak magnetite
Bands of i) andradite ≫ pyx > epidote
> carbonate
ii) pyx > garnet > epidote ≫ qz
> carbonate
Vein scheelite at 30.0 metres
At 29.1 m banding = 50° to core axis
30 = 50°
31 = 45°
35.5 = 45°
37.0 = 50°

37.3 - 39.7
drilled 2.4

<u>Amphibole - magnetite skarn</u>
Interlayered with 'mixed hornfels'
Moderate to weak sulphide mineralization
Magnetite : moderate 37.7 - 37.8
weak 38.3 - 38.5
strong 38.8 - 39.7
Amphibole > mag > pyx > qz., epidote >
garnet. At 37.5m banding = 50°
39.0 = 45°

39.7 - 40.1
drilled 0.4

<u>Banded hornfels</u>
Upper contact gradational to amp-mag
skarn. At 40m banding = 40°

40.1 - 43.8
drilled 3.7

<u>Amphibole - magnetite skarn</u>
Amphibole, magnetite > qz, scapolite
> pyx > andradite, epidote.
Varying proportions of minerals in
section but a gradual decrease in pyroxene
and epidote towards end of section

Magnetite:	40.1 - 40.5	moderate
	40.5 - 40.7	weak
	40.7 - 41.1	moderate
	41.1 - 41.5	weak
	41.5 - 42.8	moderate
	42.8 - 43.1	strong
	43.1 - 43.8	weak
Sulphides:	40.1 - 41.6	weak
	41.6 - 42.3	moderate
	42.3 - 43.8	weak

At 41m banding = 50° to core axis
42 = 50°

43.8 - 44.1
drilled 0.3

<u>Banded hornfels</u>
Overall, a dark coloured rock which changes in composition with depth: banded hornfels to pyroxene hornfels to amphibole - qz rock to grossularite - biotite hornfels
At 44m banding = 55° to core axis.

44.1 - 44.4
drilled 0.3

<u>Granite - pegmatite</u>

44.4 - 44.8
drilled 0.4

<u>Banded hornfels</u>
Grossularite hornfels gives way to pyroxene hornfels with depth.

44.8 - 45.6
drilled 0.8

<u>Pyroxene hornfels</u>
Pyroxene, amphibole > mag, qz > epidote > andradite > carbonate
Layered rock with varying proportions of minerals
Weak to moderate magnetite
Weak sulphides
At 45m banding = 57° to core axis

45.6 - 60.8
drilled 15.2

<u>Amphibole - magnetite skarn</u>
Varying amp and mag content
Amp, mag > qz > andradite > carbonate, pyroxene
Narrow layers of pyroxene - rich hornfels at 46.4 - 46.8; 54.5 - 55.1; 55.6 - 55.8

Magnetite:	45.6 - 50.4	weak
	50.4 - 50.7	moderate
	50.7 - 51.6	weak
	51.6 - 56.0	moderate
	56.0 - 56.4	strong
	56.4 - 60.2	moderate
	(Massive at 57.5 and 58.5m)	
	60.2 - 60.6	strong
	60.6 - 60.8	moderate
Sulphides:	45.6 - 46.2	moderate good molybdenite
	46.2 - 46.5	massive
	46.5 - 46.8	weak
	46.8 - 54.9	moderate
	54.9 - 55.8	weak
	55.8 - 57.2	moderate
	57.2 - 58.2	weak
	58.2 - 60.3	moderate - strong
	60.3 - 60.8	weak

Between 46 and 56 metres banding = 60° to core axis
At 58.6 metres = 47°
At 60 metres = 40°

60.8 - 61.3
drilled 0.5

<u>Pyroxene - magnetite hornfels</u>
Pyx > mag > qz > calcite > andradite
Magnetite: moderate becoming weak
Sulphide: weak

61.3 - 62.4 drilled 1.1	<u>Skarn</u> chloritized ?amp ?/qz , scapolite Weak sulphides Foliation at 62 metres = 28° to core axis
62.4 - 63.6 drilled 1.2	<u>Garnet hornfels</u> Andradite, grossularite, pyx, fls, epidote Overall very weak sulphides Banding at 63 metres = 25° to core axis
63.6 - 63.9 drilled 0.3	<u>Skarn</u> Coarse amphibole epidote, qz , carbonate
63.9 - 64.3 drilled 0.4	<u>Garnet hornfels</u> Two-garnet hornfels
64.3 - 70.0 drilled 5.7 END OF HOLE	<u>Pyroxene and garnet hornfels</u> Granite and pegmatite intruded pyroxene - garnet hornfels interlayed with grossular garnet hornfels. Scapolite, amphibole epidote and microcline developed. At 69.5 metre qz - Fluorite - calcite vein in granitic gneiss. At 66 metres banding = 45° to core axis 67 metres = 40° 68 - 69 metres low angles At 70 metres banding = 25°.

MDDH2: 4854.6N 5678.4E Inclination - 45° Total drilled 87.0 metres

DRILLING	DESCRIPTION
0 - 10.3 drilled 10.3 recovered 5	Granitic rock Highly weathered, low recovery to about 6,2 metres; moderately weathered to end of section.
10.3 - 13.2 drilled 2.9 recovered 2.8	Pyroxene - felspar - quartz hornfels Varying proportions of minerals in section Accessory magnetite and garnet. Weakly banded. At 11.0 - 11.2m fault, carbonate veined, 40° to core axis At 11.5 metres banding = 40° to core axis 13.0 = 60°
13.2 - 13.4 drilled 0.2	Contact alteration Serpentinized pyroxene in a qz - fls matrix
13.4 - 18.9 drilled 5.5	Grey granitoid Felspar - qz - biotite - mag(hem) - barite weakly foliated 18.2 - 18.3 metres pyx - fls - qz hornfels. Foliation 57° to core axis
18.9 - 21.4 drilled 2.5 m	Pyroxene - felspar - quartz hornfels
21.4 - 26.1 drilled 4.7	Grey granitoid Biotite content increases with depth
26.1 - 28.4 drilled 2.3	Pyroxene - felspar - quartz hornfels Accessory andradite and epidote At 26.4 metres banding = 25° to core axis 28 = 45 - 50°
28.4 - 40.7 drilled 12.3	Foliated granitic rock Pyx - fls - qz hornfels at: 32.7 - 33.0m 34.0 - 34.4m, 35.2 - 37.6m Scapolite developed at 32.6 - 32.7m At 32.5 foliation = 37° to core axis 34 banding = 47° 36.5 banding = 60°
40.7 - 41.2 drilled 0.5	Pyroxene - quartz hornfels At 41.1 banding = 55° to core axis
41.2 - 41.6 drilled 0.4	Amphibole - magnetite rock Amp > pyx > qz > mag > carbonate Weak magnetite, rare sulphides
41.6 - 42.3 drilled 0.7	Banded hornfels Bands of pyx > qz > andradite with bands of garnet > biotite

42.3 - 42.7 drilled 0.4	Amphibole - magnetite rock Moderate magnetite, weak sulphides
42.7 - 46.5 drilled 3.8	Banded hornfels At 43 metres banding = 47° to core axis At 44.5 m = 50° 46.5 m = 60°
46.5 - 47.6 drilled 1.1	Magnetite - pyroxene rock Mag > pyroxene > qz Moderate - strong magnetite Moderate sulphides
47.6 - 48.4 drilled 0.8m	Banded hornfels Irregular banding; some magnetite and sulphide - containing bands
48.4 - 49.9 drilled 1.5m	Amphibole - magnetite rock Moderate magnetite, weak sulphides At 49 metres banding = 60° to core axis
49.9 - 50.3 drilled 0.4m	Banded hornfels
50.3 - 53.1 drilled 2.8m	Interlayered rock Narrow layers of amp-mag rock with layers of banded hornfels. Weak magnetite and sulphides. Some molybdenite flames at 52.0 - 52.1m.
53.1 - 54.7 drilled 1.6m	Banded hornfels At 53.3 metres banding = 65° to core axis
54.7 - 57.0 drilled 2.3m	Amphibole - magnetite rock Amp, mag > pyx > qz >scapolite, epidote Moderate magnetite, weak to moderate sulphides. Banded hornfels at 55.1 - 55.3 55.5 - 55.7 Shear Zone at 56.0 - 56.4 cutting core axis at 45° Banding = 60° to core axis
57.0 - 57.9 drilled 0.9	Banded hornfels Banding irregular but approximately 70° to core axis
57.9 - 63.2 drilled 5.3	Amphibole - magnetite rock Moderate magnetite; moderate sulphides, in places strong. Banded hornfels at 59.2 - 59.5m and 62.7 - 62.9m Banding averages 70° to core axis
63.2 - 64.2 drilled 1.0	Breccia Brecciated banded hornfels with interlayered amphibole - magnetite rock Quartz veined, some magnetite altered to hematite.

64.2 - 65.2	<u>Banded hornfels</u> Grossularite - epidote - pyx - chlorite bands with pyx - qz bands. Sheared, chloritic at top of section At 65 metres banding = 65° to core axis.
65.2 - 68.6 drilled 3.4	<u>Amphibole - magnetite rock</u> Moderate magnetite, rare to weak sulphides Banding 65° to core axis.
68.6 - 70.6 drilled 2.0	<u>Pyroxene - magnetite rock</u> Pyx, mag > scapolite, qz Carbonate veined, at top of section. Moderate magnetite, weak sulphides At 68.7 - 69.0 shear zone cutting at 40° to axis Banding 70° to core axis
70.6 - 71.4 drilled 0.8	<u>Pyroxene - garnet hornfels</u> Pyx > andradite > qz > amp, mag, scap, epi Soft, friable, carbonate veined Increasing andradite with depth Weak magnetite, weak sulphides
71.4 - 72.8 drilled 1.4m	<u>Garnet skarn</u> Andradite - carbonate rock decreasing in carbonate with depth. Some pyx, qz and magnetite in bands. Weak magnetite, weak sulphides At 72 metres banding = 62° to core axis
72.8 - 74.9 drilled 2.1m	<u>Pyroxene - magnetite rock</u> pyx > mag, qz >> carbonate, scap, garnet Moderate magnetite, weak sulphides Increasingly dark and hard with depth as garnet content increases.
74.9 - 77.6 drilled 2.7m	<u>Garnet skarn</u> Garnet - magnetite giving way to garnet rock with minor carbonate with depth At 76.5 - 76.8m is an interband of pyx - mag - garnet rock Weak magnetite, moderate to weak sulphide At 77 metres banding = 60° to core axis
77.6 - 79.4 drilled 1.8m	<u>Amphibole - magnetite rock</u> Moderate magnetite, moderate sulphides
79.4 - 79.9 drilled 0.5m	<u>Pyrite breccia</u> Massive pyrite, qz; a pod of scheelite in vein
79.9 - 80.2 drilled 0.3	<u>Amphibole - magnetite rock</u> Mag > amp > qz > sulphides carbonate Moderate to strong magnetite Moderate sulphides with molybdenite.

80.2 - 81.6 drilled 1.4	<u>Magnetite skarn</u> Massive magnetite with accessory qz and sulphide. With increasing depth gives way to mag - qz rock at 81.4m At 80.4 - 80.5 is massive pyrite. Banding at 80 metres = 55° to core axis
81.6 - 83.1	<u>Amphibole - magnetite rock</u> Varying proportions of mag, amp, qz, pyx in rock. Some coarse amphibole and quartz. Some pegmatite At 82 metres banding = 50° to core axis
83.1 - 87.0 drilled 3.9 END OF HOLE	<u>Banded hornfels</u> Grossularite - biotite - fls - qz bands with pyx > qz > biotite > magnetite bands Banding averages 65° to core axis

MDDH3: 5035N 5671.9E Inclination - 45° Total drilled 62.3metres

DRILLING	DESCRIPTION
0 - 1 drilled 1m recovered 0.2m	Granite rock Moderately weathered
1 - 4 drilled 3m recovered 2m	Pyroxene - Felspar hornfels pyx > fls >> andradite > carbonate Banded rock
4 - 4.5 drilled 0.5m	Skarn pyroxene, epidote, calcite
4.5 - 6.9 drilled 2.4m	Garnet hornfels Grossularite - biotite, calcite, potash felspar
6.9 - 7.1 drilled 0.2m	Banded hornfels At 7.0 metres banding = 60° to core axis
7.1 - 8.9 drilled 1.8m	Garnet hornfels Mainly grossularite - biotite rock with some pyroxene - rich bands. Some hematite inclusions in pyroxene
8.9 - 11.6 drilled 2.7m	Banded hornfels Some hematite inclusions in pyroxene of the pyroxene-rich bands At 11.0 metres banding = 60° to core axis
11.6 - 12.8 drilled 1.2m	? Pyroxene hornfels Soft, weathered green rock, weakly ferruginous
12.8 - 14.4 drilled 1.6m	Garnet hornfels Pink fine grained grossular garnet; weakly ferruginous At 13.7 - 13.9 metres is a shear zone with clay and carbonate veining
14.4 - 17.45 drilled 3.5m	Banded hornfels Grossular garnet-rich bands and pyroxene-rich bands. Scapolite developed. Hematite inclusions in pyroxene
17.45 - 21.8 drilled 3.35m	Ferruginous garnet - pyroxene hornfels Andradite - pyroxene, accessory qz, grossularite sulphide, epidote, scapolite; traces of molybdenite. Hematite inclusions in pyroxene. At 18.7 - 19.0 metres banded hornfels Banding irregular and indistinct but about 60° to core axis

21.8 - 23.0 drilled 1.2m	<u>Fault breccia</u> Brecciated hornfels, pegmatite and granite healed with qz, fluorite, barite and calcite
23.0 - 24.8	<u>Scapolitized rock</u> Scapolite, carbonate; pyroxene - garnet - hematite rock with garnet content increasing with depth
24.8 - 26.7 drilled 1.9m	<u>Garnet - pyroxene hornfels</u> Andradite > pyx > grossularite > calcite, qz, scapolite, epidote. Minor sulphide and some molybdenite Hematite enclosed in pyroxene, in stringers and narrow veins Some granitoid bands
26.7 - 27.5 drilled 0.8m	<u>Granite</u> Some garnet hornfels inclusions
27.5 - 35.7 drilled 8.2m	<u>Garnet - pyroxene hornfels</u> Andradite > pyx > qz >hematite > grossularite >sulphide, carbonate. Rare molybdenite.Hematite inclusions in pyroxene.
35.7 - 36.1 drilled 0.4m	<u>Skarn and granitoid</u> Coarse epidote with andradite, pyx, qz, calcite, magnetite. Some intrusive granite and qz - carbonate veins
36.1 - 38.2 drilled 2.1m	<u>Garnet skarn</u> Andradite garnet hornfels with accessory pyroxene becoming coarser grained with increasing depth to a garnet skarn containing coarse (1-2cms) rythmically zoned garnets (andradite - grossularite) and accessory calcite, hematite and epidote. Pegmatite at end of section.
38.2 - 42.8 drilled 4.6m	<u>Pink granite</u> Granite with three narrow bands of epidote skarn. Coarse pistachio epidote and dark ? epidote
42.8 - 47.3 drilled 4.5m	<u>Breccia</u> Brecciated hornfels, skarn and granitic rocks healed with quartz, fluorite and carbonate.
47.3 - 62.3 drilled 15m END OF HOLE	<u>Hornfels and granitoid</u> Grossularite, qz >pyroxene, scapolite, carbonate. hornfels and intrusive granitic rock At 50 metres is a band of pyx - qz hornfels, banding = 48° to core axis. At 59.0 - 59.1 fault/shear filled with calcite, qz and epidote At 61.05 - 61.35 breccia healed with qz

MDDH4: 4884.8N 5690E Inclination - 45° Total drilled 117.4metres

DRILLING	DESCRIPTION
0 - 3.1 drilled 3.1 recovery low	Weathered granitic and hornfelsic rubble
3.1 - 5.9 drilled 2.8 recovery low	Quartzo felspathic hornfels Qz - fls - pyx hornfels chips
5.9 - 6.75 drilled 0.85	Hornfels and granite

Recovery 0 - 6.75 metres = 1.8 metres

6.75 - 9.6 drilled 5.85	Granitic rocks Granite intruded hornfels and grey granitoid containing scapolite, ? amphibole and epidote Limomite and calcrete in bands or veins at 7.6 metres and 8.5 - 8.6 metres
9.6 - 10.0 drilled 0.4	Quartzo - felspathic hornfels At 9.8 metres foliation = 45° to core axis
10.0 - 11.0 drilled 1.0	Grey granite
11.0 - 12.4 drilled 1.4	Pyroxene - quartz - felspar hornfels Interbanded with quartzo-felspathic hornfels
12.4 - 50.5	Granite Pink and grey granite. Minor scheelite in a narrow shear at 16.4 - 16.5 metres in pink granite. Barite, magnetite and pyrite in grey granite. 23.4 - 30.0 metres. Scapolite developed in grey granite from 30.0 - 48 metres Epidotized pink granite 49 - 50 metres
50.5 - 51.3 drilled 0.8	Pyroxene - quartz - felspar hornfels quartz and epidote - filled breccia at 51.3
51.3 - 53.0 drilled 1.7	Pink granite Contains bands of epidotized pyroxene hornfels and granitic hnfls.
53.0 - 55.2 drilled 2.2	Pyroxene - Felspar - quartz hornfels Pyx $>$ fls $>$ qz $>$ garnet, minor py, epi and calcite. Banded. At 54m banding slightly contorted but between 50 - 60° to core axis At 55m, b = 50°
55.2 - 59.6 drilled 4.4	Pink granite
59.6 - 60.2 drilled 0.6	Banded hornfels Qz - grossularite $>$ bio bands with pyx qz fls bands. Traces of molybdenite associated with calcite - epidote veins. Upper contact gradational over 0.1m. At 60m, b= 50°

60.2 - 61.3 drilled 1.1	<u>Amphibole - magnetite skarn</u> strong magnetite, moderate sulphide Molybdenite 60.2 - 60.6, good scheelite 60.6 - 60.8 Hematite dust in and around pyx; some altered to probable actinolite
61.3 - 63.1 drilled 1.8	<u>Intercolated hornfels and skarn</u> Epidotized banded hornfels with subsidiary mag-amp skarn. Strong mag, weak sulphides 61.7 - 62.0 in mag-amp skarn. Molybdenite associated with hematite in fine veinlets. Minor scheelite and microcline. Banding at 62m = 50° to core axis
63.1 - 67.5 drilled 4.4	<u>Banded hornfels</u> Garnet > qz > epi and pyx > qz > fls bands with some microline developed At 65.8 - 66.1 is a hem - qz filled breccia At 65m banding = 50° to core axis; at 66m = 55° at 67.3m = 45°
67.5 - 69.0 drilled 1.5	<u>Amphibole - magnetite skarn</u> Amp > mag > pyx (alt to actinolite) > qz > epi andradite with some scapolite and calcite Weak - moderate mag; weak sulphides At 68m banding = 45°; at 69m = 45°
69.0 - 79.4 drilled 10.4 recovery 9.9m	<u>Intercalated hornfels and skarn</u> Banded hornfels 70%, amp-mag skarn 30% of total drilled core. Intercalations becoming narrower with increasing depth; maximum width at top of section about 0.3m 70.0 - 70.2 strong mag, mod sulphides, traces of scheelite. 70.8 - 70.9 good scheelite 72.0 - 75.0 traces of molybdenite At 74.4 a blob of scheelite 76.6 - 76.8m strong mag and sulphides Minor scheelite, trace molybdebite between 77.3 and 78.7m Overall, the amp-mag skarns contained weak-mod mag and sulphides Core lost between 77.3 and 79.4m At 73m banding = 60° to core axis; at 74m = 55°; at 76m = 60°; at 77m = 62°
79.4 - 85.0 drilled 5.6m recovery 90%	<u>Amphibole - magnetite skarn</u> Overall scheelite about 0.5% and molybdebite 0.2%. Minor banded hornfels, especially between 80.7 and 81.3m. Overall, generally moderate magnetite. Weak sulphides 79.4 - 80.4m but elsewhere generally moderate sulphides. Core recovery 80% 79.4 - 80.7m; 60% 81.3 - 81.7m where are 0.1 metres of amp-mag skarn with strong mag and sulphide and good scheelite; At 80.5m banding = 67° to core axis; at 82m = 60°; at 85m = 65°

85.0 - 86.1 drilled 1.1m	<u>Banded hornfels</u> Garnet > bio and pyx > amp > bio, rare sulphide
86.1 - 92.8 drilled 6.7m	<u>Amphibole - magnetite skarn</u> Mag - amp > qz > pyx >> sulphides. Variable grossularite and scapolite. Black ? hornblende and green actinolite, possibly formed from pyx. Minor epidote. Moderate - strong magnetite, moderate sulphide. Scheelite 0.5%
92.8 - 94.8 drilled 2.0m	<u>Andradite hornfels</u> And >> pyx >> qz > calcite Very weak mag, weak to mod. sulphide, minor molybdenite. 4cms of massive pyrite at 93.3m
94.8 - 95.2 drilled 0.4m	<u>Quartzite</u> Qz > sulphide > biotite. Moderate-strong sulphide, good chalcopyrite. Gradational contacts.
95.2 - 98.6 drilled 3.4m	<u>Andradite skarn</u> Andradite > qz >> mag > amp, calcite, some actinolite. Moderate magnetite, sulphide; good molybdenite and chalcopyrite. Good scheelite 96.1 - 97.3m. Some garnet crystals enclosed in fine molybdenite
98.6 - 98.9 drilled 0.3m	<u>Sheared rock</u> Calcite-filled shear in probable garnet skarn.
98.9 - 100.4 drilled 1.5m	<u>Magnetite skarn</u> Mag >> qz >> scapolite > actinolite, minor sulphide andradite and calcite. Good molybdenite
100.4 - 101.1 drilled 0.7m	<u>Amphibole skarn</u> A black to dark green rock. Amp-pyx > qz >> mag >> garnet, minor pyrite aggregates
101.1 - 102.3 drilled 1.2m	<u>Quartzite</u> Hematite - stained, brecciated, with some andradite-rich bands
102.3 - 102.8 drilled 0.5m	<u>Shear</u> Dark grey-green chloritic rock, hematite and calcite veinlets. Hematite salvage to some K-spar and qz. Altered pyroxene and amphibole
102.8 - 106.1 drilled 3.3m	<u>Banded hornfels</u> Chloritic at upper contact. At 103m banding = 66° to core axis; at 106m = 70°
106.1 - 107.8 drilled 1.7m	<u>Pegmatite</u> Inclusions of sheared chloritic mag-amp rock

107.8 - 108.6 drilled 0.8m	<u>Banded hornfels</u> Microcline developed, veins of pegmatite.
108.6 - 110.9 drilled 2.3m	<u>Breccia zone</u> Chlorite > brecciated qz, K-spar > calcite Weak magnetite, sulphides. Sheared, brecciated, calcite and hematite veinlets with some hem. selvages to crystals. Some serpentinized rock 109.7 - 110.2m
110,0 - 117.4 drilled 7.5m END OF HOLE	<u>Granitized banded hornfels</u> Bands of gross-bio-qz and bio-pyx-epi-actinolite, traces of sulphide and magnetite intercalated with bands of gross > qz > bio > fls > mag and qz > pyx (act) > bio > mag > py with andradite and epidote. Veins and "bands" of K-spar-qz - biotite At 114m banding = 70° to core axis; at 117m = 72°

MDDH5: 4977.7N 5679.4E Inclination - 45° Total drilled 59.4 metres

DRILLING	DESCRIPTION
0 - 20.5 drilled 20.5m recovery to 8.9m is 4.1 metres	<u>Granite</u> Pink granite, highly weathered to 8 metres moderately weathered to 11 metres, slightly weathered to 20 metres. Shear 5.45m to 5.6m, trace of scheelite at 5.85m in a joint From 8.86 - 10.9m and 11.3 - 12.5m is white granite
20.5 - 20.7 drilled 0.2	<u>Gradational contact</u> at 60° to core axis
20.7 - 27.3 drilled 6.6m	<u>Banded hornfels</u> Andradite > pyx >> grossularite, calcite bands with subsidiary pyx > gross > fls > epi > calcite bands. Narrow calcite veinlets. At 20.8m is a shear At 23.75 - 24.0m sheared limonitic rock At 23.5m banding = 65° to core axis; at 27m = 60°
27.3 - 28.0 drilled 0.7m	<u>Shear</u> Qz - calcite - fluorite veined, calcite veined; chlorite developed; slickensided. Cutting core axis at 45° and at 90° to banding
28.0 - 33.2 drilled 5.2m	<u>Banded hornfels</u> At 30m banding = 65° to core axis
33.2 - 36.2 drilled 3.0m	<u>Two-garnet (mixed) hornfels</u> Andradite > pyx > gross > epi, minor calcite Some grossularite veins and bands developed
36.2 - 36.8 drilled 0.6m	<u>Banded hornfels</u> Pyx hnfls > garnet hnfls, similar to the red-brown ferruginous garnet pyx hnfls in MDDH3
36.8 - 37.2 drilled 0.4m	<u>Pegmatite-veined hornfels</u> Grossularite-rich hornfels and pegmatite
37.2 - 38.2 drilled 1.0m	<u>Banded hornfels</u> The grossular garnet is replaced by andradite garnet with increasing depth.
38.2 - 48.0 drilled 9.8m	<u>Two-garnet (mixed) hornfels</u> And > gross > pyx, minor calcite, weak-rare sulphide. At 39.0 - 39.3m a pyroxene - rich band. At 41.6 - 41.9m shear, cutting core axis at 40° and parallel to banding. Banding generally indistinguishable. At 39.5m banding = 55° to core axis; at 45.5m = 50°; at 47.5 = 45°.

48.0 – 49.2 drilled 1.2m	Pyroxene hornfels Pyx ≫ and, gross, calcite, qz
49.2 – 56.3 drilled 7.1m	Two-garnet (mixed) hornfels Two narrow bands mag-qz hornfels with minor sulphide, rare molybdenite. Upper contact transitional to pyroxene hornfels over 0.4m
56.3 – 57.1 drilled 0.8m	Magnetite skarn Mag ≫ qz, calcite > sulphide
57.1 – 58.6 drilled 1.5m	Pegmatite and mixed hornfels And > gross > hem (after magnetite?) > calcite At 58.0 – 58.6m calcite – healed breccia
58.6 – 59.4 drilled 0.8m END OF HOLE	Banded hornfels gross ≫ bio > pyx bands and pyx ≫ gross, andradite, magnetite, qz bands. At 59m banding = sub-parallel to core axis

MDDH6: 4925N 4995E Inclination - 45° Total drilled 76.3 metres

DRILLING	DESCRIPTION
0 - 68.1m drilled 68.1m recovery 64m	Granite and granitic rock 0 - 6.7m highly weathered, low recovery 6.7 - 8.7m shear, breccia with epidote and calcite veining. Moderately weathered to 20 metres. 22 - 27.4 metres pink pegmatitic granite. Slightly weathered to 39 metres. 52 - 53.1 shear with epi; chlorite, qz. At 62 - 62.75 inclusion of gneiss
68.1 - 71.4 drilled 3.3m	Granitic gneiss Bands of K-spar and qz. Porphyroblasts of K-spar. At 69m foliation/banding = 55° to core axis; at 70m = 75°; at 71m = 80°
71.4 - 76.3 drilled 4.9 END OF HOLE	Granite At 71.4 - 72.45 pegmatite granite 72,45 to E.O.H. grey, pink granitic rock with some qz - fls - bio granitic gneiss At 73 metres foliation = 70° to core axis; at 75m = 70°

MDDH7; 4875N 4944E Inclination - 45° Total drilled 62.95 metres

DRILLING	DESCRIPTION
0 - 10.0 drilled 10.0m recovery 0.6m	Granite Highly weathered
10.0 - 11.8 drilled 1.8m recovery 0.2m	Quartzo - Felspathic hornfels Qz - fels - pyx - bio; carbonate veined
11.8 - 20.9 drilled 9.1m recovery 5.5m	Granitic rock Moderately weathered pink and grey granites with short sections of foliated biotite granite
20.9 - 21.2 drilled 0.3m	Foliated contact rock Change from granitic rock to hornfels Contact angle 55° to core axis
21.2 - 23.8 drilled 2.6m	Pyroxene - garnet hornfels Grey green bands of pyx - bio - mag - gross hornfels and narrow pink bands of gross. hnfls. At 22.5m banding = 40° to core axis
23.8 - 25.7 drilled 1.9m	Andradite hornfels Andradite > epi At 23.8m banding = 45° to core axis
25.7 - 27.9 drilled 2.2m	Pyroxene hornfels Pyroxene with varying amounts of fls, andradite
27.9 - 30.6 drilled 2.7m	Pyroxene - garnet hornfels Green pyx - rich hnfls and garnet hnfls pyx >> andradite, calcite, grossularite
30.6 - 31.1 drilled 0.5m	Pegmatite
31.1 - 36.9 drilled 5.8m	Mixed hornfels Upper section richer in pyx but becomes richer in andradite garnet which changes to grossular garnet with depth. Narrow pegmatite veins. At 33.8 banding = 70 - 75° to core axis
36.9 - 39.5 drilled 2.9m	Breccia Slickensided, calcite veined, brecciated gross - andradite and epi - qz hornfelses
39.5 - 41.2 drilled 1.7m	Mixed hornfels Contorted, irregular banding. Gross, andradite, pyx, epi, calcite, fls, qz

41.2 - 41.5 drilled 0.3m	<u>Skarn</u> Mag > fls > qz, calcite ≫ amphibole, minor sulphide
41.5 - 58.7 drilled 17.2m	<u>Banded hornfels</u> pyx-rich and garnet-rich bands. Some veins at calcite. At 57.2 - 68.7m are sections with ? amphibole; amp > and > epi, pyx > calcite. Banding 70-80° to core axis throughout.
58.7 - 62.95 drilled 3.3m	<u>Granite</u>

MDDH8 4872.7N 5711.9E Inclination - 70° Total drilled 207metres

DRILLING	DESCRIPTION
0 - 23.0 drilled 23.0m recovery 19m	Granite Moderately weathered to 10m, slightly weathered to 20m. Fault pug 8.8 - 8.9m Some inclusions of granitic hornfels at 17.4m Foliation = 45° to core axis
23.0 - 23.8 drilled 0.8m	Breccia
23.8 - 94.6 drilled 70.8m	Intercolated granite and hornfels Dominant granite with short sections of hornfels Hnfls: 29-30m, 30.4-31.2m, 33.5-34m, 37.2-38.4m, 43.7-44.7m, 56.9-57.2m, 66.4-66.8m, 88.1-90.7metres Weak molybdenite and chalcopyrite at 53.8-54.0 Sheared, chloritic rock at 85.4-85.9. At 79.7-79.8 is amp-epi-chl skarn. At 29m banding in the hornfels = 55° to core axis, at 39m = 55°, at 44m = 45°, at 67m = 30°
94.6 - 98.8 drilled 4.2m	Pyroxene - magnetite skarn. Pyx, mag, qz, scapolite, andradite, epi. Subsidiary banded hornfels. Mag moderate - strong, sulphides weak.
98.8 - 102.1 drilled 3.3m	Grossular garnet hornfels Includes short sections of mixed hornfels, banded hornfels and pyx-mag skarn. Shear zone 101.5 - 102.1m
102.1 - 105.5 drilled 3.4m recovery 3m	Pyroxene - magnetite skarn (sheared) Moderate mag in places. Sheared rock from 102.4 to 105.5m Altered, chloritic, slickensided
105.5 - 108.6 drilled 3.1m	Breccia Fluorite - qz - calcite - barite healed breccia. Qz vein 105.7 - 105.8m, barite at 106.6 - 106.7m, qz veining 106.7 - 107m chalcopyrite at 107.1m
108.6 - 109.0 drilled 0.4m	Sheared rock Altered, ferruginous, chloritic, slickensided
109.0 - 114.1 drilled 5.1m	Andradite skarn Andradite - calcite, with minor mag and sulphide. Mixed hnfls 109.3 - 109.9m At 111m foliation = 35° to core axis

114.1 - 115.8 drilled 1.7m	Pyroxene - grossularite skarn Gross-pyx banded hornfels and pyx-mag skarn 114.1-114.3m skarn; mod mag and sulphide 115.2-115.8 skarn; weak mag and sulphide At 115m banding = 35° to core axis
115.8 - 117.0 drilled 1.2m	Amphibole - pyroxene skarn Amp/pyx > mag, sulphide > scap, qz, hem > epi, garnet Overall mod mag and sulphide. Some patches of molybdenite. At 116m banding = 40° to core axis, at 117m = 47°
117.0 - 119.7 drilled 2.7m	Garnet skarn Andradite - qz - mag - sulphide - scap - calcite skarn, mod mag and sulphide 117.0 - 118.0m Andradite - pyx - scap - calcite - mag, sulphide Skarn 118-119.7m, weak mag mod sulphide but good molybdenite 119 - 119.7m
119.7 - 120.5 drilled 0.8m	Pyroxene - garnet skarn Pyx > garnet (and > gross) > epi, V. Weak sulphide. Mod mag and sulphide 120.3 - 120.5m
120.5 - 125.1 drilled 4.6m	Pyroxene - quartz skarn Pyx, scapolite, qz, mag, sulphide, epi, andradite, calcite in varying proportions. Overall weak mag, mod sulphide. Molybdenite 121.6 - 121.8m, 123.1 - 123.3m, 124 - 124.2m, Chalcopyrite 124.9 - 125.1m. At 121m banding = 47° to core axis, at 124.5, = 55°
125.1 - 125.8 drilled 0.7m	Andradite skarn Andradite, some calcite, patches of moderate sulphide, weak magnetite.
125.8 - 126.9 drilled 1.1m	Pyroxene - magnetite skarn Pyx > mag > qz > sulphide. Mod. mag, weak sulphide
126.9 - 128.0 drilled 1.1m	Magnetite - quartz skarn Massive magnetite, some hem-qz-sulphide at 126.9 - 127.4m Mag - qz - sulphide at 127.4 - 128.0m Molybdenite 127.7 - 127.9m
128.0 - 129.3 drilled 1.3m	Scapolite - garnet skarn Scap > andradite > mag, qz. Weak mag and sulphide
129.3 - 130.2 drilled 0.9m	Garnet skarn Andradite with epi, calcite. Overall weak-mod mag and sulphide
130.2 - 131.8 drilled 1.6m	Pyroxene hornfels Pyx, variable mag (overall weak), weak sulphide minor qz and calcite

131.8 - 133.6 drilled 1.8m	<u>Banded hornfels</u> Gross > pyx > fls > epi, andradite. Minor calcite veins. Gradational upper and lower contacts over few cms.
133.6 - 145.6 drilled 12.0m	<u>Granitic gneiss</u> At 137.0 - 137.4 calcite veined shear or fault. At 138m foliation = 46° to core axis. at 143 = 46°
145.6 - 146.2 drilled 0.6m	<u>Amphibole - magnetite skarn</u> Qz - amp > epi, garnet, talc, chlorite. Minor molybdenite and variable mag.
146.2 - 147.0 drilled 0.8m	<u>Granite</u>
147.0 - 152.5 drilled 5.5m	<u>Granitic gneiss</u> At 150m foliation = 55° to core axis
152.5 - 155.3 drilled 2.8m	<u>Two-garnet hornfels</u> Gross, andradite, pyx, epi, qz, calcite, spotty magnetite, rare sulphide. Some pegmatite and K-spar aggregates. At 152.6 - 153m mod mag, weak sulphide, minor molybdenite in a pegmatite - scapolite - epidote skarn
156.3 170.6 drilled 15.3m	<u>Granitic gneiss</u> Subsidiary fluorite - veined granite At 159m Foliation = 60° to core axis
170.6 173.6 drilled 3m	<u>Banded hornfels</u> Pyx - qz mag - calcite bands with garnet-mag - pyx bands. Subsidiary granite
173.6 - 181.8 drilled 8.2m	<u>Granite</u> Some granitic gneiss
181.8 - 184.2 drilled 2.4m	<u>Pyroxene hornfels</u> Pyx - qz hornfels and subsidiary intercolated granite - gniess. Some fluorite veins At 182m Foliation = 58° to core axis
184.2 - 207.0 drilled 22.8m	<u>Granite and granite - gneiss</u> Fluorite veins common, some in breccias Minor barite veining

APPENDIX 3

PETROGRAPHY The Symbol OE - refers to the sample locality shown on Plan 2.

Petrographic descriptions were supplied by Otter Exploration N.L. from reports by Central Mineralogical Services Pty. Ltd.

The following are summaries of the C.M.S. reports.

Report CMS 77/11/9

OE1 (Mnc 31(8): Otter Exploration identification symbol)

A sheared granite with a very simple composition and of uncertain origin. Stressed, disrupted, granulated, microfractured and in places recrystallised quartz and microcline. Some argillized albite and accessory small dark zircon crystals. Epidote is extensively developed along shears.

OE2 (Mnc 31(1))

A microgranite; the term referring to the composition rather than the origin because the presence of well-rounded detrital heavy mineral grains suggests a sediméntary origin composed of granular quartz, microcline, sericitized plagioclse and flakes of chloritized biotite. The fabric is uniform and granular, the distribution of minerals is erratic. Formation of the rock was probably by granitization producing a typically tectogenic "granite" rather than by regional metamorphism.

OE3 (Mnc 31(2))

A quartz - felspar - chlorite - epidote schist typical of a green schist facies rock. Small inclusions of microgranular sphene and epidote in chlorite. Some sphene contains relict skeletal patches of iron oxide indicating derivation from magnetite or ilmenite.

The assemblage suggests the original rock may have been an intermediate igneous type but less likely to have been a sediment.

OE4 (HD 29(5))

Quartz vein with (non oxidized) sulphide. The sulphides are represented by coarse and fine cellular hematite - goethite boxworks derived from generally coarse sphalerite with minor pyrite and possible chalcopyrite.

OE5 (Mac 31(10))

A microgneiss of granitic composition. Eyes or lenses of coarse microcline quartz and combinations of these with sub-parallel orientation and showing granulated margins, often have tails of microcrystaline (recrystallized) quartz - felspar mosaics. They are set in a finely granular matrix of crushed, granulated quartz and felspar with subordinate muscovité and iron-stained ? biotite. Some small replacive epidote developed.

For samples OE6 - 9, the C.M.S. Report number is not known.

OE6 (HX 3-11-1)

Quartzo felspathic micro-gneiss or mylonite. Small, strongly stressed microcline and quartz is a fine quartz-felspar matrix. Accessory fine magnetite, sphene, epidote, biotite and occasional metamict allanite.

OE7 (HD 3-11-3)

Quartzo-felspathic gneiss. Eyes and lenses of strongly deformed orthoclase cleavage fragments alternating with highly deformed quartz. Fabric similar to OE6.

OE8 (HD 3-11-5)

Lithic ?chert. Fragments of quartzofelspathic microgneiss, quartz, felspar, chert nodules in a fine cherty matrix. Thought to be a chemical sediment incorporating fragments of brecciated microgneiss.

OE9 (HD 5-11-3)

Silicified quartz breccia. Angular fragments of quartz, felspar and quartz breccia in a fine cherty matrix. Extensive quartz veining.

OE 10 (HDLJT) Report C.M.S. 77/11/9

Brecciated and mylonitized rock of granitic composition. Simple mineral assemblage of large and small fragments of quartz and microcline in a fine cloudy mylonitic matrix of the same minerals.

OE11a (NT 171/P) Report C.M.S. 77/4/2

Gossanous ferruginous, finely micaceous rock with patches of oxidized pyrrhotite, ? galena and ? molybdenite. Fabric obscured by ferruginization but may have been a fine mica schist or skarn. Hematite-calcite veins and minor jarosite. Assay by A.M.D.L. Report 2435/77

0.38% Mo 0.82% W

OE11b (N.T. 172/P)

? Skarn. An assemblage of ferrohastingsite, quartz, actinolite magnetite, sulphides, scapolite (replaced by carbonate), allanite and replaced garnet. Scheelite, chalcopyrite - covellite and molybdenite occur as scattered grains and flakes. Evidence of two metasomatic events, an earlier tremolite - garnet and a later iron-rich event which introduced magnetite and sulphides.

Polished section shows pyrite, pyritized pyrrhotite, molybdenite, chalcocite with chalcopyrite and covellite, irregular patches of magnetite and bladed hematite. The magnetite contains molybdenite inclusion. Occasional patches of yellow-fluorescing sheelite.

Assay 0.21% Mo 0.03% W

OE11c (NT 174/P)

Microcline rock. Coarse and fine microcline with interstitial decomposed ferrohastingsite and minor quartz. Probably a metasomatic rock related to OE11b and representing an alkali-rich phase complementary to the iron-rich phase.

Assay 40ppm Mo 55ppm W.

OE 11d (NT 176/P)

Mineralised Skarn. Coarse quartz, partly replaced scapolite, ferrohastingsite, magnetite, molybdenite and scheelite. Minor sulphides throughout. The scapolite is coarse and euhedral, partly chloritized and replaced by ferrohastingsite. Despite the abundance of microcline, the rock is not regarded as granitic.

Assay 0.28% Mo 1.43% W

OE11e (NT 177/P)

Mineralized scapolite rock of contact metasomatic origin consisting of large prismatic scapolite crystals, ferrohastingsite, epidote, magnetite, allanite and sulphides. The mineral assemblage suggests an unusual host rock or metasomatic phase or both. The rock is radioactive due to allanite and uraninite.

Assay 0.6% Mo 8.05% W

OE11f (NT 179/P)

Skarn containing medium grained scapolite, diopside with hastingsite rims, acicular hastingsite, actinolite, epidote, chlorite, magnetite and sulphides. Minor allanite, quartz, coarse sphene and scheelite. Scheelite occurs as single crystals up to 1mm across and as larger clusters up to several centimetres across. It fluoresces yellow in short-wave U.V. indicating an appreciable molybdenum content.

Assay 280ppm Mo 0.6% W

OE11g (NT 180/P)

A conventional garnet skarn consisting granular to subhedral andradite, interstitial microcline, calcite, epidote and chloritized ? altinolite. Minor quartz and traces of sphene.

Assay 18ppm Mo 190ppm W

CE12 (HD 30(1)) Report C.M.S. 77/11/9

A thoroughly altered quartzo felspathic gneiss consisting of strongly stressed quartz and completely altered felspar, now a whitish, semi-opaque mass of finely intergrown kaolinite and amorphous silica. This type of alteration is low temperature hydrothermal and not weathering. The rock was altered and fractured then veined with quartz. Its origin is thought to be sedimentary rather than igneous.

Drill Hole No: MDDH 1
Project: Molyhil
Originator: D. Barraclough
Location: Molyhil

SAMPLE NUMBER	FROM	TO	INTERVAL	W%	Mo ppm	Cu ppm	Co ppm	Zn ppm	Pb ppm	Ag ppm	Au ppb	S. Grav
8668	37.0	37.4		0.08	90	96	96	128	86	3.2	<30	3.145
8669	37.4	38.0		0.02	130	760	158	108	78	3.2	<30	3.281
8670	38.0	39.0		0.03	65	174	135	152	111	3.3	<30	3.200
8671	39.0	40.0		0.11	385	210	117	101	80	3.0	<30	3.244
8672	40.0	41.0		0.02	200	570	135	104	83	2.9	<30	3.272
8673	41.0	42.0		0.13	320	790	150	97	84	2.9	<30	3.178
8674	42.0	43.0		0.71	750	600	155	91	76	2.7	210	3.326
8675	43.0	44.0		0.02	1400	43	117	127	103	3.7	<30	3.197
8676	44.0	44.8		0.03	340	17	58	105	77	2.8	<30	2.753
8677	44.8	46.0		0.01	1250	540	137	134	82	3.5	<30	3.136
8678	46.0	47.0		0.49	2100	1930	395	118	88	3.4	100	3.426
8679	47.0	48.0		0.31	2750	3270	310	117	86	3.7	165	3.207
8680	48.0	49.0		0.03	2100	2410	375	123	94	3.4	<30	3.256
8681	49.0	50.0		0.01	450	2440	300	120	96	3.4	<30	3.186
8682	50.0	51.0		0.91	900	2620	290	132	115	3.1	165	3.244
8683	51.0	52.0		1.17	3100	1440	310	122	292	3.4	210	3.219
8684	52.0	53.0		0.03	190	3130	285	131	124	3.1	<30	3.172
8685	53.0	54.0		0.10	395	2400	220	150	72	2.8	50	3.169
8686	54.0	55.0		2.15	1650	630	205	91	108	3.3	280	3.488
8687	55.0	56.0		0.06	730	290	147	119	72	3.3	<30	3.317

Drill Hole No: MDDH1
Project: Molyhil
Originator: D. Barraclough
Location: Molyhil

Date Desp. Field: 19/8/77
Transport: Air
No. of Samples: 10/30

Drill Hole No: MDDH 1
Laboratory: AA1 - Kal
Work Required: Mo.W.Cu - Ni
Ni Co Zn Pb Ag-Au-(As Sn Bi S) S. Grav.

SAMPLE NUMBER	FROM	TO	INTERVAL	W%	Mo ppn	Cu ppn	Co ppn	Zn ppn	Pb ppn	Au ppb	Ag ppn	S. Grav
8688	56.0	57.0		0.86	12300	580	212	133	112	260	3.6	3.589
8689	57.0	58.0		0.12	95	330	215	120	84	140	3.7	3.760
8690	58.0	59.0		0.06	2750	950	215	74	73	90	4.4	3.872
8691	59.0	60.0		1.54	1090	510	198	92	80	245	3.6	3.821
8692	60.0	61.0		0.23	170	1360	197	147	106	80	3.0	3.161
8693	61.0	62.0		<0.01	<10	54	120	119	77	<30	3.0	3.258
8694	62.0	62.5		<0.01	<10	43	115	139	73	<30	3.2	3.253
8695	62.5	63.45		<0.01	<10	16	93	117	79	<30	3.3	3.285
8696	63.45	63.85		<0.01	<10	21	128	183	77	<30	3.3	3.287
8697	63.85	64.25		<0.01	<10	46	99	164	76	<30	4.0	3.329

Drill Hole No: MDDH 2
Project: Molyhil
Originator: D. Barraclough
Location: Molyhil

Date Desp. Field: 9 November 1977

Drill Hole No: MDDH 2
Laboratory: AAl Kal
Work Required: Mo W Cu Au

SAMPLE NUMBER	FROM	TO	INTERVAL	Au ppm	W ppm	Mo ppm	Ni ppm	Cu ppm	Co ppm	Zn ppm	S. Grav
77/AS/8170	41.10	41.55	0.45	<0.03	300	<10	51	29	59	110	3.166
71	41.55	42.35	0.80	0.06	2000	<10	63	78	59	122	3.045
72	42.35	42.80	0.45	<0.03	<200	<10	54	26	60	124	3.133
73	42.80	43.80	1.00	<0.03	<200	<10	49	43	57	114	2.949
74	46.50	47.50	1.00	<0.03	<200	<10	49	79	58	132	3.206
75	47.50	48.40	0.90	<0.03	<200	<10	62	118	58	107	3.017
76	48.40	49.10	0.70	0.04	1850	<10	104	580	201	119	3.772
77	49.10	49.90	0.80	<0.03	<200	380	56	194	79	98	3.307
78	49.90	51.20	2.10	<0.03	900	75	65	1010	58	120	2.972
79	51.20	52.00	0.80	<0.03	<200	1350	64	270	79	99	3.333
77/AS/8180	52.00	52.80	0.80	<0.03	400	2950	69	340	106	90	3.423
81	52.80	53.80	1.00	<0.03	300	50	66	38	49	111	2.919
82	53.80	54.50	0.70	<0.03	<200	50	68	59	54	100	3.264
83	54.50	55.50	1.00	<0.03	<200	<10	90	490	92	112	3.193
84	55.50	56.10	0.60	0.05	1800	200	71	390	81	138	3.126
85	56.10	56.50	0.40	<0.03	<200	50	64	152	58	222	2.739
86	56.50	57.00	0.50	0.07	1200	560	67	640	113	146	3.389
87	57.00	57.9	0.9	<0.03	<200	<10	59	12	44	110	2.962
88	57.9	59.0	1.1	0.06	1300	1060	74	590	110	96	3.255
77/AS/8189	59.0	60.0	1.00	<0.03	800	110	78	1030	142	111	3.251

Drill Hole No: MDDH 2

Project: Molyhil

Originator: D. Barraclough

Location: Molyhil

Date Desp. Field: 9 November 1977

Drill Hole No: MDDH 2

Laboratory: AA1 - Kal

Work Required: Mo W Cu Au

SAMPLE NUMBER	FROM	TO	INTERVAL	Au ppm	W ppm	Mo ppm	Ni ppm	Cu ppm	Co ppm	Zn ppm	S. Grav
77/AS/8190	60.00	61.00	1.00	0.04	1550	200	59	1010	94	109	3.329
91	61.00	62.00	1.00	<0.03	<200	360	94	1460	262	110	3.481
92	62.00	62.80	0.80	0.05	1800	1400	72	1230	164	140	3.384
93	62.80	64.00	1.20	<0.03	450	30	54	232	47	82	2.841
94	64.00	65.15	1.15	<0.03	300	110	56	40	47	134	2.818
95	65.15	65.65	0.50	<0.03	1200	450	48	550	92	202	3.233
96	65.65	67.00	1.35	0.09	1200	1000	70	960	126	710	3.275
97	67.00	68.00	1.00	<0.03	1250	70	51	222	72	114	3.179
98	68.00	69.00	1.00	<0.03	<200	<10	46	1350	65	56	3.090
99	69.00	70.00	1.00	0.05	1500	<10	51	360	89	60	3.344
77/AS/8200	70.00	70.70	0.70	<0.03	900	<10	45	520	88	38	3.224
01	70.70	71.70	1.00	0.06	200	<10	44	236	49	41	3.100
02	71.70	73.00	1.30	<0.03	<20	<10	56	220	46	29	3.527
03	73.00	74.00	1.00	<0.03	<20	820	46	580	69	45	3.306
04	74.00	75.00	1.00	<0.03	<20	<10	59	640	96	45	3.315
05	75.00	76.00	1.00	<0.03	<20	<10	58	490	62	31	3.490
06	76.00	77.00	1.00	<0.03	<20	<10	67	630	96	28	3.497
07	77.00	77.90	0.90	<0.03	<20	<10	54	930	48	36	3.382
08	77.90	78.50	0.60	<0.03	<20	1180	46	620	88	52	3.446
77/AS/8209	78.50	79.45	0.95	<0.03	550	270	45	1830	60	118	3.494

Drill Hole No: MDDH 2 Date Desp Field: 9 November 77 Drill Hole No: MDDH 2

Project: Molyhil Laboratory: AA1 - Kal

Originator: D. Barraclough Work Required: Mo W Cu Au

Location: Molyhil

SAMPLE NUMBER	FROM	TO	INTERVAL	Au ppm	W ppm	Mo ppm	Ni ppm	Cu ppm	Co ppm	Zn ppm	S. Grav
77/AS/8210	79.45	79.80	0.35	<0.03	800	3500	184	4000	615	320	3.989
11	79.80	80.40	0.60	0.28	1700	2750	36	111	46	124	3.855
12	80.40	81.55	1.15	<0.03	<200	<10	69	380	148	191	4.243
13	81.55	82.50	0.95	0.14	1500	2450	38	20	36	46	3.432
14	82.50	83.15	0.65	<0.03	<200	670	39	72	31	38	3.269
77/AS/8215	83.15	83.50	0.35	<0.03	<200	<10	58	7	27	56	3.320

PETROCARB EXPLORATION N.L.

(Incorporated in Victoria)

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SOUTH AUSTRALIA. 5001

TELEPHONE: 212 2200
TELEX: 89446

KDR/P.47/2777

1st July 1980

The Director of Mines and Energy
Department of Mines and Energy,
P.O. Box 2901,
DARWIN, N.T. 5794

Attention : Mr. G. Mickljohn

Dear Sir,

Being in the throes of organising a percussion drilling and diamond drilling programme to extend the excellent and valuable work carried out by your Department (N.T. Geological Survey GS 79/16), I was made concious of the fact that certain assay data had not been sent on to you.

The data is attached for D.D. Holes 4 and 8 being holes drilled below the zone between the old open - cut (the "Yacht Club") and the new open - cut, and below a section of the new open cut, respectively.

It is our intention to further drill and hopefully greatly extend our potential resource reserve in the area of the open cut, which is opening up well, however does not at this stage anywhere near cover the bulk of the anomolous zone delineated by ground magnetometry.

Furthermore we intend to drill the two anomolies to the west of Moly Hill as delineated by Departmental Survey as soon as possible.

I have had discussions in Alice Springs with Mr. Peter Woysbun and more recently with Mr. Vic Thompson on these anomolies and their assistance is gratefully acknowledged.

Our Company has enlisted the services of two senior geologists. Currently they work as Adelaide based consulting geologists.

They are Les G. Nixon and David M. Ransom who will be separately in the Moly Hill area in the near future.

I recently joined Petrocarb Exploration N.L. in the capacity of Director and Mining Engineer and our new technical team along with your old friend Jack May are particularly keen to prove up extensive resource reserves in the Central Australian area.

Once again, we would be delighted to have you visit Moly Hill at your earliest convenience.

Maybe you can cajole the Minister, the Administrator and Mr. Roger Vale into making up a party.

Petrocarb would be delighted to fly you all out to the mine from Alice Springs.

Jack May who is currently interstate asked me to send you his kind regards and apologise for the delay in forwarding on the attached drill hole assays.

Yours faithfully,
PETROCARB EXPLORATION N.L.

K.D. PRICE
DIRECTOR

MOLY HILL DIAMOND DRILL DATA

To be read in conjunction with core logs Appendix 1. N.T. Geological Survey GS 79/16 "Geological Investigations at the Moly Hill Scheelite Mine, Central Australia" by D. Barraclough.

Drill Hole No. 4
Project Moly Hill

4884.8N 5690E Inclination 45°
Total drilled 117.4 m

SAMPLE NO.	FROM M	TO M	INTERVAL M	WO3 PPM %	MO PPM	REMARKS
9193-9190	59.6	63.5	3.5	2106	1810	
9189-9184	63.1	69.0	5.9	76	10	
9183-9178	69.0	75.0	6.0	2396	700	
9177-9172	75.0	79.4	4.4	945	35	Vide core log losses
9171-9165	79.4	85.0	5.6	1.35%	1620	
9164-9163	85.0	86.1	1.1	151	110	
9162-9159	86.1	89.8	3.7	1.05%	2600	
9158-9156	89.8	92.8	3.0	4262	430	
9155-9150	92.8	97.3	4.5	3240	860	
9149-9146	97.3	100.4	3.1	50	5720	
9145-9144	100.4	102.17	1.77	∠ 25	55	

DRILL HOLE NO. 8
Project Moly Hill

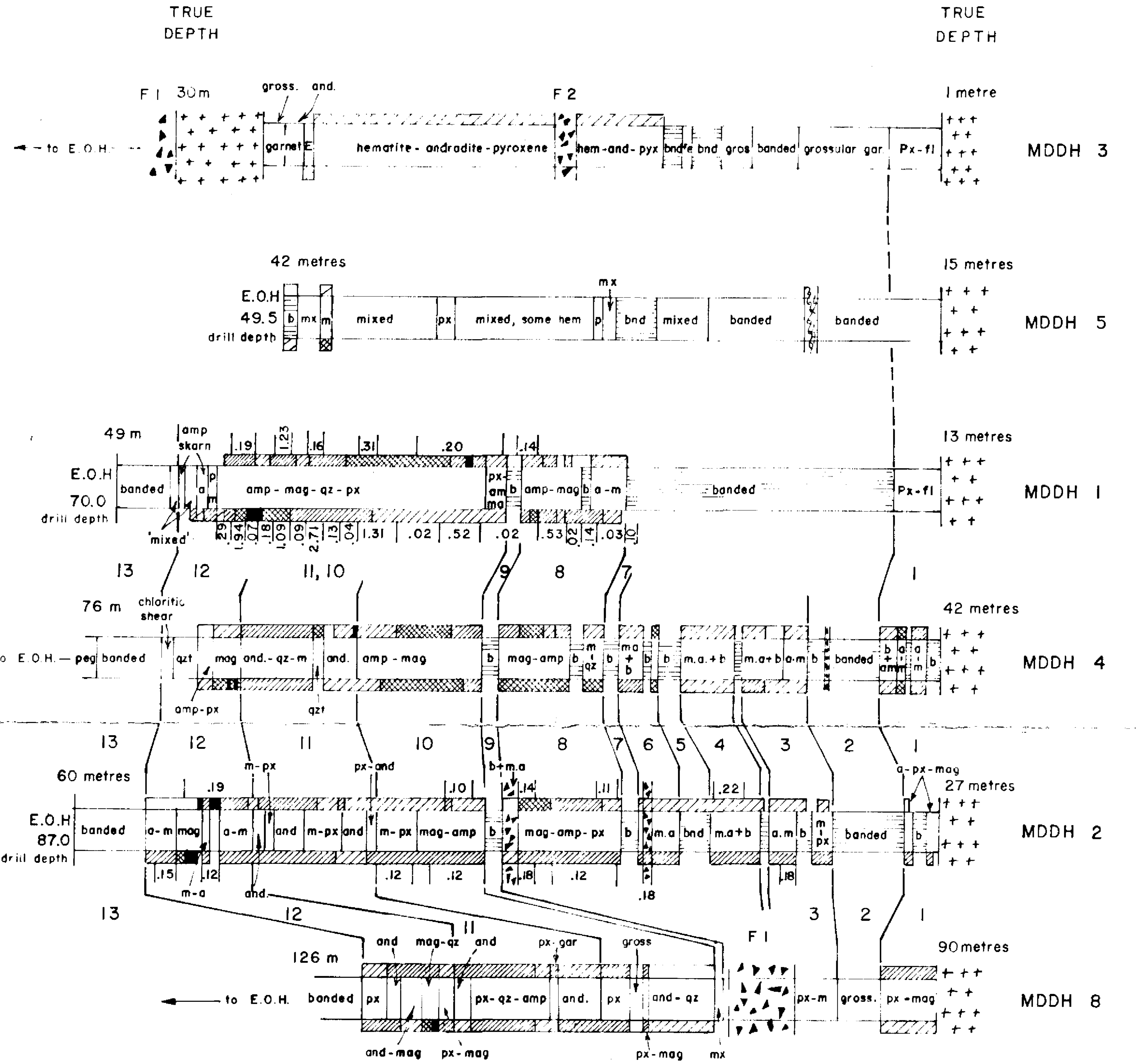
4872.7N 5711.9E Inclination - 75°
Total drilled 207 metres

SAMPLE NO.	FROM M	TO M	INTERVAL M	WO3 PPM	MO PPM	REMARKS
9998-9990	109.9	114.1	4.2	<25	15	
10000-10006	114.1	121.0	6.9	<25	1860	
10007-10010	121.0	125.0	4.0	656	3930	
10011-10015	125.0	129.9	4.9	75	20	
10016-10018	129.9	132.8	2.9	126	65	

The above results were copied from the Certificate of Assay compiled by :
Stuart G. Clarke
Griffith Australia Services Pty. Ltd.,
5 Bishop Place,
Kensington, S.A. 5068 10-1-80
from bulked samples of diamond drill core supplied.

COMPARISON OF DRILL-CORE LITHOLOGIES

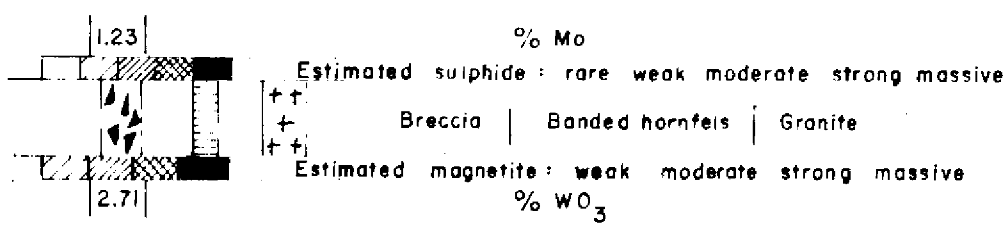
based on calculated true widths



ABBREVIATIONS

a, amp	amphibole
and	andradite garnet
b, bnd	banded hornfels
E	coarse epidote skarn
fe	ferruginous rock
gross	grossular garnet
m, mag	magnetite
mixed, mx	two-garnet hornfels
m.a+b	interlayered magnetite - amphibole rock with banded hornfels
p, px	pyroxene
qz, qzt	quartz, quartzite

EXPLANATION OF SYMBOLS



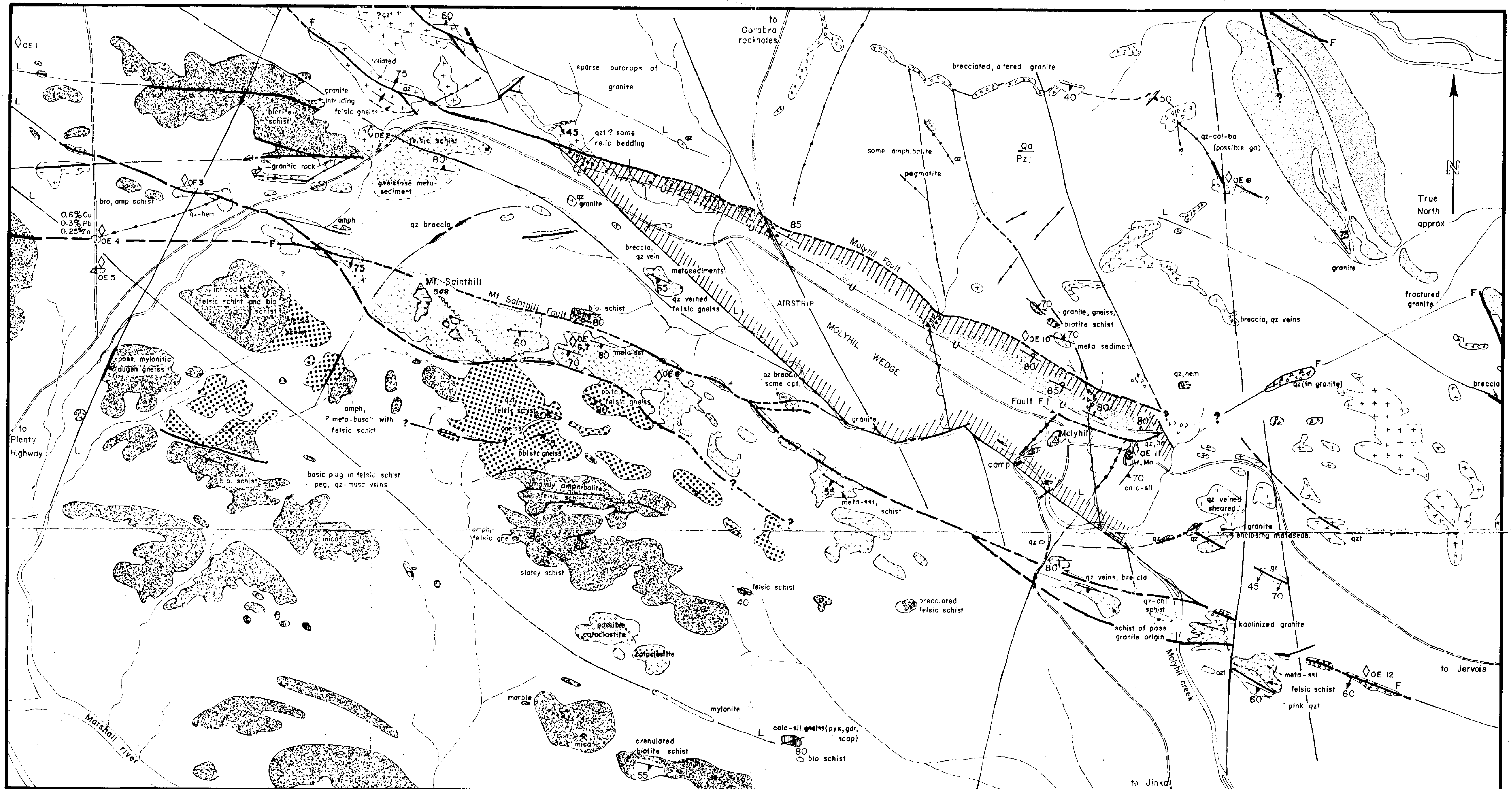
The numbers 1 to 13 refer to recognisable rock units.

SCALE 1 : 200 metres

0 1 2 4 6 8 10 20

Interpretation, draughting by D.B 1978

PLATE I



GEOLOGICAL PLAN OF THE MOLYHIL - MT. SAINTHILL AREA, N.T.

REFERENCE

?Tertiary

- Unamed unit

Lower Cambrian - Adelaidean

- Mt. Baldwin Formation
- Grant Bluff Formation

Proterozoic

- Jinka Granite
- Arunta Complex Phyllonite, diapthorite
- Calc - silicate rocks
- Irindina Gneiss
- Bruna Gneiss

SYMBOLS

- Attitude of sedimentary bedding
- Overturned sedimentary beds
- Attitude of metamorphic foliation, banding
- Dyke, vein / Quartz infilling
- Fault, dip shown if measured / Quartz infilling
- Air-photograph lineation
- Shear
- Breccia
- Open cut
- Mine, pit
- ◊OE 5 Sample locality of Otter Expl. N.L. Petrographic description supplied courtesy O.E.

ABBREVIATIONS

amp	amphibole	amph	amphibolite
apt	apatite	ba	barite
bio	biotite	calc-sil.	calc-silicate
chl	chlorite	ga	galena
hem	hematite	hnfl	hornfels
Mo	molybdenum	musc	muscovite
peg	pegmatite	qz	quartz
qzt	quartzite	W	tungsten

SCALE 1 : 24700 (approx)

kilometre
0 .2 .4 1

PLAN 2

GEOLOGY and DRAUGHTING by D. BARRACLOUGH 1977/8

GEOLOGICAL PLAN OF THE MOLYHIL AREA

REFERENCE

Stipple	Adelaidean	Grant Bluff Formation	
Cross-hatch	Proterozoic	Arunta Complex	Metasedimentary rocks altered to calc-silicate hornfels or skarn
Not delineated	Proterozoic	Jinka Granite	Pink granite, grey granitoid. Assumed to underlie most of area

SYMBOLS

- Attitude of sedimentary bedding (80)
- Vein, dyke; see abbreviations for filling; Dip shown if measured (qz, 50)
- Unconformity; Top of U towards younger formation
- Attitude of metamorphic banding showing plunge of crenulation (70, 55)
- Fault (F)
- Diamond-drill hole; Elevation -45° unless shown otherwise
- Pit, cut, costean

ABBREVIATIONS

amp	amphibole	amph	amphibolite	ba	barite
bio	biotite	cal	calcite	chl	chlorite
epi	epidote	epid	epidotized	f	fluorite
fe	ferruginous	fls	felspar	gar	garnet
gran	granite	hem	hematite	hnfl	hornfels
mag	magnetite	mal	malachite	py	pyrite
pyx	pyroxene	qz	quartz	scap	scapolite

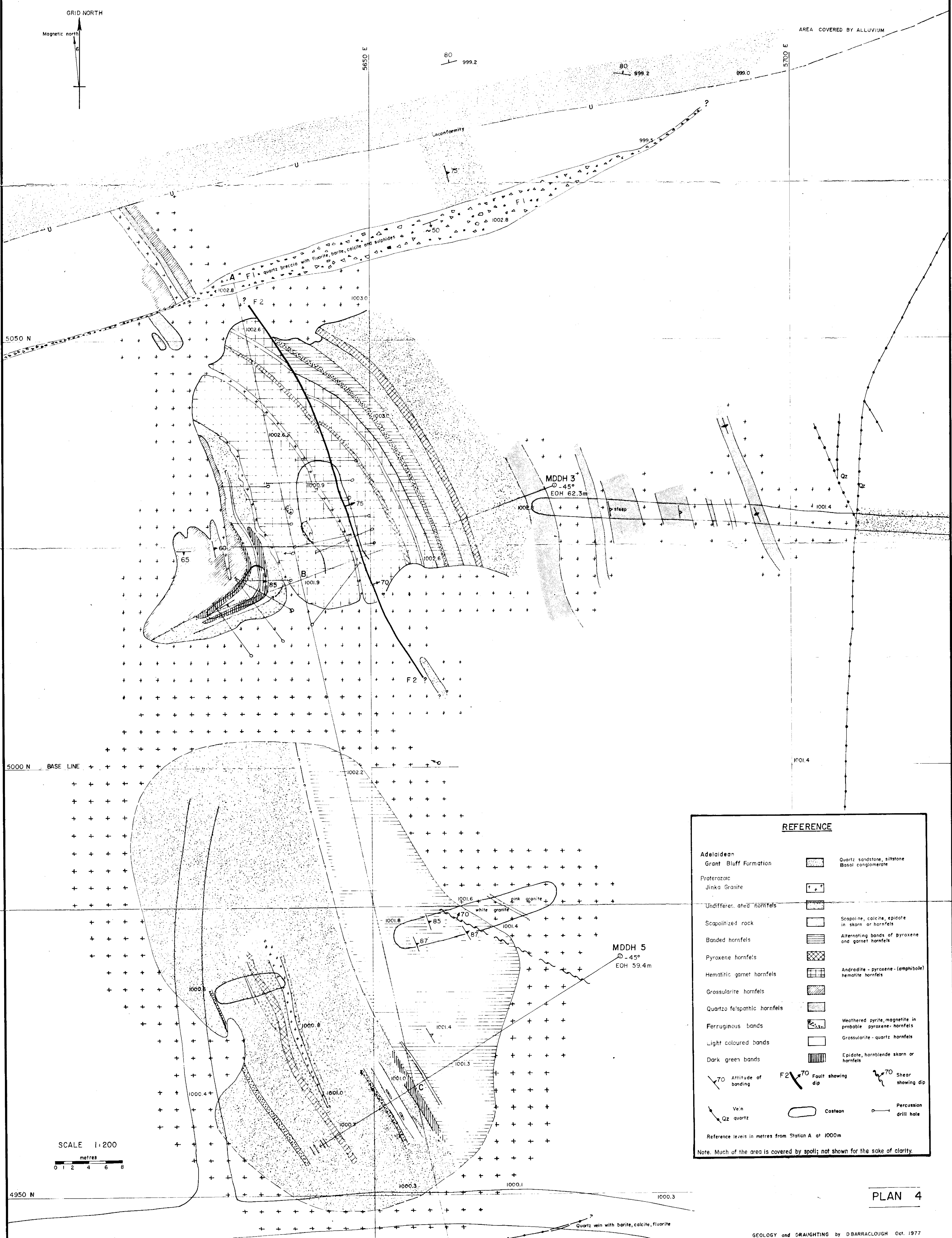
SCALE 1 : 2000

metres
0 10 20 40 60 80 100

PLAN 3

GEOLOGY and DRAUGHTING by D. BARRACLOUGH 1977/8

GEOLOGICAL PLAN, NORTH OF THE OPEN-CUT, MOLYHIL, N.T.

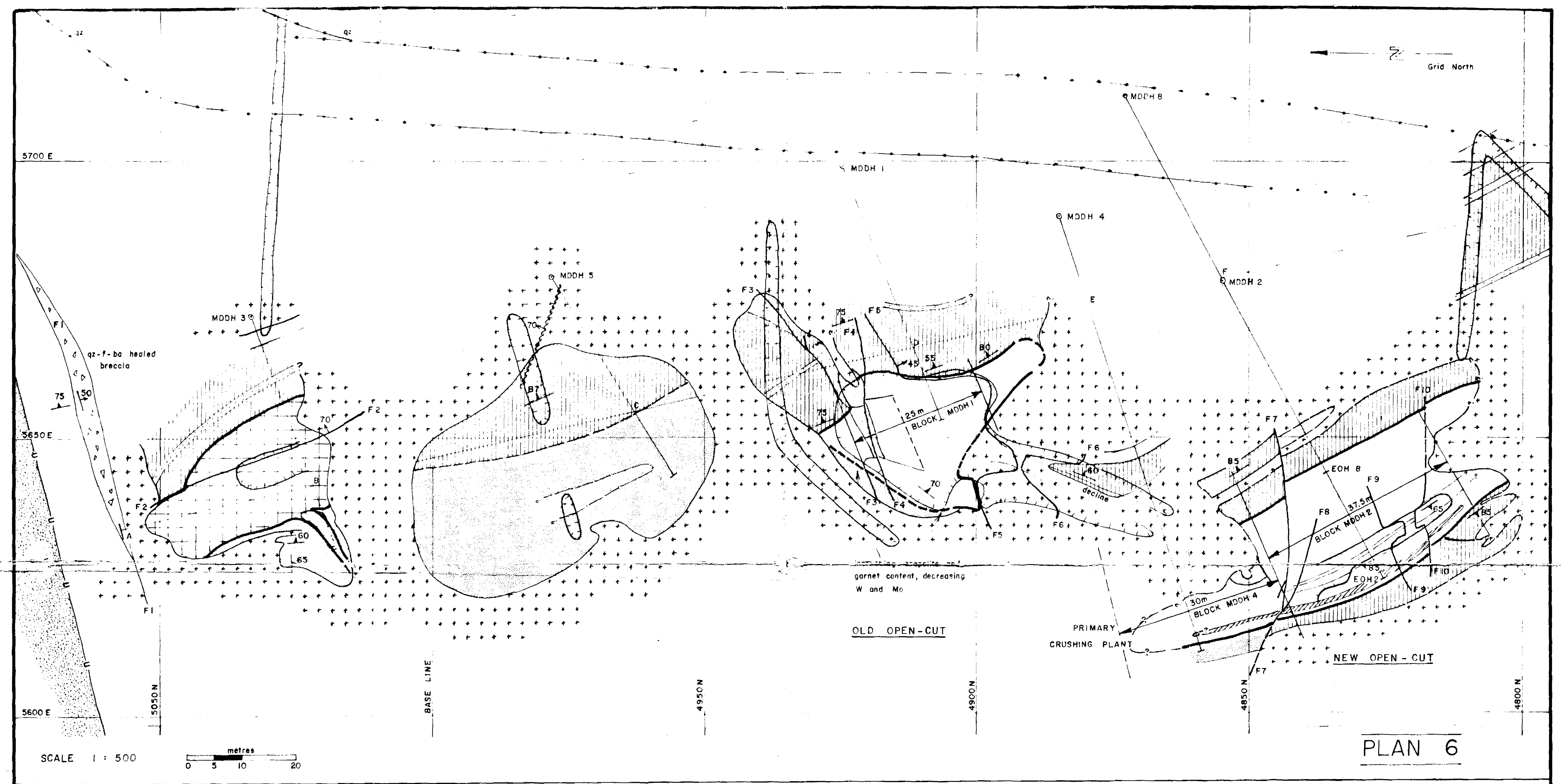


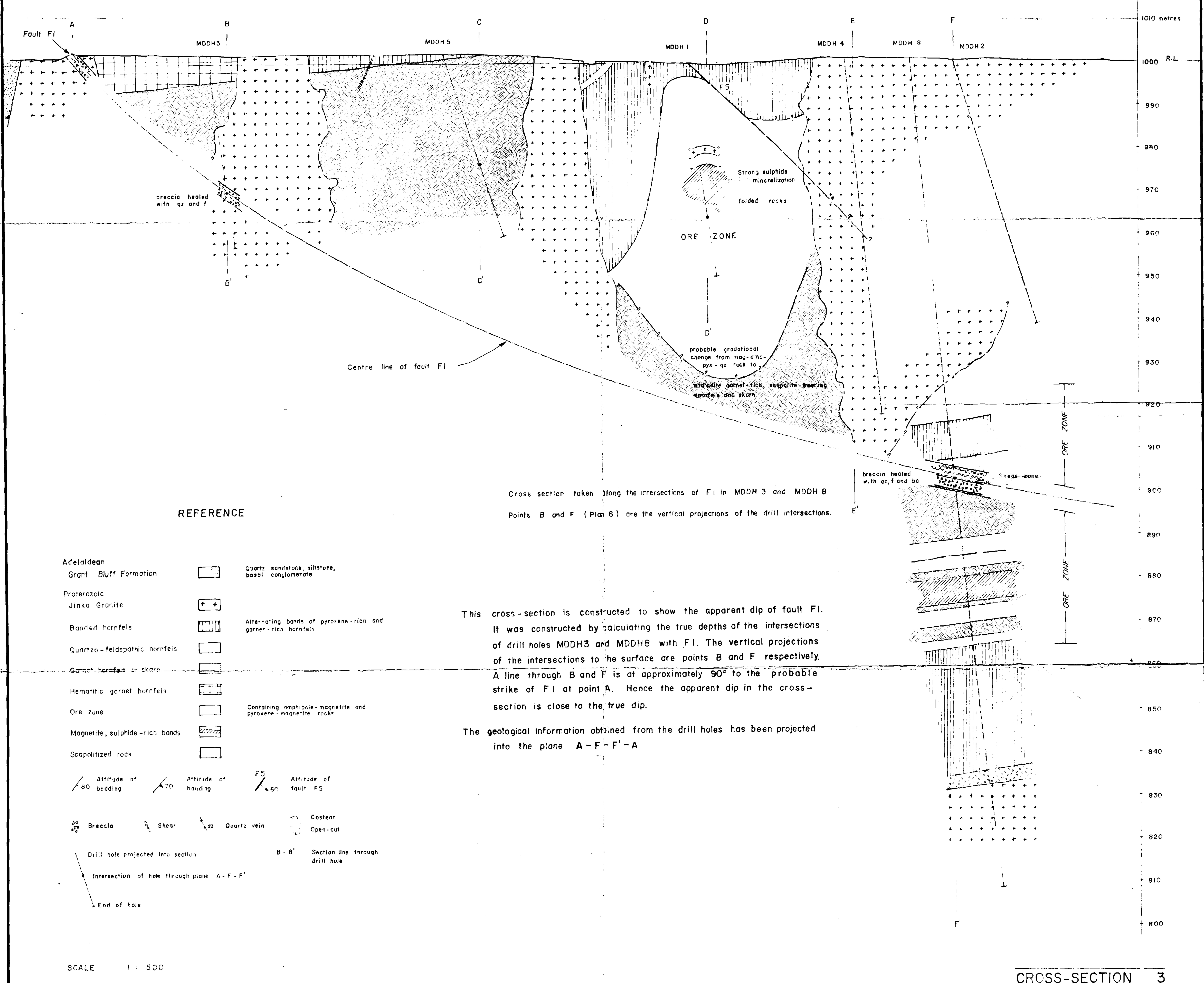
PLAN 4

GEOLOGY and DRAUGHTING by D BARRACLOUGH Oct. 1977

GEOLOGICAL PLAN OF THE OLD AND NEW OPEN-CUTS, MOLYHIL, N.T.

GEOLOGY and DRAUGHTING by D. BARRACLOUGH 1977/8





Cross section taken along the intersections of F1 in MDDH 3 and MDDH 8
Points B and F (Plan 6) are the vertical projections of the drill intersections.

REFERENCE

Adelaidean

Grant Bluff Formation		Quartz sandstone, siltstone, basal conglomerate

Proterozoic

Jinka Granite		
Banded hornfels		Alternating bands of pyroxene-rich and garnet-rich hornfels
Quartzo-feldspathic hornfels		
Garnet hornfels or skarn		
Hematitic garnet hornfels		
Ore zone		Containing amphibole-magnetite and pyroxene-magnetite rocks
Magnetite, sulphide-rich bands		
Scapolitized rock		

Attitude of bedding (80) — Attitude of banding (70) — Attitude of fault F5 (60)

Breccia — Shear — qz Quartz vein — Costean — Open-cut

Drill hole projected into section

Intersection of hole through plane A-F-F'

End of hole

B-B' Section line through drill hole

This cross-section is constructed to show the apparent dip of fault F1. It was constructed by calculating the true depths of the intersections of drill holes MDDH3 and MDDH8 with F1. The vertical projections of the intersections to the surface are points B and F respectively. A line through B and F is at approximately 90° to the probable strike of F1 at point A. Hence the apparent dip in the cross-section is close to the true dip.

The geological information obtained from the drill holes has been projected into the plane A-F-F'-A

SCALE 1 : 500

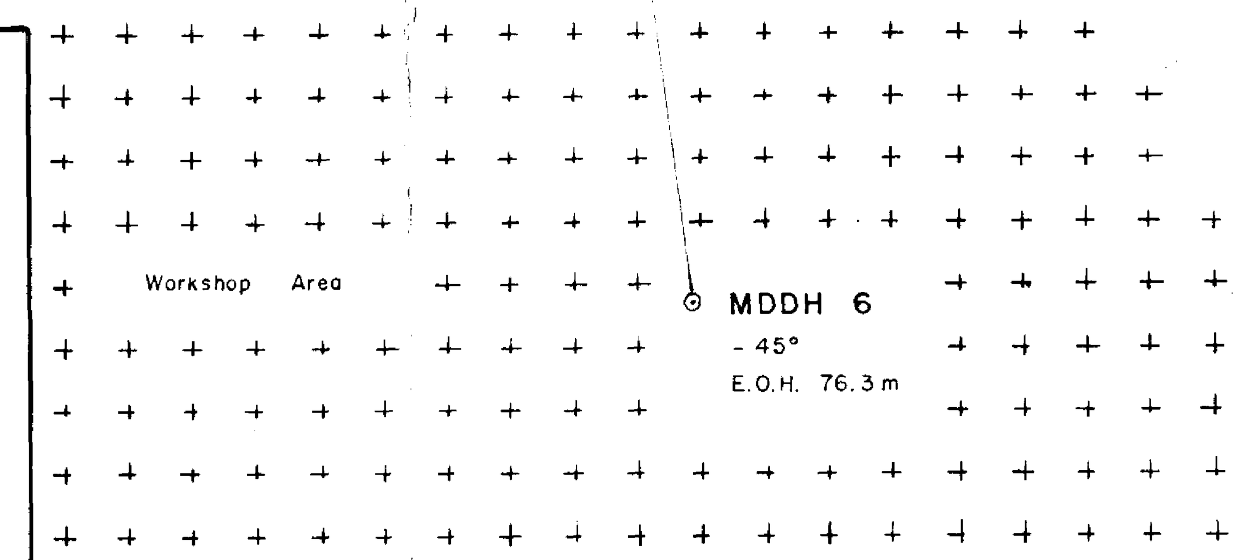
metres

0 2 5 10 15 20 25

GEOLOGICAL PLAN AND CROSS-SECTION OF THE MOLYHIL ORE-BODY

CROSS-SECTION 3 & PLAN 6

GEOLOGY and DRAUGHTING by D.BARRACLOUGH 1978



GEOLOGICAL PLAN OF MOLYHIL

REFERENCE

Proterozoic

Jinka Granite	+ +	
Scapolitized rock		Large crystals common
Epidotized rock	• •	Containing amphibole, coarse epidote common
Pale green rock		Metasomatized hornfels, usually in contact with pegmatite
Banded hornfels		Alternating bands of garnet-rich and pyx-rich hnfels. Differentially weathered. Usually crenulated
Garnet - pyroxene hornfels		
Andradite hornfels / skarn		Sometimes massive, sometimes coarse granular when associated with calcite

70 Attitude of banding — Pit Cut — △ Reference level Datum at 1000 m — 996 Spot height

ABBREVIATIONS

amp	amphibole	cal	calcite	epi	epidote
gar	garnet	hnfls	hornfels	mag	magnetite
peg	pegmatite	py	pyrite	pyx	pyroxene
qz	quartz	scap	scapolite	xst	crystal

SCALE 1 : 200

metres
0 1 2 4 6 8 10

Note. Reference level is not equivalent to R.L. at the Open-cut.
Much of the area covered by spoil. Omitted for sake of clarity.

PLAN 7

GEOLOGY and DRAUGHTING by D.BARRACLOUGH 1978

SECTIONS THROUGH DIAMOND DRILL HOLES MDDH 3 AND MDDH 5, LOOKING NORTH-WE WARDS.

REFERENCE

Proterozoic

Jinka Granite	+ +	
Undifferentiated hornfels		
'Mixed' hornfels or skarn		Two garnet-pyroxene-quartz hornfels. Not banded, a melange
Banded hornfels		Alternating bands of pyroxene- and garnet hornfels
Pyroxene hornfels		
Garnet-pyroxene-hematite hnfls		
Grossularite-biotite hornfels		
Quartzo felspathic hornfels		
Andradite ± calcite hornfels		A distinctive unit in MDDH 2, 4, 8
Light coloured bands		Grossularite-pyroxene-quartz banded hornfels
Dark green rock		Epidote, amphibole, ± magnetite skarn
Ferruginous rock		Weathered pyrite or magnetite in probable pyroxene hnfls

Breccia — Shear — Fault — Intersection angle of banding

B–B' Sub-section on section A–F

Estimated position of fault F1

ABBREVIATIONS

cal calcite — chl chlorite — F fluorite
lim limonite — qz quartz — W scheelite

CROSS-SECTION I

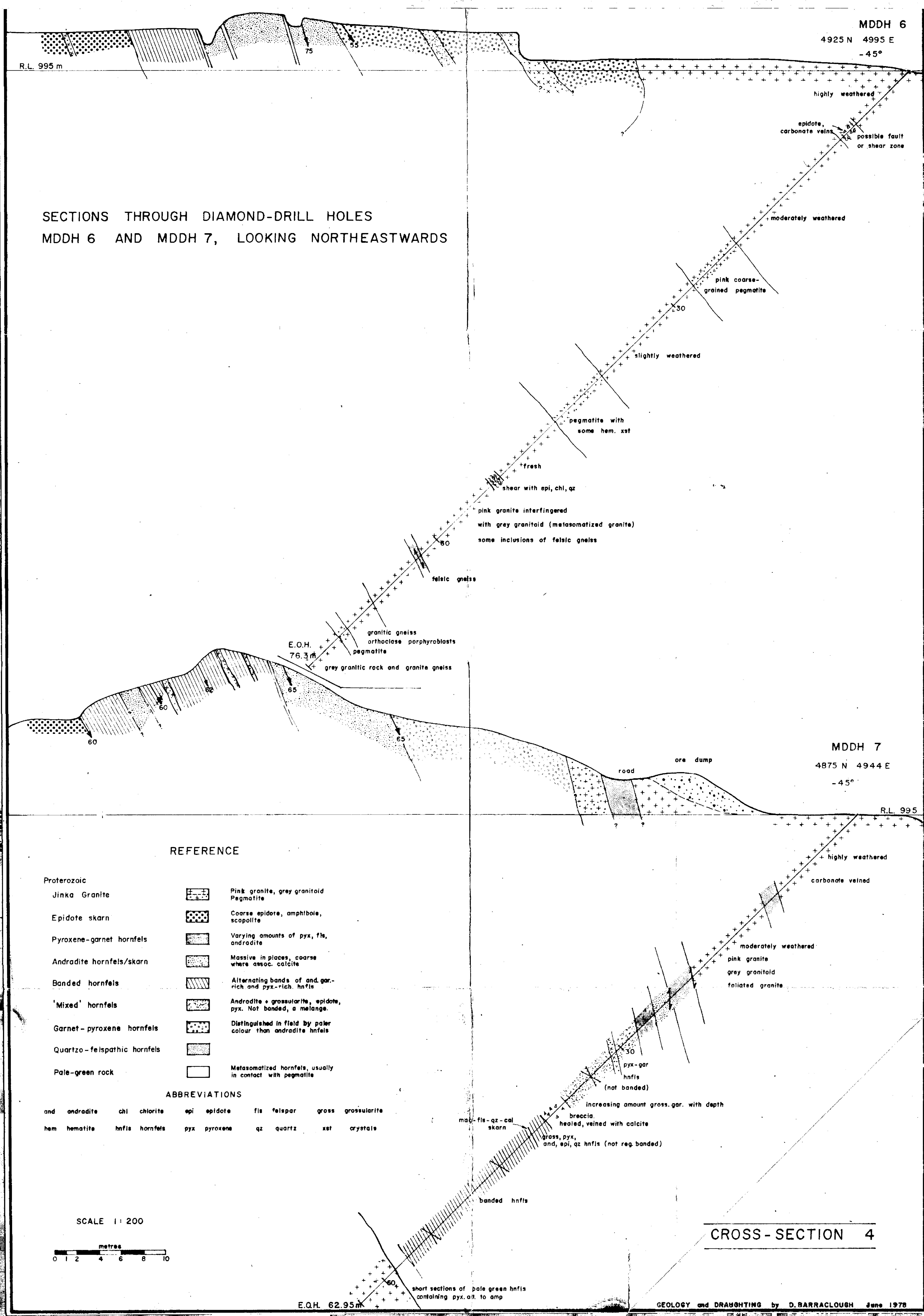
SCALE 1:200

metres 0 1 2 4 6 8

GEOLOGY and DRAUGHTING by D.BARRACLOUGH March 1978

SECTIONS THROUGH DIAMOND-DRILL HOLES MDDH 1, MDDH 2, MDDH 4 AND MDDH 8, LOOKING NORTH-WESTWARDS.

GEOLOGY and DRAUGHTING by D.BARRACLOUGH May 1978



SECTIONS THROUGH DIAMOND-DRILL HOLES
MDDH 6 AND MDDH 7, LOOKING NORTHEASTWARDS
MDDH 6
4925 N 4995 E
-45°
R.L. 995 m
75
55
highly weathered
epidote, carbonate veins
possible fault or shear zone
moderately weathered
pink coarse-grained pegmatite
30
slightly weathered
pegmatite with some hem. xst
fresh
shear with epi, chl, qz
pink granite interfingered
with grey granitoid (metasomatized granite)
some inclusions of felsic gneiss
60
felsic gneiss
granitic gneiss
orthoclase porphyroblasts
pegmatite
E.O.H. 76.3 m
grey granitic rock and granite gneiss
62
65
60
60
65
MDDH 7
4875 N 4944 E
-45°
ore dump
road
R.L. 995
highly weathered
carbonate veined
moderately weathered
pink granite
grey granitoid
foliated granite
30
pyx-gar hnfls (not banded)
increasing amount gross. gar. with depth
breccia, healed, veined with calcite
mag-fls-qz-cal skarn
gross, pyx, and, epi, qz hnfls (not reg. banded)
banded hnfls
60
short sections of pale green hnfls containing pyx. alt. to amp
E.O.H. 62.95 m
REFERENCE
Proterozoic
Jinka Granite — Pink granite, grey granitoid Pegmatite
Epidote skarn — Coarse epidote, amphibole, scapolite
Pyroxene-garnet hornfels — Varying amounts of pyx, fls, andradite
Andradite hornfels/skarn — Massive in places, coarse where assoc. calcite
Banded hornfels — Alternating bands of and. gar.-rich and pyx-rich. hnfls
'Mixed' hornfels — Andradite + grossularite, epidote, pyx. Not banded, a melange.
Garnet-pyroxene hornfels — Distinguished in field by paler colour than andradite hnfels
Quartzo-felspathic hornfels
Pale-green rock — Metasomatized hornfels, usually in contact with pegmatite
ABBREVIATIONS
and andradite   chl chlorite   epi epidote   fls felspar   gross grossularite
hem hematite   hnfls hornfels   pyx pyroxene   qz quartz   xst crystals
SCALE 1 : 200
metres
0 1 2 4 6 8 10
CROSS-SECTION 4
GEOLOGY and DRAUGHTING by D. BARRACLOUGH June 1978