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ON

E.L. 41/71

(HENTY-YOLANDE AREA)

1973-74

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1. INTRODUCTION

A large proportion of the year's work concentrated in the West Sedgwick Grid area.

The West Sedgwick Grid consisting of 20 lines, 600 ft. (180 m) apart was established in November, 1973, over a sequence of acid lavas and pyroclastics south of the Lake Margaret township. The grid was surveyed with gradient array I.P., ground magnetics and mapped in detail in December, 1973. The I.P. survey outlined 36 anomalous responses of which four are considered to have major significance. Two anomalies coincide with zones of disseminated pyrite mineralisation, outlined by the detailed mapping. All four major I.P. anomalies will require further follow up work.

Reconnaissance geological mapping and associated stream sediment sampling undertaken elsewhere in the licence area have broadly outlined the geological succession and structure. An area of interest has been indicated north of Basin Lake, where zones of disseminated pyrite mineralisation and associated gossans occur near the boundary of a large intermediate intrusive. This area will be surveyed with I.P. in 1974-75.

Expenditure during the year amounted to \$25,930, bringing the total expenditure on E.L. 41/71 since 1971 to \$43,599. A budget of \$50,300 has been recommended for 1974-75.

The exploration programme proposed for the 1974-75 year consists of :

1. Completion of the regional mapping and stream sediment sampling programme,
2. Airborne E.M./magnetic survey.
3. Geophysical coverage, and detailed geological mapping of the mineralised area north of Basin Lake.
4. Detailed geophysics and geochemistry over the anomalous zones on the West Sedgwick Grid.

2. ACCESS

Two walking tracks were cut into the N.W. part of the licence area to facilitate access for reconnaissance mapping. Their approximate positions are shown on Map 1, but their exact location away from the streams is unknown as they have yet to be traversed.

3. GEOLOGY

3.1 Introduction

Reconnaissance mapping was largely confined to an area bounded by the Zeehan Highway, the Yolande River, the West Coast Range and Queenstown, with detailed mapping being carried out over the West Sedgwick Grid.

Two suites of rocks comprising samples of both major and indeterminate rock types were sent to Central Mineralogical Services and AMDEL for thin section description. Duplicates of 8 of the total of 31 samples were made and sent to both companies. In general, the rock names applied by the authors of the two reports (Cowan 1974, Whitehead 1974) were similar. Interestingly enough the thin section descriptions tended to complement each other (each author concentrating on a different aspect) rather than covering the same ground. There were a couple of significant discrepancies however, in both rock name and description, particularly as regards the interpretation of texture and genesis. In these cases the present writer's opinions were split fairly evenly between the two reports. The results are a substantial first step in the elucidation of a number of rock types of previously doubtful affinities, and in the more precise definition of the mineralogy and composition of some of the major lithologies. They have been incorporated in the stratigraphic terminology as shown in the geology maps and cross-section (Maps 2 - 4) and in the following description.

3.2 Henty-Yolande Greywacke and Other 'Trough' Sequences

No mapping has been carried out in the past year in areas where rocks of this group outcrop. On the basis of thin section descriptions of a rhyolite and tuff given below, and the apparent absence of any intermediate or basic igneous rocks, the Henty-Yolande Greywackes would appear to be generally acidic in composition. They appear to interfinger to the north beneath an area of moraine with a so far unnamed

sequence of the Dundas Group (?). A recent review of samples collected along the Henty River and Zeehan Highway during the 1972-73 field season indicates that the latter sequence is characterised by a variety of intermediate and basic lavas, pyroclastics and minor intrusives as well as the more normal argillaceous and greywacke type sediments.

An indistinctly flow-banded trachyandesite (276/9 (P17)) has been recorded from the Henty River. The rock has a high micro-phenocryst/groundmass ratio, the former comprising mainly poorly twinned andesine with subordinate augite, olivine was also probably present. The groundmass is mostly composed of fine felsitic feldspar with variable development of microlites which sometimes show a trachytic texture, leucoxenised opaques are common. Clastic fabrics occur occasionally, probably in response to flow brecciation. Alteration comprises mainly development of fine chlorite and sericite in the groundmass, in addition the plagioclase phenocrysts are slightly saussuritized and augite is partly replaced by granular diopside.

An acid igneous rock (554) mentioned in the 1972-73 annual report under the 'Acid Porphyries' heading, and unusual in that it is the only igneous rock discovered so far in the Henty-Yolande Greywackes, has recently been described as a devitrified, weakly altered, flow-banded rhyolite. The rhyolite differs from the quartz keratophyre intrusives found in the Queenstown Pyroclastics by its more acidic composition as evidenced by the presence of rare orthoclase phenocrysts; it also contains oligoclase as the porphyritic feldspar instead of albite. However the groundmass texture and the fairly common presence of quartz phenocrysts, are features common to both rock types. In contrast, the porphyritic plagioclase found in both the rhyolite and the micro-granophyres of the Queenstown Pyroclastics is oligoclase, but quartz phenocrysts are rare, and porphyritic potash feldspar has not been noted in the latter. The groundmass of the two types is similar in composition, largely comprising potash feldspar and quartz, but quite different in texture, the rhyolite showing a felsitic/micro-granular appearance, whilst the micro-granophyres display a variety of graphic, spherulitic and granophyric textures. The submarine environment of the sequence would suggest an intrusive origin; however the presence of a lapilli tuff, containing abundant fragments of altered or pumaceous rhyolite,

and immediately overlying the rhyolite, suggests that the latter is at least in part, extrusive.

A coarse grained lithic vitric crystal tuff (551) which outcrops just west of the Zeehan Highway in the stream between the Henty and Yolande Rivers, was found to contain angular fragments of both volcanic and non-volcanic material. The former comprised strongly altered, dacitic, porphyritic and microporphyritic lavas, and the latter, stressed quartzite and schists containing varying proportions of mica and quartz. These widely varying rock types indicate a derivation from two sources, the lava fragments from the Mt. Read Volcanics, and those of schist and quartzite from the Precambrian rocks. The presence of Precambrian material suggests another criteria for distinguishing between pyroclastics of the Queenstown Pyroclastics and Henty-Yolande Greywackes which outcrop near the interdigitating boundary of the two sequences. Crystal fragments in the tuff are mainly sodic plagioclase with some quartz. The matrix contains abundant devitrified shards and amongst other things, occasional chalcedonic spherules which were provisionally interpreted as flattened radiolaria. The possible occurrence of radiolaria is interesting in that it implies that the rock was formed in an open-water and possibly, oceanic environment, an interpretation which is compatible with the dominant rocks of the sequence, i.e. argillaceous and greywacke sediments. Apart from the presence of the schist and quartzite fragments, the texture of the tuff and its constituents closely resemble those found in the lithic fragment variety of the subaqueous pyroclastic flows of the Ohanapecosh Formation, Washington, as described by Fiske (1963). The abundance of dacitic lava fragments in the tuff suggests an approximate time equivalence with the Mt. Lyell and West Sedgwick Grid acid lava piles. Today the distance between possible source and deposition is approximately 2 miles, but if the compressional effects of isoclinal folding are removed the original distance becomes several times greater.

3.3 Queenstown Pyroclastics

3.3.1 Acid Tuffs and Agglomerates

These vary enormously in colour and composition. Very generally, in the lapilli tuffs (and agglomerates?) lithic fragments, mostly pumice acid lava, predominate over other components, whilst in the medium-coarse grained tuff category which predominates in the

Queenstown Pyroclastics, crystal tuffs containing little or no lithic fragments and varying amounts of glass are the main rock type. Fine and medium grained tuffs are mostly various shades and combinations of grey, green and blue, although a few show orange/brown and pink/red colours.

Two rather unusual rock types are a mottled dark blue/white lithic vitric lapilli tuff which occurs as thin units sparsely distributed through both the Queenstown Pyroclastics and the ignimbritic parts of the Central Lava/Ignimbrite Belt, and a 'spotted' tuff containing numerous dark green 'spherules' 2-3 mm in diameter in a fine grained groundmass. The composition of the spherules is not known. The rock is confined to the Queenstown Pyroclastics where it has been noted in a number of localities.

Massive, medium-coarse grained, grey/green ash-fall tuffs with little or no interbedded sediment form the anticlinal core of the Queenstown Pyroclastics, they are well exposed along the road to the Lower Power Station and in the Yolande River to the north. These pyroclastics are well sorted and essentially non-graded (except perhaps over a substantial width) and unbanded.

Two samples of these tuffs were described as follows. The coarser grained variety comprise abundant loosely packed quartz and partly sericitised plagioclase crystals with a few fragments of dacite?; the matrix is mostly very fine grained plagioclase, quartz and chlorite. The medium grained tuff is similar in mineral content but also includes a few deformed grains of chlorite (altered biotite?) and is better sorted with much closer packing of the grains, the interstices containing sericite, chlorite and minor leucoxene. It is interpreted as a waterlain tuffaceous sandstone (reworked tuff?) derived from acid volcanics.

A series of keratophyric ash-fall lapilli tuffs and agglomerates interbedded with finer grained pyroclastics outcrop along the Lake Margaret road $\frac{3}{4}$ - 1 mile from the junction with the Zeehan Highway, and along the first part of the track to the No. 1 dam. Weathering

has produced a characteristic 'knobbly' appearance. In hand specimen they bear a strong resemblance to the typical crystal lithic tuffs of the Comstock Tuff sequence, with scattered fragments of brick red acid lavas and numerous salmon pink feldspars in a dark green matrix. Fragments in the lapilli tuff are generally sub-angular and appear to be mainly of acid lavas, the fabrics of which are varied, but most are felsitic (devitrified) with some perlitic microtextures. Feldspar phenocrysts are sometimes present. The matrix consists mainly of fine microgranular feldspar which is partly orthoclase but mostly a strongly potassic albite. The exact stratigraphic position of these coarse pyroclastics is not quite certain but they probably represent a near source part of the Queenstown Pyroclastics.

3.3.2 Ignimbrites

Occasional ignimbrites occur within the Queenstown Pyroclastics, a notable example being a thick unit which outcrops along the Zeehan Highway just north of the Yolande River. This pink green rock (73/6 (F399)) is generally similar to its counterparts in the Central Lava/Ignimbrite Belt, but contains a number of sericitised and carbonated porphyritic lava fragments (?dacite), and its lesser degree of alteration enables numerous closely packed, oriented and devitrified shards to be recognised in the matrix. The size of this particular unit and its compositional similarity to the Central Lava/Ignimbrite Belt ignimbrites as remarked on above, suggests that it was deposited at the same time as those rocks, and could perhaps be grouped with them as a particularly far travelled flow. If this was the case the adjacent pyroclastics could then be regarded as time equivalents of at least part of the Central Lava/Ignimbrite Belt. The environment of deposition was almost certainly marine, as evidenced by the other rocks of the sequence which comprise argillaceous sediments, ash-fall and cold ash flow tuffs; and therefore these ignimbrites must likewise have formed under or flowed into water.

3.3.3 Andesitic Volcanics

Scattered andesitic lavas (pyroclastics and minor conformable intrusives may also occur) outcrop along the Zeehan and Lake Margaret roads from near the junction with the Strahan Highway to a point about one mile along the Lake Margaret road. These rocks are grey to grey/green in colour, vary in texture from andesite to micro-diorite, and are often almost completely hydrothermally or deuterically altered to sericite, chlorite and quartz, particularly towards the south.

The widest and most extensive body is less altered than most, and contains variably argillised andesine phenocrysts 1-3 mm in size which exhibit relict zoning, a few partly altered clinopyroxene phenocrysts up to 1 mm long and some poorly defined chloritic patches, all in a groundmass of orientated plagioclase laths and numerous opaque oxide grains with a little interstitial quartz and potash feldspar. Accessory fine magnetite is common, apatite is also present in trace amounts. The groundmass plagioclase has been partly replaced by very fine grained zoisite or clinzoisite; this is intergrown with fine chlorite, granular epidote and semi-fibrous actinolite, the whole making up a typical propylitic assemblage. Irregular amygdale-like patches are lined with feldspar crystals and some quartz and chlorite, and filled with moderately fine grained carbonate, probably dolomite.

These andesitic volcanics seem to outcrop along an anticlinal axis, and may represent a small exposed portion of an underlying andesitic platform. They appear to be similar in composition and texture to the intermediate volcanics around Agglomerate Hill, (although the feldspar composition of the latter has yet to be determined) and should perhaps be grouped with them.

3.3.4 Micro-Granophyres and Quartz Keratophyres (Acid Porphyries)

During the past year several very small bodies have been discovered, and the boundaries of some of the larger intrusives, particularly in the vicinity of the Yolande and Langdon Rivers, have now been located. Limited petrographic studies of the acid porphyries have been undertaken by Solomon (1960, 1964) and Corbett et al (1974),

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amongst others. These have recently been supplemented by several more thin section descriptions. An analysis of this work indicates that the acid porphyries may be divided into two groups on the basis of differences in the plagioclase feldspar and the texture of the groundmass.

1. 'Granophyric' microgranite/micro-granodiorite (rhyodacite). Rocks from this group form a faulted? stock-like intrusion on Davies Hill from which a sill extends northwards across the Yolande River, and may link up with a similar body which outcrops along the Tyndall track. The Davies Hill body is atypical in being dark brown in colour and containing numerous feldspar phenocrysts, superficially it resembles many of the Central Lava/Ignimbrite Belt dacites, and could easily be mistaken for them in hand specimen. The other micro-granophyres (as they will be collectively referred to), are mostly shades of red, occasionally grey/green or blue/grey; the small (1-2 mm) scattered feldspar phenocrysts are frequently masked by body colour. Sporadic pale green patches up to 5 mm in size typify the rock grouping. In the Yolande River where there is a well exposed sharp planar contact of the microgranophyre with baked shales (356.9 yards E, 826.7 yards N), a distinct banding can be seen over a width of about 6 inches, parallel to the contact.

In thin section the microgranophyres are generally weakly porphyritic, with variably sericitised oligoclase, and rare quartz and altered amphibole? microphenocrysts. Groundmass texture is variable, and includes modified granophyric (micrographic), spherulitic and graphic textures in which anhedral quartz encloses partly sericitised plagioclase (micro-granodiorite) or abundant potash feldspar with minor plagioclase (micro-granite). These textures are believed to have resulted from unstable cooling or devitrification. Alteration of the groundmass varies from extensive replacement by carbonate to the development of vermiculitised biotite.

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In composition and texture the micro-granophyres compare favourably with the spherulitic potash rhyolites 'Darwin Keratophyre' described by Solomon (1960, 1964) and later by Corbett et al (1974), who referred to them as Darwin-type lavas. These potash rhyolites form a narrow core to the Mt. Read Volcanics and are believed to be the oldest exposed lavas in the Queenstown area. In this context it is interesting to note that the micro-granophyres are situated just west of the major anticlinorium axis in the volcanics (and possibly along it on the Tyndall track), and are thus amongst the oldest outcropping volcanics in the lease area. It is therefore postulated that the two are possible stratigraphic equivalents and that the micro-granophyres are the intrusive equivalents of the spherulitic potash rhyolites. The micro-granophyres are believed to be totally intrusive, and thus represent a deeper level of intrusion than the quartz keratophyres, some of which are probably partly extrusive.

2. Quartz keratophyre. These rocks have been relatively well studied from a petrographic point of view, and in the process have been given a number of alternative names such as sodic rhyolite and the more field orientated quartz porphyry, quartz-felspar porphyry and acid porphyry.

In hand specimen the rock is characteristically dark red, but pale green varieties also occur, with an abundance of large quartz and felspar phenocrysts (up to 6 mm). Chlorite is sometimes present in irregular patches. Banding has not been detected in these bodies.

A variant of this typical description can be seen in the southern part of the Yolande River Porphyry and its probable northern extension which outcrops along the Tyndall track. In these areas the quartz phenocrysts are smaller and much decreased in number, felspar phenocrysts are somewhat decreased in amount, the chloritic patches become far more abundant, and scattered small chloritised ferro-magnesian laths occur. This change is believed to accompany

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the change in form of deposition from a shallow intrusion to a lava.

Mineralisation is generally not associated with these bodies (apart from Au-quartz veins) but along the margins of the Yolande River Porphyry (357.4 yards E, 823.5 yards N) some pyritisation has taken place in the keratophyre adjacent to a fault (see 1971-72 Annual Report).

In this section, the Power-Line Porphyry, while essentially similar to the other quartz keratophyres, differs in the texture of the groundmass. This is comprised of fairly coarse grained interlocking albite laths 'partly mantled with potash feldspar and with interstitial quartz', instead of the more usual granular appearance. The coarser texture probably represents a slightly greater depth of intrusion than the other quartz keratophyres. There are fairly marked petrological similarities between these quartz keratophyres and the quartz-porphyry lavas (not present? in the lease area) of the Central Lava/Ignimbrite Belt (Corbett et al, 1974), and it is possible to speculate that the two groups may in fact be stratigraphic equivalents.

3.3.5 Upper Haulage Station Sequence

A thick unit of massive, greenish, coarse grained tuff, with occasional broad indistinct banding, outcrops around the Upper Haulage Station on the Lake Margaret pipe-line. The finer portion has been described as an acid vitric tuff, and is mainly composed of very fine grained quartz intergrown with sericite and chlorite. Relict textures, and variations in staining and composition suggest that this fine grained mass represents an accumulation of very small fragments of glassy volcanic material including now devitrified shards.

The stratigraphic position of this pyroclastic is uncertain. It is markedly anomalous from a lithological point of view with the surrounding rocks. Thick sequences of dacitic lavas and ignimbrites are present to the west, south and north (a thin unit of similar rocks enclosed by dacitic volcanics does occur along strike in the Yolande River), whilst to the east the

pyroclastic is obscured by the Lake Margaret moraine. The vitric tuff comprises a coarse grained middle part which fines both to the west and east. This, together with the attitude of the banding in the tuff and in shaly intercalations which appear in its eastern portion, suggests that it forms the core of an anticline, the axis of which runs approximately through the middle of the tuff outcrop. The thinness of the tuff in the Yolande River to the north implies either an attenuation of the sequence or a northward plunge of the anticline. Its abrupt disappearance just south of the Haulage Station suggests a faulted contact with the dacitic lavas, a conclusion supported by a thick, slickensided quartz vein, outcrop pattern and anomalous strikes in the shale intercalations. It is tentatively suggested that the tuff represents an older part of the Queenstown Pyroclastics which is mostly overlain in the area east of the Lake Margaret township by the younger dacitic volcanics.

N.N.E. of the Upper Haulage Station a 'quartz-felspar porphyry' outcrops in the Yolande River, totally surrounded by moraine. In appearance it resembles the 'Yolande River Porphyry', and could possibly be placed in the Queenstown Pyroclastics. However from a spatial point of view it might well belong to the quartz porphyry lava portion of the Central Lava/Ignimbrite Belt. Further west, in the vicinity of where the stream from Basin Lake joins the Yolande River, a series of massive olive green lithic crystal lapilli tuffs occur which contain fragments of this or a similar porphyry, and large rounded quartz crystals.

3.3.6 Spilites

The distinguishing of andesitic and basic lavas, minor intrusives and their attendant tuffs in hand specimen is frequently difficult, particularly when the rock is altered or weathered to any degree. Generally the correct identification has to be carried out on the basis of a thin section and/or chemical analysis.

Understanding of the spatial relationships between the various intermediate and basic rocks within an area of about $\frac{1}{2}$ mile of the Strahan/Zeehan road junction is far from complete, mainly because of the strongly weathered

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or altered nature of most of the rocks. The two spilites? listed here are characterised by a green/dark green colour and the presence of vesicles and/or amygdales.

A strongly altered basic volcanic can be seen a few hundred yards north of the above road junction, in the bank of the Lake Margaret tramway. It comprises random to semi-orientated saussuritised plagioclase phenocrysts up to 3 mm in size and some irregular chloritic patches with dimensions of 1-2 mm, set in a groundmass which is mainly chlorite and secondary potash felspar. Traces of sericite, 5%+ opaque oxide grains, a few moderately large crystals of apatite and a little interstitial or secondary quartz make up the total. Coarse aggregates of carbonate occur, probably both as vesicle fillings and patchily replacing the groundmass. Relict textures in the groundmass show that it contained abundant randomly orientated prismatic plagioclase crystals, devitrification textures are also present.

The other spilite outcrops in a creek bed just north of the faulted northern contact of the Yolande River Porphyry (355.2 yards E, 828.5 yards N) within a series of tuffs. It is a partially weathered blue/green rock containing scattered amygdales of carbonate about 5 mm in diameter.

3.4 Central Lava/Ignimbrite Belt

Detailed mapping of the West Sedgwick Grid and further reconnaissance mapping in the surrounding area has shown that a thick sequence of acid lavas and ignimbrites (* see footnote) outcrops between the Lake Margaret road and the West Coast Range. To the north they pass beneath the Lake Margaret terminal moraine or are faulted against the 'Upper Haulage Station' sequence, whilst to the south they are believed to strike into the 'Lyell Schists' which are the host rocks for the Mt. Lyell orebodies.

* Ignimbrite is used here as a field term to define pyroclastics which possess a strong sericitic (original pumice?) foliation and/or an abundance of flattened, aligned and curved fragments, the general appearance being one of streakiness. Except where stated otherwise, i.e. in petrographic descriptions, it does not imply any particular mode of formation or environment.

The andesitic hornblende/pyroxene porphyry intrusives, and their recently delineated extrusive and pyroclastic counterparts, which outcrop on the east of Crown Hill and increase in volume southwards, have been incorporated into the Central Lava/Ignimbrite Belt grouping because of their lithologic similarities and close spatial relationships to the acid volcanics, both in the lease and the mine area.

The boundary of the Central Lava/Ignimbrite Belt with the Queenstown Pyroclastics is an interdigitating one which follows approximately the line of the Lake Margaret road. However rocks typical of the Queenstown Pyroclastics outcrop along the upper parts of Swan Creek and on several grid-lines (L. 36, 66, 72, 78, 84) well to the east of the main contact, and further work needs to be carried out to determine the significance of this.

3.4.1 Acid Lavas and Ignimbrites

A preliminary interpretation of the mapping indicates that the acid volcanics can be sub-divided into three groups. Firstly, a fairly well defined zone of lavas with very minor ignimbrites and in which argillaceous sediments are rare or absent, outcrops over varying widths immediately east of the West Coast Range. The zone varies in width from a minimum of about 1,500 ft. to a possible maximum of 5,000 ft. immediately south of the Lake Margaret moraine. To the south outcrop is obscured by conglomerate scree and/or a thin cover of moraine, and by the overlying Comstock Tuff, but it appears that the lavas are finally terminated by a major cross-cutting andesitic porphyry intrusive. This contact may be a faulted one, caused by the western extension of the northern-most of the major W.N.W. striking Comstock Valley faults. To the west of the lavas is a sequence composed predominantly of ignimbrites with isolated lavas and minor argillaceous sediments. Northwards they seem to interfinger with the lavas whilst to the south the ignimbrites apparently extend down the ridge between the West and East Queen Rivers; this area has yet to be mapped. Finally, in the Yoiande River N.E. of the Lake Margaret township, the lavas and ignimbrites apparently alternate to such an extent that without detailed mapping it is impossible to detect whether this is a true reflection of the sequence or whether in fact parts of the succession can be assigned to either of the above two groupings.

The lavas are massive, often partially weathered rocks which when fresh are generally shades of purple or purple/grey in colour, although light grey/green varieties do occur. They contain varying amounts of small, pale pink (rusty brown when weathered) feldspar phenocrysts mostly 1-2 mm in size and scattered irregular patches of chlorite. Amygdales and vesicles can be seen in places, a particularly good example being a lava (73/55) which outcrops at 358.7 yards E, 826.8 yards N. This body was mistakenly interpreted in last years annual report as an extrusive phase of the andesitic Crown Hill Porphyry. Quartz phenocrysts (up to 3 mm) have only been seen in hand specimen from two localities, both just west of the West Coast Range.

The lavas have been frequently sheared and altered in varying amounts. Generally this has only resulted in a parallel orientation (possibly an original feature) and drawing out of the feldspar phenocrysts, (in more advanced cases the feldspar tends to resemble the pumice fragments of ignimbrites) but occasionally shearing, silicification and sericitisation have proceeded to such a degree that the resulting rocks are indistinguishable from some of the host rocks of the various Mt. Lyell orebodies. Occasional grains and scattered sparse disseminations of pyrite can be found throughout the lavas.

From petrography and stratigraphic position these rocks appear to be equivalent to both the sodic potassic rhyolite and keratophyres of Solomon (1964), and to the feldspar porphyries described by Corbett et al (1974) from the Central Lava Belt. The majority of the phenocrysts are variably sericitised plagioclase, (oligoclase where composition can be determined) sometimes marginally albitised, orientated and glomeroporphyritic, and occasionally accompanied by scattered quartz microphenocrysts. The devitrified? turbid groundmass consists of a mosaic of varying amounts of sericitised plagioclase feldspar, quartz, chlorite, sericite and leucoxenised opaques (magnetite) with accessory apatite, generally fine grained but occasionally coarser. In one instance the groundmass shows relict textures of fine acicular quartz crystals

which were probably originally tridymite. Oval to irregular patches of chlorite with quartz and sericite, and calcite-quartz aggregates probably represent vesicle fillings. Calcite and dolomite? infrequently replace phenocrysts and small patches of groundmass. Overall composition of the lavas is dacitic.

A wide range of colours is typical of the acid ignimbrites, which can be found in various shades and combinations of purple, blue, grey and green; texturally the lapilli tuff size range is the most common. The ignimbrites contain deformed and sericitised plagioclase (oligoclase where determinable) and infrequently, scattered small quartz (about 0.4 mm) crystals, rare relict lithic fragments (now composed of plagioclase, chlorite and sericite) and patches of quartz and/or sericite which probably represent altered vitric material. In several hand specimens a single lapilli size fragment of massive pyrite has been noted. The matrix is micro to cryptocrystalline with occasional coarser patches, and comprises varying proportions of chlorite, sericite, plagioclase and quartz, sometimes with scattered relict shard textures; the general impression is frequently one of flattened fragments of probable vitric origin. Calcite has occasionally replaced parts of the plagioclase crystals and small areas of the matrix. Boundaries of the plagioclase crystals and fragments are diffuse probably due to welding. Other textures include a foliation defined by sub-parallel streaks of sericite which curves round some crystals probably as a result of compaction. These sericitic patches also often show relict textures suggestive of collapsed pumice. Like the lavas, the ignimbrites appear to be generally dacitic in composition.

3.4.2 Andesitic Lavas and Pyroclastics

A belt of andesitic lavas and minor ignimbrites outcrop at the north-western end of the Comstock Valley. They interfinger with acid lavas and agglomerates? to the north-west, and massive intermediate? tuffs to the north-east which in turn pass into or are faulted against hornblende-felspar porphyry. The southern boundary has not yet been mapped but is believed to be at least partly controlled by faulting. A much smaller

development of andesitic ignimbrites and tuffs has been recorded to the north of the hornblende/pyroxene felspar porphyries generally taking the form of thin, isolated bands of pyroclastic material amongst the dacitic volcanics.

The lavas contain numerous phenocrysts of variably sericitised plagioclase 0.5-2 mm in size which sometimes form aggregates which tend to be drawn out parallel to the direction of flow; fresh partly altered diopsidic pyroxenes up to 4 mm in size, are also present and vary in number from a few to 5-10% of the rock. The groundmass is blue/grey/green in colour, fine grained and turbid, and is composed of plagioclase, chlorite, amphibole and a secondary epidote mineral. Texturally it comprises very thin prismatic or fibrous crystals or crystallites of felspar and possibly some of amphibole. The orientation of these crystallites varies from generally random with a poorly developed direction developed only locally, to a strongly preferred orientation probably related to flow. Turbid carbonate has occasionally replaced parts of some phenocrysts and small areas of groundmass.

The andesitic lava which forms the tor-like prominence of Agglomerate Hill and which contains disseminated and small patches of massive pyrite with some copper values appears to have been fractured. Irregular, elongate and also vein-like zones of coarser grained clear (secondary?) plagioclase intergrown with epidote and pyrite suggest the passage of hydrothermal solutions. Well developed auto-brecciation textures are present on the east side of the hill.

The andesitic ignimbrites are fine grained greenish grey rocks containing lenticular or flattened 'fragments' 2-8 mm in size defined by variations in colour and composition. The fragments now have indistinct boundaries probably due to welding and devitrification. In one rock many of the 'fragments' contain plagioclase phenocrysts in a very fine grained groundmass of felspar, chlorite and sericite, and are andesitic (possibly dacitic) in composition. Others contain more abundant chlorite and are probably andesitic. The ignimbrites are mostly composed of chlorite, sericite, minor very fine grained

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quartz? and opaques, one sample has been extensively replaced by fine grained secondary carbonate (dolomite?) and it also includes very numerous and generally irregular aggregates of coarse grained pale brownish, strained carbonate which appears to have infilled interstices in the rock before it was compacted. Original textures are generally completely obliterated except in a few areas where there are scattered relict shard structures; some of the fragments were vesicular but the vesicles have partly collapsed. Foliation varies from weak to strong, it is probably caused by compaction and concomitant parallel orientation of chlorite and sericite.

A massive grey/green intermediate tuff (73/52) outcrops north of and along strike from the hornblende-felspar porphyry immediately east of the Crown Hill Porphyry. In thin section, partly altered plagioclase crystals 0.5 - 1 mm in size are numerous, and pyroxene crystals many of which appear to be broken, are also fairly common. The tuff also contains well defined, elongate and irregular fragments 2-4 mm in size, mostly of extremely fine grained rock, but a few slightly coarser grained liths composed mainly of plagioclase and some very irregular and 'flattened' patches of very fine grained material which exhibit relict pumice textures are also present. There has been some recrystallisation of plagioclase, sericite and very fine grained epidote minerals, and replacement of a few lithic fragments by siderite? and chlorite but there is no evidence of foliation. The lithic fragments and crystals appear to have been closely packed, and probable later compaction has resulted in deformation of the softer fragments.

3.4.3 Hornblende/Pyroxene-Felspar Porphyries

This group of rocks as mapped probably includes some lavas and tuffs. The definite intrusive portion is a light purple/grey/green in colour and distinctive, generally randomly orientated, glistening black laths of hornblende and/or pyroxene, it frequently displays auto-brecciation textures. Some differentiation may have taken place in these intrusive bodies as evidenced by a sample from a cutting beside the Lake Margaret track (358.6 yards E, 825.4 yards N) which contained extensively corroded hornblende laths in conjunction with scattered large quartz phenocrysts.

Two small andesitic or basic dykes (one at least is cross-cutting) have been observed intruding tuffs of the Queenstown Pyroclastics on the Lake Margaret road (358.2 yards E, 826.7 yards N). The bodies are approximately 10 ft. and 5 ft. wide, both are completely altered to a pale greenish clay in which can be seen numerous lath shaped dark green patches which presumably were ferro-magnesian phenocrysts, scattered xenoliths of tuff are also present. Similar intermediate-basic dykes have been reported by Corbett et al (1974) from Conglomerate Creek and Philosopher's Ridge to the east of Queenstown. Two other isolated sills? of probable andesitic composition are situated well within the Queenstown Pyroclastics, one N.E. of the Lower Power Station in the Yolande River, and the other in the Langdon River near its confluence with the Yolande River.

3.5 Basic Intrusives

A massive, dark green, fine grained rock containing numerous phenocrysts of augite up to 4 mm in size which outcrops in a quarry near the Strahan/Zeehan/Queenstown road junction was described by Solomon (1964) as an augite-albite gabbro. However from his description, and personal examination the author considers that a more appropriate name would seem to be porphyritic dolerite or even basalt.

To the north no further exposures of basic rocks have been found until the northern boundary of the Yolande River Porphyry is reached, which is a faulted contact with a dolerite sill approximately 700 ft. wide. This mafic body strikes northwards and disappears under moraine near the Tyndall track. Although the outcrops of characteristically brown rounded boulders are fairly fresh, the dolerite has in places been completely weathered to an orange/brown clay. In thin section scattered saussuritised plagioclase phenocrysts and rare serpentized olivine phenocrysts are set in a groundmass of semi-random saussuritised plagioclase laths, granular augite and a mesostasis of potash feldspar, chlorite, quartz and accessory? Ti-magnetite.

Several small intermediate or basic dykes and sills ranging from 6 ft. - 20 ft. in width have been noted on the Zeehan Highway south of the Loftus-Hills Geological Memorial; all are altered to clay. The most extensively altered have a whitish exterior and dark brown interior, and can only be distinguished from

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weathered tuffs by their cross-cutting relationships and content of xenoliths. Some of the less altered bodies are pale green in colour and one was noted to be porphyritic, containing scattered dark green patches which were probably originally ferro-magnesian minerals. Xenoliths of shale and tuff occur occasionally, generally close to the contacts and sometimes aligned parallel to them. The proximity of the dolerite sill to the east, and the similarities in texture between it and these minor intrusives suggests that they are off-shoots of the dolerite.

3.6 Comstock Tuff

Large boulders of distinctive, massive and very fresh, mottled pink/dark green coarse grained crystal tuff outcrop over a width of about 300 ft. at the eastern end of line 60 on the West Sedgwick Grid, approximately 200 ft. west of the Owen Conglomerate rock face. Just over 500 ft. to the south, on the south bank of a creek, is an exposure of thinly banded shales and quartzitic siltstones. These two exposures are so far the only places in the lease where Tyndall Group rocks have been located away from the Comstock Valley. This paucity of outcrop is largely due to the cover of conglomerate scree and/or moraine. Weathered acid lavas (and ignimbrites?) can be seen on an old track, approximately 200 ft. west of the Comstock Tuff pyroclastics and sediments, and the unconformable contact at the base of the Comstock Tuffs appears to run in a north-south direction. Because of the drift cover the picture becomes very uncertain to the south, but if the unconformity continues on a north-south strike, in order to link up with the position of the unconformity on the western slopes of Zig-Zag Hill it must be faulted back towards the Comstock Valley, perhaps along the W.N.W. striking fault postulated earlier (see 3.4.1) as the northern contact of the Cockatoo Porphyry.

Several lines of the West Sedgwick Grid extend beyond the andesitic volcanics and intrusives of the Central Lava/Ignimbrite Belt onto the Comstock Tuff rocks, and this has enabled a fairly detailed picture of the basal portions of the Comstock Tuffs on the west and south-west slopes of Zig-Zag Hill to be built up.

The following sequence is taken from line 106S. Blue-black laminated shales up to 100 ft. thick form the lowest exposed portion of the Comstock Tuffs, and are believed to if not immediately overlie the unconformity, occur fairly close to it. These sediments are succeeded by a lithic lapilli tuff 100 ft. - 200 ft. thick which contains fragments of shale (locally up to

25 x 15 cm) and a whitish looking rock (altered rhyolite, quartz porphyry or pumice) in a blue/grey, glassy? matrix. Overlying the tuff is a pink and pale green, rather weathered rock approximately 100 ft. - 200 ft. thick containing scattered quartz crystals or phenocrysts, planar banding is present in places. Uncertainty exists as to whether the rock is an acid lava or a crystal tuff; it wedges out very quickly to the north. After another band of shale, about 50 ft. thick, comes the typical and distinctive rock of the Comstock Tuffs, the 'keratophyric' crystal tuffs briefly described in the first paragraph. However here they are somewhat coarser, generally a lapilli tuff and occasionally reaching the agglomerate size range. Fragments of pink acid lava are fairly common, and the distinctive texture of scattered rock fragments surrounded by an albitic halo may be seen in places.

The position of the unconformity on the north-western slopes of Zig-Zag Hill is somewhat obscure, partly because of masking moraine deposits, and partly because of the uncertain stratigraphic position of a rather weathered or altered lapilli tuff which outcrops immediately east of a hornblende-felspar porphyry intrusive on line 84. This pyroclastic, apart from its altered appearance, resembles the lithic tuff described above that occurs near the base of the Comstock Tuffs, and has been tentatively correlated with it. Further east along the same line is an outcrop of laminated shales followed by the distinctive 'keratophyric' lapilli tuffs. The shales are striking E.N.E., and this radical change in strike from N-S striking shales only about 500 ft. to the south implies a major fault nearby, probably the one mentioned previously in connection with the more northerly exposures of Comstock Tuff.

To date only two dips have been obtained from the Zig-Zag Hill outcrops and these come from the western parts of the sequence; they indicate an easterly dip of about 50° . The single dip from the shale/siltstone exposure to the north denotes an essentially vertical succession younging east.

A very general preliminary impression of the Comstock Tuffs is that the source area, at least in these parts, lies to the south. To date the only volcanic breccia (containing 'rafts' of shale and hornblende-felspar porphyry) and the only lava? seen have been in the Comstock Tramway or immediately to the north. Similarly the 'keratophyric' tuffs as mentioned above appear to contain more lava fragments and increase in coarseness towards the south.

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3.7 Lamprophyres

Several lamprophyre sills have been mapped in the licence area. Abundant brown biotitic mica, extensive sericitisation, and a pale green colouration are the characteristics of these lamprophyres. They are generally extensively weathered and may be mistaken for micaceous tuffs or greywackes. They can be distinguished by their sharp planar contacts, general thinness (except in one case, a maximum width of 4 ft.) and their position on or close to the contact of an igneous body (mostly quartz keratophyre but in one instance andesite). The most extensive lamprophyre, which has a width of several tens of feet and splits into several parts in places, has been traced over a strike length of more than 3,000 ft. The lamprophyres were presumably injected during a period of tension, and are thought to be possibly Jurassic or Cretaceous in age. Fresher examples occur scattered through the mine area.

3.8 Structure

A substantial number of facings have been obtained. Graded bedding is the most widespread facing, however frequently, contradictory gradings are found over a distance of a few feet or less in a single exposure, and where possible the use of other facings, either in conjunction with, or instead of graded bedding, is preferred. These include flame structures and other contact features, i.e. sharp planar boundaries and boundaries produced by ash-fall tuffs which may be sharp but irregular. Flow deposits, both tuffs and lavas, may scour up fragments from the underlying beds, and incorporate them in the basal portions of the flow.

These facings have enabled what is believed to be a fairly accurate picture of the major folding in the area to be deciphered. This comprises a number of N.N.W. trending, upright, tight folds, the limbs of which dip at angles of 70° - 90°. Occasional opposing facings on major fold limbs are probably indicative of relatively small scale drag folds.

It appears that the fold plunges in the licence area are rather variable. The major anticlinal axis in the Queenstown Pyroclastics, at least to the north of the road to the Lower Power Station, appears to be plunging northwards, however its possible extension south of Davies Hill is plunging in the opposite direction. The possible anticlinal axis recently detected in the vicinity of the Upper Haulage Station also seems to be plunging north, whilst the major synclinal axis situated

east of the Sisters Hills is definitely plunging to the south. Plunge dips are generally of the same order as the dips of the fold limbs, however along the Tyndall track the probable northerly extension of the Queenstown Pyroclastics' anticlinal axis has an apparent plunge of 35° or less.

An examination of the geology map (Map 2) shows that the fold axes are getting progressively closer together towards the east. The implied increasing compression in this direction (during the Taberabberan Orogeny?) may have eventually resulted in further movement on the Lyell Shear, this time of a compressional nature, along the eastern limb of the easternmost anticline shown on the geology map.

4. MINERALISATION

4.1 Lake Margaret Tram Pyrite Lens

Recently a rock geochemical and brief geological investigation was carried out over this semi-massive pyrite body.

The body is exposed in an old tramway cutting over a width of about 10 ft. It is a massive, extensively weathered, dark green laminated rock which in parts appears to be composed entirely of fine grained pyrite; however analyses show that only about one third is actually pyrite, and the rest is probably finely granular quartz which is masked by the colour of the pyrite. In places thin bands of a whitish siliceous looking rock containing disseminated pyrite are intercalated with the pyritic tuff. The rocks on both sides of the mineralised zone have been extensively altered or weathered to a blue/grey or whitish clay, in the former however, numerous whitish patches, some of which have definite feldspar lath outlines, can be seen. A few tens of feet to the south similar but fresh rocks outcrops, and are considered to be andesitic lavas. The extent of these lavas to the west is not known, but eastwards they cannot be more than a few feet thick, and it seems probable that the pyritic lens is situated on or close to the contact of an andesitic lava sequence with shales and acid tuffs. The extent of the pyritic lens along strike is uncertain. Southwards iron staining and fragments of iron-rich dark brown rubble indicate its presence over a distance of about 100 ft., it then appears to pass into thinly bedded tuffs which bear a strong resemblance to the pyrite impregnated siliceous bands within the pyrite body.

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Five samples, each representing a 2 ft. width, were taken across the lens. Values obtained were as follows (pyrite in %, all others in ppm) :

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
FeS ₂	29.5	35.2	19.1
Cu	565	1020	220
Pb	80	100	50
Zn	23	35	15
Co	39	45	30
Ni	18	20	10
Mn	21	45	15
Ag	0.76	1.0	0.4
Au	0.68	1.0	0.4

The concentrations of all elements, except Ni, Zn and FeS₂ increased towards the centre of the lens; Cu x 5, Mn x 3, Au and Ag x 2½ and Pb x 2. Zn and Co concentrations across the body were erratic, whilst Ni and FeS₂ content remained essentially constant (the low pyrite content - 19.1%, of the sample on the eastern side of the lens is probably due to the inclusion of some country rock or above average amounts of siliceous material). Ag and Au contents are relatively high (unlike the low base metal values) and are of similar magnitude to the precious metal contents of several of the Mt. Lyell orebodies as shown below :

	<u>Averages (gm/tonne)</u>	<u>Ag</u>	<u>Au</u>
Lake Margaret tram pyrite		0.76	0.68
Cape Horn		1.50	0.80
Prince Lyell		2.00+	0.30
Crown Extended		8.55	0.30
The Blow		53.00	0.14

4.2 Basin Lake North - Gossan and Pyrite Mineralisation

Limited mapping carried out in the area north of Basin Lake over a large, patchily altered hornblende/pyroxene felspar porphyry intrusive was accompanied by a chip sample taken across the 500 ft. + wide pyritised zone mentioned in the 1972-73 Annual Report. The following figures were recorded; 5.8% pyrite, 175 ppm Cu, 75 ppm Pb, 400 ppm Zn, 5 ppm Co and 40 ppm Ni. The pyritic zone appears to wedge out rather sharply to the north but exposure is limited, the area being covered by rain-forest and/or swamp, and it is possible that narrower bands or lenses of mineralisation extend northwards to link up with the disseminated pyrite exposed in the Tyndall track (1972-73 Annual Report). The southern limit of the mineralisation is unknown,

mapping having not yet been carried out in this area. Gossanous material was discovered in the roots of a fallen tree along side a track in rain-forest, (358.6 E, 833.4 N) about 2,000 ft. S.W. of the pyritic zone mentioned above; no other exposures of the gossan could be found in the immediate vicinity. A sample assayed 105 ppm Cu, 195 ppm Pb, 620 ppm Zn, 35 ppm Co, 75 ppm Ni and 240 ppm Mn.

4.3 N.E. of West Sedgwick Grid - Disseminated Pyrite Mineralisation

Detailed mapping of the West Sedgwick Grid has extended the zones of disseminated pyrite (mentioned in previous annual reports) situated to the east and east-south-east of the Lake Margaret township. Two such zones (see Map 4) which trend approximately parallel to the strike of the enclosing acid lavas (and ignimbrites?) appear to be present (visual indications are supported by the I.P. survey which also probably defines the extent of the mineralisation). The host rocks in both zones are similar, but altered and sheared to varying degrees, in some cases to such an extent that they are indistinguishable from some of the Mt. Lyell mine rocks.

Several further samples taken from these mineralised areas have been assayed. The results when taken in conjunction with those obtained previously (see Map 4 Geochemistry, 1972-73 Annual Report) show that pyrite is present mainly in the range of 2-3%, but values of up to 9.4% have been recorded. Copper values are with one exception (0.19%) less than 0.1%. Likewise Zn content apart from one value (0.15%) is also less than 0.1%. The figures for Pb are uniformly low, reaching a maximum of 0.017%.

4.4 S.E. of West Sedgwick Grid - Vein/Disseminated Pyrite Mineralisation

Disseminated pyrite and scattered patches of massive pyrite occur through a fractured, andesitic lava which outcrops on Agglomerate Hill. The mineralisation appears to be restricted to the immediate vicinity of the hill top. A sample of the disseminated mineralisation sent for analysis revealed 1.65% pyrite and minor amounts of the base metals, but previous sampling in 1971-72 apparently yielded figures of up to 4% pyrite and 0.4% Cu.

4.5 Miscellaneous Gossans

Immediately north of the Strahan road and about $\frac{1}{4}$ mile S.W. of the Strahan/Zeehan road junction (358.1 yards E, 321.2 yards N) a gossan outcrops over a length of about 15 ft. and a width of 6 ft. and overlies a dolerite close to its contact with foliated crystal

tuffs. The latter contain sparsely disseminated pyrite which may be related to their proximity to the 'Linda Fault'. The gossan was sampled and assayed, and yielded values of 340 ppm Cu, 100 ppm Pb, 100 ppm Zn, 280 ppm Co and 150 ppm Ni. The base metal values are rather low, and overall the figures do not suggest that the gossan is anything more than the weathered capping of a basic igneous rock.

Approximately 200 yards east of the Zeehan Highway, in the bottom of the old overgrown Zeehan - Lake Margaret township track (354.6 yards E, 828.5 yards N) a haematitic and limonitic gossan outcrops. Its extent remains to be checked, but in view of its proximity to the dolerite sill to the east and the frequent occurrence of small off-shoots from the dolerite (see 3.5), it is probable that like the gossan described above, it represents the weathered capping of a mafic intrusive.

4.6 Madame Howard Plains Barytes Deposits and a West Sedgwick Grid Barytes Occurrence

Mapping has been carried out around the Madame Howard Plains baryte deposits (known workings are marked on the geology map) but has been greatly hampered by the totally altered (kaolinized?) nature of the rocks. This alteration has reduced the original rock (quartz keratophyre) to a whitish - light brown clay which can only be recognised as a quartz keratophyre by the occasional quartz phenocryst. In the area south of the junction of the Zeehan Highway and the Lake Margaret road, and to the west of the former, no quartz phenocrysts have been observed and thus these rocks which have a strong resemblance to massive tuffs, have been mapped as such. However Groves (1964) in the logs of the three drill holes put down by the Department of Mines on the E-W striking barytes lode, states that the keratophyre, which was the only rock type encountered, was 'weathered' to a depth varying between 20 ft. and 32 ft., and that quartz phenocrysts were extremely rare, this would account for their not having been observed in surface exposures. The mineralogy of the lodes is very simple, consisting of massive, white opaque baryte with varying amounts of quartz and carbonate veining, minor fluorite and haematite have only been seen in the drill holes. Light grey, translucent-transparent crystalline baryte can be found on the ground at the west end of the E-W striking lode. No sulphides have been observed, but Groves mentions the presence of occasional small veins of pyrite in the drill holes.

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On the west extension of line 84 of the West Sedgwick Grid some baryte was observed in conjunction with quartz in a massive pink acid lava?

4.7 Diamond Hill and Other Gold Prospects

1 1/4 miles W.N.W. of the Strahan/Queenstown road junction lies Diamond Hill, formed by a small plug of quartz keratophyre very similar in mineralogy and texture to the Yolande River Porphyry. Massive, white quartz pebbles and boulders (up to 15 ft. x 10 ft. x 3 ft.) lie scattered about in large quantities on the upper slopes of the hill associated with large quartz veins which were worked in the past in numerous pits and trenches (now partially or totally infilled) for gold. However the gold apparently gave out at very shallow depths (G.F. Hudspeth personal communication). The most extensive workings are on the top of the northern end of the hill where several interlocking shallow tunnels can be seen. On the north-western slopes of the hill, a large quartz vein with a length of 100 ft.+ and width of 4 ft.+ outcrops with a westerly strike, and it appears that it was the eastern extension of this vein that was worked in the tunnels. A brief inspection of quartz boulders at various points on the hill revealed no sign of gold or sulphides. Similar large quartz veins have been seen in other quartz porphyries, notably just south of the Yolande River in the porphyry of the same name; and quartz reefs have been worked in the past in the Queenstown area for gold at the Woody Hill, Macquarie and King River mines; however, in all of them gold was absent or decreased markedly in amount with depth. As the quartz in the first two mentioned mines occurs in rocks of Silurian age it is suggested that the quartz veining was associated with the Taberabberan Orogeny.

Coarse particles of gold have been found in thin gravel deposits along the banks of a small stream near the Lake Margaret township road (358.2 yards E, 826.1 yards N), and gold has also been reported from a quartz reef in an adit just west of the same road (358.9 yards E, 824.2 yards N).

5. GEOCHEMISTRY5.1 Stream Sediment Geochemistry5.1.1 Introduction

The stream sediment sampling programme continued in conjunction with geological mapping; approximately 80 samples were collected, dried, sieved and the -80 mesh fraction analysed for Cu, Pb, Zn, Co and Ni. (All values are rounded to the nearest 5 ppm if not already done so by the Assay Lab.) A programme of stream water pH measurements, using indicator paper, was also commenced. All analyses carried out over the past two field seasons have been collated and are listed in Appendix 2.

5.1.2 Discussion - pH and Elements Analysed

pH is a major controlling factor in the mobility of elements in many environments (Fletcher and Doyle 1974, Levinson 1974). This effect of pH on the metal content of samples makes it essential that the pH of stream waters be measured, where sediment samples are collected.

The reasons behind the analysis of the elements listed in the introduction are as follows. Cu, Pb and Zn, fairly obviously, are indicators of volcanogenic stratiform sulphide mineralisation of the Rosebery and Prince Lyell type.

Ni was originally envisaged as an indicator to nickel mineralisation; no samples have yet been collected from areas where this type of mineralisation might be expected to occur, but Ni has since proved to be a fairly reliable pointer to the intermediate porphyry intrusives as mentioned in the 1972-73 Annual Report.

Co was expected to substantiate and perhaps more clearly define Ni anomalies caused by Ni mineralisation, however a recent paper by Lahti (1974) suggests that in fact the opposite may be the case. In the licence area, from Co values obtained to date, Co does not correlate at all with Ni. It shows no response to the intermediate porphyry intrusives and unlike Ni, a strong positive correlation with Mn is evident. This correlation was first detected in a study of the analytical data, and was subsequently confirmed by a check of the literature (Boyle et al 1966, Lahti 1974, Nichol et al 1967).

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It apparently occurs in both stream and soil sediments and is caused by the strong affinity of Co for Mn hydroxides. It thus appears that the Co content of a stream sediment from most, if not all of the licence area, may be used as a substitute for or confirmation of, a 'false' anomaly caused by the action of Mn and Fe hydrous oxide precipitates.

Analyses for Mn have recently been carried out because of the tendency for base metal elements to be adsorbed onto or co-precipitated with Fe and Mn hydrous oxides, (HIMO) particularly in areas of poor drainage, but anywhere where metal containing waters are oxidised. (See Levinson 1974, pp 134-138 for a full discussion).

Graphs have been drawn of Mn v. Cu, Pb, Zn, Co and Ni to determine to what degree relative to each other, these elements have been scavenged by Mn hydroxide precipitates. The results are only preliminary as not enough analyses are available in the higher Mn range to draw firm conclusions, but as might be expected the strongest positive correlation is between Mn and Co. There is a fairly wide scatter of points on the graph because small changes in Co values (i.e. 5-10 ppm) correlate with large changes in Mn content (i.e. 100-500 ppm), and it is impossible to obtain good accuracy for the Co results under conditions of sampling and analysis inherent in a routine assay mine laboratory. A consideration of the figures shows that the presence of HIMO precipitates is indicated by values of > 5 ppm Co and $>$ approximately 430 ppm Mn.

With regard to the other elements there may be a weak correlation between Ni and Mn, however it is believed to be more apparent than real, as in all except two samples containing high Ni and Mn values the Ni content can be related to proximity to an intermediate porphyry intrusive. As regards the base metals a definite positive correlation exists between Mn and some Pb samples; these samples plot on a 'straight-line' graph. However a number of Pb values lie well off the graph line and these are interpreted as 'true' anomalies (or sub-anomalies). Cu and Zn show a positive correlation with Mn, but it is much less marked than for Pb. Particularly in the case of Zn but also for Cu the wide

scatter of values and small population in the higher Mn and Zn ranges precludes any really meaningful graph being drawn, but similar to Pb a small number of values lie well away from any possible graph line and can be regarded as 'true' anomalies.

Threshold and background values have been compiled for Cu, Pb and Zn, based on a population of 109 samples. They were calculated using the method of Hawkes and Webb (1962, p 31) for small populations, in which the median value of an element is taken as background, and threshold is estimated as that figure which is exceeded by no more than $2\frac{1}{2}\%$ of the total population, markedly high erratic values being excluded from the determination.

					<u>Threshold</u>	<u>Background</u>
Cu	(excluding 4 erratic high values)				60	15
Zn	(" 3 " " ")				80	20
Pb	(" 3 " " ")				80	30 (Queenstown Pyroclastics and Central Lava/ Ignimbrite Belt)
	88 samples					
Pb	21 samples				?	5 (Henty-Yolande Greywackes)

As can be seen from the figures above, the data for Pb appears to be made up of two distinct populations, one confined to the predominantly sedimentary Henty-Yolande Greywackes whilst the other covers the Mt. Read Volcanics. A threshold value for Pb for the former cannot be calculated as only one value (15 ppm) exceeds 5 ppm. This distinction may be present for Cu, but if so it is much less obvious and therefore a separate threshold and background for the Henty-Yolande Greywackes for Cu has not been determined. The data for Zn show no signs of being divided into two populations.

When the thresholds for Cu, Pb and Zn were known, all samples containing anomalous values of these elements were re-assayed for the element(s) in question and any of the other elements that were present in significant concentrations. The check showed that all elements apart from Pb mostly gave at least adequate repeatability ($\pm 20\%$). The variability in the Pb analyses is probably due to its occurrence as galena which has a specific gravity of 7.5 and is relatively insoluble compared with the

minerals the other metal elements are found in. The low degree of solubility results in most Pb being present in a mechanical form rather than being adsorbed onto the surface of other particles, which is probably the more usual method of occurrence of the other elements. The appearance of Pb as discrete particles of galena and its weight contrast with the other mineral grains in the sample probably results in irregular concentrates of the mineral throughout the sample which only thorough mixing and careful sampling can eradicate.

5.1.3 Discussion - Anomalies

An isolated value of 85 ppm Cu from about $\frac{1}{2}$ mile west of the Strahan/Queenstown road junction may be due to proximity to the old smelter which is situated $1\frac{1}{2}$ miles to the east-south-east, accompanying Pb and Zn values are well below threshold. Concentrations of 65 and 115 ppm Cu from just west of the Zeehan Highway in a stream between the Henty and Yolande Rivers are almost certainly caused by contamination, either from concentrates blown from ore trucks or from material used in the construction of the road, as samples obtained immediately upstream from the road yielded Cu values in the background range.

A single value of 230 ppm Cu obtained from a small creek south of the Upper Haulage Station must be regarded as one of the most significant obtained to date. It is accompanied by an anomalous Pb value of 110 ppm, and although unfortunately no figure is available for Mn the Co concentration is low which suggests that the Pb and Cu values represent true anomalies and are not caused by HIMO precipitates. This anomalies' significance is enhanced by the knowledge that an outcrop of pyritised grey altered acid lava situated along the watershed of the stream from which the sample was taken and about 1,300 ft. to the north, assayed 0.19% Cu.

In the upper reaches of Swan Creek H.Y.87 contains anomalous amounts of all three base metals, 85 ppm Cu, 115 ppm Pb and 160 ppm Zn. Although no Mn value is available the sample assayed 30 ppm Co which suggests that the anomaly is probably due to HIMO precipitates. However only a couple of hundred feet upstream from where the sample was taken is one of the most

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significant induced polarization anomalies recorded on the West Sedgwick Grid, so re-sampling is advised before arbitrarily assigning the anomaly to a HIMO precipitate origin. H.Y.86 taken a short distance away from the previous sample on a tributary assayed 105 ppm Zn and sub-anomalous amounts of Cu and Pb, but also moderate proportions of Co; the remarks made about H.Y.87 also apply to this sample. Anomalous and sub-anomalous Zn and Pb values occur both upstream and downstream of these two samples, both these former are accompanied by moderate amounts of Co and one contains a substantial concentration of Mn. Cu, Pb and Zn all decrease gradually downstream, suggesting the presence of a dispersion train.

Three samples taken from the headwaters of the West Queen River, and located just within the Cockatoo Porphyry, are all anomalous for Zn (85, 85 and 110 ppm), two for Pb (90, 90 ppm), and the one furthest upstream for Cu (65 ppm). Moderate proportions of Co are present in all three samples, and as the only sample for which a Mn value is available contains 1,500 ppm Mn it can fairly be assumed that the anomalies are caused by HIMO precipitates. However there is a gap in the sampling coverage upstream which should be rectified before completely discarding the anomalies.

The highest Pb value recorded so far is an isolated high of 205 ppm near the head of one of the tributaries of the West Queen River just west of the Owen Conglomerate. Cu and Zn are present only in background quantities, and as the sample also contains the highest amounts of Co and Mn yet observed (105 ppm and 7,800 ppm respectively) it seems certain that this anomaly is caused by a HIMO precipitate.

Situated just outside the N.W. boundary of the lease is a Zn value of 155 ppm. Its significance at present is uncertain because of its isolation, Co and Mn contents indicate a slight degree of HIMO precipitation, however Cu and Pb values are well below threshold levels. The sample was collected from a stream which drains an area of largely unknown geology, but which may well contain a large proportion of argillaceous sediments. A pyritic black shale from the Queenstown Pyroclastics assayed

900 ppm Zn, and thus it is a possibility that the Zn anomaly is due to effects of drainage over a predominantly shaley sequence. Much more work is needed to be carried out on the area, this may show that the Zn values represent a separate population whose background and threshold levels are much higher than elsewhere.

A stream with its watershed just below the Tyndall track, which flows east into the Langdon River, recorded a sub-anomalous 70 ppm Zn from a sample collected just above its confluence with the Langdon River and an anomalous value of 115 ppm Zn from a sample taken just over $\frac{1}{2}$ mile upstream. In both samples Mn and Co concentrations signify at least minor quantities of HIMO precipitates but it is not certain that the anomaly can be completely ascribed to this source. No mineralisation is known from the area.

H.Y.92 situated on a tributary of Leslie Creek north of the northern margin of the Cockatoo Porphyry contains 110 ppm Zn and sub-anomalous Cu and Pb values of 55 ppm and 80 ppm respectively. Again no figure for Mn is available, but Co concentration is fairly high so HIMO precipitates may be regarded as the source of the anomaly. A sample containing 155 ppm Zn was taken from a tributary of the West Queen River just above its junction with that river and just west of the Cockatoo Porphyry. Again high Mn and Co values suggest that the anomaly is spurious.

Isolated anomalous samples containing high Mn and base metal values in areas considered to have low economic potential can on this basis be fairly confidently eliminated from further consideration, but problems arise in areas where mineralisation occurs or is suspected to occur, and some stream sediment samples contain anomalous contents of both Mn and one or more base metals. Such anomalies should be treated with caution; re-sampling, together with a description of where the sample was taken from, whether from active sediment in the middle of a stream or amongst roots near the banks, also whether a dispersion train exists or not may all help to decide whether the anomaly is true or spurious.

6. GEOPHYSICS - WEST SEDGWICK GRID6.1 Induced Polarization Survey

As recommended and detailed in the 1972-73 Annual Report a reconnaissance gradient array induced polarization (I.P.) survey was carried out over the grid by Scintrex Pty. Ltd. in two stages, between the 7th and 15th December using two operators and between the 21st and 30th December utilizing three operators, who were assisted by up to four field assistants provided by Mt. Lyell. Progress during the first period was slow and was eventually abandoned due to excessive electrical 'noise' from the D.C. trains operating in the Mt. Lyell underground workings. Subsequently the bulk of the work was carried out during the Mt. Lyell Christmas break when the trains were not operating. The I.P. technique utilized in the survey employed large current dipoles of 7,000 ft. - 10,000 ft. with a potential dipole of 100 ft. moved at 100 ft. or 50 ft. intervals as required to define the extent of any anomalous response.

A detailed discussion of the results can be found in the report by Howland-Rose (1974), however the more important points will be repeated here. The resistivity data was generally rather uniform. The highest apparent resistivity occurs adjacent to and originates from the Owen Conglomerate. A zone of above average resistivities was encountered over the intermediate porphyry intrusives, but oddly enough their extrusive equivalents? were characterized by background resistivities which were amongst the lowest recorded in the survey. Similarly the background chargeabilities were very constant, rarely varying from between 10 and 15 milliseconds, again the only significant departure from this norm was in the vicinity of the Owen Conglomerate where values as low as 5 milliseconds were found. The chargeability and resistivity data, apart from the exceptions detailed above, did not outline major rock units, and the minor changes that have been recorded are caused by local variations in rock composition or degree of silicification.

6.2 Description and Discussion of Anomalies

A total of 38 anomalies have been defined as a result of the survey of which four described below are considered to be of major significance by Scintrex Pty. Ltd.

A substantial chargeability anomaly of about 20 milliseconds has been recorded at 550'E on line 4200'S. Its width is less than 100 ft. and it apparently dips steeply to the east. The

maximum depth to the top of the source is probably less than 50 ft. The anomaly is situated within an acidic sequence of ignimbrites with occasional lavas; no mineralisation other than scattered grains of pyrite has been observed in the immediate area. Shales have not been recorded along the line in the vicinity of the anomaly, but they may occur in the upper reaches of Swan Creek which flow just north of the line and across the projected strike of the anomaly have yet to be mapped. Anomalous Cu, Pb and Zn values have been obtained from stream sediments taken just below the I.P. anomaly and a dispersion train extends downstream, but some doubt has been cast on the authenticity of these values (see 5.1.3).

A 10 millisecond anomaly on line 4800'S is centred at 1650'E, its source is considered to be less than 50 ft. in width, less than 30 ft. from the surface and to dip steeply east. The strongest chargeability anomaly (25 milliseconds) observed during the survey, is situated on line 8400'S between 1050 and 1200'E, its source has an essentially vertical dip. These two anomalies are located just within or along the western boundary of the Cockatoo Porphyry, a major intermediate intrusive body. The nature of the adjacent rocks is not known because of lack of exposure, caused in the latter case by a moraine-filled valley, but several exposures of blue-black shales can be seen at two points between the two anomalies just to the west of the Cockatoo Porphyry, and these may be the source of the anomaly. One of the tributaries of the West Queen River which drains part of the contact area yielded an anomalous Zn stream sediment value, but again it is believed to be a 'false' anomaly.

The remaining major I.P. anomaly gave a strong response of 16 milliseconds, the source of which probably dips east. It is situated (line 8400'S, 225'-380'E) in the midst of an area of Queenstown Pyroclastics (massive, medium-coarse grained crystal lithic tuffs), which would not be expected to be a favourable environment for volcanogenic stratiform sulphides.

The steep easterly dip for three of these anomalies inferred by the geophysics is consistent with the meagre geological evidence available. Over all these chargeability anomalies only minor reductions in resistivity have been recorded, and therefore it has been suggested by Howland-Rose that they are caused by one or more of the following: disseminated sulphides, electrically discontinuous massive sulphides, graphitic and/or pyritic shales.

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6.3: Magnetometer Survey

A proton magnetometer survey was carried out by Mt. Lyell personnel during February and March, 1974; the results were processed and interpreted by Scintrex Pty. Ltd. and incorporated in their report on the induced polarization survey. The most noteworthy aspect of the survey was the very similar response of most of the rock units. The only rock groupings that could be distinguished were the intermediate porphyry intrusives and the Comstock Tuffs. Magnetic values over the former were characteristically higher than over the surrounding rocks and erratic peaks were also present. This irregular type of profile is what could be expected from an intrusive sequence with minor lavas and/or pyroclastics. Sharp and substantial rises of up to 2,000 gammas were recorded at the contact of and over the Comstock Tuffs in the S.E. corner of the grid, and the distinctive crystal lithic tuffs-agglomerates of this formation appear to be the most magnetically active rocks outcropping on the grid. No peaks were associated with any of the known mineralisation or the major I.P. anomalies.

7. RECOMMENDATIONS 1974-757.1 Reconnaissance Exploration7.1.1 Geological Mapping and Stream Sediment Geochemistry

The reconnaissance mapping carried out since the licence area was acquired by Mt. Lyell will be continued in conjunction with the stream sediment and pH sampling programme as outlined in Section 5.1. The two major areas still remaining to be mapped are those north of the Lake Margaret township, and north and north-west of the Henty River.

7.1.2 Airborne E.M./Magnetic Survey

Certain parts of the licence, in particular the areas west of the Zeehan Highway and north-west of the Henty River, are thickly vegetated and difficult of access. Only limited stream sediment sampling and mapping has been carried out and consequently the economic potential of these areas is largely unknown. An airborne (probably by helicopter) geophysical survey coupled with some further geological mapping and stream sediment sampling should provide enough information to decide whether the areas warrant further work or should be relinquished, thus concentrating effort on the zones of indicated economic potential.

The advantages of an airborne E.M./magnetic survey are as follows : E.M. techniques can be used to detect massive sulphide mineralisation. Mineralisation of this type which has recently been discovered in N.W. Tasmania was initially detected by an helicopter E.M. method. E.M. may also detect narrow conductive zones containing economic concentrations of chalcocite in areas of disseminated non-conductive sulphides (Howland-Rose, 1972, 1973).

Extension of the survey to cover the remaining Cambrian rocks in the licence area would complement rather than duplicate previous work and provide a complete geophysical coverage of all possible areas of interest in the licence area rapidly and relatively cheaply.

A survey is recommended with an interline line spacing of 700 ft. This would comprise 62 lines with a total line mileage of 345 miles (555 km).

7.1.3 Photogeological Re-Interpretation

It is now six years since the previous and only photogeological interpretation of the areas currently held by Mt. Lyell was carried out. This study was undertaken using black and white photography and at a time when very little was known about the geology of the Cambrian rocks, in fact the only rock types recognised by the study within the Cambrian succession were a few 'acid porphyries' and ultrabasic bodies, and most if not all of these were already known from the limited mapping carried out prior to 1968.

A re-interpretation at this stage is recommended as it would have the benefit of colour photographs and a greatly increased and more detailed geological coverage. It would be even more valuable if it incorporated the wealth of structural information likely to flow from an airborne magnetic survey.

7.2 Detailed Exploration

7.2.1 West Sedgwick Grid

The gradient array I.P. survey has outlined a number of anomalies (Map 4), four of which were considered to be of major geophysical significance. It is recommended that all the anomalies be soil sampled at about 25 ft. intervals and the samples analysed for Cu, Pb, Zn, Co, Ni and Mn. All I.P. anomalies that on geological or other evidence appear promising but do not generate any soil geochemical anomalies should first be checked with a pole-dipole or dipole-dipole array to make certain that they are not 'false' anomalies generated by inductive coupling (Howland-Rose, 1973) (a problem to which gradient array is particularly prone).

7.2.2 West Sedgwick Grid - Projected North Extension

Two zones of disseminated pyrite in the northern part of the West Sedgwick Grid (Map 4) have been delineated by geology and I.P. (for a description see Section 4.3), both are open to the north, the easternmost passing under moraine. In nearly all cases analyses of samples from both these zones have yielded insignificant base metal values, however a sample of disseminated pyrite in a pale grey altered acid lava from a location approximately 800 ft. north of the northernmost grid

line, and along strike from the disseminated pyrite zone, assayed 0.19% Cu. In addition a stream sediment sample taken from a creek which drains this zone at a point about 1,300 ft. south of the rock sample locality gave anomalous Cu and Pb values of 230 ppm and 110 ppm respectively (5.1.3). The former is by far the highest Cu value recorded to date. A major N.E. striking fault has been postulated just north of the rock locality to explain the juxtaposition of two very different lithologies (3.3.5), major faults such as this one appears to be, are often the loci for significant mineral deposits.

For the above reasons it is considered that the West Sedgwick Grid should be extended northwards to close off the extensions of the two disseminated pyrite zones, and especially the westernmost one. To this end an additional three lines at 600 ft. spacings are proposed (Map 9), magnetic bearing 058° ; a sub-baseline, magnetic bearing 328° , length 1,800 ft., commencing from the point where line 00 crosses the old track from the Upper Haulage Station to the water-race; and a walking track to connect the western ends of the three lines, total footage approximately 22,000 ft. Reconnaissance pole-dipole or dipole-dipole I.P. is recommended, although if the moraine cover is too thick, gradient array may have to be employed.

7.2.3 West Sedgwick Grid - Projected South West Extension

An extension to the south-west part of the West Sedgwick Grid is proposed to test the response of various geophysical and geochemical methods to the Lake Margaret tram pyrite body (see Section 4.1 for a description, details of assay results and an assessment of its significance), and to search for extensions of the body. To this end lines 8400'S - 11400'S will be extended west for varying distances (see Map 9) and a short line put in another 600 ft. to the south (total footage 25,000 ft.) to adequately cover the strike of any mineralisation that might occur in an old adit (gold prospect?) situated just west of the Lake Margaret road. A reconnaissance pole-dipole or dipole-dipole I.P. survey is recommended as a first step to cover this area.

7.2.4 Basin Lake Grid

A grid with subsequent mapping and geophysical work over an area north of Basin Lake was suggested for the 1973-74 year but was deferred. The arguments put forward then in support of the proposal will be briefly recapitulated. The proposed grid lies on the southern extension of a geophysically anomalous zone with intermittent gossans and disseminated pyrite mineralisation, which has been outlined from north of Newton's Creek, through Howard's Anomaly into the Basin Lake area. This zone appears to be located along the eastern contact of, and within, a major intermediate porphyry intrusive; another similar but less extensive zone has also been detected at several localities along the western margin of the intrusive.

Two drill holes were put down by Pickands Mather International, who previously held the area under E.L. 12/65, in 1970 in a zone N.E. of Basin Lake, after a reconnaissance dipole-dipole (500 ft. electrode spacing) I.P. survey had outlined a strong anomaly which was subsequently detailed using the same array with a 300 ft. electrode spacing (Wuerch, 1971). The drilling of these holes was subject to major difficulties because of the thick moraine cover (D.D.H. BL 802 encountered 127 ft. of glacial material before penetrating bed-rock). Disseminated pyrite and generally insignificant base metal values were recorded in both holes, however BL 802 averaged 0.46% Pb, 0.18% Zn, 0.04% Cu and nearly 17 gm/tonne Ag over the last 15 ft. before it was abandoned because of difficulties with the contractor. Subsequent to the drilling a Turam survey carried out over the same area delineated an anomaly coincident with the I.P. anomaly.

The proposed grid will comprise 17 lines (Map 9), magnetic bearing 148° , at 600 ft. spacings; and a base-line, magnetic bearing 058° , down the western side of the grid, total footage 145,000 ft.; access to the eastern side will be provided by the Pickands Mather 4-wheel drive track. Again a reconnaissance pole-dipole or dipole-dipole I.P. array is recommended.

7.2.5 Madame Howard Plains Grid

This grid is proposed on the basis of an occurrence of several baryte lodes (Section 4.6) in a strongly kaolinized? quartz keratophyre. Baryte is a major gangue constituent of the Rosebery massive sulphide orebodies, and is associated with the North Lyell mineralisation also, the keratophyre/pyroclastics contact is considered to be a possible loci for such deposits. However if no anomalies are obtained over the grid area from the suggested airborne E.M./magnetic survey the grid and ground survey can probably be dispensed with as no sulphide mineralisation is known in the area and the geological environment is not one in which disseminated sulphide orebodies are likely to occur.

The proposed grid (Map 9) comprises 7 lines on 600 ft. spacings, magnetic bearing 068° , and a base-line, magnetic bearing 158° , down the eastern part of the grid, commencing from the Zeehan Highway opposite the Lake Margaret turn-off.

7.3 Access

To improve access to selected parts of the lease the following tracks are recommended (Map 9). Two tracks into the Henty River; cutting out part of the old Pickands Mather I.P. line to facilitate movement between lines at the eastern end of the West Sedgwick Grid, and to provide a link between the former and the Basin Lake Grid and access into the area east of Basin Lake. A track for mapping purposes along a west flowing tributary of the Langdon River should also be cut.

7.4 Staffing

To complete the work outlined, one geologist and one field assistant will be required for most of the year. Whilst the ground geophysical coverage of the various grids is underway, these personnel will need to be supplemented by up to five field assistants, depending on which I.P. array is employed.

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7.5 Budget

A total budget of \$50,300 for E.L. 41/71 has been recommended for 1974-75. This comprises :

<u>Item</u>	<u>Cost</u>
Salaries (geologist and field assistants)	\$16,800
Outside Services (bulldozing, etc.)	\$ 4,400
Geophysics	\$22,000
Geology (slide preparation, etc.)	\$ 2,200
Materials	\$ 2,100
General Costs	\$ 2,800
	<hr/>
Total	\$50,300
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N. S. Leonard

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APPENDIX 1HENTY-YOLANDE PROSPECTBUDGET 1974-75

PERIODS	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
Salaries	1,200	300	500	2,400	2,400	2,900	1,800	1,200	800	700	700	700	1,200	16,800
Materials	100	100	100	200	200	200	200	200	200	200	200	100	100	2,100
Outside Services						2,200			2,200					4,400
Geophysics							1,400		8,000					22,000
Geology				100	200	200	300	400	400	200	200	100	100	2,300
General Costs		100	100	100	100	600	500	400	400	200	100	100	100	2,800
TOTAL COST	1,300	500	700	2,800	2,900	6,100	16,800	2,200	12,000	1,300	1,200	1,000	1,500	50,300

STREAM SEDIMENT VALUES

APPENDIX 2

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Sample No.	Cu	Pb	Zn	Co	Ni	Mn	Sn
H.Y. 1	25	65	20	75	75	5	75
227	15	30	15	75	75	75	75
228	30	15	45	75	75	55	75
229	30	75	10	N/S	75	N/S	N/S
259	115	30	25	5	75	50	75
258	65	75	20	N/S	75	N/S	N/S
257	20	75	15	75	75	45	75
256	20	75	40	75	10	280	75
255	15	5	50	N/S	25	N/S	75
254	10	75	25	N/S	75	N/S	N/S
253	5	75	10	75	75	75	75
252	5	75	15	75	75	10	75
251	15	75	20	5	75	25	75
250	35	75	25	75	15	165	75
249	10	75	15	75	75	140	75
248	5	75	15	75	75	85	75
247	5	75	20	75	75	5	75
246	5	75	20	5	75	35	75
245	15	15	30	75	30	55	75
244	5	5	15	75	75	25	75
243	5	5	20	75	75	35	75
242	5	75	15	75	75	25	75
241	5	75	20	75	75	15	75
240	5	75	25	75	75	80	75
239	5	75	25	75	75	10	75
238	15	20	55	75	75	305	75
237	40	50	60	75	20	155	75
236	40	50	60	75	20	155	75
235	25	25	40	75	10	100	75
234	25	25	110	75	15	1500	10
233	25	45	10	75	5	190	75
232	25	45	10	75	5	190	75
231	25	25	45	75	75	85	75
230	15	205	15	105	5	7800	75
229	15	50	15	50	75	2950	75
228	35	15	20	75	75	N/S	N/S
227	35	50	35	5	5	80	75
226	35	50	25	75	75	N/S	N/S
225	20	15	15	75	75	N/S	N/S
224	20	15	15	75	75	N/S	N/S
223	20	15	15	75	75	N/S	N/S
222	35	50	25	75	75	N/S	N/S
221	20	15	15	75	75	N/S	N/S
220	40	55	155	15	5	475	75

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- 2 -

Sample No.	Cu	Pb	Zn	Co	Ni	Mn	Sn
H.Y. 77✓	55	90	110	25	15	N/S	N/S
281 78✓	10	20	50	<5	<5	20	<5
305 79✓	45	70	95	35	15	1380	<5
331 80✓	10	15	30	<5	<5	N/S	N/S
230 81✓	10	5	20	<5	<5	N/S	N/S
352 82✓	5	15	10	<5	<5	10	<5
351 83✓	10	20	10	<5	<5	5	<5
310 84✓	20	40	30	5	10	N/S ³⁵	N/S
309 85✓	25	50	45	5	5	N/S	N/S
307 86✓	55	70	105	15	10	N/S	N/S
306 87✓	85	115	160	30	20	N/S	N/S
329 88✓	15	20	40	<5	<5	N/S ⁵	N/S
328 89✓	15	30	80	<5	<5	N/S	N/S
320 90✓	25	25	5	<5	<5	N/S ⁵	N/S
312 91✓	35	55	60	20	10	N/S ⁷⁰⁰	N/S
311 92✓	55	80	110	25	25	N/S ⁷⁰⁵	N/S
327 93✓	15	30	30	<5	<5	N/S ¹⁰	N/S
322 94✓	230	110	20	<5	<5	N/S ⁴⁰	N/S
326 95✓	10	25	10	<5	<5	N/S ⁵	N/S
318 96✓	10	10	10	<5	<5	N/S	N/S
319 97✓	10	15	5	<5	<5	N/S ⁵	N/S
321 98✓	20	40	35	10	5	N/S ⁷⁰	N/S
317 99✓	10	15	5	<5	<5	N/S	N/S
294 100✓	65	90	85	25	10	N/S	N/S
299 101✓	10	45	15	10	5	N/S	N/S
301 102✓	15	35	10	5	5	N/S	N/S
298 103✓	15	30	10	<5	<5	N/S	N/S
293 104✓	145	75	85	25	10	N/S	N/S
105	50	80	60	15	10	N/S	N/S
106	25	50	20	5	5	N/S	N/S
303 107✓	45	60	30	15	5	N/S	N/S
108	30	60	15	<5	<5	N/S	N/S
285 110✓	45	55	155	20	20	1330	<5
288 111✓	45	75	75	25	15	1500	<5
289 112✓	15	55	20	15	10	990	<5
290 113✓	5	<5	5	<5	5	10	<5
313 114✓	25	30	60	10	10	540	<5
314 115✓	15	30	25	10	5	800	<5
315 116✓	20	60	10	<5	5	80	<5
324 117✓	15	25	25	<5	10	80	<5
325 118✓	10	15	10	<5	5	10	<5

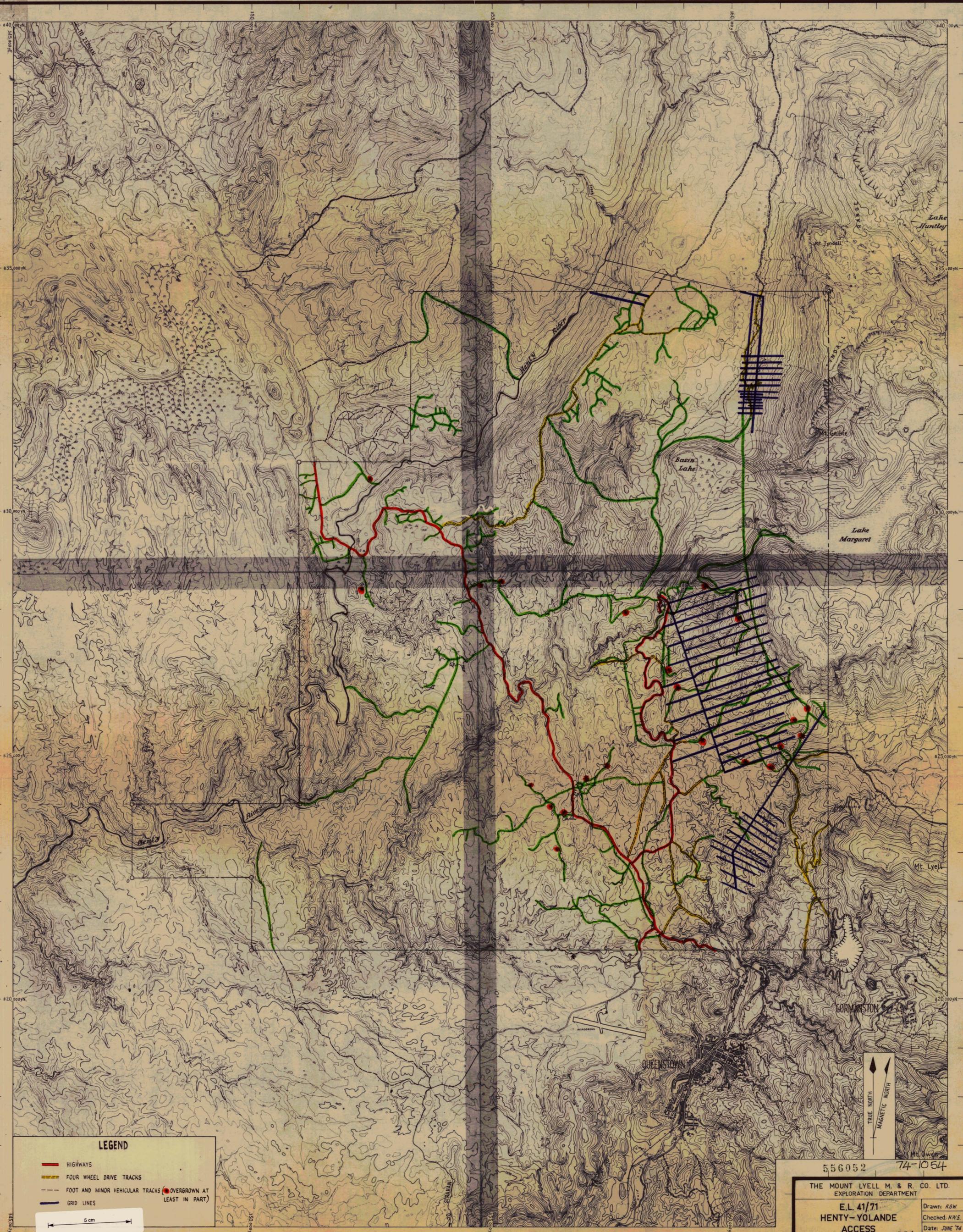
050

556051

- 3 -

Sample No.	Cu	Pb	Zn	Co	Ni	Mn	Sn
23323 H.Y. 119 ✓	35	25	15	<5	5	50	<5
27283 120 ✓	35	60	55	10	<5	430	<5
23368 121 ✓	15	30	20	<5	5	40	<5
23316 122 ✓	15	10	15	<5	<5	5	<5
276 123 ✓	25	65	65	<5	5	425	<5
277 124 ✓	20	75	30	<5	5	305	<5
278 125 ✓	25	50	55	<5	10	340	<5
279 126 ✓	15	40	15	<5	<5	35	<5
280 127 ✓	40	75	70	10	15	570	<5
268 128 ✓	15	25	25	<5	5	170	<5
269 129 ✓	10	45	15	<5	5	400	<5
270 130 ✓	10	25	25	<5	5	60	<5
271 131 ✓	15	45	25	5	5	135	<5
273 132 ✓	10	45	10	<5	<5	185	<5
274 133 ✓	20	70	35	5	5	175	<5
275 134 ✓	10	25	30	5	10	90	<5
332 135 ✓	10	20	10	5	<5	125	<5
235 136 ✓	15	40	5	<5	<5	<5	<5
234 137 ✓	20	25	5	<5	<5	5	<5
233 138 ✓	30	25	45	<5	<5	10	<5
335 139 ✓	30	55	115	15	15	555	N/S
333 140 ✓	25	45	70	10	10	480	N/S
260 141 ✓	20	20	20	<5	5	40	N/S
262 142 ✓	10	10	10	<5	<5	5	N/S
261 143 ✓	20	30	40	<5	15	90	N/S
263 144 ✓	10	15	15	<5	<5	25	N/S
264 145 ✓	10	15	30	<5	5	20	N/S
267 146 ✓	10	15	20	<5	<5	20	N/S
266 147 ✓	5	10	5	<5	<5	5	<5
366 148 ✓	15	20	10	<5	<5	220	<5
265 149 ✓	5	5	10	<5	<5	5	<5

N/S - No sample



LEGEND

- HIGHWAYS
- FOUR WHEEL DRIVE TRACKS
- FOOT AND MINOR VEHICULAR TRACKS ● OVERGROWN AT LEAST IN PART
- GRID LINES

5 cm

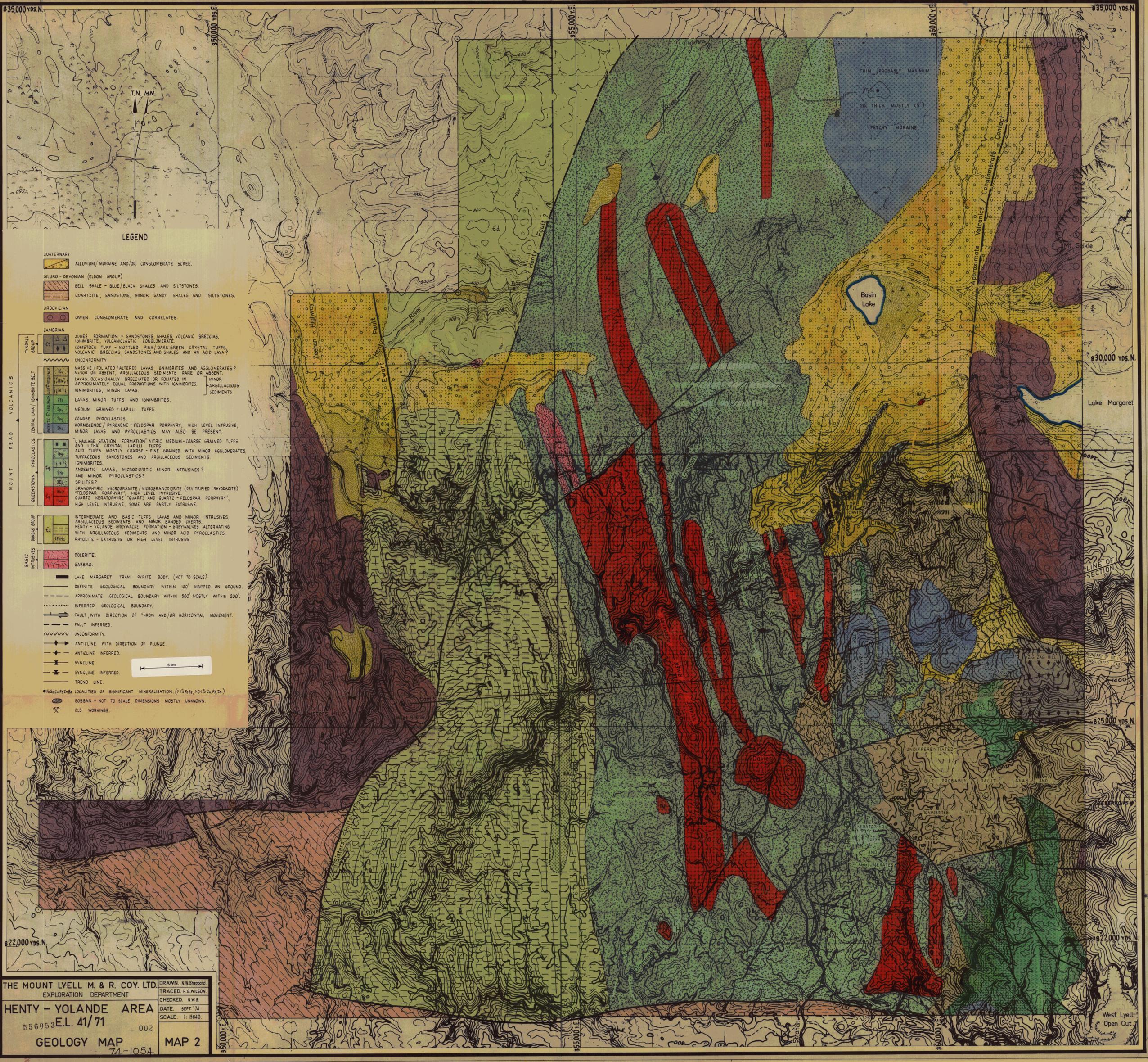
556052 74-1054

THE MOUNT LYELL M. & R. CO. LTD.
EXPLORATION DEPARTMENT

E.L. 41/71
HENTY-YOLANDE
ACCESS
MAP 1

Drawn: RBW
Checked: MWS
Date: JUNE '74
Scale: 2" = 1mk

001



THE MOUNT LYELL M. & R. COY. LTD
 EXPLORATION DEPARTMENT
HENTY - YOLANDE AREA
 556053 E.L. 41/71 002
GEOLOGY MAP 74-1054 **MAP 2**

DRAWN: N.W. Sheppard
 TRACED: R.G. Wilson
 CHECKED: N.W.S.
 DATE: SEPT '74
 SCALE: 1:19840

West Lyell
 Open Cut

WEST

EAST

74-1054

SISTERS HILLS FAULT

GREAT LYELL FAULT

SEDGWICK PLATEAU

EAST SISTER

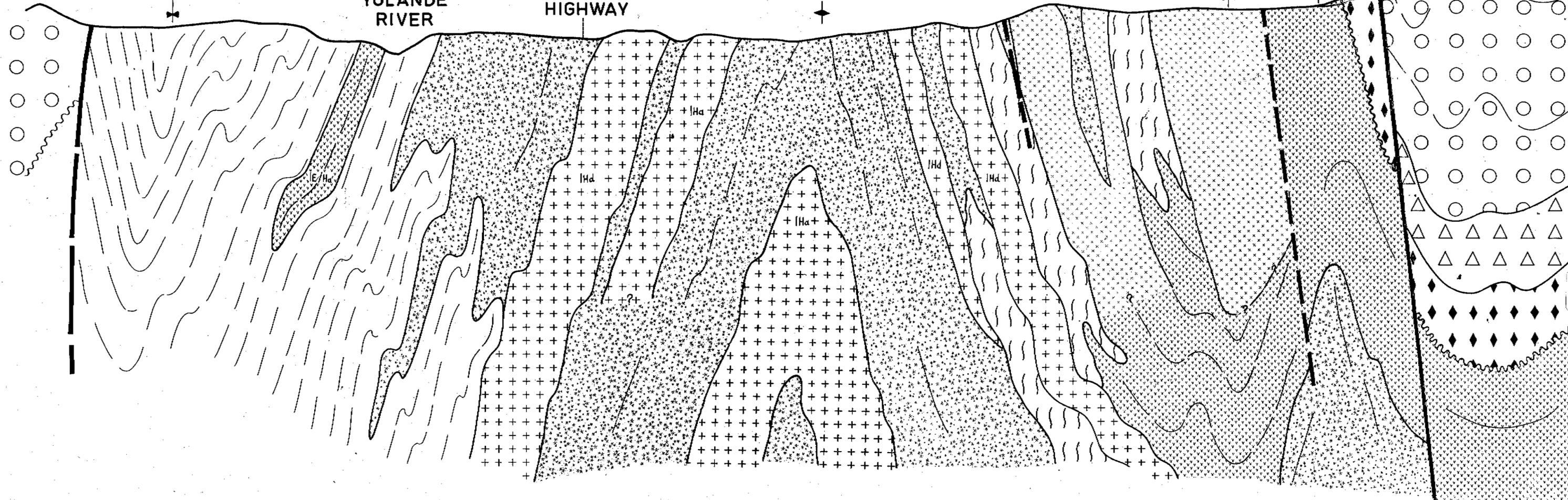
YOLANDE RIVER

ZEEHAN HIGHWAY

CROWN HILL

CONGLOMERATE

SCREE



0 0.5 1 2 Km

0 0.5 1 Mls.

V=H

5 cm

556054

NOTE: LEGEND AS FOR GEOLOGICAL MAP- No 2

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HENTY-YOLANDE AREA
E. L. 41/71

GEOLOGICAL CROSS SECTION
MAP 3

DRAWN: N.W.S.

CHECKED: N.W.S.

DATE: JULY '74

SCALE: AS SHOWN

003



556056 74-1054

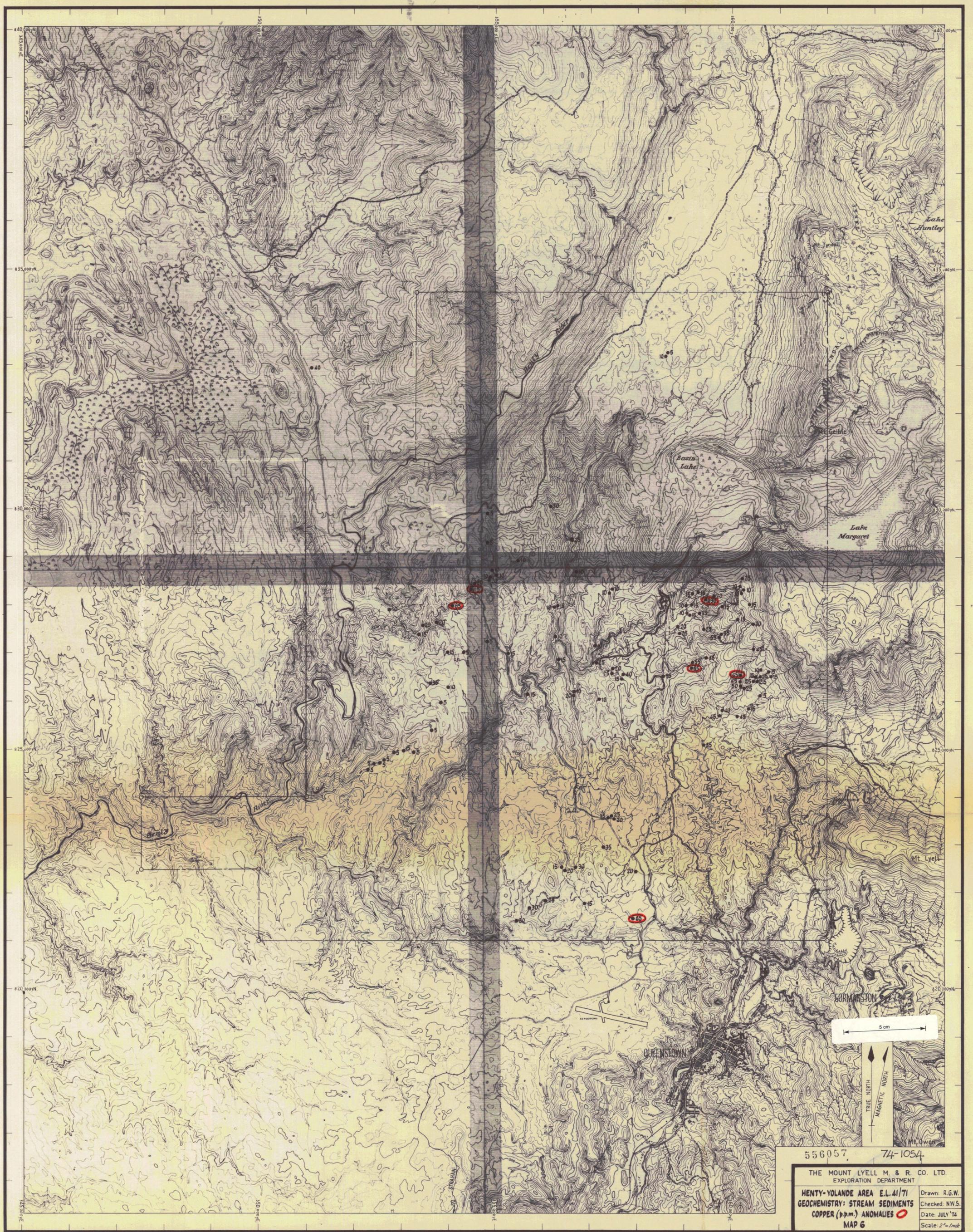
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HENTY-YOLANDE AREA E.L.41/71 Drawn R.G.W.
GEOCHEMISTRY: STREAM SEDIMENTS Checked N.W.S.
SAMPLE NOS 005 Date JULY '74
MAP 5 Scale 2" = 1 mile

Base map by Lands and Surveys Department, Hobart. 40 chains to 1 inch sheets.

0 500 75-1093
23226 Feature No 615

Co-ordinates on State Grid



556057 74-1054

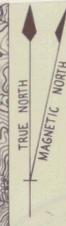
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 EXPLORATION DEPARTMENT
HENTY-YOLANDE AREA E.L. 41/71
GEOCHEMISTRY: STREAM SEDIMENTS
COPPER (p.p.m.) ANOMALIES
MAP 6

Drawn: R.G.W.
 Checked: N.W.S.
 Date: JULY '74
 Scale: 2" = 1 mile

Base map by Lands and Surveys Department, Hobart. 40 chains to 1 inch sheets.



5 cm



556058 74-1054

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EXPLORATION DEPARTMENT

HENTY-YOLANDE AREA E.L.41/71
GEOCHEMISTRY: STREAM SEDIMENTS
LEAD (ppm) ANOMALIES

MAP 7

Drawn: R.G.W.
Checked: N.W.S.
Date: JULY '74
Scale: 2" = 1 mile



556059 74-1054

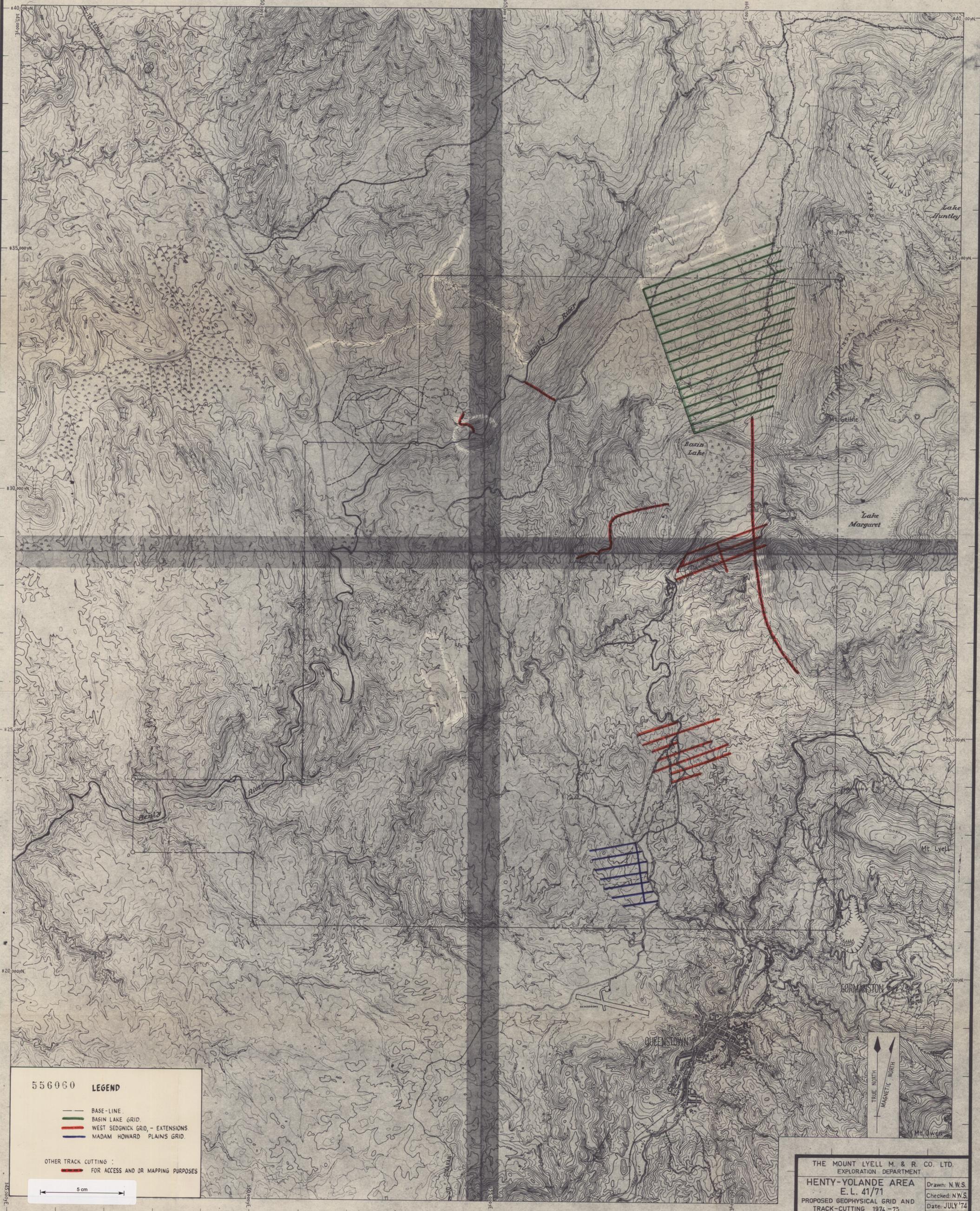
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HENTY-YOLANDE AREA E.L. 41/71
GEOCHEMISTRY: STREAM SEDIMENTS
ZINC (p.p.m.) ANOMALIES 
MAP 8 003

Drawn: R.G.W.
Checked: N.W.S.
Date: JULY '74
Scale: 2" = 1 mile

Base map by Lands and Surveys Department, Hobart. 40 chains to 1 inch sheets.

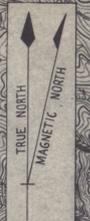
Co-ordinates on State Grid.



556060 LEGEND

- BASE-LINE
- BASIN LAKE GRID
- WEST SEDGWICK GRID - EXTENSIONS
- MADAM HOWARD PLAINS GRID

OTHER TRACK CUTTING :
 — FOR ACCESS AND OR MAPPING PURPOSES



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 EXPLORATION DEPARTMENT
HENTY-YOLANDE AREA
 E. L. 41/71
 PROPOSED GEOPHYSICAL GRID AND
 TRACK-CUTTING 1974-75
 MAP 9 003

Drawn: N.W.S.
 Checked: N.W.S.
 Date: JULY '74
 Scale: 2ms/1mle

Co-ordinates on State Grid.

Base map by Lands and Surveys Department, Hobart. 40 chains to 1 inch sheets.