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THE SHELL COMPANY OF AUSTRALIA LIMITED

METALS DIVISION

E.L. 10/80 - GREAT PYRAMID

Progress Report on Exploration During the Period

3/8/82 to 1/9/83

OPEN FILE

Author : P.A. Ruxton

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SUMMARY

The Shell Company of Australia Limited entered into a Joint Venture with the Broken Hill Proprietary Company Limited on E.L. 10/80, Great Pyramid on 3/8/82. This report summarizes previous work on the Great Pyramid prospect and outlines work completed by S.C.O.A. between 3/8/82 and 1/9/83 (summaries Tables 1 and 2).

The Great Pyramid tin prospect consists of closely spaced, NE trending, cassiterite-bearing open fractures hosted by intensely silicified deep water turbidite sediments of the Mathinna Beds (Silurian/Devonian in age). Fracturing and veining on Pyramid Hill is shown to be related to regional stress patterns and the silicification and mineralization presumably related to an underlying tin-bearing, late stage differentiated granitoid of the Blue Tier Batholith (Late Devonian in age).

Three mineralized blocks have been outlined by drilling (North, South and Brock's Blocks), with three major controls on mineralization:

1. A WNW gross trend parallel to a silicified sediment ridge and central WNW trending major fault.
2. NW trending sandstone/quartzite beds.
3. NE trending fractures.

The distribution of tin is highly erratic. Tin concentrates preferentially in fractured sandstone/quartzite units which are frequently separated by low grade siltstone and shale beds.

Geostatistical studies have highlighted several uncertainties inherent in the drill testing of Pyramid Hill. As a result no real confidence can be placed on tin grade estimates and clearly bulk testing is required to accurately define grade.

Ore reserve estimates using previous drilling and adit sampling data indicate possible reserves of:

- a) 4.1mt @ 0.31% Sn (Aberfoyle, 1972 - based on cross-sections - percussion holes)
- b) 4.1mt @ 0.22% Sn (BHP, 1981 - using a triangulation method - all data)
- c) 3.3mt @ 0.26% Sn (BHP, 1981 - extrapolating a rectangular method used on 170m Level - all data)
- d) 2.8mt @ 0.225% Sn (Shell, 1983 - Inverse distance squared method - Aberfoyle Percussion holes)
- e) 2.9mT @ 0.212% Sn (Shell, 1983 - Inverse distance method - Aberfoyle percussion holes)

The deposit has neither been closed off laterally or at depth leading BHP (1982) to estimate a possible deposit of 10mt @ 0.2 to 0.3% Sn (20,000t and 30,000t of contained tin respectively).

Only preliminary metallurgical test work has been completed to date. Initial results indicate that the Great Pyramid ore is ammenable to gravity separation with estimated total recoveries of between 40% and 60% tin depending on project economies.

1.0 INTRODUCTION

The Great Pyramid licence E.L. 10/80 covers an area of 12 sq km centred on Pyramid Hill, 6 km NW of Scamander, NE Tasmania. (Fig. 1 & 2).

The Shell Company of Australia commenced exploration on E.L. 10/80 in August, 1982 having entered into a Joint Venture Agreement with the Broken Hill Proprietary Co. Ltd. on the 3rd August, 1982. Shell is required to match BHP expenditure in the licence area (between 21/7/80 and 3/8/82) to earn a 50% equity.

Arenaceous and argillaceous sediments of the Mathinna Group (Silurian/Devonian age) outcrop in the licence and are traversed by thin NE trending dolerite dykes of uncertain age. The presence of intrusive granitoids belonging to the Blue Tier Batholith (Upper Devonian age) are inferred at depth.

Two styles of mineralization have been reported in the licence: 1) fault-related copper (Dunns and Ringarooma Prospects), copper-tin (Orieco Prospect), and arsenopyrite (East Pinnacles Prospect) and 2) fracture-related tin mineralization (Great Pyramid and West Pinnacles Prospects).

Exploration has centred on the Great Pyramid tin deposit which was first discovered in 1909 by Charles Cheshire who panned cassiterite in streams draining Pyramid Hill. The prospect has been explored by adits, shafts, percussion and diamond drilling.

This report details work completed on the Great Pyramid prospect by the Shell Company of Australia between 3/8/82 to 1/9/83.

1.1 Previous Exploration

Mining interest in the Great Pyramid prospect stretches back to 1909. Exploration activity between 1909 and 1980 is outlined in a BHP company report, "Specification for Exploration of the Great Pyramid Mine E.L. 10/80, NE Tasmania", by R. Hine and A. Goode, May 1980, and summarized in Table 1. Work completed by BHP between 21/7/80 and 3/8/82 is recorded in 4 reports (Ranson, 1980, Steele & Hine, 1981, Steele, 1981 & 1982) and summarized in Table 2.

Fifteen adits were driven into the east and west sides of Pyramid Hill on two main levels by Great Pyramid Tin Mines N.L. (1909 - 1911) generally parallel to the mineralized fracture set. Several shafts were sunk. Spasmodic channel sampling of the adits and rock chip sampling of shafts and trenches was completed. Work was discontinued due to the low grades encountered. Between 1964 and 1965, BHP drilled 26 open spaced (50m to 60m) percussion holes, 3 of which intersected "significant" mineralization ($>0.2\%$ Sn). One diamond hole was drilled to test mineralization in the North adit area and a ground magnetic survey was completed. A serious attempt to outline and define the tin resource on Pyramid Hill was made by Aberfoyle/Paringa between 1969 and 1974. A total of 137 vertical percussion holes were drilled on a closely spaced grid (15m x 30m) with hole depths upto 45m, a total of 5000m of drilling. This drilling outlined 3 mineralized blocks, the North and South blocks centred on Pyramid Hill with grades in excess of 0.3% Sn. 6 vertical diamond holes were drilled in the C adit area (South Block) SW of the summit (a total of 666m drilling) with best intersections of 41m at 0.4% Sn and 33m at 0.38% Sn. Ore reserve calculations

outlined a possible reserve of 4.1mT at 0.31% Sn. In 1976 to 1979 the Tasmanian Mines Department drilled 4 inclined diamond drillholes (-60°) on the SW side of the hill to test the mineralization around C adit (South Block). 710m were drilled with the holes placed roughly parallel to the mineralized fracture set (050°).

Exploration by BHP between 21/7/80 and 3/8/82 included emplacement of a surveyed grid with soil sampling at 25m by 50m intervals and the -40# soil fraction analysed for Sn, WO_3 , As, Cu, Pb, Zn and Ag. The grid was mapped at 1:1,000, adits were logged at 1:200 and a structural synthesis initiated. 13 inclined diamond/percussion drillholes (-70° and -60° to 120°) were drilled (a total of 1229m) across the hill. Ore reserves were recalculated using all the available data to give a deposit of 4.1mT at 0.22% Sn (triangulation calculation method) or 3.3mT at 0.26% Sn (extrapolating a rectangular area of influence method made on 170 level). BHP suggested that at least 5mT of untested ground lies adjacent to drilled areas. Analysis of the sludge samples from BHP diamond drilling indicated a significant tin loss presumably from friable fracture zones, downgrading the assay result by as much as 20%. Parallel diamond and percussion holes drilled 1m apart indicated that diamond drilling may downgrade the tin content by as much as 50%. It is clear that the reliability of assay results from drilling on Pyramid Hill is questionable, which led BHP to conclude that bulk sampling is required to accurately test the deposit.

4 bulk samples (each $\frac{1}{2}$ tonne) were collected from North, C, 2SLL and 2NLL adits for metallurgical testing at

TABLE 1

GREAT PYRAMID - SUMMARY OF PREVIOUS EXPLORATION

COMPANY	YEAR	WORK COMPLETED	RESULTS/COMMENTS
Great Pyramid Tin Mines N.L.	1909-11	-Exploratory tunnelling and shaft sinking. -Adit sampling.	-Adit sampling sporadic/incomplete. -Work halted due to low grades.
Troy Tin Syndicate	1914	-some driving of crosscuts. -sporadic resampling and sampling of adits.	-as above.
Mr H Aulich	1925-36	-minor mining and milling (from North adit and drive).	-production: 1928,33,34 and 1936 totalled 331 tons of ore, 5.379 tons of concentrate - equiv to .88%Sn recovery grade (poss 1.5%Sn feed grade).
Tas Mines Dept	1957 and 1963	-small bulk sampling from richer old workings.	-grades from larger samples consistently higher than previous samples.
BHP Co Ltd	1964-65	-geological mapping, surface and underground -ground magnetics -1 DD hole. -26 open holes	-discontinuous, narrow intersections of Sn to 0.56%. -narrow intersection of massive sulphides + 1.3% Sn in DDH. -concluded not economic
Paringa Mining and Exploration Co-Aberfoyle Management	1969-74	-soil sampling (Sn,Cu) -geological mapping -6 DD holes -137 open holes, grid drilled -ore reserve calculation	-incomplete soil data -concluded 4mT at .3%Sn, sub economic
Tas Mines Dept	1976-80	-4 DD holes	-Ministerial Reserve declared (1976) -holes drilled for stratigraphy - parallel to vein set. Sn up to 0.60%. -narrow intersection of massive sulphides + 2.8% Sn in MD3.

COMPANY	YEAR	WORK COMPLETED	RESULTS/COMMENTS
M. Roach & J.S. Robertson	1920-25)	
Mr Espie & Mr Murrison	1925-41)	
Mr Mackermott	1957(?))	Leases were held but
E.Z. Co of Aust	?-1962)	no work recorded.
Mr L Price & Mr H.D.L. Palmer	1964-68)	
Geophoto Resources Ltd	1968-74	-costeaining, rock chip sampling	-Sn range .05-1.18%Sn -held area immediately surrounding deposit - no rights to explore mine itself.

TABLE 2GREAT PYRAMID - B.H.P. EXPLORATION 21-7-80 to 3-8-82

1. Literature review - compilation.
2. Surveyed grid 600m x 1000m and old workings.
3. Soil sampling (25m grid E-W by 50m) -40# fraction assayed for Sn, WO_3 , Cu, Pb, Zn, Ag.
4. Geological mapping of grid 1:1,000 and underground workings 1:200 including structural and fracture density analysis.
5. Ground magnetic survey at 5m intervals on 50m line spacing and 10m line spacing over selected areas.
6. Rock chip sampling on surface of the NW trending fault zone.
7. Drilling programme - 13 holes - 1229m - core logged, assayed + sludge assays.
8. Petrological study of 30 samples from underground workings and surface exposures and 68 samples from drill core.
9. Underground sampling in 2NLL adit
 - a) 35 x 2m channel samples 30-40 kg each
 - b) 4 bulk samples ($\frac{1}{2}$ tonne each) for metallurgy.
10. Ore Reserve Estimates
 - a) Triangulation - all available data.
 - b) Rectangular areas of influence level 170 and extrapolated to the whole deposit.
 - c) Recalculated using estimates of tin lost in sludge.
11. An aeromagnetic survey was flown over both E.L. 10/80 and the enclosing licence E.L. 12/78, Scamander.
12. E.L. 10/80 was also covered by a dighem survey.
13. Hons. student project in the Great Pyramid area - P. Viney, 1981.

BHP laboratories in Whyalla. Head grades of 0.5%, 0.3%, 0.65% and 0.35% Sn were recorded respectively. Problems with the testwork followed initial over-grinding. The remains of the 2NLL adit channel sample were submitted to the Tasmanian Mines Department laboratories in Launceston for further tests.

BHP recognized two types of ore - oxide ore consisting of cassiterite/Fe-oxides and sulphide ore composed of cassiterite/arsenopyrite/pyrite/pyrrhotite/galena/sphalerite/chalcopyrite. Complications in the separation of cassiterite from the sulphide ore were anticipated.

1.2 Exploration Philosophy & Objectives

Exploration on Pyramid Hill will be aimed at proving up a bulk low grade tin deposit suitable for open cut extraction. Previous work has outlined a resource of 4.0mT @ 0.3% Sn (Aberfoyle/Paringa), 4.1mT @ 0.22% Sn (BHP) and 3.3mT @ 0.26% Sn (BHP extrapolated) containing an estimated 12,000t, 9,000t and 8600t of contained tin respectively. The deposit remains undefined both laterally and vertically although indications are that grades decrease with depth. BHP estimated a further 5mT of potentially mineralized ground adjacent to drilled sections. There is apparently potential for a reserve of 10mT grading between 0.2% and 0.3% Sn.

The tin grade of the Great Pyramid prospect can be considered marginal. The highly erratic nature of cassiterite distribution and the inaccuracies inherent in the drill sampling of low grade tin deposits has led to considerable uncertainty of true tin grade. Further exploration should include bulk sampling in an effort to define the average tin grade in areas

included in the calculated reserve estimates, and further drill testing to define the limits of the deposit.

A regional evaluation should be undertaken to test the possibility of further low grade tin deposits which may be combined with the Great Pyramid reserve to form an economic resource.

1.3 Summary of Work Completed

1. Re-evaluation of previous exploration data and published works.
2. Structural analysis based on the Pyramid Grid involving bedding, cleavage, joints, fractures, faults etc. with specific emphasis on fracture orientations.
3. The grid was remapped at 1:1,000 during the structural study.
4. A structural plan of the hill was completed and three cross-sections drawn (orientated 050°).
5. A geostatistical study was completed and a computer based ore-reserve estimate made using Aberfoyle percussion drill data only.
6. Level plans used in the computer based ore reserve estimate were contoured with respect to tin grade to define the shape of mineralized areas.
7. N, 1SLL and C adit were channel sampled based on lithological divisions. The adits were geologically mapped at 1:200 scale.

8. Ground magnetic data collected by BHP was evaluated and modelled. The effects of the dolerite dyke which crosscuts Pyramid Hill were removed.
9. Metallurgical work on 2NLL adit channel bulk sample continued at the Tasmanian Mines Department Laboratories in Launceston.
10. An M.Sc project involving petrological, fluid inclusion and geochemical studies on Great Pyramid and surrounding mineral deposits in the Scamander mineral field was initiated. (Gavin Plummer - LaTrobe University, Melbourne).

2.0 REGIONAL GEOLOGY

Sedimentary rocks of the Mathinna Group form the major rock type in the area. (Figs. 1 and 2). Siltstones and shales predominate with intercalated sandstone units. The sediments were deposited in deep water environments by turbidity current activity. No carbonate rocks occur in the sequence. The occurrence of monograptids suggests a Silurian/Devonian age.

The Mathinna Beds were folded during the Middle Devonian Tabberabberan orogeny which produced NW trending tight folds with steep axial surfaces and long planar limbs - folds plunge gently to the SE. NW - SE and NE - SW faulting and fracturing are related to fold deformation. Mathinna Bed sediments in the Upper Scamander area generally strike NW and dip and young to the SW.

Mathinna Bed rocks were intruded by granitoids of the Blue Tier Batholith during the Upper Devonian (Fig. 2). Several stages of granitoid intrusion are represented in the Scamander /St. Helens area. Early intrusives include the pyroxene - hornblende granodiorite of the St. Mary's Pluton in the south

and the hornblende - biotite granodiorites of the St. Helens Pluton and the Scamander Tier Dyke. Intrusion of biotite-bearing adamellites of the Poimena and Mt. Pierson Pluton followed with the late stage formation of the Constable Creek two mica granite sheet in the roof zone of the Mt. Pierson Pluton. The Constable Creek Sheet is believed to be a flat-lying, late stage differentiated two mica, tourmaline-bearing granite, which is known to contain tin mineralization. Unroofing of this granite sheet to the north during Quaternary and Recent times has led to the accumulation of sporadic alluvial tin concentrations. The dip of the southern contact of the Constable Creek granite is shallow (10° to 15°) suggesting that it underlies the Mathinna Beds to the south. Intrusion of the Blue Tier Batholith is considered passive (Groves et al, 1977) with a narrow contact metamorphic aureole represented by recrystallization and metamorphic spotting.

Mineralization in the Scamander area is generally confined to quartz/sulphide lodes within faults, veins and fractures in Mathinna Bed sediments. A metal zonation from WO_3/Mo to Cu/Sn and Ag/Pb/Zn with increasing distance from the Constable Creek contact has been identified by Groves (1972) (Fig. 3). This mineral zonation implies a progressive increase in depth to granite (Constable Creek Granite?) to the south.

3.0 GEOLOGY

The Great Pyramid prospect is associated with a ridge of silicified Mathinna Bed sediments which trends NW - SE from the Baden Powell/Carson de Beers WO_3/Mo prospects close to the granite contact, to the North Scamander Pb/Zn/Ag prospect by the Scamander River (Fig. 3). The sediments on Pyramid Hill are intensely silicified with coarser units fractured

and veined. Fine sediments are folded, cleaved and contorted. Cassiterite occurs in NE - SW trending fractures which predominate in the coarser sediments.

A dolerite/diorite dyke of uncertain age was intruded along a highly fractured zone in the centre of Pyramid Hill (Fig. 4).

3.1 Lithology

The sediments in the Upper Scamander area consist of siltstones and shales with interbedded sandstone units (one grit horizon is recognized on Pyramid Hill). Lateral facies changes are not observed on outcrop scale however can be inferred over distances of 100's of metres. Bedding is often narrow with graded units from sandstones or siltstones to shale. Bedding contacts are generally planar however erosive bases, flute casts and load structures indicate wayup. Small scale lunate and planar current ripple cross-stratification are recognizable in fine sandstones and siltstones.

The lack of marker horizons and the fine scale of bedding in the Mathinna Beds has led to difficulties in mapping. Geological mapping has been based on the following divisions, made at outcrop scale.

<90% Sandstone
50 - 90% Sandstone

Intercalated sandstones/siltstones/shales + siltstones.

50 - 90% Shales
>90% Shales

Pyramid Hill is dominated by sandstone lithologies (Refer plan D/LH 01/538). Sandstone units are generally thicker and more common than in other parts of the Scamander area. Siltstones and shales are sheared and cleaved tending to pinch and swell to accommodate folding.

3.2 Structure - Folds

Most beds on Pyramid Hill are steeply dipping trending NW - SE and dipping SW. Folding is common. The dominant structure is an antiform centred on the top of the hill with an associated synform to the north (fold wavelength approx. 250 to 400m) (Refer plan D/LH 01/540). The antiformal hinge zone is faulted by a WNW - ESE fault which dips steeply NE. Numerous minor folds (fold wavelength approx. 50 to 100m) are superimposed on this major structure. Small scale folds (fold wavelength approx. 1 to 5m) are observed in outcrop. Stereonet projection plots of bedding (Figs. 5 to 11) indicate that fold axes generally trend NW and plunge gently to the SE. The fact that the majority of beds strike NW and dip SW implies that all folds on Pyramid Hill are superimposed on a much larger structure which has an antiform to the NE.

Contrary to previous work (Ranson, 1980) both the North and South Blocks of Pyramid Hill contain folds (fold wavelengths approx. 50 to 100m) (Plan D/LH 01/540). On North Block folds plunge 23° (aver.) to 130° (Fig. 5) in contrast to folds on South Block which plunge 40° (aver.) to 180° (Fig. 6). Competent quartzite units of intercalated shales, siltstones and sandstones across the entire hill contain tight cylindrical folds with long planar limbs, steep axial planes (striking NW, dipping steeply SW) and may have curved hinge zones (D/LH 01/540, 539). These folds may die out along

strike at the boundary between shale/siltstone/sandstone and thick sandstone/quartzite units. This type of folding is common when competent rock units and intercalated less competent beds are folded in response to regional stresses. Flexural slip is the common fold style on Pyramid Hill with characteristic faults parallel to fold limbs showing near vertical slickensides and typical smokey quartz tension gash features developed in competent rock units normal to bedding.

Cleavage is developed in shales and siltstone units. Cleavage planes generally trend NW and are either parallel to bedding or dip NE. Bedding/cleavage intersections are difficult to measure however, measurements by Groves (1972) suggests that cleavage is related to NW - SE trending folds.

Minor folds plunging 70° to 80° towards 220° to 240° were recognized and are attributed to a minor late stage buckling event (Fig. 7).

Structure - Fractures/Veins

A structural synthesis of fractures and veins on Pyramid Hill has led to the identification of 4 phases (summarized in Fig. 11).

- (a) Smokey/amorphous quartz - an early fracture - filling phase found in sandstone units forming gashes perpendicular to bedding or highly irregular in shape. This quartz phase is ubiquitous on Pyramid Hill and elsewhere, and is related to deformation of the rocks.

- (b) NE - SW trending fractures - dipping NW (aver. 70°). This fracture set is referred to as the main mineralized fracture set and contains euhedral quartz, muscovite, limonite/heamatite (sulphides at depth), cassiterite and traces of fluorite, wolframite etc. Fracturing is intense on Pyramid Hill with upto 150 mineralized fractures/metre. Three stages of silicification are related to the mineralized fracture set.
- (i) early pervasive silicification,
 - (ii) secondary silicification along fractures - forming a silicified border,
 - (iii) quartz fracture fills.
- (c) NW - SE trending fractures - with vertical to 80° NE/SW dips. This set is recognized principally in the North Block area. These fractures cross-cut smokey/amorphous quartz veins and disseminations. The fractures contain euhedral quartz with minor iron oxides and rare cassiterite.
- (d) Flat-lying fractures - with a range of strikes from W to E and S to N and dips from NNW to SSE (no flat-lying fractures with SW dips are recorded). Fracture fills consist of euhedral quartz, iron oxides plus very rare cassiterite. These flat-lying fractures cross-cut all other fractures and veins.

The NE - SW, NW - SE and flat-lying fractures are mutually perpendicular suggesting formation in response to similar principal stress directions. This fact coupled with the similarity of fracture orientations on North and South Blocks suggests that these three fracture sets were produced by regional stresses.

The coincidence of NW - SE trending folds with the NW - SE trending fracture set and the fact that the mineralized fracture set is normal to the average fold hinge (Fig. 11) indicates that fractures and folding were formed in the same deformational stress regime.

3.3 Mineralization

Cassiterite mineralization occurs in NE/ENE trending closely spaced fractures on the top of Pyramid Hill. The host rock Mathinna Beds are unmineralized. Three mineralized areas were outlined by Aberfoyle percussion drilling, North, South and Brock's Block. The three areas have a gross WNW trend which is spatially related to a WNW trending major fault zone. Each mineralized block is coincident with an area of greater than 95 mineralized fractures/metre (Refer Plan: BHP A1 10/80-60).

Contouring of level plans produced by Craigie (1983) for ore reserve estimates (who used an inverse distance squared method with a search radius of 10m x 10m x 40m and Aberfoyle percussion drillhole data only) indicates a strong NW trend to the mineralized block, a trend which is parallel to bedding (Refer plans D/LH 01/144, 145, 146). This work also indicates that the mineralization in North Block plunges vertically to steeply with depth and in Brock's Block plunges vertically with depth. These plans also indicate numerous areas where mineralization ($>0.1\%$ Sn) has not been closed off. Contouring was completed using a 0.1% Sn cut-off and allowing for distortion of the block grade calculated values inherent in an unconfined inverse distance squared method of computation and additional assay results from Mines Department, Aberfoyle and BHP drillholes.

Mineralized fractures are essentially restricted to sandstone/quartzite units. They vary in width upto 5mm across and exhibit open space filling. Most fractures are quartz filled but a general sequence of crystallization from muscovite, cassiterite, quartz to sulphides has been identified. Minor wolframite, fluorite and pyrolusite have been recorded. Sulphides are converted to Fe - oxides in the oxidation zone. Fractures may contain halos of silicified material with associated pyrite cube formation.

Mineralized fractures are generally confined to more competent sandstone beds. Adjacent siltstone and shale units are generally unfractured but may contain thin limonite-stained fracture lines. Fracture densities in South Block range upto 150 fractures per metre. Where sandstone units show little lithological variation the fractures are generally parallel (Fig. 10, 1SLL). Where siltstone and shale units occur with sandstones the orientation of fractures is variable (Fig. 7, Brock's Block).

Tin grades within mineralized blocks are generally less than 0.6%, with values around 0.2% more common. Channel sampling results in North, C and 1SLL adits (using a jackhammer) indicate the erratic nature of tin distribution (Refer plans D/LH 01/502, 503, 531-534) (see Section 6.2). A fractured sandstone with a grade of 0.66% Sn over 0.5m may occur next to a shale unit with a value of 0.013% Sn over 0.35m (N adit, east wall Plan D/LH 01/503). In North adit where the two walls of the adit were sampled the correlation of tin grade from the same lithological unit on either side of the adit was poor for example values of 0.066% corresponding with 0.185% and 0.0195% with 0.08% Sn. However, when

comparing the bulk grade over 12.2m on the west wall and the corresponding 13.6m on the east wall there is a close similarity 0.072% and 0.094% Sn respectively. This would tend to suggest that despite the highly erratic distribution of tin on a fine scale areas of uniform bulk tin grade occur.

The highest grades of tin are associated with massive sulphide intersections in the major WNW trending fault which runs along the top of Pyramid Hill and appears to separate the N and S Blocks. A maximum value of 2.8% Sn was recorded in drilling (MD 3, DDS 1, B.P.D.7).

To summarize, the major controls on the sheeted fracture style cassiterite mineralization on Pyramid Hill are:

- (a) a gross WNW trend coincident with the trend of the Pinnacles/North Scamander silicified ridge and a major fault on Pyramid Hill,
- (b) NW trending thick sandstone/quartzite units; and
- (c) closely-spaced fractures orientated NE normal to local fold axes.

Tin mineralization on Pyramid Hill is believed to be related to an underlying cupola of the Constable Creek Granite sheet. Granite intrusion during or shortly after Tabberabheran deformation led to the intense, localized silicification on Pyramid Hill associated with regional fractures and faults. Cassiterite was deposited in open NE fractures with minor wolframite, molybdenite and sulphides at depth.

4.0 GEOPHYSICS

An aeromagnetic anomaly of 60 gammas, 1800 by 1000m (elongate NE) is centred on Pyramid Hill. Ground magnetics and geological reconnaissance indicated that the anomaly is caused by a NE trending NW dipping dolerite dyke 5 to 10m thick with magnetic susceptibilities of upto $20,000 \times 10^{-6}$ cgs units. Indications from early work by BHP, 1965 recorded in Taylor (1964) suggested a second broad magnetic anomaly. Reprocessing of magnetic data collected by BHP, 1982 including modelling to remove the effects of the NE trending dyke was completed by Shell (Refer plans D/LH 01/1005 - 1010). With the effects of the dyke removed and the use of a low pass filter (<10 cycles/km) a deep, broad magnetic anomaly of 40 gammas was revealed offset to the NW of Pyramid Hill (Refer plan D/LH 01/1010). The cause of this anomaly is unknown.

5.0 RESEARCH

An M.Sc. project has been initiated (1983) with an agreement between Shell and Tuenis Kwak (LaTrobe University, Melbourne). The M.Sc. student, Gavin Plummer has completed several weeks fieldwork during which he collected samples for thin sectioning, fluid inclusion, lithogeochemical and stable isotope studies. The project seeks to define the fluid inclusion history and lithogeochemical signature of the zoned mineral veins of the Scamander Mineral Field. Particular attention will be paid to the Great Pyramid prospect since it represents the largest tin concentration known in the area and the geology is fairly well understood.

6.0 ECONOMIC POTENTIAL

6.1 Geostatistics/Ore Reserve Calculation

A geostatistical study was made on data collected from the various drilling and sampling programmes in order to define statistical parameters, the degree of correlation between different sample results and the relationship between grade, lithology and fracture density (Craigie, 1983).

The results clearly demonstrate the sampling problems suggested by BHP with:

- 1) a comparison of tin grades from all diamond drill-holes drilled by BHP and all percussion holes drilled by Aberfoyle indicates that percussion values are 40 - 50% higher than diamond drill sample results,
- 2) there is no correlation between diamond and percussion drillhole grades with holes drilled 1m apart,
- 3) correlation diagrams indicate that more tin is reporting to the sludge portion than is contained in the diamond core (particularly in shale units).

These problems are difficult to reconcile and clearly bulk testing is required to achieve any degree of confidence in grade estimates.

Semi-variogram analysis indicates that to give a true estimate of tin grade drill holes should be placed between 5 and 6 metres apart and normal to the mineralized fracture set. Such a close hole spacing may

counteract the highly irregular distribution of tin and frequent lithological variation (and hence tin content). It is however impractical.

An ore reserve estimate was also made using the 137 percussion holes drilled by Aberfoyle/Paringa. Inverse distance and inverse distance squared methods were used with a search radius of 10m thickness and 40m radius, to define blocks of 10m x 10m x 10m on designated levels. Assuming a 0.1% Sn cutoff and a 10m boundary envelope a reserve of 2.8mt @ 0.225% Sn (Inverse distance squared) and 2.9mt @ 0.212% Sn (Inverse distance) was computed.

6.2 Grade Estimates

Continuous channel samples were collected in three adits (North, C and 1SLL) to enable comparison between actual assay results and calculated block grades in areas included in the ore reserve estimate. Samples were collected on a lithological basis using a jack-hammer. Sample sizes varied depending on sample width. Most samples collected were in excess of 5 kgs in weight. Geological information and assay results are documented on Plans D/LH 01/502, 503, 531-534. Channel sample results are indicated below:

Channel Sample Assay Results

<u>Adit</u>	<u>No of Metres</u>	<u>Bulk Grade</u>
North (west wall)	70.45m	0.119% Sn
North (east wall)	12.2m	0.072% Sn
C	62m	0.23% Sn
1SLL	40.1m	0.188% Sn

(an average overall grade of 0.175% Sn)

Comparisons with calculated block grades shown in Figs. 12, 13 and 14 indicate that North and 1SLL adit areas may be overvalued by the ore reserve calculation method and C adit undervalued.

6.3 Metallurgy

Metallurgical test work by the Tasmanian Mines Department in 1945 produced 78.6% tin recovery from a sample of ore analysing 0.64% Sn using gravity tables. In 1963 three bulk samples with grades between 0.47 and 2.17% Sn were treated and after initial coarse grinding and gravity table separation, tin recoveries ranged from 60% for low grade and 80% for high grade samples. In 1971 a composite sample from Aberfoyle percussion drilling assaying 0.29% Sn produced a concentrate of 47.6% Sn with a 63.5% recovery. It was concluded that a recovery of 60 - 70% could be expected in commercial treatment of this type of ore.

In 1980 BHP collected 4,½ tonne bulk samples for metallurgical testing in the BHP laboratories in Whyalla. These samples were overground and no useful data has emerged. In 1981 BHP submitted a further 400 - 500 kg sample to the Tasmanian Mines Department in Launceston for further testing. This sample was a composite of channel samples collected in 2NLL adit. Results from this testwork have recently been received (Appendix 1). The results of metallurgical work to date can be summarized as follows:

- (a) the cassiterite ore of Pyramid Hill is amenable to gravity separation with probable recoveries of 60% from gravity circuits only.

- (b) reasonable overall recoveries will require final grinding of 95% of the initial volume to -300 microns. A two stage grinding with interstage gravity concentration will probably be the preferred route to comminution.
- (c) heavy liquid separation may be effective in a pre-concentration process.
- (d) a step involving magnetic separation may be useful in removing high density iron minerals and hence reducing sale penalties resultant from a high sulphur content.
- (e) final concentrate grades are likely to be 40-60% tin dependant on project economies.
- (f) contaminants in the concentrates should be expected to result in considerable penalties from smelters.
- (g) cassiterite grain size varies from about 400 to 10 microns. The median cassiterite grain size is 150 microns where "cassiterite grain size" is used to describe a metallurgical entity. Microscope studies suggest a cassiterite grain size of 5 to 30 microns which may occur in clusters of upto 400 micron in size.

There is clearly further metallurgical work necessary.

7.0 CONCLUSIONS

The Great Pyramid tin deposit at present represents a marginally economic open cut mining proposition. Several problems require solution prior to mining:

- (i) an accurate ore reserve estimate should be completed incorporating all previous sampling and geological information. Coupled with this study an estimate of further tonnage potential on Pyramid Hill should be made.

- (ii) several bulk samples should be collected and analysed to accurately define tin grade preferably in areas included in the geological ore reserve estimate.

- (iii) if the tonnage potential exists further metallurgical work is required to define recovery and outline problems in extraction and impurities present.

- (iv) a drilling programme is required to outline the limits of the deposit and to estimate total reserves.

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5 440 000 N

5 430 000 N

5 420 000 N

5 410 000 N

5 400 000 N

5 390 000 N

5 380 000 N

Pöimena
Pluton

Mt. Pierson
Pluton

Constable
Creek
Granite

St. Helens
Pluton
ST. HELENS

Scamander
Tier Dyke

GREAT
PYRAMID PROSPECT

E.L.10/80

Scamander

E.L.12/78

St Mary's
Pluton

ST. MARYS

590 000 E

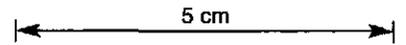
600 000 E

610 000 E



LEGEND

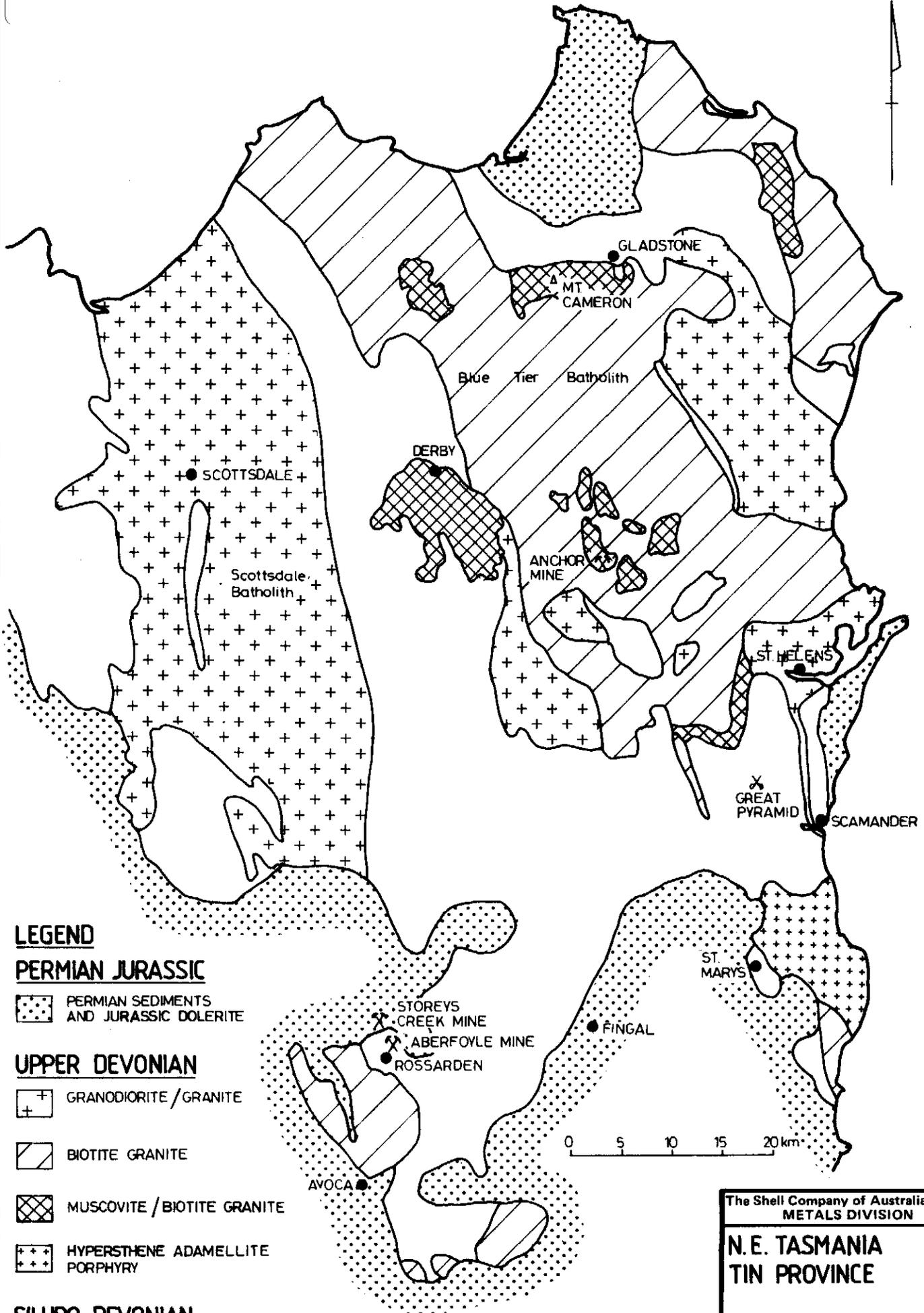
-  Alluvium
-  Upper Devonian
Adamellite-Granite-Granodiorites
-  Biotite Granite
-  Biotite / Muscovite Granite
-  Lower Devonian
Mathinna Beds.



5 0 5Km

The Shell Company of Australia Limited METALS DIVISION	
GREAT PYRAMID PROSPECT LOCATION PLAN	
SCALE 1:250 000	DATE 11-4-83
AUTHOR R.G.W.	DRAWN H.L.H.
OFFICE DEVONPORT	REP.No.
DRG No.D/MT24.023	FIG No 1

5 cm



LEGEND

PERMIAN JURASSIC

PERMIAN SEDIMENTS AND JURASSIC DOLERITE

UPPER DEVONIAN

GRANODIORITE / GRANITE

BIOTITE GRANITE

MUSCOVITE / BIOTITE GRANITE

HYPERSTHENE ADAMELLITE PORPHYRY

SILURO DEVONIAN

MATHINNA BEDS

MINE

PROSPECT

0 5 10 15 20 km

The Shell Company of Australia Limited
METALS DIVISION

**N.E. TASMANIA
TIN PROVINCE**

SCALE 1:500 000	DATE 13-4-83
AUTHOR R.G.W	DRAWN J.L.L.
OFFICE D'PORT	REP.No.
DRG.No. D/MT2469	FIG.No. 2

505034 N

GOSHEN

Georges Bay

ST. HELENS

W/Mo Zone

Sn Zone

Cu Zone

Pb, Ag Zone

YARMOUTH Ag

Tasman Sea

SCAMANDER

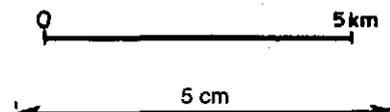
FALMOUTH

E.L. 12/78

DEVONIAN GRANITE

-  GRANODIORITE/GRANITE
-  BIOTITE GRANITE
-  MUSCOVITE/BIOTITE GRANITE

-  MATHINNA BEDS
-  PROSPECTS

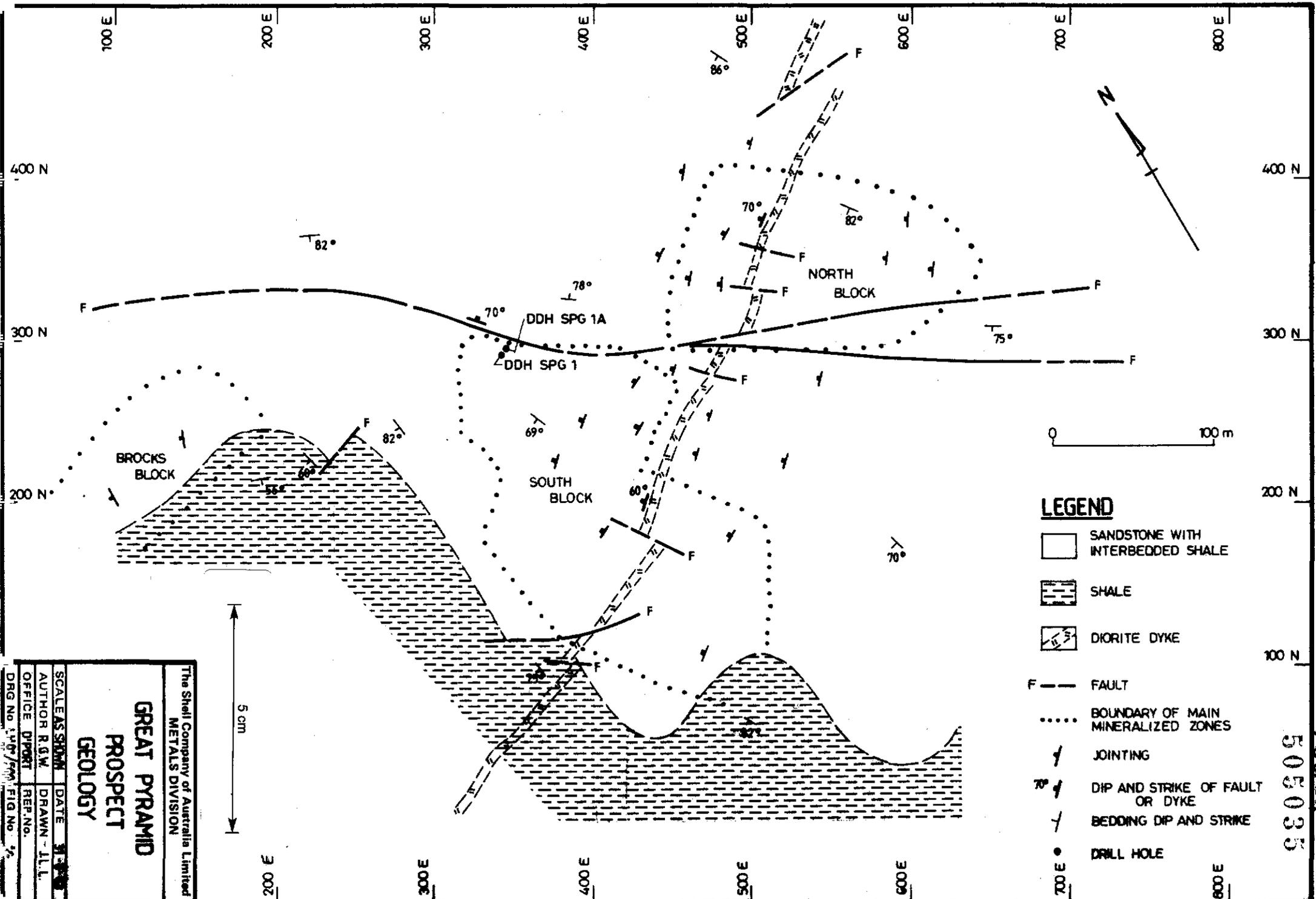


The Shell Company of Australia Limited
METALS DIVISION

E.L. 12/78 SCAMANDER GEOLOGY & PROSPECTS

SCALE ASSIGNED	DATE 12/78
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE D'FORT	REP.No.
DRG No. 117	FIG.No. 3

- SILVER ECHO Ag, Pb
- ECHO W, Mo, Zn
- LOILA Sn
- TIER Sn
- WILLIAMS Cu, Pb, Zn
- BADEN POWELL W, Mo
- CARSON DE BEERS W, Mo
- LUTWYCHE W, Mo
- PINNACLES Sn
- NORTH ORIECO Cu
- GREAT PYRAMID Sn
- RINGAROOMA Cu
- CRAMPS Cu
- DUNNS Cu
- ORIECO Cu
- PAUL BEAUFORT Sn, Pb, Zn
- NORTH SCAMANDER Cu, Pb, Zn
- BEULAH Ag, Pb, Zn
- SCAMANDER BELL Ag, Pb, Zn
- SCAMANDER Ag, Pb, Zn



The Shell Company of Australia Limited
 METALS DIVISION

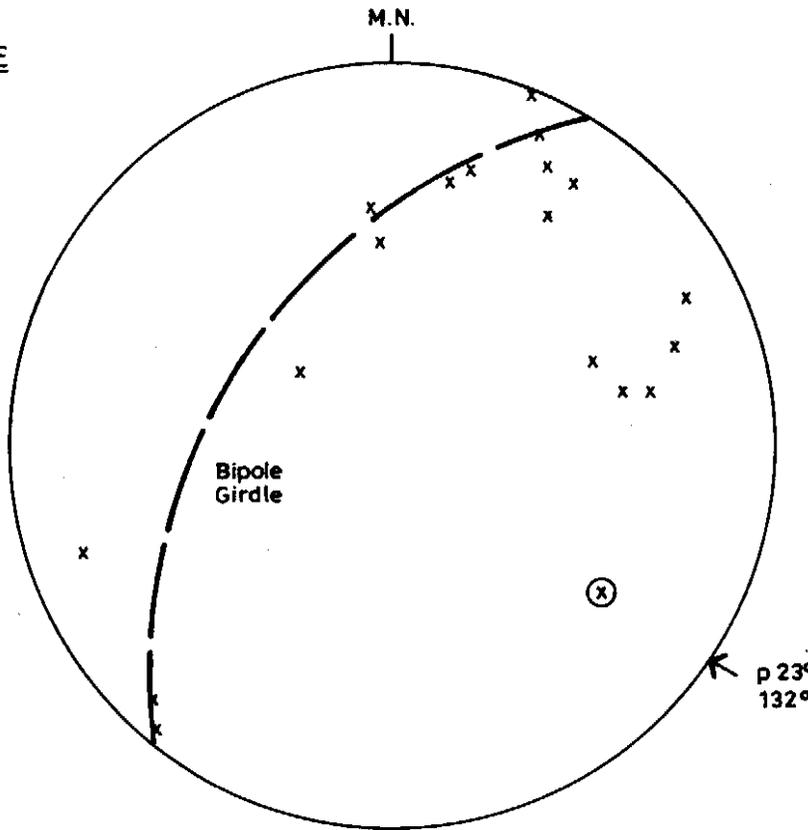
**GREAT PYRAMID
 PROSPECT
 GEOLOGY**

SCALE AS SHOWN	DATE	31-5-83
AUTHOR R.B.W.	DRAWN	J.L.L.
OFFICE DIPP/ST	REP. NO.	
DRG No. 1407/500	FIG. No.	1/2

Figure 4
 503035

BEDDING / CLEAVAGE

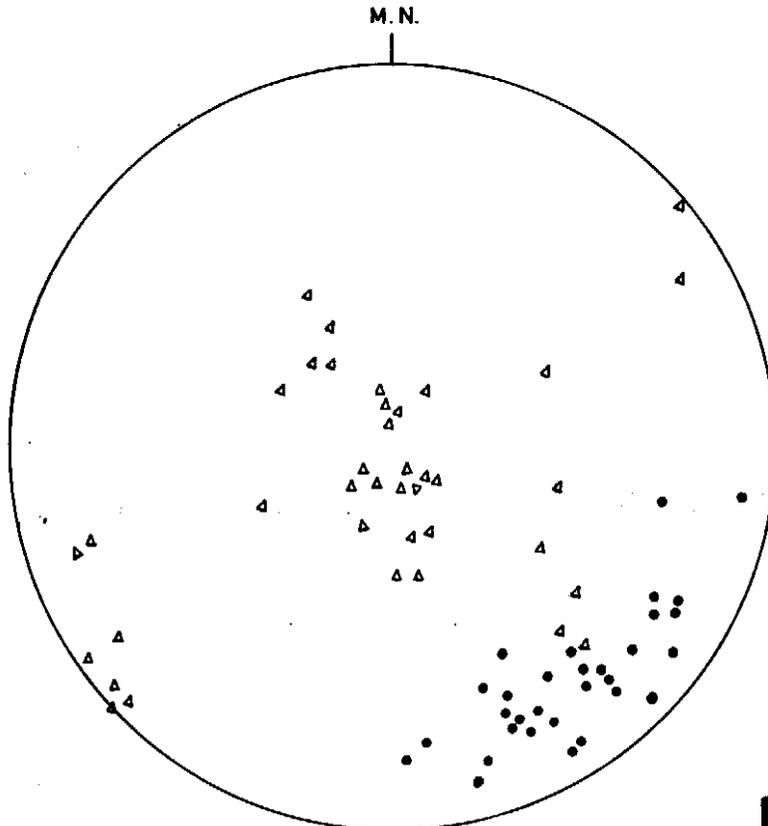
x, n = 18



FRACTURES

●, n = 31

△, n = 39



x *BEDDING*

● *MINERALISED FRACTURE SET*

△ *FLAT LYING FRACTURES*

⊗ *FOLD AXIS (AVERAGE)*

POLES TO PLANES

The Shell Company of Australia Limited
METALS DIVISION

E.L. 10/80 GREAT PYRAMID
PYRAMID HILL
STEREONET -
NORTH BLOCK

SCALE DATE 26-9-83

AUTHOR P.A.R. DRAWN J.L.L.

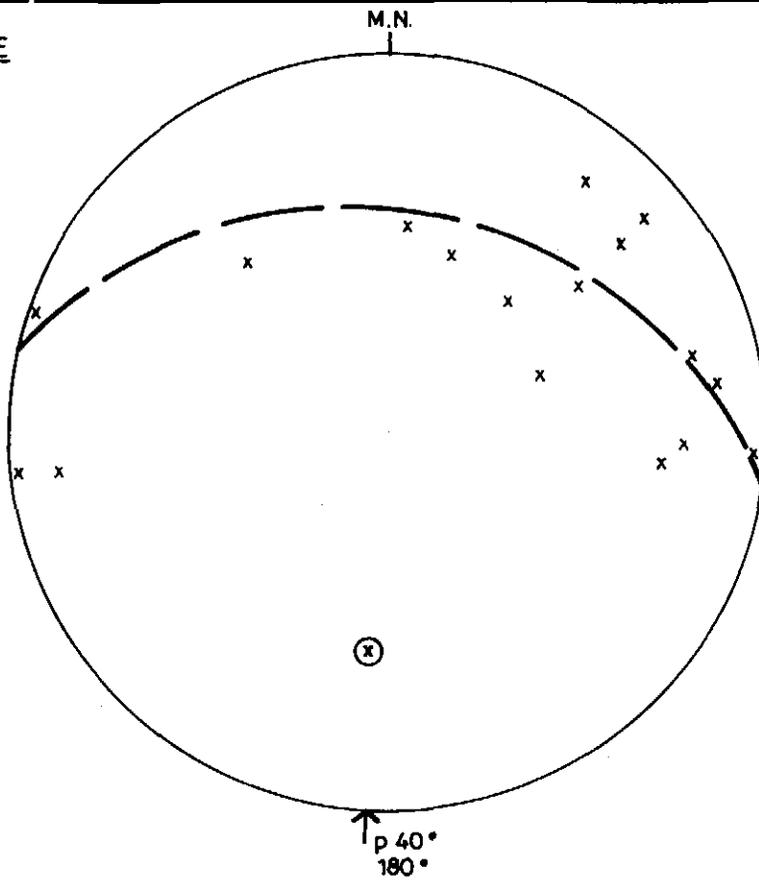
OFFICE D'PORT REP.No.

DRG.No.D/LH01/548 FIG.No. 5

BEDDING / CLEAVAGE

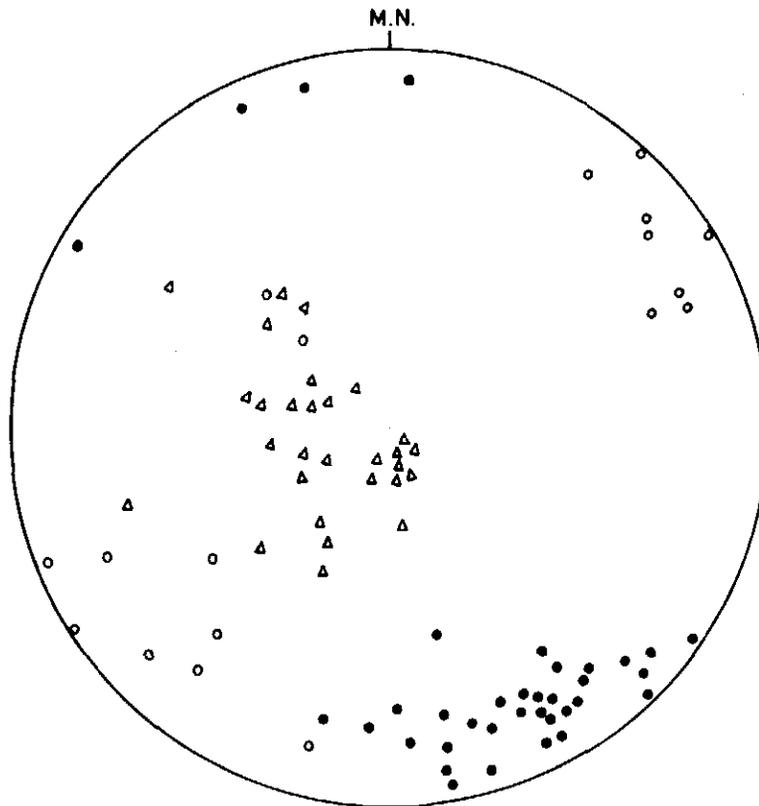
505037

x, n = 17



FRACTURES

●, n = 36
○, n = 18
△, n = 29



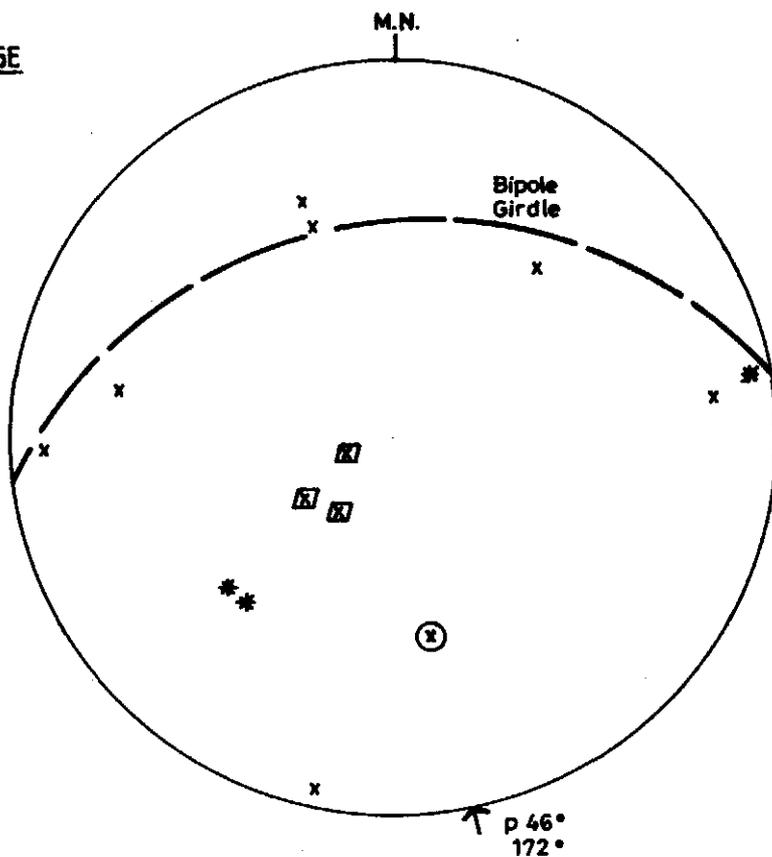
- x *BEDDING*
- *MINERALISED FRACTURE SET*
- △ *FLAT LYING FRACTURES*
- ⊙ *FOLD AXIS (AVERAGE)*
- *N. W. FRACTURES*

POLES TO PLANES

The Shell Company of Australia Limited METALS DIVISION	
E. L. 10/80 GREAT PYRAMID PYRAMID HILL STEREONET SOUTH BLOCK	
SCALE	DATE 26-9-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE D'PORT	REP.No.
DRG.No. D/LH01/549	FIG.No. 6

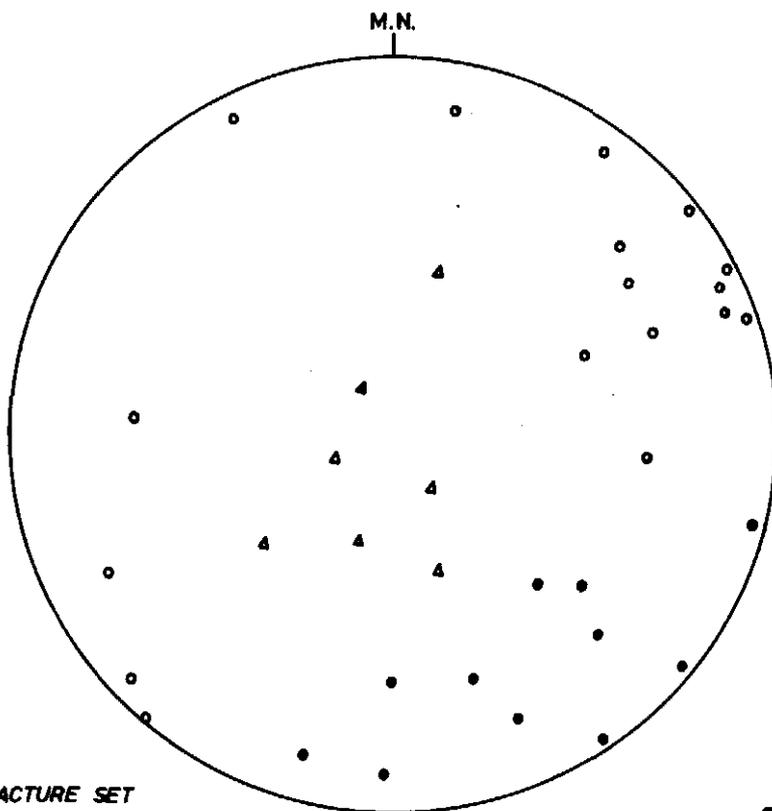
BEDDING / CLEAVAGE

- x, n = 8
- * , n = 3
- , n = 3



FRACTURES

- , n = 11
- ▲, n = 7
- , n = 17



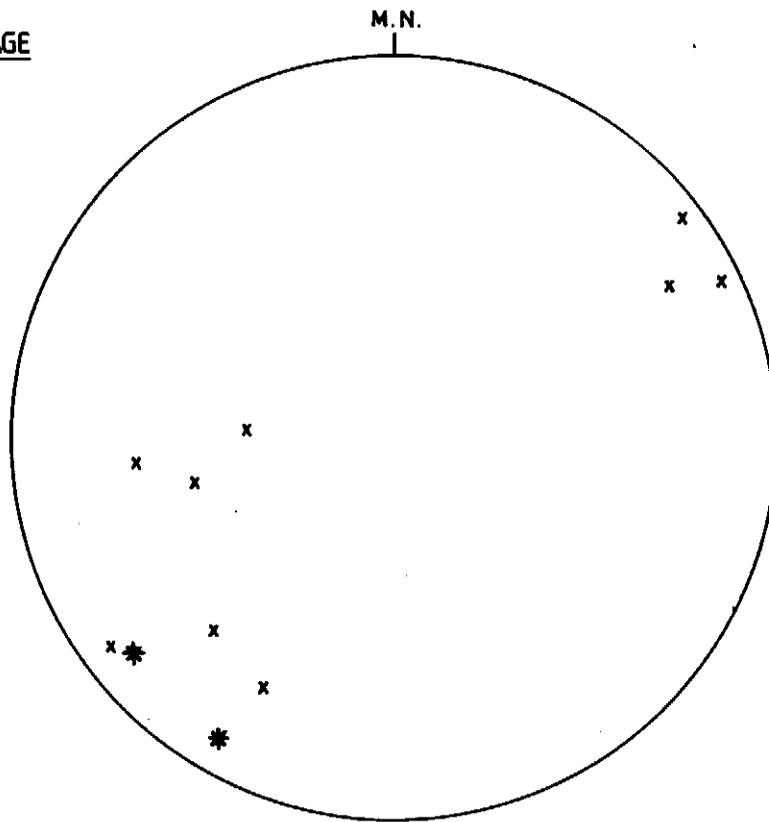
- x *BEDDING*
- *MINERALISED FRACTURE SET*
- ▲ *FLAT LYING FRACTURES*
- x *FOLD AXIS (AVERAGE)*
- *N.W. FRACTURES.*
- *MINOR FOLD AXES*
- * *CLEAVAGE*

POLES TO PLANES

The Shell Company of Australia Limited METALS DIVISION	
E.L. 10/80 GREAT PYRAMID PYRAMID HILL STEREONET BROCKS BLOCK	
SCALE	DATE 26-5-63
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE D'PORT	REP.No.
DRG.No. D/LH01/550	FIG.No. 7

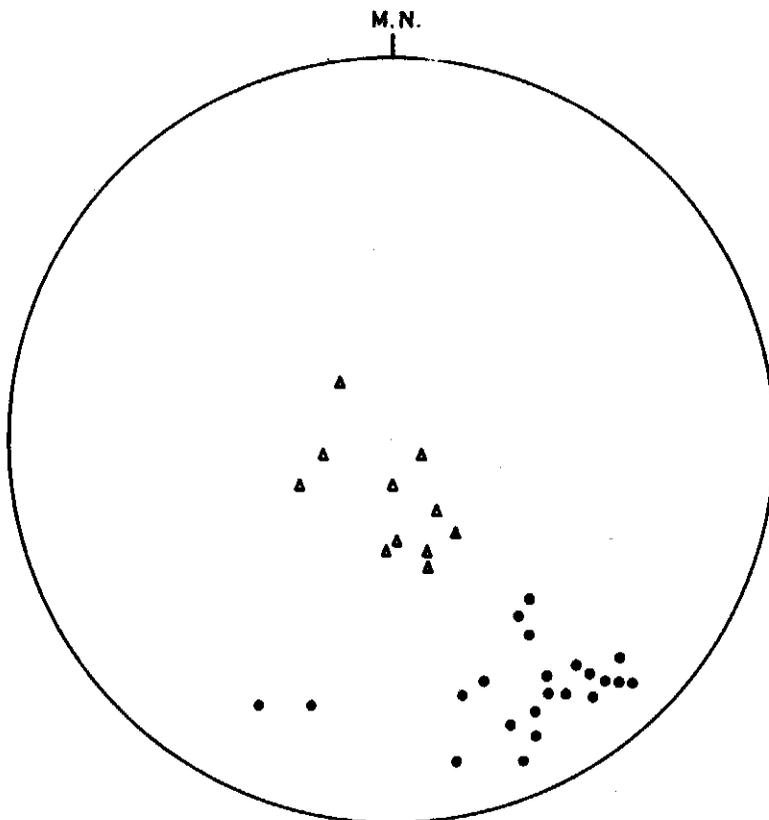
BEDDING / CLEAVAGE

x, n = 9
 *, n = 2



FRACTURES

●, n = 22
 ▲, n = 11



- x BEDDING
- MINERALISED FRACTURE SET.
- ▲ FLAT LYING FRACTURES
- * CLEAVAGE

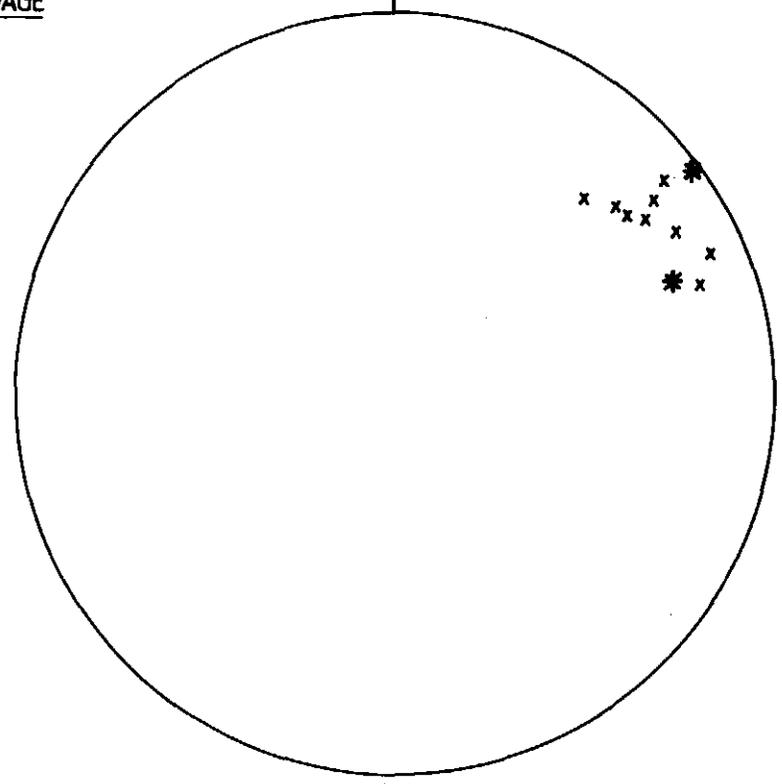
POLES TO PLANES

The Shell Company of Australia Limited METALS DIVISION	
E.L. 10/80 GREAT PYRAMID PYRAMID HILL STEREONET NORTH ADIT	
SCALE	DATE 26-9-63
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE D/P/RT	REP.No.
DRG No DLN01/551	FIG No 8

BEDDING / CLEAVAGE

M.N.

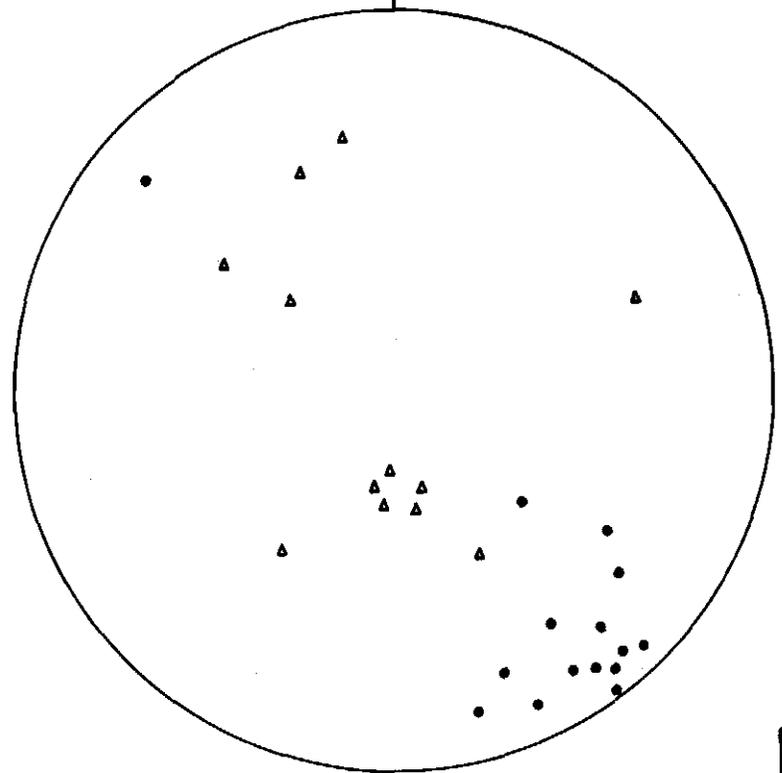
x, n = 9
 *, n = 2



FRACTURES

M.N.

o, n = 15
 Δ, n = 12



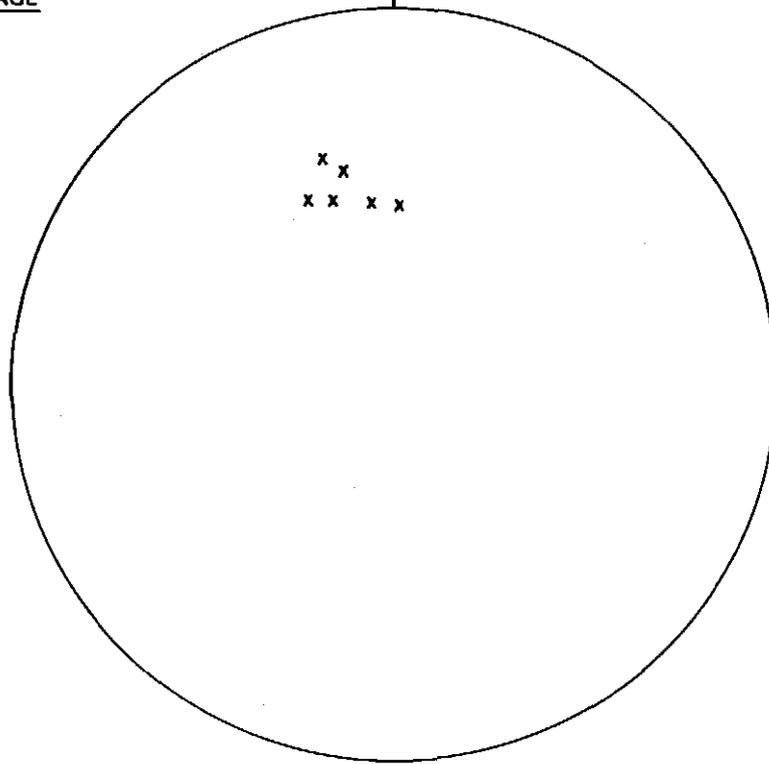
- x *BEDDING*
- o *MINERALISED FRACTURE SET*
- Δ *FLAT LYING STRUCTURES*
- * *CLEAVAGE*

POLES TO PLANES

The Shell Company of Australia Limited METALS DIVISION	
E.L. 10/80 GREAT PYRAMID PYRAMID HILL STEREONET C ADIT	
SCALE	DATE 27-9-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE D'PORT	REP.No.
DRG No D/LH01/552	FIG No 9

BEDDING / CLEAVAGE

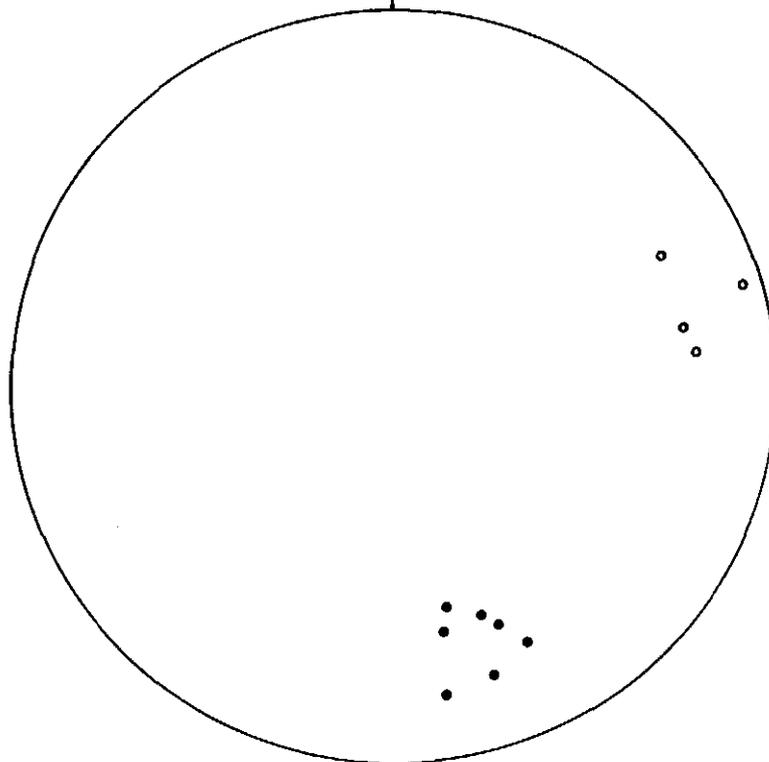
M.N



x, n = 6

FRACTURES

M.N



•, n = 7

○, n = 4

x, BEDDING

• MINERALISED FRACTURE SET

○ N.W. FRACTURES

POLES TO PLANES

The Shell Company of Australia Limited
METALS DIVISION

E.L. 10/80 GREAT PYRAMID
PYRAMID HILL
STEREONET
1 SLL ADIT

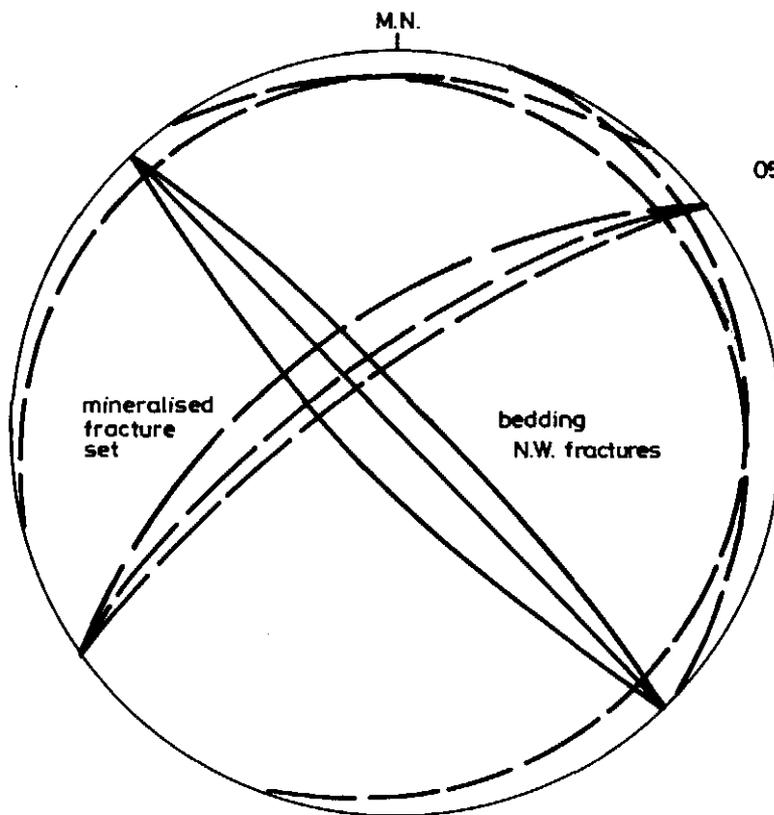
SCALE DATE 27-9-83

AUTHOR P.A.R. DRAWN J.L.L.

OFFICE D'PORT REP.No.

DRG No D/LH01/553 FIG No 10

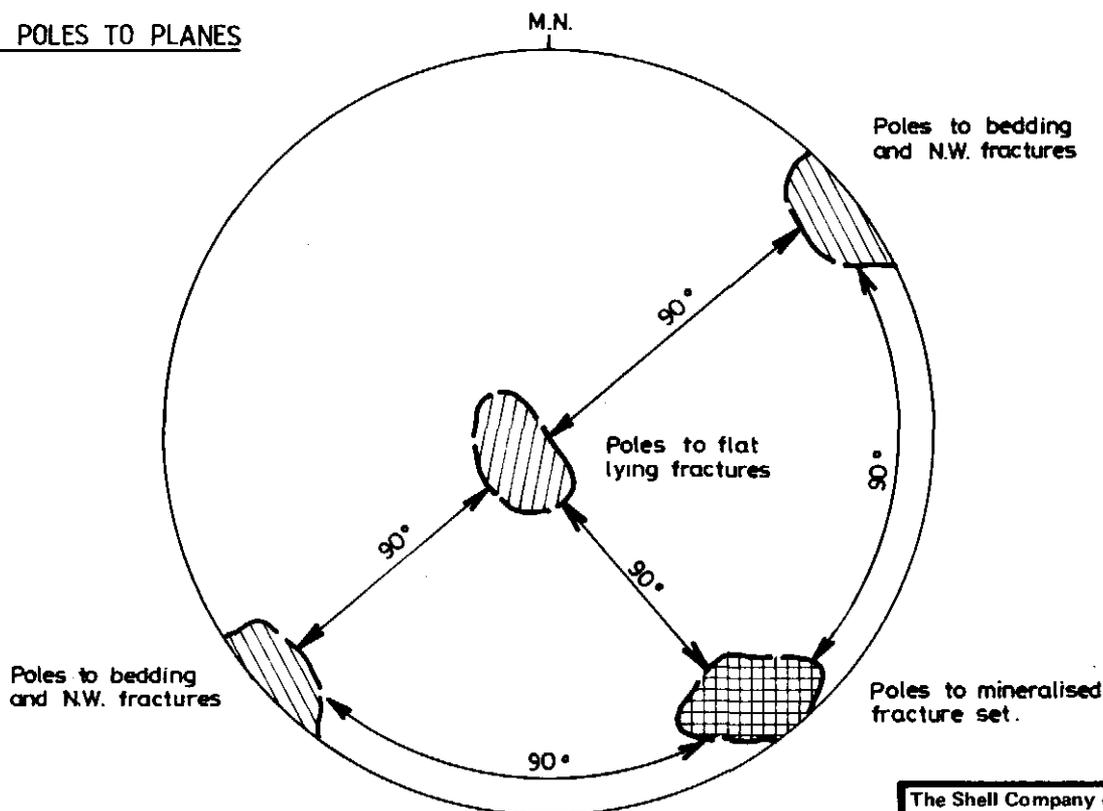
AVERAGE PLANES



052° average

flat-lying fractures.

AVERAGE POLES TO PLANES



Poles to bedding and N.W. fractures

Poles to flat lying fractures

Poles to bedding and N.W. fractures

Poles to mineralised fracture set.

The Shell Company of Australia Limited
METALS DIVISION

E.L.10/80 GREAT PYRAMID
PYRAMID HILL
STEREONET
SUMMARY

SCALE	DATE 27-9-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE D'PORT	REP.No.
DRG.No. D/LH01/554	FIG.No. 11

505043

500 E

600 E

400 N

300 N

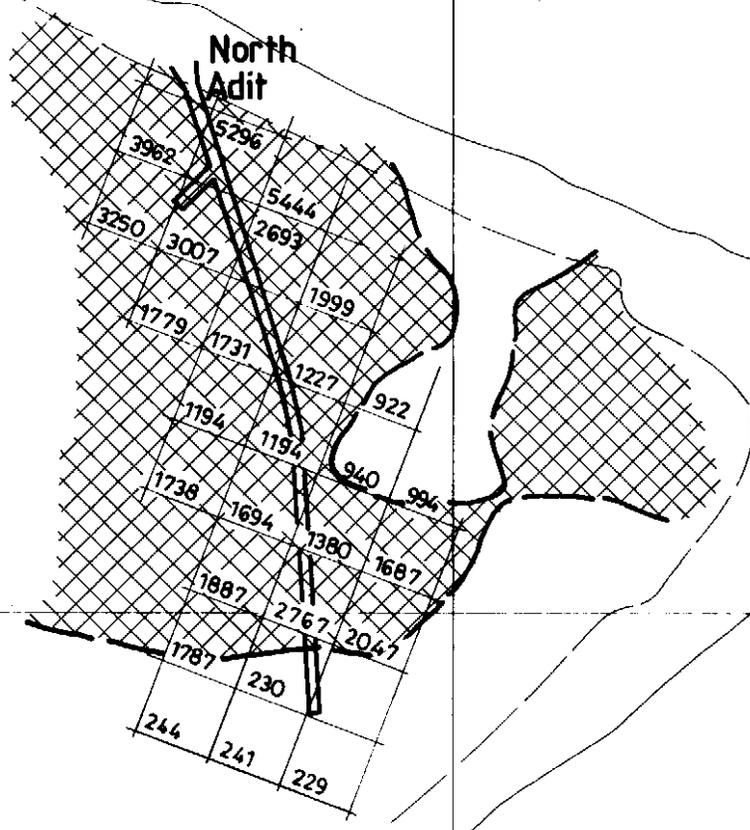
190 m

195 m

195 m

190 m

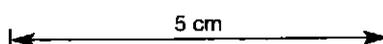
North Adit



LEGEND



> 0.1% Sn



The Shell Company of Australia Limited
METALS DIVISION

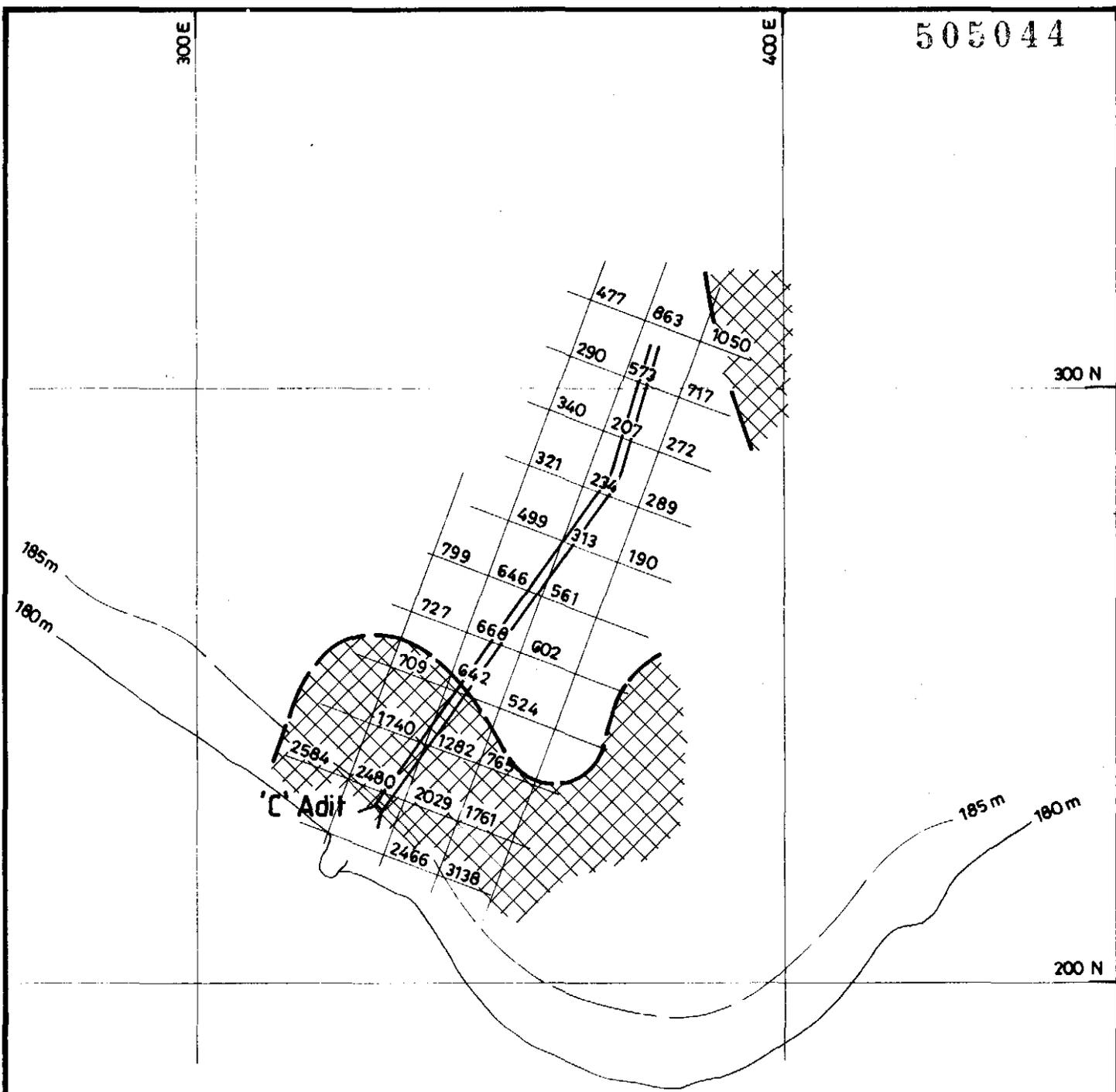
E.L. 10/80 GREAT PYRAMID
CALCULATED BLOCK GRADES
(CRAIGIE LEVEL 3)
SUPERIMPOSED ON NORTH ADIT

SCALE 1:1000 DATE 19-9-83

AUTHOR P.A.R. DRAWN J.L.L.

OFFICE D PORT REP.No.

DRG.No. D/LH01/542 FIG.No. 12



LEGEND

 > 0.1% Sn

The Shell Company of Australia Limited METALS DIVISION	
E.L. 10/80 GREAT PYRAMID	
CALCULATED BLOCK GRADES (CRAIGIE LEVEL 4) SUPERIMPOSED ON C. ADIT	
SCALE 1:1000	DATE 19-9-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE D'PORT	REP.No.
DRG No D/LH01/541	FIG.No. 13

5 cm

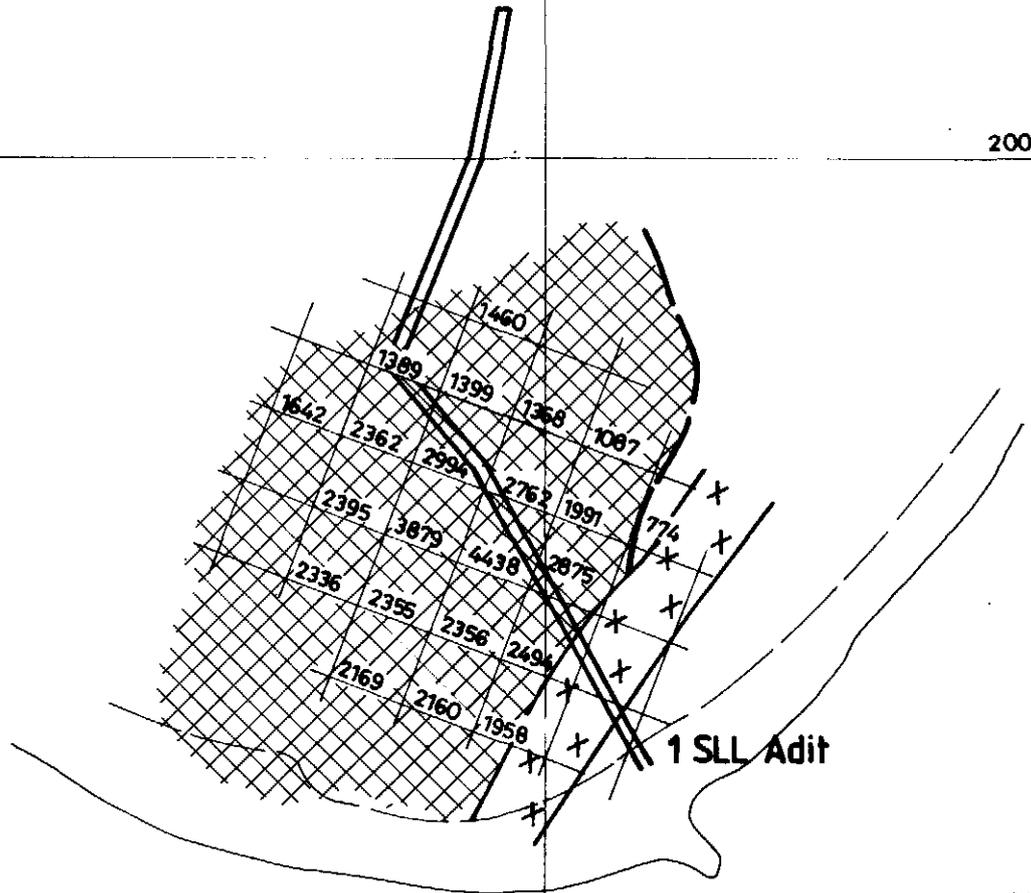
300 E

400 E

505045

200 N

100 N



LEGEND

 > 0.1% Sn

 DOLERITE DYKE

5 cm

The Shell Company of Australia Limited
METALS DIVISION

E.L. 10/80 GREAT PYRAMID
CALCULATED BLOCK GRADES
(CRAIGIE LEVEL 8)
SUPERIMPOSED ON 1 SLL ADIT

SCALE 1:1000	DATE 19-9-83
AUTHOR P.A.R	DRAWN J.L.L.
OFFICE D'PORT	REP.No.
DRG.No. D/LH01/543	FIG.No. 14

APPENDIX 1

Metallurgical Report

From the Tasmanian Mines Department, Launceston

505047

Keeflow → *(2) BKH - Darwinport.*

L417
L401 - 982
(NGL Files)

The Shell Company of Australia Limited *at Gt Pyramid.*

Incorporated in Victoria. Registered User of Shell and other Trade Marks



METALS DIVISION

Your ref
Our ref AHO BCD:BS:YP
Date March 16, 1983

Correspondence
Shell Corner
155 William Street
P.O. Box 872K
Melbourne 3001
Location
30th Floor
Merland House
570 Bourke St.
Melbourne

Mr. H.K. Wellington,
Chief Chemist and Metallurgist,
Department of Mines,
287 Wellington Street,
South Launceston, 7250

Cable Address Shell Melbourne
Telex Nos 30560 - 30973
Telephones
Switchboard - 609 1711
Direct Lines - 609 Ext

Dear Mr. Wellington,

RB14: Great Pyramid Tin Prospect: Upper Scamander

I would like to acknowledge, with thanks, receipt of a copy of the above report.

I have only scanned the contents to date and will be tackling it in earnest in the very near future. The mineralogists comments are very interesting and I wonder if he could comment on the following:

- If cassiterite is not restricted to veins (GP3 suggests it is not), can an estimate be made of the vein restricted/rock cassiterite distribution to, and the grain size distribution in, each "host"?
- Cassiterite seems to be present as either individual grains (+15 microns to ? microns) or clusters of fine 5-30 microns. The cluster sizes are not reported and if the above interpretation is true, the relative importance of the styles of occurrence would be interesting.
- Would comment by the mineralogist on some of the test work products (especially the "reduced" fractions from the cassiterite grain size distribution) add to the understanding of the stability of cassiterite clusters to comminution.

I had discussed with Peter James, the possibility of obtaining a brief listing of available samples together with the approximate amounts remaining. I would be interested in testwork products as well as head samples.

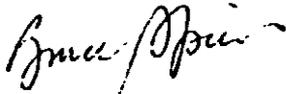
I would appreciate such a list if you are able to prepare it.

- 2 -

My attempts, today, to contact Allan Clarke of BHP have been unsuccessful. Should he indicate they require a copy of this report, I will send him one.

I look forward to following up this very interesting report.

Yours faithfully
For THE SHELL COMPANY OF AUSTRALIA LIMITED



Bruce Spiers
Business Development Manager



DEPARTMENT OF MINES—TASMANIA

Devonport
505049

TELEPHONES:

Metallurgical Research	} 44 2431-2 (2 lines)
Laboratory	
Mines Inspection	
Explosives & Inflammable Liquids	

LAUNCESTON OFFICES
287 WELLINGTON STREET
SOUTH LAUNCESTON 7250

14th March 1983

Shell Co of Aust. Ltd.,
Metals Division,
570 Bourke Street,
Melbourne 3000
VICTORIA

Attent. Bruce Spiers

R814: Great Pyramid Tin Prospect: Upper Scamander.

Dear Sir,

Please find herewith a copy of the above report.
If a copy is to go to BHP as well would you let me know?.

I regret the delay in getting this report finalized but after the initial writing up the author felt something was amiss relative to the cassiterite grain size and recovery. The belief we had was that held by your geologists in the nature of the cassiterite occurrence. Reference to our geologists tended to confirm this view also. However the differences were thought significant enough to warrant a mineralogical examination which reveal that belief was not correct. I believe the resolution of this issue has justified the delay.

Yours faithfully,

(H. K. Wellington)
Chief Chemist & Metallurgist



DEPARTMENT OF MINES—TASMANIA

LAUNCESTON OFFICES
287 WELLINGTON STREET
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Explosives & Inflammable Liquids }

3rd March 1983

RB14SHELL CO OF AUSTRALIA

Concentration Tests and other Studies on Tin Ore,
Pyramid Prospect, Upper Scamander.

Introduction

A total of 35 crushed samples were received from the Broken Hill Pty. Co. Ltd.

B.H.P. Numbers were 14-4, 08-428 PCS 1 to 35 inclusive. They were stated to be channel samples from No. 2 NLL Drive, Pyramid Prospect, Upper Scamander.

The Company requested that the 35 samples be mixed together to give a bulk sample for metallurgical testing.

The objective of the metallurgical test work was to establish the recovery level of tin in a concentrate containing 45 to 50% Sn.

During the course of the testing program it was advised that the Prospect had been taken over by the Shell Co of Australia; objectives of the test work remained the same and this report is addressed to that Company.

Make Up Of The Bulk Sample.

A number of the samples were found to be in a pulverized condition, too fine to provide any meaningful information on tin recovery because of the almost certain degradation of the original cassiterite grain size. This is minimized in properly controlled crushing and grinding operations.

These samples were therefore excluded from the composite. They were:-

PCS 1 to 10 inclusive and PCS 14.

A sizing of one of these (PCS - 4) showed.

59.5% minus 75 μ m.
and 50 % minus 38 μ m.

The samples included were:-

<u>B.H.P. No.</u>	<u>Mass (Kg.)</u>
14-4, 08-428 PCS 11	23.6
12	27.2
13	23.2
15	15.4
16	24.4
17	26.2
18	23.4
19	24.0
20	17.0
21	24.4
22	24.6
23	26.0
24	24.0
25	17.6
26	27.0
27	23.6
28	24.1
29	23.6
30	16.6
31	21.5
32	24.5
33	23.6
34	26.1
35	15.2

The final composite, numbering 24 samples, weighed 546.7 kg.

Preliminary Test Work.

This comprised, mixing, sampling, determination of tin head value, a sizing analysis of the head sample and heavy liquid sink/float tests at density 2.95 t/m^3 on the sized fractions from 6.35mm to 600 μm .

A cassiterite grain size analysis was also done. This is achieved by dissolving sulphides, oxides, and silicates by suitable acid treatment, followed by a sizing analysis of the refractory cassiterite rich residue.

In general this shows the naturally occurring grain sizes of the mineral.

Results.

Head assay.

0.22 % Sn.

Head Sample - Sizing Analysis - Wet & Dry Screening

Fraction	Per Cent			
	Mass	Sn	Sn Dist.	Sn Dist. Cum
+6.35 mm	6.8	0.16	5.6	5.6
+3.18 "	32.4	0.14	23.3	28.9
+1.18 "	19.4	0.18	17.9	46.8
+600 μ m	9.1	0.27	12.6	59.4
+300 "	6.9	0.30	10.6	70.0
+150 "	6.0	0.27	8.3	78.3
+ 75 "	3.9	0.29	5.8	84.1
+ 38 "	2.9	0.29	4.3	88.4
- 38 "	12.6	0.18	11.6	100.0
Composite H.	100.0	0.20	100.0	

Heavy Liquid Sink/Float Tests 2.95 t/m³

Fraction	Product	Per Cent (in individual fraction)		
		Mass	Sn	Sn, Dist.
+6.35 mm	F/T	100	0.16	100
	S/K	Nil		
	Composite	100	0.16	100
+3.18 mm	F/T	99.7	0.12	83
	S/K	0.3	7.5	17
	Composite	100.0	0.14	100
+1.18 mm	F/T	99.0	0.10	54
	S/K	1.0	8.7	46
	Composite	100.0	0.18	100
+600 μ m	F/T	98.1	0.08	29
	S/K	1.9	9.8	71
	Composite	100.0	0.27	100

- 4 -

Cassiterite Grain Size AnalysisOre Stage roll crushed to - 1.0 mm

Fraction	Sn Distribution	
	%	% Cum
-1.0mm + 600 μ m	3.1	3.1
-600 μ m + 300 "	15.8	18.9
-300 " + 150 "	23.0	41.9
-150 " + 75 "	24.2	66.1
- 75 " + 38 "	17.6	83.7
C/S 1	7.5	91.2
2	1.4	92.6
3	3.1	95.7
4	2.0	97.7
5	1.0	98.7
O/F	1.3	100.0
Total	100.0	

Cyclosizing at 21.5°C.Comments

The sizing analysis indicates that no significant depreciation of cassiterite grain size has occurred in the generation of this crushed material. Only 12.6% of the mass and 11.6% of the tin occur in the minus 38 μ m fraction. It is therefore suitable for the metallurgical test work envisaged.

The head assay of 0.22% Sn is lower than anticipated. B.H.P. tests at Whyalla indicated a head grade of 0.3% Sn, and a letter from B.H.P. Hobart dated 12 Nov 1981 indicated 0.25% Sn.

Some significant results were obtained from the heavy liquid tests. No tin liberation is apparent in the plus 6.35 mm material. Liberation commences in the plus 3.18 mm fraction and progressively increases down to the plus 600 μ m fraction. This size appears to be the maximum at which a reasonably low grade tailing could be discarded.

It seems likely that liberation of gangue from cassiterite bearing material has occurred rather than liberation of much free cassiterite; had much cassiterite liberation occurred the tin content of the S/K product would have been much higher.

The grain size analysis shows that about 90 percent of the cassiterite occurs in size ranges recoverable by gravity concentration procedures. Allowing for grain size depreciation

during crushing and grinding operations, the results of this exercise indicate that a recovery of some 70 per cent could be expected, by gravity concentration, assuming that vanners would be used for material between 40 and 20 μm .

Further Exploratory Tests

A further series of experiments were undertaken, based on observations and information outlined in the previous section.

These comprised magnetic separations, gravity concentrations, and heavy liquid tests at 2.7 t/m^3 density, on ore stage roll crushed to minus 3.18 mm, and sized by wet screening on Sweco vibrating screens, to the sizes indicated in the tables of results. The Sweco products were cleaned up by hand screening to ensure accurate sizing.

Magnetic Separation of Sized Fractions.

Observations of the products obtained from the heavy liquid separations done at 2.95 t/m^3 showed that the sink products were much darker in colour than the floats. It was thought possible that this was because of a much higher iron content in the sinks and if this was so magnetic separation might prove a feasible method of pre-concentration.

The separations were done dry on a "Rapid" high intensity magnetic separator down to the plus 108 μm fraction. The minus 108 μm fraction was wet separated on a "Jones" high intensity wet magnetic separator.

The results were of little significance but are reported as a matter of interest and record.

- M/A = Magnetic product in total
- M/A1 = Highly magnetic material
- M/A2 = Feebly magnetic material
- H = Non magnetic material
- W = Jones Washings (Middling Prod)

M/S of Sized Fractions

Prod	% Mass O'all	% Sn	% Sn Dist O'all	In Individual Sizes	
				% Mass	% Sn Dist
-3.18 + 1/24 M/A N	1.2	0.29	1.45	2.7	3.7
	43.3	0.21	38.09	97.3	96.3
	44.5	0.21	39.54	100.0	100.0
-1.24 + 653µm M/A N	2.1	0.32	2.81	13.5	15.9
	13.7	0.26	14.91	86.5	84.1
	15.8	0.27	17.72	100.0	100.0
-653µm + 315 M/A N	4.5	0.28	5.28	40.9	36.3
	6.5	0.34	9.26	59.1	63.7
	11.0	0.32	14.54	100.0	100.0
-315 + 108 M/A1 M/A2 N	0.7	0.27	0.80	6.4	6.3
	1.3	0.35	1.93	12.0	15.1
	9.2	0.26	10.01	81.6	78.6
	11.2	0.27	12.74	100.0	100.0
-108µm M/A Jones W N	1.7	0.38	2.73	9.6	17.6
	4.0	0.23	3.85	22.9	24.9
	11.8	0.18	8.88	67.5	57.5
	17.5	0.21	15.46	100.0	100.0
Head Comp.	100.0	0.24	100.0		

Tabling results were generally as expected being in line with results obtained from previous work on this ore. An acceptably low grade tailing consistent with good grade and recovery in concentrate occurred in the $-315\mu\text{m} + 108\mu\text{m}$ fraction.

Results - Gravity Concentration of Sized Fractions of -18mm Ore.

-9-

Products	Overall %			In Individual Sizes	
	Mass	Sn	Sn Dist.	% Mass	% Sn Dist.
-3.18mm + 1.24mm JC	1.3	0.89	5.6	2.9	15.2
JT	43.2	0.15	31.0	97.1	84.7
Composite + 1.24mm	44.5	0.17	36.6	100.0	100.0
-1.24mm + 653µm JC	0.5	2.9	7.0	3.2	40.7
JT	15.3	0.14	10.2	96.8	59.3
Composite + 653 µm	15.8	0.23	17.2	100.0	100.0
-653 + 315µm TC	0.07	18.5	6.2	0.6	42.2
TM	0.73	0.77	2.7	6.7	18.3
TT	10.20	0.12	5.8	92.7	39.5
Composite +315µm	11.00	0.28	14.7	100.0	100.0
+315µm + 108µm TC	0.08	22.6	8.7	0.7	59.2
TM	0.58	1.10	3.0	5.2	20.4
TT	10.54	0.06	3.0	94.1	20.4
Composite + 108µm	11.20	0.28	14.7	100.0	100.0
-108µm S1 No product					
-108µm S2 TC	0.06	13.1	3.8	2.2	71.7
TM	0.23	0.55	0.6	8.6	11.3
TT	2.40	0.08	0.9	89.2	17.0
Composite S2	2.69	0.41	5.3	100.0	100.0
-108µm S3 TC	0.02	18.5	1.8	1.2	66.7
TM	0.15	0.61	0.4	8.8	14.8
TT	1.53	0.07	0.5	90.0	18.5
Composite S3	1.70	0.34	2.7	100.0	100.0

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table cont. over

Products	Overall %			In Individual Sizes	
	Mass	Sn	Sn Dist.	% Mass	# Sn Dist.
-108µm) TC	0.04	6.0	1.1	1.3	31.4
Cyclone U/F) TM	0.41	0.44	0.9	13.0	25.7
H/Size O/F) TT	2.70	0.12	1.5	85.7	42.9
Composite H/S O/F	3.15	0.23	3.5	100.0	100.0
-108µm Cyclone O/F (-10µm approx.)	9.90	0.11	5.3	Untreated	Untreated
Composite II	100.0	0.21	100.0		

Review of Results to this Stage

1. Pre-Concentration Possibilities

The heavy liquid tests show that pre-concentration can only be considered after reduction in size to minus 1.24mm. At this size H/L separation at density 2.7 t/m³ rejected as F/T 87.3% mass assaying 0.07% Sn, with a tin recovery in the S/K of 73.0% assaying 1.30% Sn. Separation at 2.95 t/m³ was not much different.

The tin content of such a F/T is on a par with total tailings produced by treatment of the whole ore by gravity concentration, as shown in the final metallurgical balance in investigation R621, and in this program also.

Closed circuit rod milling through an appropriate screen with a high circulating load would produce a maximum amount of, say, 1mm material with minimum generation of fines and is the obvious method of feed preparation for any pre-concentration process.

Processes to be considered would be:-

- A. (i) Heavy media cone separation.
(ii) Akins heavy media trough spiral
(iii) Dense medium cyclones
- B. (i) Humphries spirals.
(ii) Reichert cones
- C. Jigging.

The necessity for a relatively fine feed to any process would seem to eliminate A (i) and (ii). Dense medium cyclones may have a possible application but could only be properly assessed by suitable experiments.

It is thought that 1mm feed would be too coarse for either spirals or Reichert cones. However, grinding to 500µm should produce a suitable feed to these devices without significant adverse effects. Feed to either should be sized by some means, preferably by screening.

Carefully controlled jigging may produce an acceptable result, although results obtained so far do not encourage this line of thought.

In any case, more experimental work would be needed to properly assess these possibilities.

Magnetic separation has no application as a pre-concentration process.

2. Production of Concentrates.

The foregoing discussion refers only to the possibility of discarding most of the mass as a relatively barren tailing

The production of high grade concentrate requires grinding either the whole ore, or the concentrate from a pre-concentration process to about 600 μ m for primary gravity concentration.

Investigation R621, in which gravity concentration of -85 μ m roll crushed ore, sized by screening, was done, revealed that at this degree of size reduction, some 70% of the total gravity feed needed regrinding for secondary concentration to achieve a reasonable recovery.

It was therefore concluded in that report, that grinding the whole ore to about minus 250 μ m before sizing and concentration would be the preferred path. This applies, of course, only if pre-concentration at coarser sizes is not practical.

Larger Scale Concentration Tests

With the above background of information in mind, a larger scale test was undertaken on -3.18mm roll crushed ore. About 50 kg. of ore was continuously ground in the pilot plant 12" X 3.6" ball mill closed with a 170 μ m Sweco screen. The screen was somewhat finer than ideal, but was closest on the fine side to the 250 μ m suggested by R621 data. It is not thought that this would adversely affect the end result.

A small Denver mineral jig was included in the grinding circuit to recover relatively coarse cassiterite from the circulating load.

Screen undersize was hydraulically cycloned to produce a -5 μ m (quartz) overflow which was not further treated.

Cyclone underflow was classified in the GEC^h hydrosizer and the products separately tabled.

Middlings were reground to -75 μ m and tabled without further sizing, although some form of sizing would be desirable in commercial treatment.

The composite primary and secondary concentrates were lightly ground to about -200 μ m in a 12" X 12" batch ball mill and the small amount of sulphide present removed by cleaner froth flotation.

The flotation tailings were screened on 150 μ m, 75 μ m and 38 μ m and the sized fractions separately tabled to relatively high grade concentrates.

Table concentrates were dried and magnetically separated in individual sizes to produce M/A1 (highly magnetic) M/A2 (feebly magnetic) and N (Non magnetic- final tin concentrate).

The several M/A1's and M/A2's are not shown separately in the result table but as composite M/A1 and M/A2. The plus 75 μ m fraction contributed more than half the total M/A2 produced.

Inclusion of the M/A2 in the final concentrate enhances recovery by 3.45%, but reduces the concentrate grade from 53% Sn to 42% Sn.

50 kg Concentration Test - Tables of Results.

Primary Treatment

Product	Per Cent		
	Mass	Sn	Sn Dist.
C/L JO	0.04	14.4	2.58
S1 TC	0.41	11.7	21.45
TM	1.43	0.11	0.70
TT	7.36	0.05	1.65
S1 Comp	9.20	0.73	23.80
S2 TC	0.39	11.9	20.75
TM	1.27	0.15	0.85
TT	17.38	0.04	3.11
S2 Comp	19.04	0.29	24.71
S3 TC	0.18	19.2	15.46
TM	0.99	0.27	1.19
TT	25.44	0.06	6.82
S3 Comp	26.61	0.20	23.47
H/Sizer O/F TC	0.18	2.6	2.09
TM	1.02	0.14	0.64
TT	26.13	0.14	16.35
H/Sizer O/F Comp.	27.33	0.19	19.08
Cyclone O/F -5µm	17.78	0.08	6.36
Composite H	100.00	0.22	100.00
Composite TC	1.20	11.60	62.33
" TM	4.71	0.16	3.38
" TT	94.09	0.08	34.29
(Includes Cyclone O/F)			

Middling Retreatment
Composite Middling Stage Ground -75 μ m and Tabled

Product	Per Cent Overall			Individual % Sn Dist.
	Mass	Sn	Sn Dist.	
TO	0.08	2.6	0.95	28.1
TM	0.21	0.22	0.21	6.2
TT	4.42	0.11	2.22	65.7
Comp Primary M	4.71	0.16	3.38	100.0

Concentrate Upgrading

Make up of Feed:-

Component	Per Cent		
	Mass	Sn	Sn Dist
Comp Primary Conc.	1.20	11.6	62.33
Secondary Conc.	0.08	2.6	0.95
Comp. Crude Conc.	1.28	11.06	63.38

Treatment:-

Ball mill ground to -200 μ m, sulphide flotation, sizing, 150 μ m, 75 μ m, 38 μ m, and -38 μ m, tabling of screen fractions and dry high intensity magnetic separation of table concentrates.

Flotation Condition:-

pH 4.0 (adjustment with sulphuric acid)
Copper Sulphate: 250 g/t
Sodium Ethyl xanthate: 125 g/t
Potassium amyl xanthate: 125 g/t
MIBC as frother.

Per Cent Overall

Product	Mass	Sn	Sn Dist.
F 2 C	0.01	2.08	0.10
+150µm TT	0.03	0.48	0.06
+ 75µm "	0.34	0.71	1.03
+ 38µm "	0.39	0.62	1.04
- 38µm "	0.15	4.5	2.90
Composite TT	0.91	1.29	5.03
Composite M/A1	0.04	1.17	0.09
Composite M/A2	0.08	11.3	3.45
+150µm TCH	0.01	33.1	1.42
+ 75 " "	0.07	56.0	16.84
+ 38 " "	0.10	51.1	21.95
- 38 " "	0.06	55.5	14.30
Composite Final Conc.	0.24	52.9	54.51
Composite Conc) Including M/A2)	0.32	42.2	58.96

F 2 C (Sulphide) Analysis:

<u>Item</u>	<u>g</u>	<u>Item</u>	<u>g</u>	<u>g/t</u>
Fe	33.3	Mo	0.05	
S	16.2	As	1.1	
Sn	2.08	Bi	0.21	
Mn	0.71	Acid/Insol	20.1	
Cu	2.5	Au		73
Pb	0.66	Ag		107
Zn	1.1			

This analysis shows that pyrrhotite is the main sulphide present

Sizings of Primary Table Tailings

Size Fraction	Mass							
	S 1 %	T T % Cum	S 2 %	T T % Cum	S 3 %	T T % Cum	O/F %	T T % Cum
+180 μm	1.5	1.5	0.5	0.5	0.1	0.1		
+150 "	21.8	23.3	15.5	16.0	3.6	3.7		
+ 75 "	57.4	80.7	63.8	79.8	37.8	41.5		
+ 38 "	15.9	96.6	17.0	96.8	42.2	83.7	17.8	17.8
- 38 "	3.4	100	3.2	100	16.3	100		
0/81 "							0.2	18.0
2 "							3.6	21.6
3 "							30.1	51.7
4 "							24.1	75.8
5 "							12.1	87.9
O/F							12.1	100
Total	100.0		100.0		100.0		100.0	

Magnetic Product Assays

<u>Item</u>	<u>% in M/A1</u>	<u>% in M/A2</u>
Sn	1.17	11.3
Fe	40.0	28.3
Mn	0.23	0.05
CO ₂	1.11	0.29

Note

The CO₂ assays show that the amount of siderite present is not significant.

Comments

Tailing sizings should closely represent the sizings of the hydrosizer products from which they were generated.

The mass proportions of the hydrosizer products are: S1 - 9.20%, S2 - 19.04%, S3 - 26.61% and O/F - 27.33%.

Clearly there is much more fine material present than desirable. This could be due to

1. Overgrinding.
2. Poor screening of the circulating load. or
3. The inherent nature of the ore, i.e. a good deal of clay like bonding material in the "quartzite".

The attached mineralogical report Appx. A which deals with an examination of core from Departmental drilling of the prospect supports the view of 2 above.

An abundance of fine grained easily ground sericitic material in the ball mill feed would result in the effective loading of the mill being reduced with consequent overgrinding of the more refractory component.

The cassiterite grain size analysis would lead one to expect a somewhat higher recovery than was obtained in the test work.

Some errors are possible in the grain size analysis, stemming from the fact that a small loss of tin is inevitable in the process, and with the low head grade this may be significant in the fine sizes.

Alternatively, there may be present, a significant proportion of fractured, or bonded clusters, of cassiterite grains easily reduced to irrecoverable sizes during crushing and grinding.

*Quartzite" according to our petrologist is better named quartz wacke.

The mineralogy appears to confirm the latter view, with the detection of clusters of cassiterite grains, of individual size 5 μ m to 30 μ m, which could appear anywhere in the grain size analysis. The possibility of relatively coarse fractured grains should not be discounted either.

Further investigation concerning the crushing and grinding characteristics of the ore would be required to determine proper conditions for comminution.

Summary

1. Heavy liquid separations show that the ore must be reduced to about 1mm particle size for any pre-concentration process to be effective. Dense medium cyclones may have an application, or, at a somewhat finer size, say 500 μ m, spirals or Reichert cones could be used. There is scope for further experimentation in this area.
2. Production of high grade concentrate requires reduction initially to about 600 μ m, followed by regrinding of middling and coarse tailing, comprising some 70% of primary feed, to about 250 μ m as shown in R621.

It is thought that finer initial grinding to 250 μ m to 300 μ m, with consequent reduction in regrind requirements would be preferred. This applies either to the whole ore, or the enriched fraction from a pre-concentration step.

3. A 50 kg pilot plant concentration test resulted in production of a concentrate containing 52.9% Sn with Sn recovery of 54.51%.

The mineralogy examination suggests that the recovery figure is realistic, under the conditions of the test. It may be possible to enhance the recovery by improved grinding control.

4. The presence of high density iron minerals in the concentrate make magnetic separation an essential step to insure concentrate grade.
5. Sulphide content is low, but its removal from the concentrate is desirable because of possible sales penalties for sulphur content. In addition, analysis of F20 indicates that it may have some value also.
6. An ideal grinding procedure has not been developed; over production of fines in closed circuit ball milling is evident.

The experience of this test program would indicate closed circuit rod milling as the most suitable method of fine comminution.

7. While 53% is not a high grade for tin concentrate another approach could be to produce a 12% Sn concentrate with 62% recovery for feeding to a fuming or similar plant should such a plant be established on the West Coast.

Research Officer.....

P.L. JAMES.


(H. K. Wellington)
Chief Chemist & Metallurgist

APPENDIX AMineralogical Report on the Occurrence of Cassiterite at
Great Pyramid

Five pieces of core with high tin values from departmental drilling were examined to investigate (a) poor tin recovery and (b) excessive slime production.

The results are as follows:

- G.P.1 203.3 m. Rock is a quartzwacke - 'dirty quartzite' - with up to 25% sericitic (fine grained muscovite 5 - 10 μ) matrix and quartz fragments to 2 - 300 μ . Vein consists of coarse quartz + radiating clusters of muscovite, tourmaline and fluorite with cassiterite as semi opaque clusters of individual grains down to 5 μ in diameter but more commonly around 20 μ diameter.
- G.P.2 15.0 m. Rock is a quartzwacke, with quartz to 300 μ and a sericitic matrix up to 40% with average particle size \sim 5 μ . The vein consists of coarse comb quartz, the matrix sericite is recrystallised and somewhat coarser adjacent to the vein (10 - 15 μ) and cassiterite occurs as individual grains from 15 μ up. Haematite specks are irregularly distributed through the section.
- G.P.3 116.5 m. Rock is a quartzwacke with quartz to > 400 μ and a sericitic matrix up to 35% in amount. The average size of sericite fragments is 7 x 15 μ . Cassiterite is irregularly distributed as individual grains and clumps of grains of individual size 5 - 30 μ .
- G.P.4 18.4 m. Excessive haematite staining - difficult to make a quantitative assessment.
- 86.4 m. Rock is a metapelite with abundant fine grained sericite and < 10% quartz. Cassiterite of average diameter 15 μ is associated with quartz veins.

From these observations it is probable that the excessive slime production is a function of the considerable amount of fine grained sericite mica in the 'quartzite'. This is characteristic of the Mathinna Group metasediments (metasandstones). The low tin recovery compared with that expected from sizing may be the result of breakdown of clumps of small cassiterite grains during crushing and also a function of their rather fine grain size - i.e. a fair proportion of < 10 μ diameter. No obvious cracks were seen in the cassiterite grains examined. The thin sections are retained for any further work, if necessary.

Symbols used in metallurgical reports

Product symbols

A	Anode	L	Liquid	S/D	Solid
C	Concentrate	M	Middling	S/K	Sink
C/E	Calcine	M/A	Magnetic	S/N	Solution
D	Discharge	N	Non-magnetic	T	Tailing
E	Extract	O/F	Overflow	U/F	Underflow
F	Fraction	O/S	Oversize	U/S	Undersize
F/D	Feed	P	Precipitate	µm	Micrometre
F/T	Float	R	Residue	+	Retained on screen
G	Gas	R/E	Raffinate	-	Passed through screen
H	Head	R/X	Reflux		
K	Cathode	S	Spigot		

Operation symbols

B	Batch	H/M	Heavy Media Separation
B/M	Ball Mill	H/S	Hydrosizer
C	Cyclone or Classifier	I/S	Infrasizer
C/E	Cradle	I/X	Ion Exchange
C/H	Crush	J	Jig
C/L	Column	L	Leach
C/N	Continuous	L/L	Liquid/Liquid Extraction
C/S	Cyclosizer	M	Mixer
C/R	Condenser	M/S	Magnetic Separation
D	Tilting Deck or Strake	P	Panning
D/N	Distillation	P/N	Precipitation
D/R	Dryer	R	Roasting
E	Electrostatic Separation	R/M	Rod Mill
E/F	Elutriation Fraction	S	Screening or Sieving
E/S	Electrolysis	S/B	Stamp Battery
F	Flotation	S/L	Spiral, Reichart Cone
F/C	Filter or Centrifuge	T	Table
G	Grind	T/H	Thickener
H/L	Heavy Liquid Separation	V	Vanner

Chemical symbols

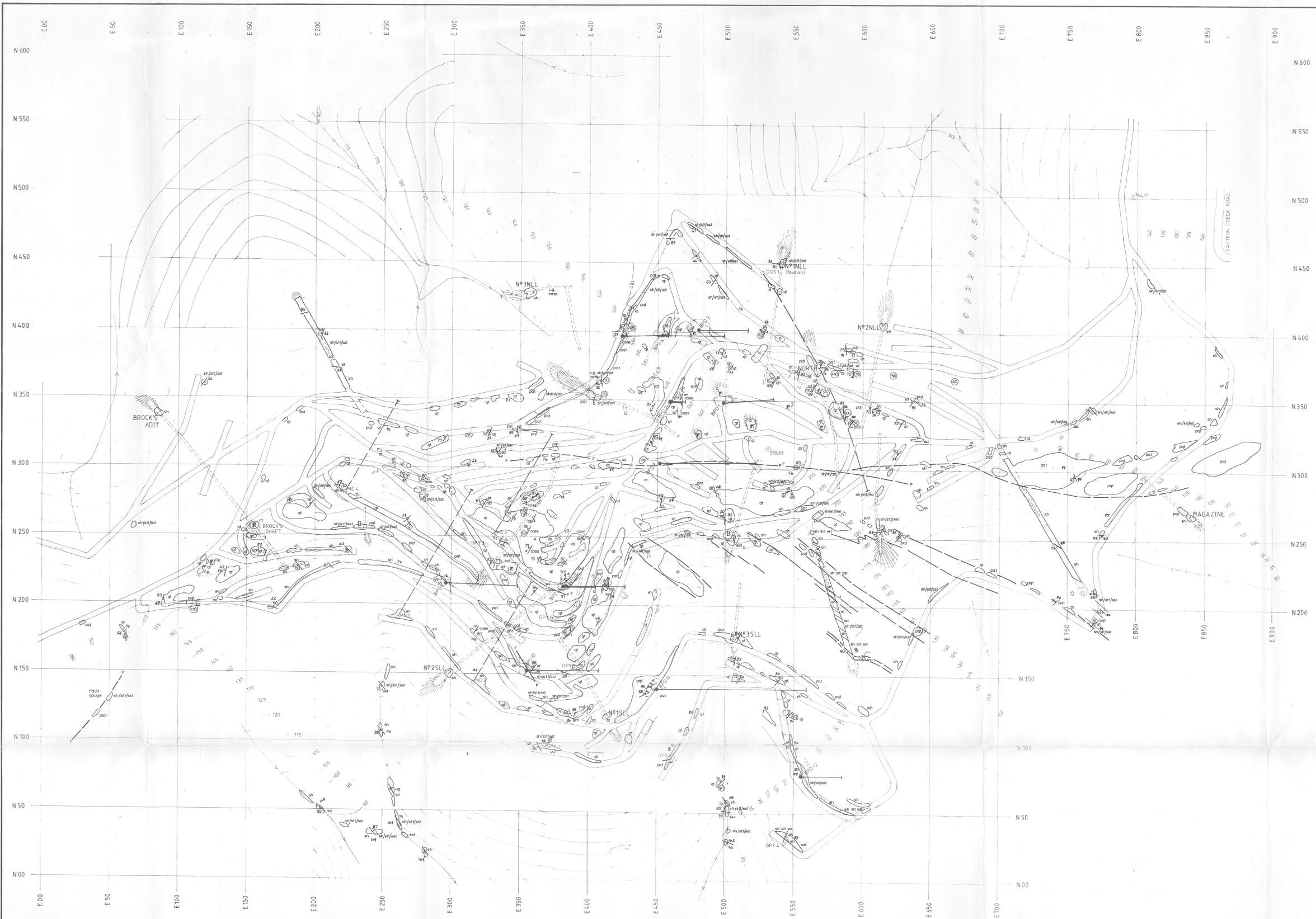
The normal chemical symbols for the elements and formulae for compounds are used, with the addition of the following:

C.Sn	Cassiterite Tin
S.Sn	Acid soluble tin (Stannite Tin)
T.Sn (or Sn)	Total tin (C.Sn + S.Sn)
S.Fe	Acid (HCl) Soluble iron
T.Fe (or Fe)	Total Iron

Use of symbols

- (1) Where there are a number of products from the one operation, e.g. magnetic products, spigot products, these are distinguished by numbers, E.G. M/A1, M/A2, M/A3, S3, S4 etc.
- (2) Where a flowsheet employs a number of processes number from beginning each process. For example a process with following steps, sizing, tabling and magnetic separation would be S-1, T-2, M/S-3.
- (3) Products from operations are described by compounding operation and product symbols thus: F4C, C/S4 means the cyclosizer fraction 4 from the concentrate made in flotation stage 4.

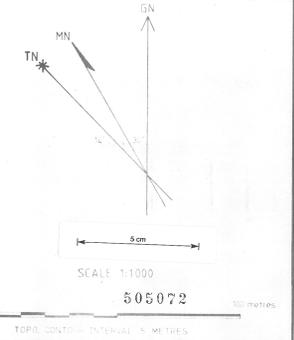
Note: Research projects are given a number prefixed with R, e.g. R.606. The tests done in the project are numbered N1, N2 etc.



LEGEND

- ADIT WITH WINZ
- SHAFT WITH DUMP
- WORKINGS, PITS, TRENCHES, ETC.
- DIAMOND DRILL HOLE
- GPY - ABERFOYLE, VERTICAL
- ND - MINES DEPT. GP DEPRESSION
- D.D.S. - 28/11/1985 / 4' GP DEPRESSION
- DD HOLE, COLLAR NOT LOCATED
- TRACK
- CREEK
- CLIFF
- STAR SPIKE IN CONCRETE TBM WITH HEIGHT
- BEDDING
- CLEAVAGE
- FAULT

- sh SHALE
- shh PREDOMINANTLY SHALE (>50% SHALE)
- sh/shs MIXED LITHOLOGIES
- qt PREDOMINANTLY QUARTZITE (<50% qt)
- qt QUARTZITE
- st SANDSTONE
- fr FRACTURE INTENSITY
- 50 FIELD NUMBER
- ca CASSITERITE
- fp FINE GRAINED
- cp COARSE GRAINED
- ol OLIGERITE
- wo WOLFRAMITE



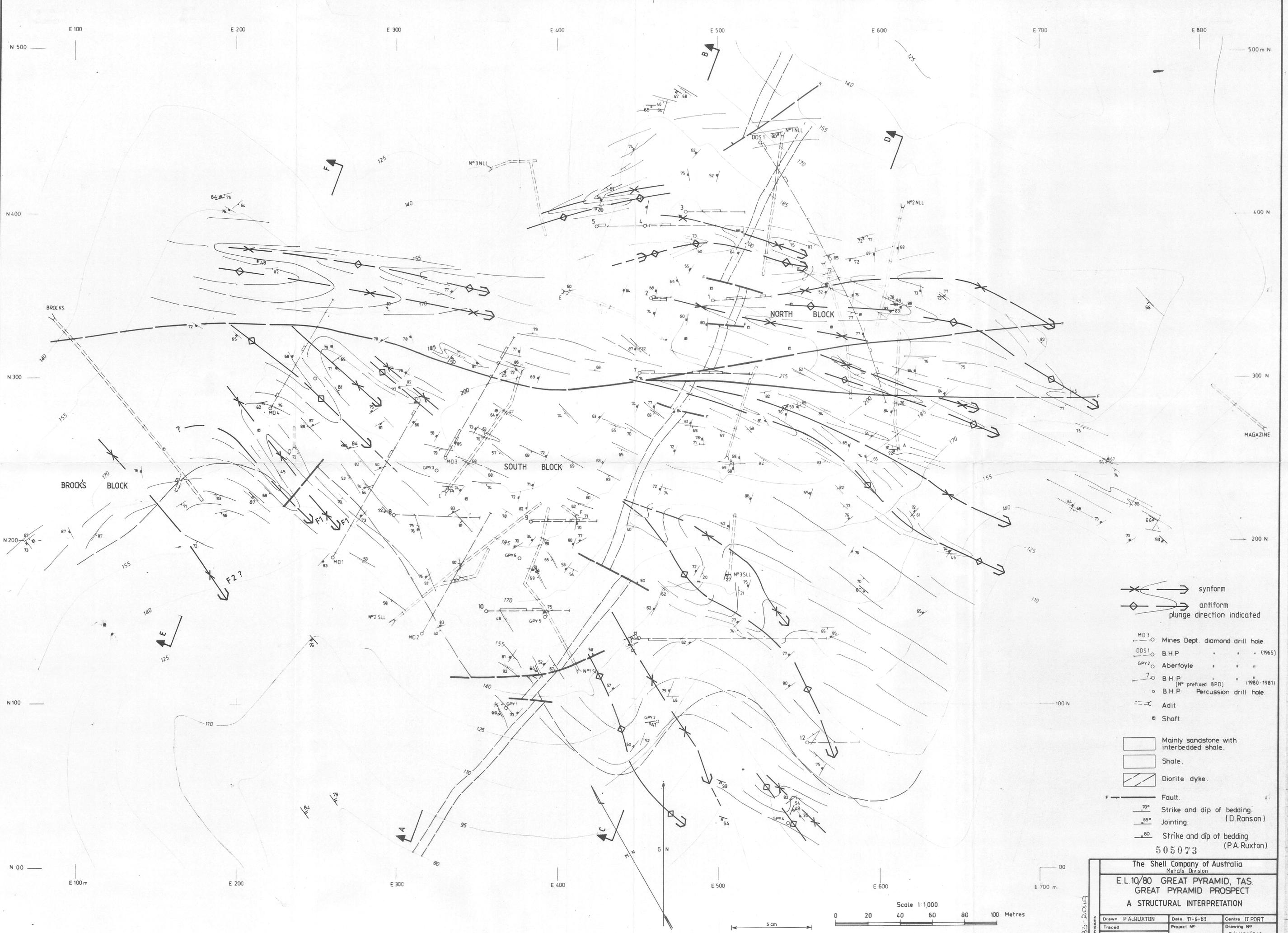
[Levels are in revised State datum. The datum has been transferred from Sydney Trig. Station (S.T. 665) to PCP 1 (refer Forestry Commission map 6041-00) by the Forestry Commission, and from PCP 1 to this site by Peacock, Davey and Anderson (refer Surveyor's notes map 81411).

**The Shell Company of Australia
Metals Division**

EL 10/80 GREAT PYRAMID PROSPECT, NE TASMANIA.
GEOLOGICAL MAP (P. A. RUXTON)

83-2049

Drawn	PAR	Date	11-7-83
Traced	JLL	Project No.	
Checked		Drawing No.	D/LH01/538
D.T.C.			

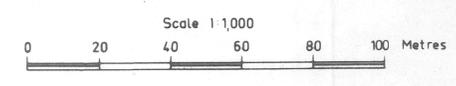


- synform
- antiform
- plunge direction indicated
- MD 3 Mines Dept. diamond drill hole
- DDS1 B.H.P. " " (1965)
- GPV2 Aberfoyle " " "
- 7 B.H.P. (N° prefixed BPD) " " (1980-1981)
- B.H.P. Percussion drill hole
- Adit
- Shaft
- Mainly sandstone with interbedded shale.
- Shale.
- Diorite dyke.
- Fault.
- 70° Strike and dip of bedding. (D.Ranson)
- 65° Jointing.
- 60° Strike and dip of bedding (P.A.Ruxton) 505073

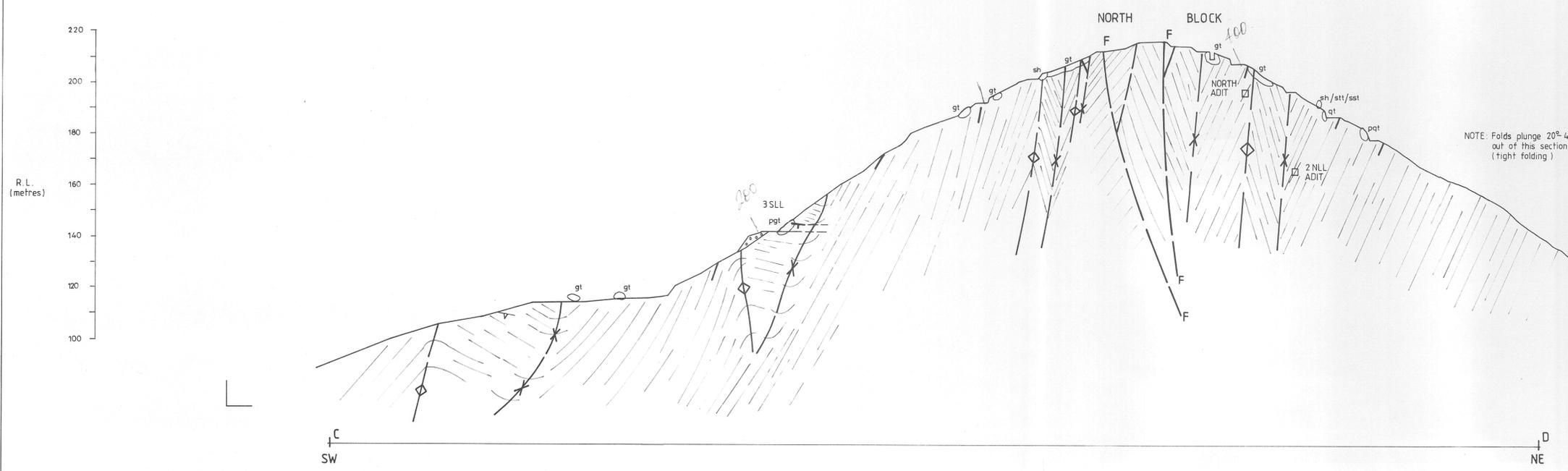
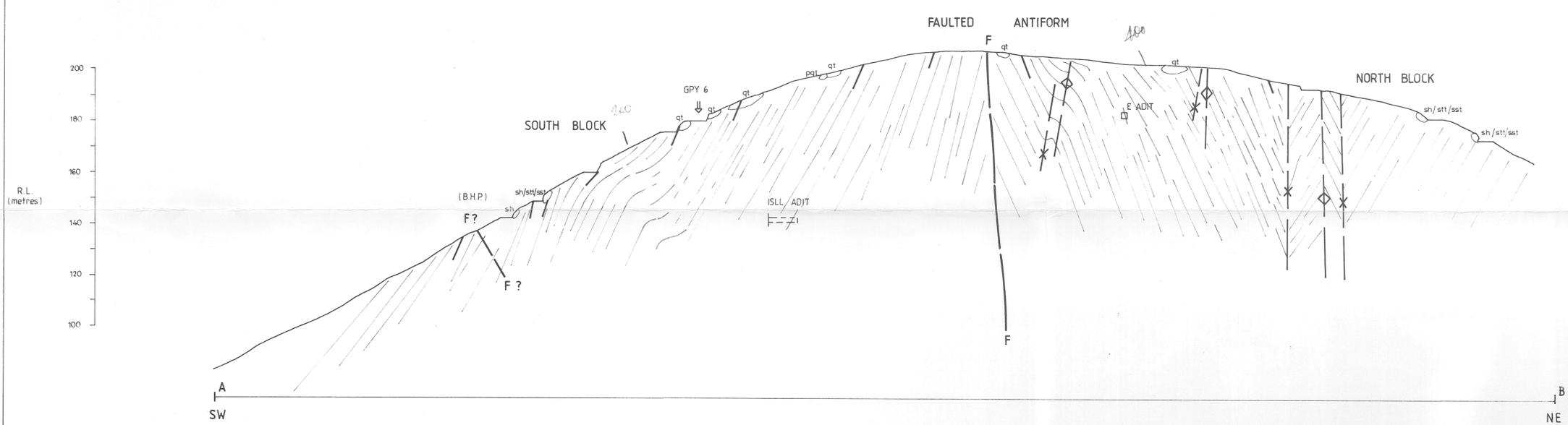
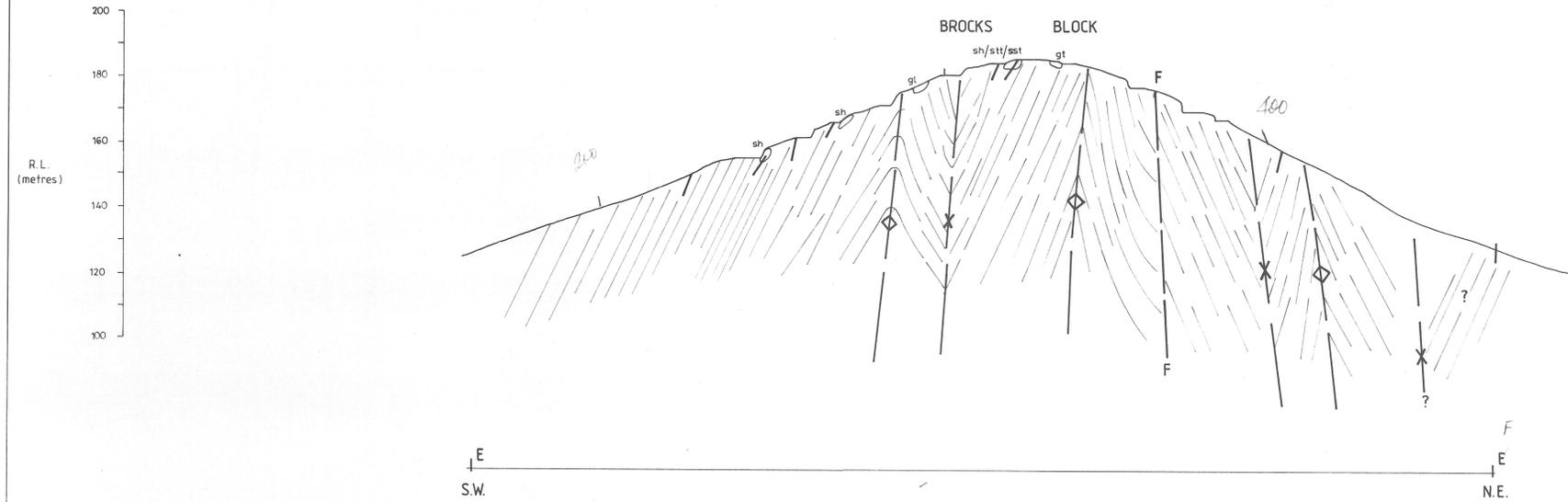
The Shell Company of Australia
Metals Division

E.L.10/80 GREAT PYRAMID, TAS.
GREAT PYRAMID PROSPECT
A STRUCTURAL INTERPRETATION

Drawn P.A.:RUXTON	Date 17-6-83	Centre D'PORT
Traced	Project No	Drawing No
Checked		D/LH01/540



S3-2042



- LEGEND**
- qt > 90% Quartzite/Sandstone
 - pat > 50% < 90% Quartzite/Sandstone
 - sh/stt/sst Intercalated shales/siltstones/sandstones
 - sh > 50% Shales
 - ◇ Antiform
 - ✕ Synform
 - F Fault

NOTE: Folds plunge 20°-40° out of this section (tight folding)



505074 0 10 20 30 40 50 m

The Shell Company of Australia Limited METALS DIVISION			
E.L. 10/80 GREAT PYRAMID PYRAMID HILL CROSS SECTIONS - INTERPRETIVE			
S3-2049			
SCALE	1:1000	DATE	27-7-83
AUTHOR	P.A.R.	DRAWN	J.L.L.
OFFICE	DEVONPORT	REP. No.	
ENCL No.		DRG No.	D/LH01/539



3000
1000 Sn contours - ppm

95 Fracture / metre contour

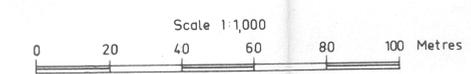
- MD 3 Mines Dept. diamond drill hole
- DDS 1 B.H.P. " " (1965)
- GPY 2 Aberfoyle " " "
- 7 B.H.P. [NP prefixed BPD] " (1980-1981)
- o B.H.P. Percussion drill hole
- Adit
- Shaft

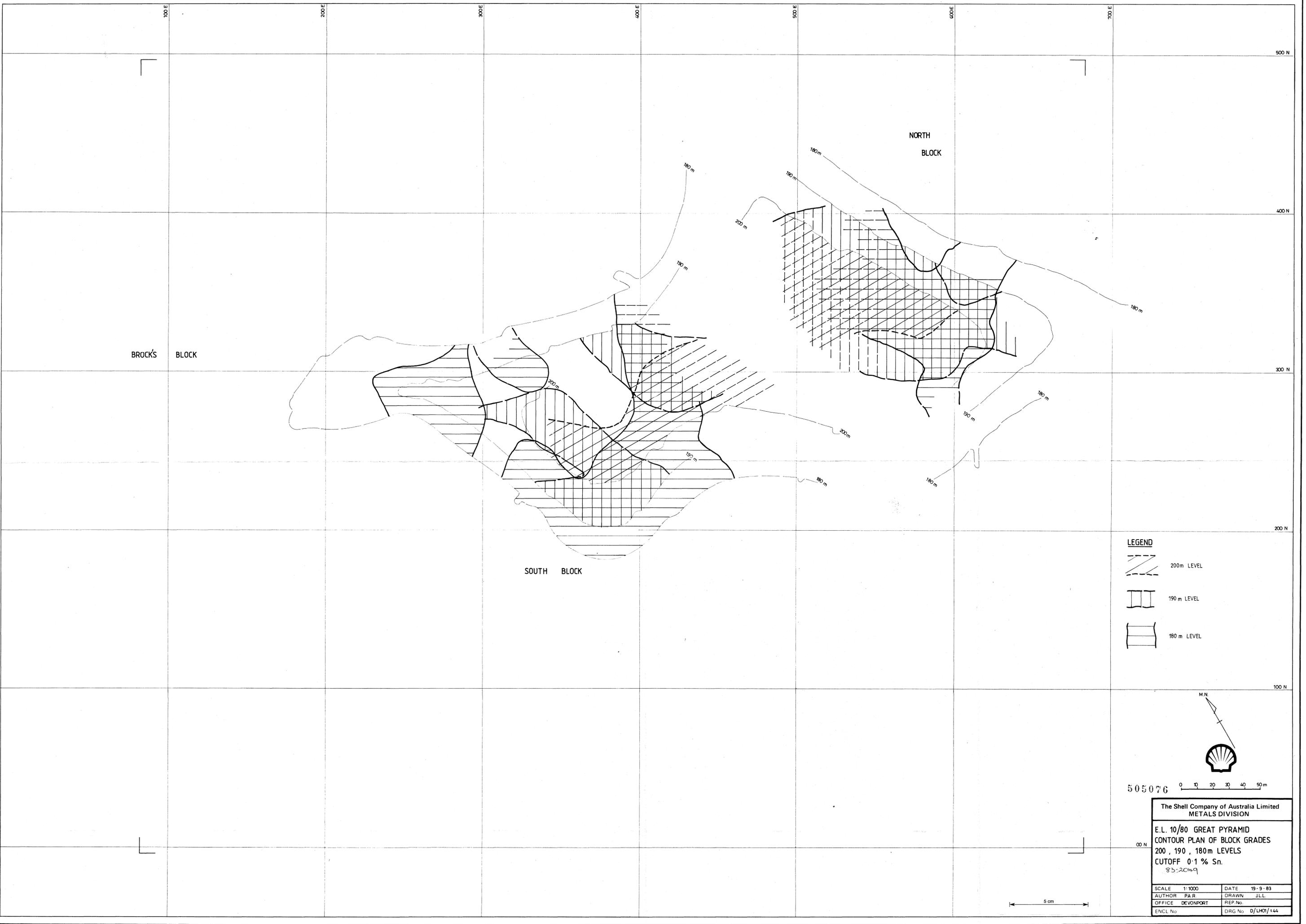
- Mainly sandstone with interbedded shale. (locally silicified)
- Shale.
- Diorite dyke.

- F Fault, with dip direction
- 70° Strike and dip of bedding.
- 65° Jointing.
- Boundary of >0.1% Tin Mineralization

505075

THE BROKEN HILL PROPRIETARY CO. LTD EXPLORATION DEPARTMENT		
E.L.10/80 GREAT PYRAMID, TAS. GREAT PYRAMID PROSPECT		
Fracture intensity & Sn Geochemistry.		
Drawn	Date	Centre
Traced	Project No	Drawing No
Checked		A1-10/80-6D





BROCK'S BLOCK

NORTH BLOCK

SOUTH BLOCK

LEGEND

-  200m LEVEL
-  190m LEVEL
-  180m LEVEL



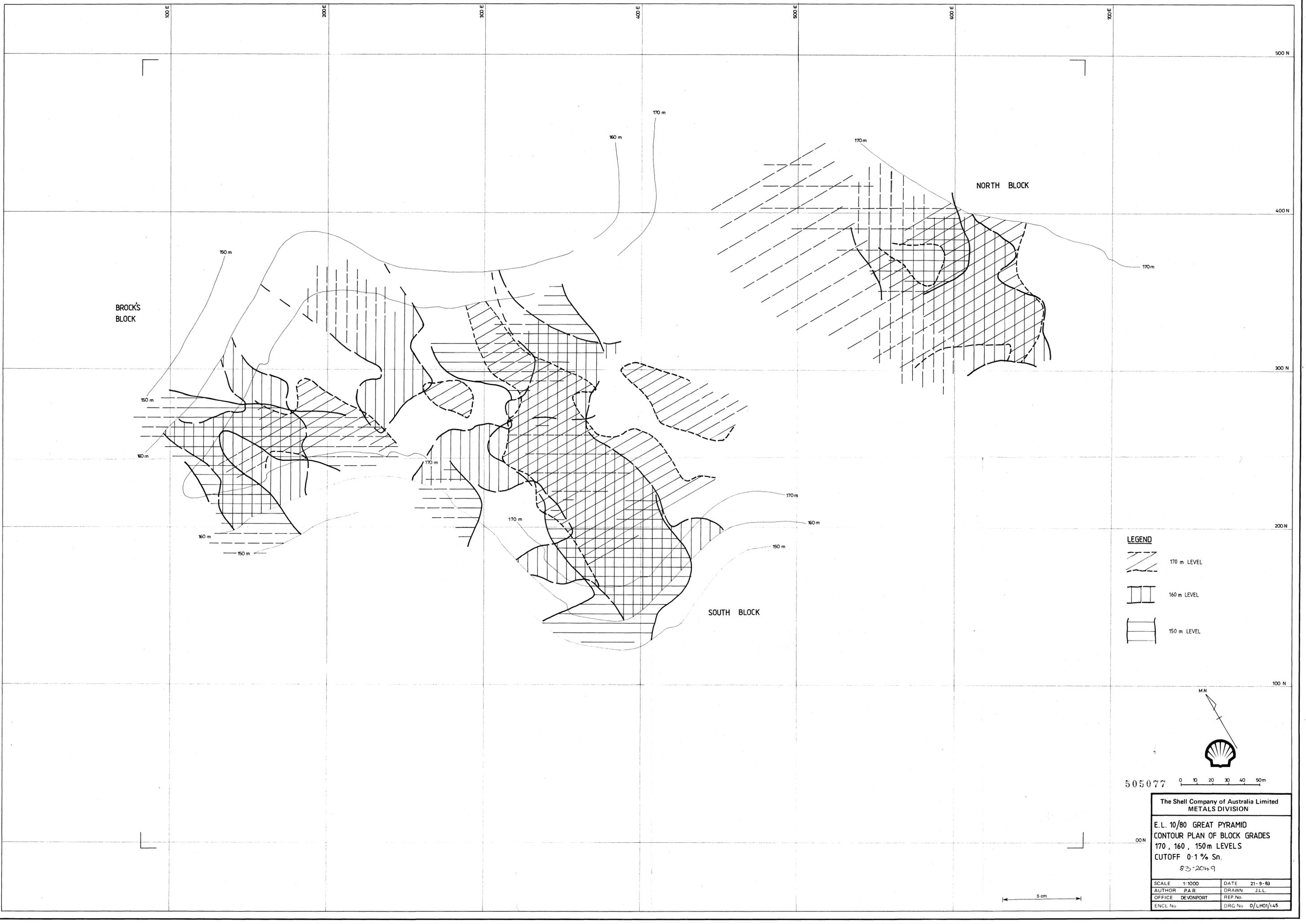
505076 0 10 20 30 40 50m

The Shell Company of Australia Limited
METALS DIVISION

E.L. 10/80 GREAT PYRAMID
CONTOUR PLAN OF BLOCK GRADES
200, 190, 180m LEVELS
CUTOFF 0.1% Sn.
83-2049

SCALE	1:1000	DATE	19-9-83
AUTHOR	PAR	DRAWN	JLL
OFFICE	DEVONPORT	REP.No.	
ENCL No.		DRG No.	D/LH01/144

5 cm



BROCK'S
BLOCK

NORTH BLOCK

SOUTH BLOCK

LEGEND

-  170 m LEVEL
-  160 m LEVEL
-  150 m LEVEL



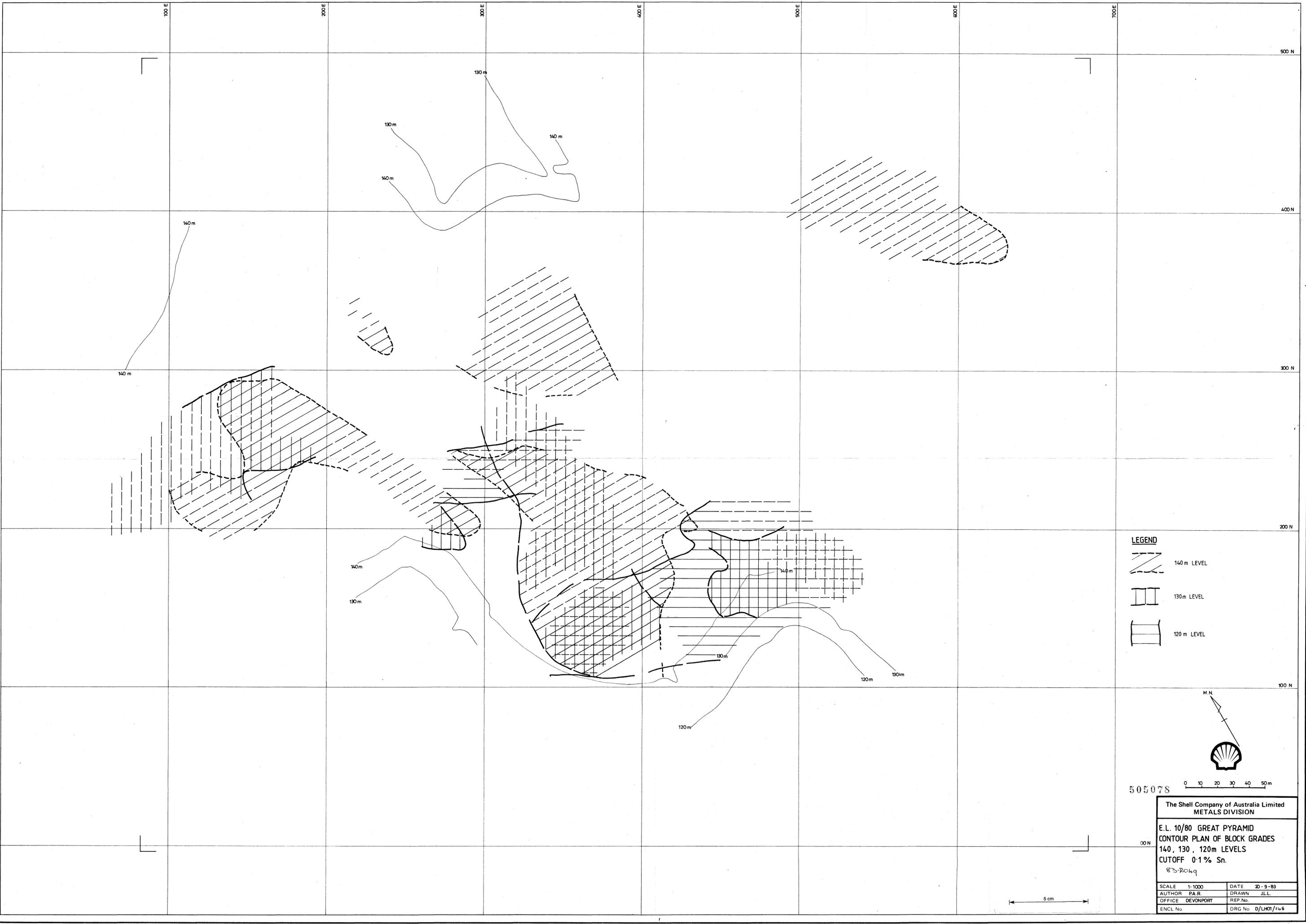
505077 0 10 20 30 40 50m

The Shell Company of Australia Limited
METALS DIVISION

E.L. 10/80 GREAT PYRAMID
CONTOUR PLAN OF BLOCK GRADES
170, 160, 150 m LEVELS
CUTOFF 0.1% Sn.
83-2049

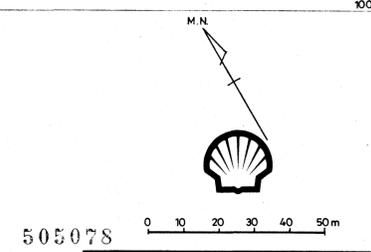
SCALE 1:1000	DATE 21-9-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE DEVONPORT	REP No.
ENCL No.	DRG No. D/LH01/145

5 cm



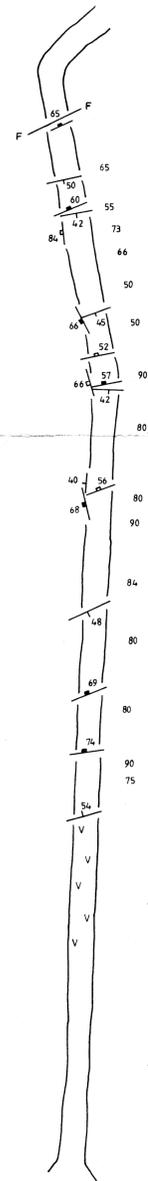
LEGEND

-  140m LEVEL
-  130m LEVEL
-  120m LEVEL

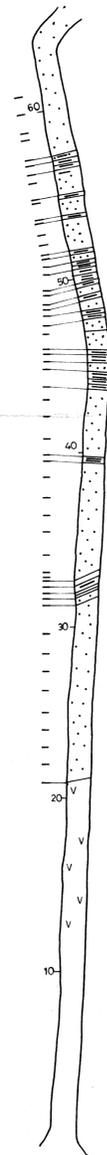


The Shell Company of Australia Limited METALS DIVISION	
E.L. 10/80 GREAT PYRAMID CONTOUR PLAN OF BLOCK GRADES 140, 130, 120m LEVELS CUTOFF 0.1% Sn. 832049	
SCALE 1:1000	DATE 20-9-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE DEVONPORT	REP No.
ENCL No.	DRG No D/LM01/146

STRUCTURAL PLAN



LITHOLOGICAL PLAN

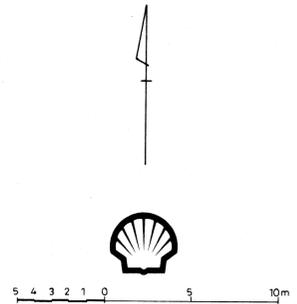


WEST WALL CROSS SECTION



LEGEND

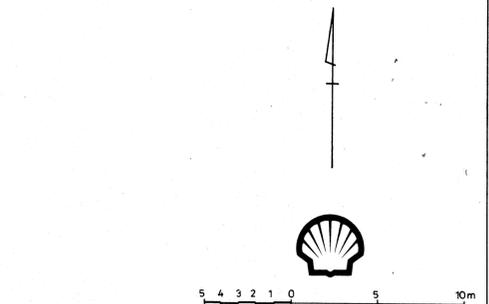
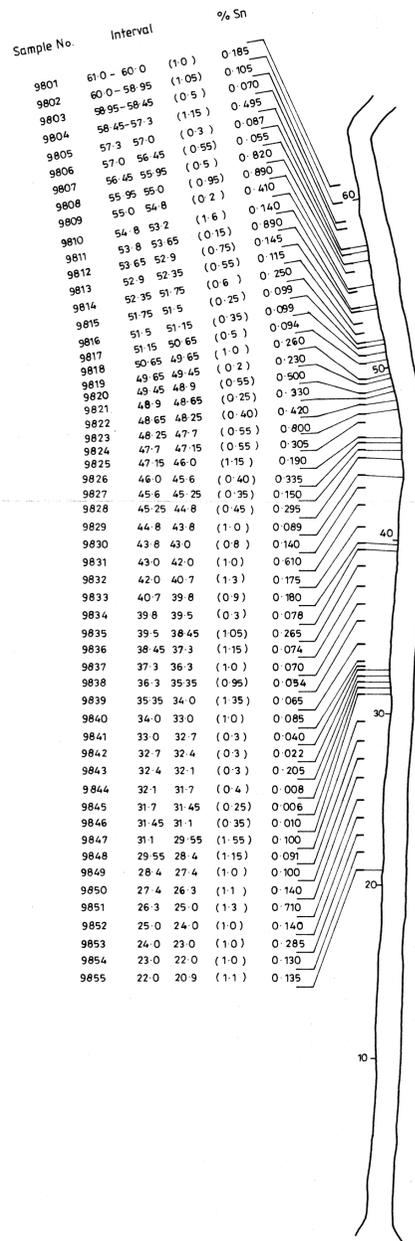
-  SANDSTONES
-  SILTSTONES
-  SHALES
-  BEDDING
-  CLEAVAGE
-  MINERALIZED FRACTURES
-  JOINTS
-  FAULTS



505079

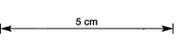
The Shell Company of Australia Limited METALS DIVISION	
E.L. 10/80 GREAT PYRAMID PYRAMID HILL 1 SLL ADIT	
83-2049	
SCALE 1:200	DATE 29-6-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE DEVONPORT	REP No.
ENCL No.	DRG No. D/LH01/533



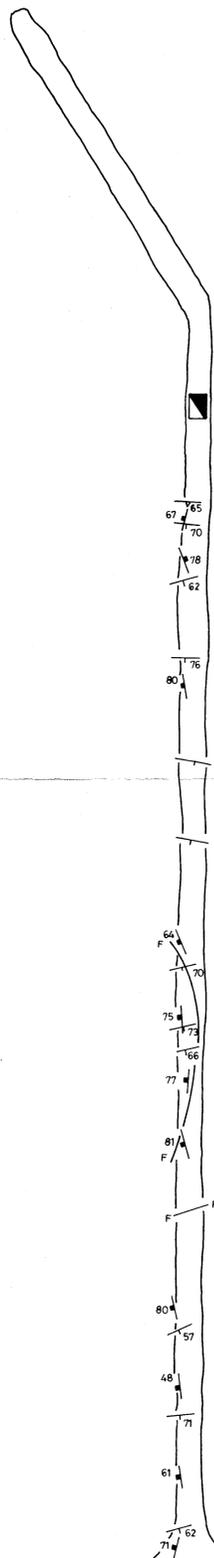


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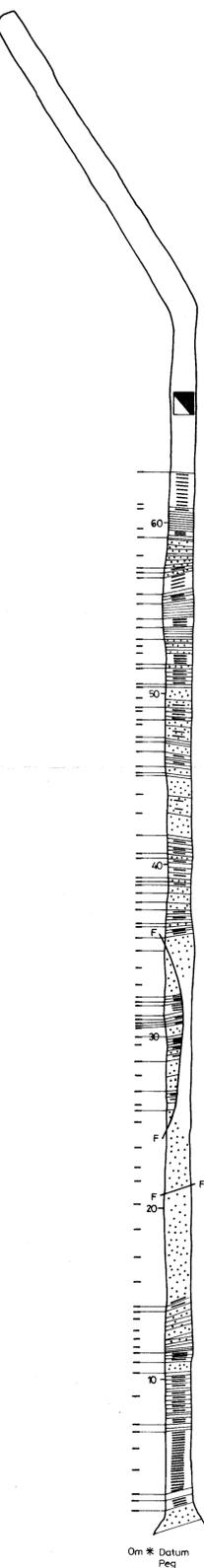
The Shell Company of Australia Limited METALS DIVISION	
E.L. 10/80 GREAT PYRAMID PYRAMID HILL 1 SLL ADIT ASSAY DATA	
83-2CH9	
SCALE 1:200	DATE 29-6-83
AUTHOR P.A.R	DRAWN J.L.L.
OFFICE DEVONPORT	REF.No.
ENCL No	DRG No. D/LH01/534



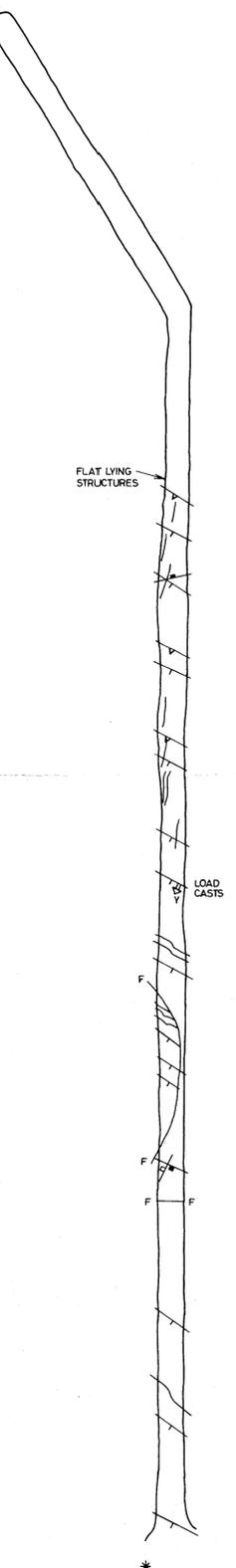
STRUCTURAL PLAN



LITHOLOGICAL PLAN

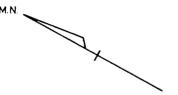


WEST WALL - CROSS SECTION



LEGEND

- SANDSTONES
- SILTSTONES
- SHALES
- BEDDING
- CLEAVAGE
- MINERALIZED FRACTURES
- JOINTS
- FAULTS
- YOUNGING DIRECTION



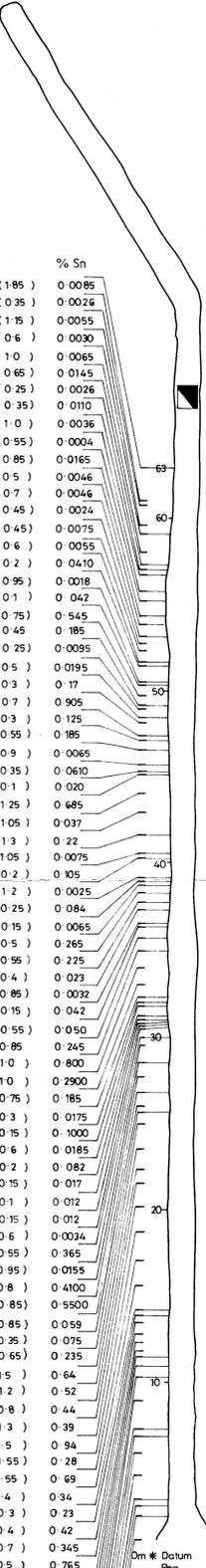
505081



The Shell Company of Australia Limited METALS DIVISION	
E.L. 10/80 GREAT PYRAMID PYRAMID HILL C ADIT	
82-2049	
SCALE 1:200	DATE 15-6-83
AUTHOR P.A.R	DRAWN J.L.L.
OFFICE DEVONPORT	REP. No.
ENCL No	DRG No D/LHO/531



Sample No.	Interval	% Sn
9901	63.0 - 61.15 (1.85)	0.0085
9902	61.15 - 60.8 (0.35)	0.0026
9903	60.8 - 59.65 (1.15)	0.0055
9904	59.65 - 59.05 (0.6)	0.0030
9905	59.05 - 58.05 (1.0)	0.0065
9906	58.05 - 57.4 (0.65)	0.0145
9907	57.4 - 57.15 (0.25)	0.0026
9908	57.15 - 56.8 (0.35)	0.0110
9909	56.8 - 55.8 (1.0)	0.0036
9910	55.8 - 55.25 (0.55)	0.0004
9911	55.25 - 54.4 (0.85)	0.0165
9912	54.4 - 53.9 (0.5)	0.0046
9913	53.9 - 53.2 (0.7)	0.0046
9914	53.2 - 52.75 (0.45)	0.0024
9915	52.75 - 52.3 (0.45)	0.0075
9916	52.3 - 51.7 (0.6)	0.0055
9917	51.7 - 51.5 (0.2)	0.0410
9918	51.5 - 50.55 (0.95)	0.0018
9919	50.55 - 50.45 (0.1)	0.042
9920	50.45 - 49.7 (0.75)	0.545
9921	49.7 - 49.25 (0.45)	0.185
9922	49.25 - 49.0 (0.25)	0.0095
9923	49.0 - 48.5 (0.5)	0.0195
9924	48.5 - 48.2 (0.3)	0.17
9925	48.2 - 47.5 (0.7)	0.905
9926	47.5 - 47.2 (0.3)	0.125
9927	47.2 - 46.65 (0.55)	0.185
9928	46.65 - 45.75 (0.9)	0.0065
9929	45.75 - 45.4 (0.35)	0.0610
9930	45.4 - 45.3 (0.1)	0.020
9931	45.3 - 44.05 (1.25)	0.685
9932	44.05 - 43.0 (1.05)	0.037
9933	43.0 - 41.7 (1.3)	0.22
9934	41.7 - 40.65 (1.05)	0.0075
9935	40.65 - 40.45 (0.2)	0.105
9936	40.45 - 39.25 (1.2)	0.0025
9937	39.25 - 39.0 (0.25)	0.084
9938	39.0 - 38.85 (0.15)	0.0065
9939	38.85 - 38.35 (0.5)	0.265
9940	38.35 - 37.8 (0.55)	0.225
9941	37.8 - 37.4 (0.4)	0.023
9942	37.4 - 36.55 (0.85)	0.0032
9943	36.55 - 36.4 (0.15)	0.042
9944	36.4 - 35.85 (0.55)	0.050
9945	35.85 - 35.0 (0.85)	0.245
9946	35.0 - 34.0 (1.0)	0.800
9947	34.0 - 33.0 (1.0)	0.2900
9948	33.0 - 32.25 (0.75)	0.185
9949	32.25 - 31.95 (0.3)	0.0175
9950	31.95 - 31.8 (0.15)	0.1000
9951	31.8 - 31.2 (0.6)	0.0185
9952	31.2 - 31.0 (0.2)	0.082
9953	31.0 - 30.85 (0.15)	0.017
9954	30.85 - 30.75 (0.1)	0.012
9955	30.75 - 30.6 (0.15)	0.012
9956	30.6 - 30.0 (0.6)	0.0034
9957	30.0 - 29.45 (0.55)	0.365
9958	29.45 - 28.45 (1.0)	0.0155
9959	28.5 - 27.7 (0.8)	0.4100
9960	27.7 - 26.85 (0.85)	0.5500
9961	26.85 - 26.0 (0.85)	0.059
9962	26.0 - 25.65 (0.35)	0.075
9963	25.65 - 25.00 (0.65)	0.235
9964	25.0 - 23.5 (1.5)	0.64
9965	23.5 - 22.3 (1.2)	0.52
9966	22.3 - 21.5 (0.8)	0.44
9967	21.5 - 20.2 (1.3)	0.39
9968	20.2 - 18.7 (1.5)	0.94
9969	18.7 - 17.15 (1.55)	0.28
9970	17.15 - 15.6 (1.55)	0.69
9971	15.6 - 14.2 (1.4)	0.34
9972	14.2 - 13.9 (0.3)	0.23
9973	13.9 - 13.5 (0.4)	0.42
9974	13.5 - 12.8 (0.7)	0.345
9975	12.8 - 12.3 (0.5)	0.765
9976	12.3 - 11.85 (0.45)	0.255
9977	11.85 - 11.5 (0.35)	0.063
9978	11.5 - 11.0 (0.5)	0.075
9979	11.0 - 10.3 (0.7)	0.115
9980	10.3 - 9.0 (1.3)	0.064
9981	9.0 - 7.4 (1.6)	0.27
9982	7.4 - 6.9 (0.5)	0.185
9983	6.9 - 6.0 (0.9)	0.038
9984	6.0 - 4.7 (1.3)	0.028
9985	4.7 - 3.25 (1.45)	0.045
9986	3.25 - 2.9 (0.35)	0.32
9987	2.9 - 2.3 (0.6)	0.13
9988	2.3 - 1.0 (1.3)	0.50



505082

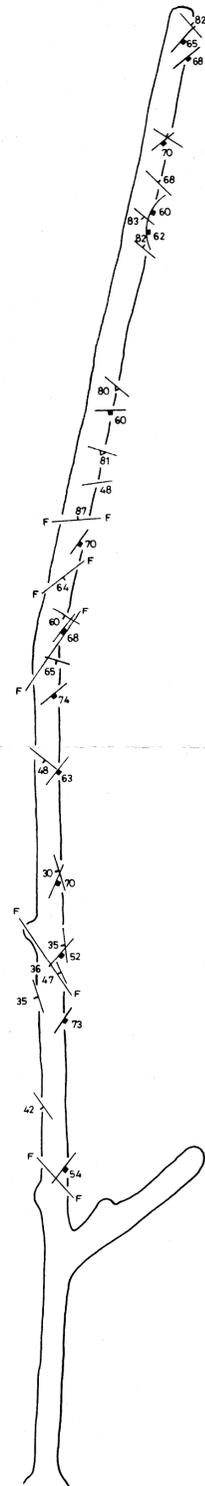


The Shell Company of Australia Limited METALS DIVISION	
E.L. 10/80 GREAT PYRAMID PYRAMID HILL C ADIT ASSAY DATA	
SCALE 1:200	DATE 28-6-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE DEVONPORT	REP.No.
ENCL No.	DRG No D/LH01/532

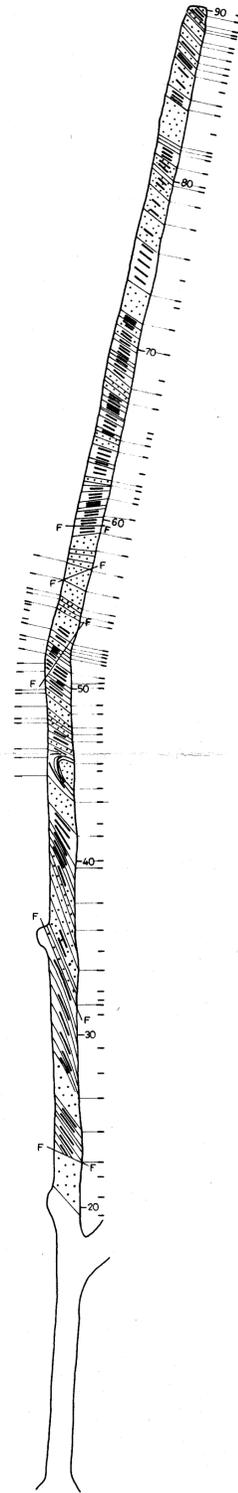


32-2049

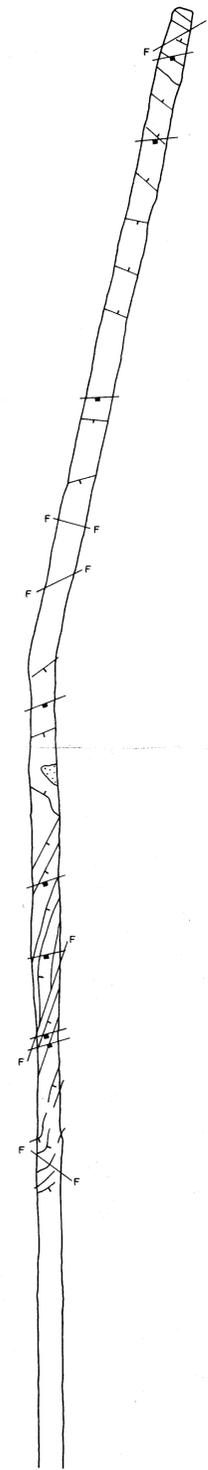
STRUCTURAL PLAN



LITHOLOGICAL PLAN

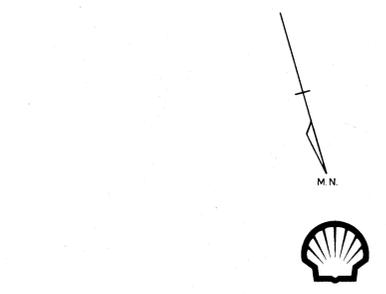


WEST WALL - CROSS SECTION



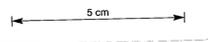
LEGEND

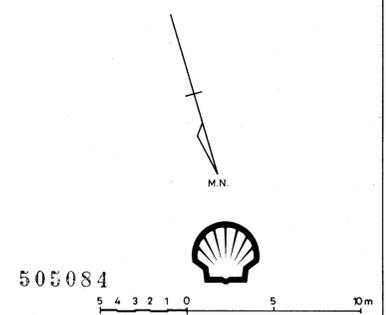
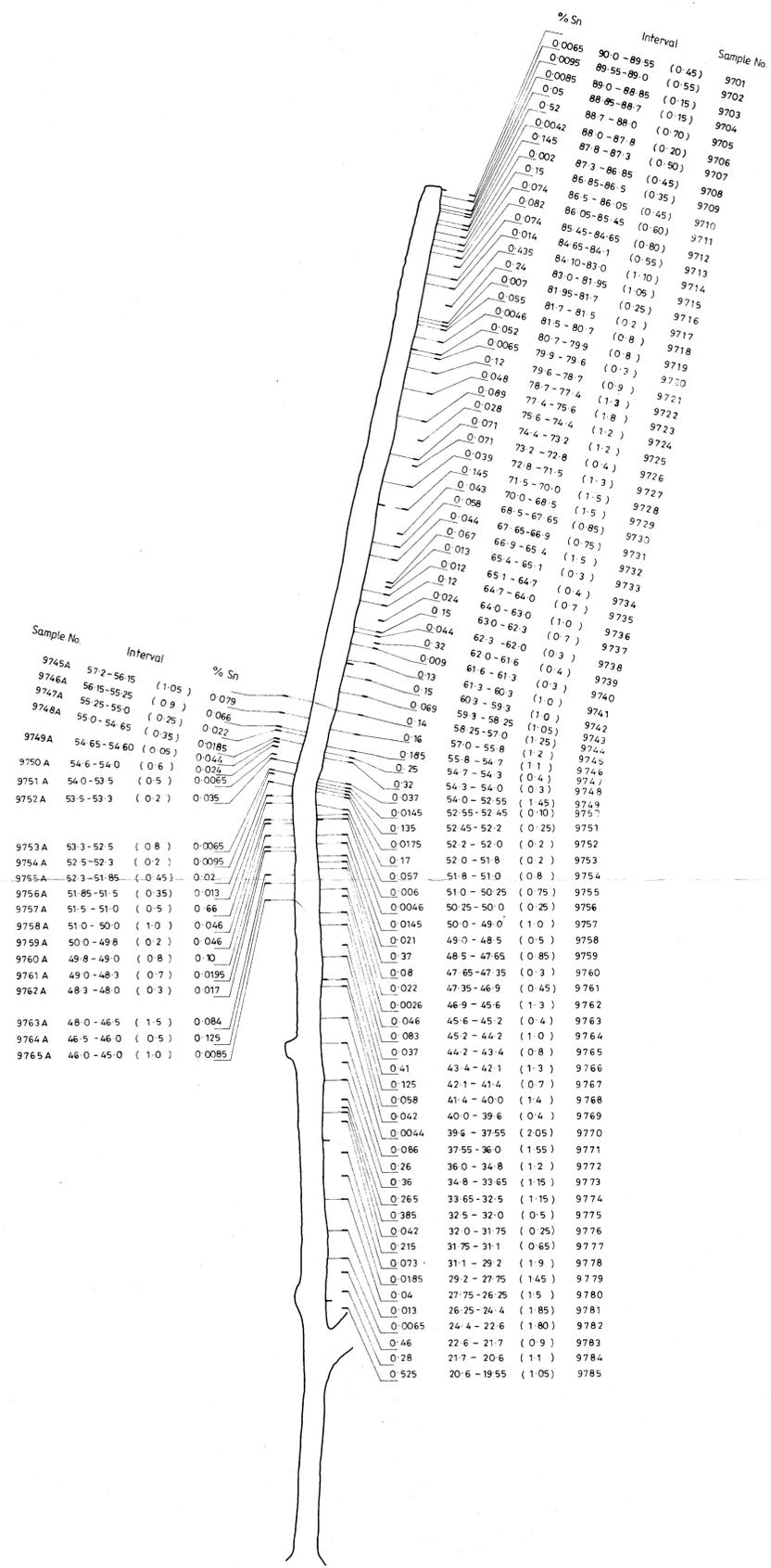
-  SANDSTONES
-  SILTSTONES
-  SHALES
-  BEDDING
-  CLEAVAGE
-  MINERALIZED FRACTURES
-  JOINTS
-  FAULTS



505083

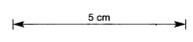
The Shell Company of Australia Limited METALS DIVISION	
E.L. 10/80 GREAT PYRAMID PYRAMID HILL NORTH ADIT	
83-2049	
SCALE 1:200	DATE 15-6-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE DEVONPORT	REP No.
ENCL No.	DRG No. 0/LH01/502





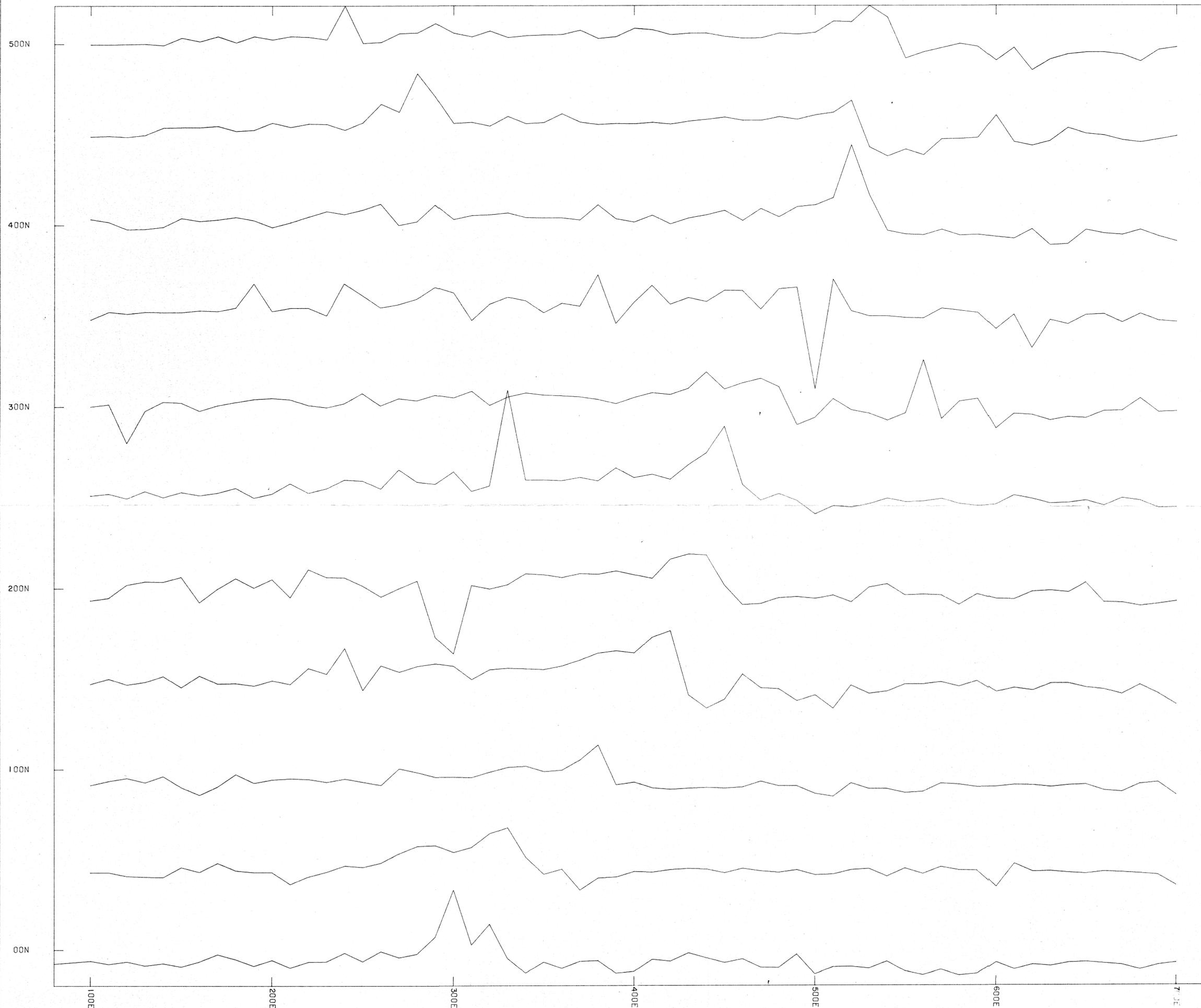
505084

The Shell Company of Australia Limited METALS DIVISION	
E.L. 10/80 GREAT PYRAMID PYRAMID HILL NORTH ADIT ASSAY DATA	
83-2049	
SCALE 1:200	DATE 15-6-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE DEVONPORT	REP. No.
ENCL. No.	DRG. No. D/LH01/503



PROGRAM STACKPLOT
 STACKED PROFILE PLOT

PROCESSED ON: FRI. JUL 15 1983
 BEGINNING AT: 10:41:38
 READING SCALE: 50.00 NT/CM
 DATUM OF 61900.0 NT SUBTRACTED



505085

SHELL COMPANY OF AUSTRALIA METALS DIVISION	
GREAT PYRAMID TASMANIA	
RAW GROUND MAGNETIC PROFILES	
SCALE 1 : 1000	
FIG. NO: 1	REPT. NO:
ENCL. NO:	DRG. NO: LH01/1005
DATE: 7/83	AUTHOR: NH
DRAWN:	OFFICE: AHO

5 cm

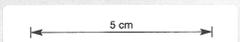


505086

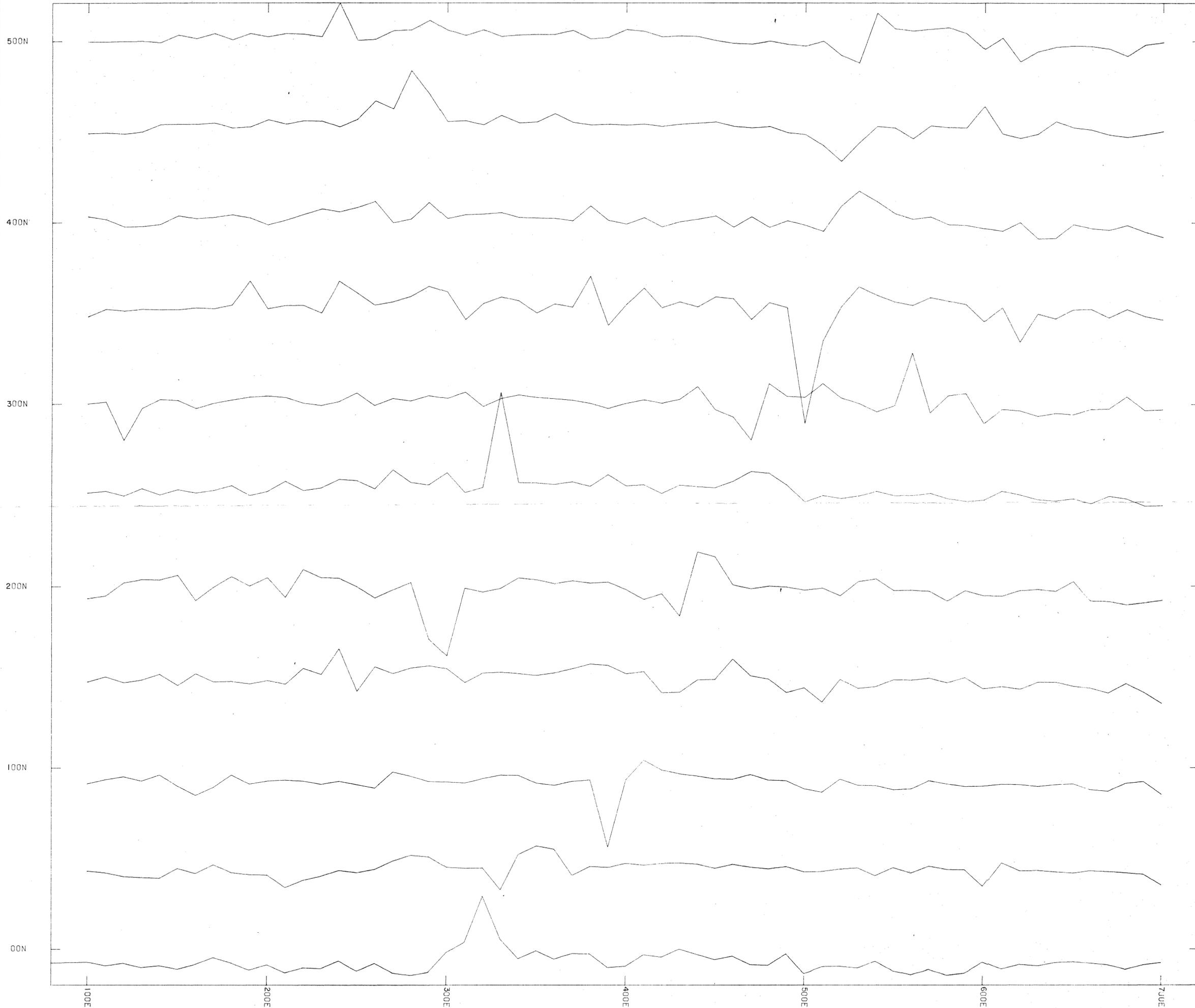
SHELL COMPANY OF AUSTRALIA,
 METALS DIVISION
 GREAT PYRAMID
 TASMANIA
 RAW GROUND MAGNETIC CONTOURS
 C.T. 20 NT

SCALE: 1 : 1000.

FIG. NO: 2	REPT. NO:
ENCL. NO:	DRG. NO: LHOI/1006
DATE: 7/83	AUTHOR: NH
DRAWN:	OFFICE: AHO



83-2049



PROGRAM STACKPLOT
 STACKED PROFILE PLOT

PROCESSED ON: FRI, JUL 15 1983
 BEGINNING AT: 11:04:10
 READING SCALE: 50.00 NT/CM
 DATUM OF 61900.0 NT SUBTRACTED

NB. Dyke effect removed after modelling
 typical dyke:
 thickness = 10 m
 depth = 5 m
 K = 0.0015 cgs



505087

SHELL COMPANY OF AUSTRALIA METALS DIVISION	
GREAT PYRAMID TASMANIA	
GROUND MAGNETIC PROFILES DYKE REMOVED	
SCALE 1 : 1000	
FIG. NO: 3	REPT. NO:
ENCL. NO:	DRG. NO: LHOI/1007
DATE: 7/83	AUTHOR: NH
DRAWN:	OFFICE: AHO

64102-28

5 cm



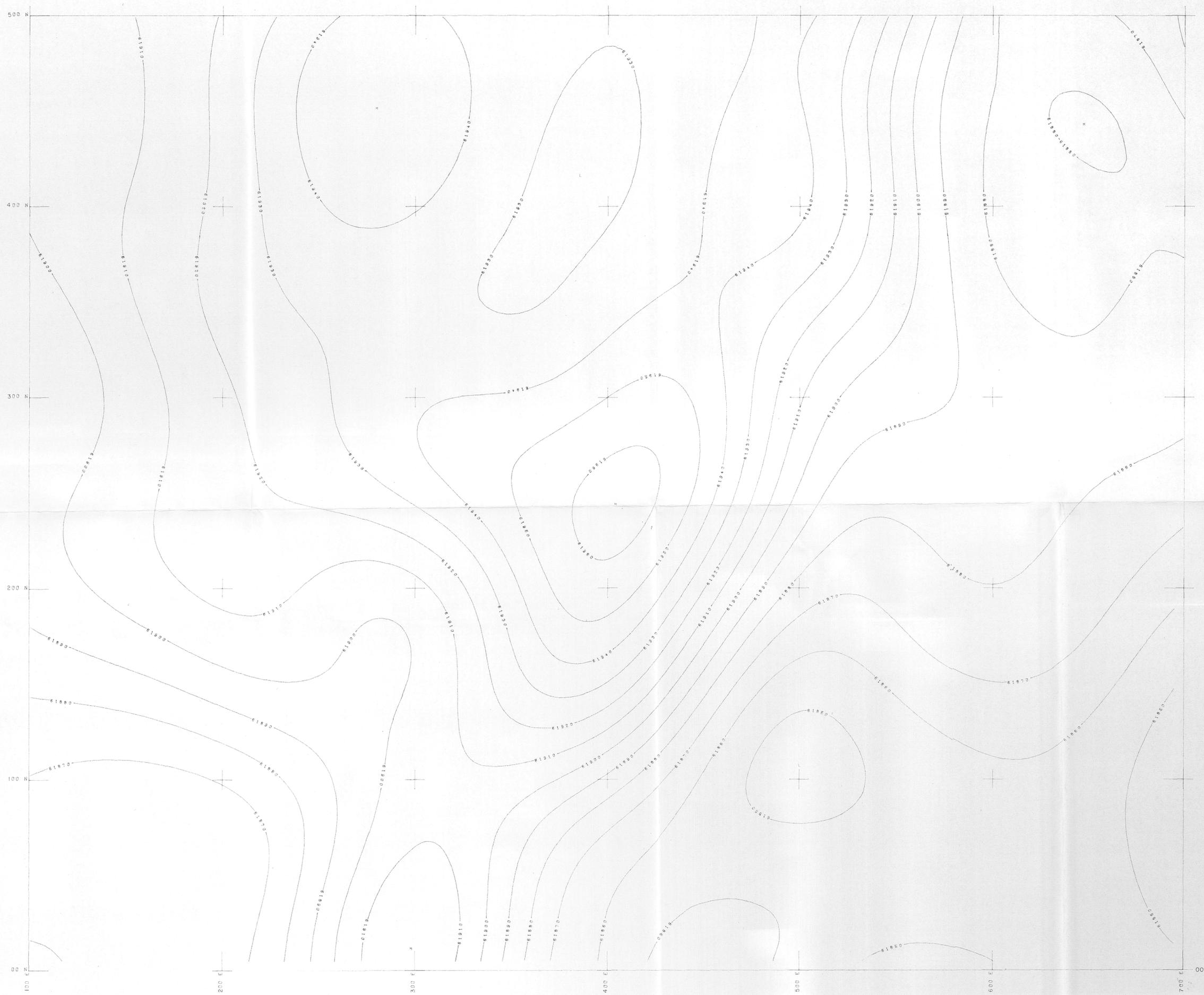
NB: Typical dyke effect removed



505088

SHELL COMPANY OF AUSTRALIA METALS DIVISION	
GREAT PYRAMID TASMANIA	
MAG GROUND MAGNETIC CONTOURS C.I. 20 NT	
SCALE: 1 : 1000.	
FIG. NO: 4	REPT. NO:
ENCL. NO:	DRG. NO: LH01/1008
DATE: 7/83	AUTHOR: NH
DRAWN:	OFFICE: AHO

83-20149



NB Filtered using low pass filter
(< 10 cycles/km)



505089

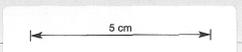
SHELL COMPANY OF AUSTRALIA
METALS DIVISION

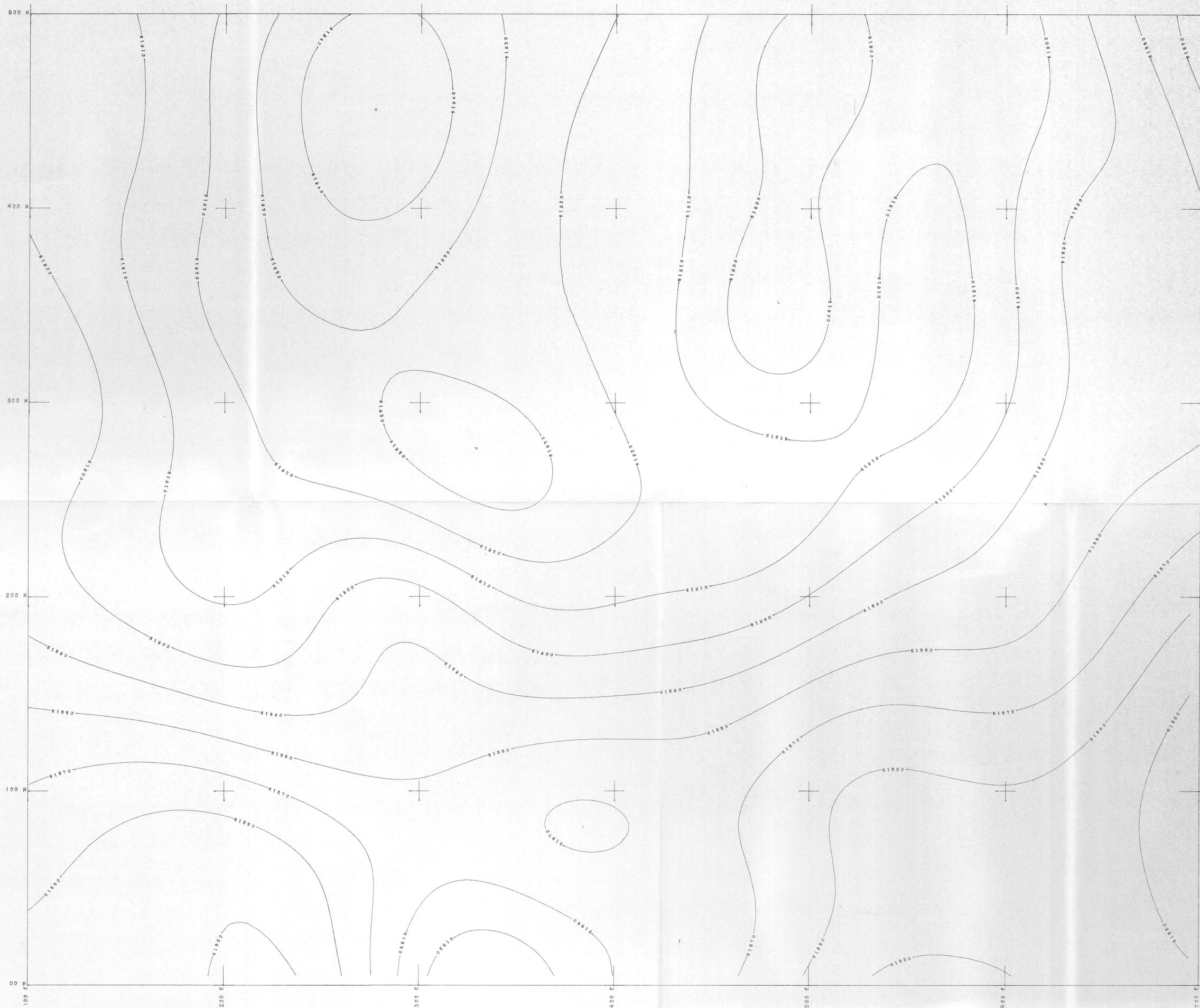
GREAT PYRAMID
TASMANIA

RAW GROUND MAGNETIC CONTOURS
FILTERED - C.I. 10NT

SCALE: 1 : 1000.

FIG. NO: 5	REP. NO:
ENCL. NO:	DRG. NO: LH01/1009
DATE: 7/83	AUTHOR: NH
DRAWN:	OFFICE: AHO





NB. 1. 'Typical' Dyke removed
 2. Filtered using low pass filter
 (<10 cycles/km)



505090

SHELL COMPANY OF AUSTRALIA
 METALS DIVISION

GREAT PYRAMID
 TASMANIA

MOD GROUND MAGNETIC CONTOURS
 FILTERED - C.I. 10NT

SCALE: 1 : 1000.

FIG. NO: 6	REPT. NO:
ENCL. NO:	DRG. NO: LHOI/1010
DATE: 7/83	AUTHOR: NH
DRAWN:	OFFICE: AHO



83-2019