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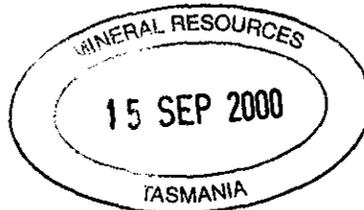
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Annual report on Exploration May 1999 to June 2000 -  
EL19/1993 & T2-MEL  
Mineral Holdings Australia Proprietary Limited\*  
Duncan, D.McP.; Rhodes, L. EL19/1993; T2MEL

**EXPLORATION LICENCES**

**EL 19/93 & T2-MEL**

**RINGAROOMA BAY, TASMANIA**



**ANNUAL REPORT ON EXPLORATION  
MAY 1999 TO JUNE 2000**

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**28th August 2000**

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**Plate 1- Sapphire Photographs (a,b,c and d)**

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**EL 19/93 & T2-MEL- Ringarooma Bay- Annual Report 2000- Volume 2****ABSTRACT**

This report describes the work carried out on the evaluation of tin-bearing placers on licences 19/93 and T2-MEL which are a central part of the Ringarooma Alluvial Project of Mineral Holdings Australia Pty Ltd. Previous exploration offshore in the 1960s has revealed an Inferred Resource of 130 Million cubic metres of potential tin wash all of which falls within the area of EL 19/93 and T2-MEL. Onshore there is an Indicated Resource of 109 Million cubic metres of tin wash held within the Fosters Marshes RLs 8715 and 8723 with additional resources in EL 38/97 Aberfoyle Hill.

While awaiting the planned offshore bulk sampling program which has been delayed for various reasons as outlined in Volume 1, Mineral Holdings embarked on a program to estimate the gemstone component of the alluvials particularly the sapphire content.

The hand tool only program sampled active creek sediments in the current drainage of the main rivers- Ringarooma, Boobyalla, Musselroe and George- and the tails, middlings and maiden wash (only occasionally accessible) of the former tin mines. Two composite samples of the seabed sediment from Ringarooma Bay were also prepared.

Study of the heavy mineral components of the samples reveals that sapphire, zircon and topaz are widespread in the current- and palaeo- drainages in the region along with cassiterite, pleonaste spinel and ilmenite. Other mineral components including gold are present in lesser amounts.

The total yield of sapphires was 530 from the main dressing sheds at Dorset Dredge, Endurance and Pioneer with 20% (105) being black/brown star sapphires. The corundum parcel of 326 grains recovered from the jig bed of Summers' Mine at Sth Mt Cameron had a total weight of 34 carats and was classified as 14% blue sapphire, 10% blue star sapphire, 22% black star sapphire, 1% green sapphire and 53% non gem corundum. All of this sapphire is below 4mm due to screening in the processing for tin and the plus 4mm component of the natural population is unknown.

The sapphire grades in the current drainage range up to 300g/BCM with the proximal hill creeks being higher grade than the distal plains creeks. In the former tin mines, the maiden wash is up to 7g/BCM and the tails up to 5.8g/BCM.

As two blue sapphire grains in the plus 0.3mm size have been found in one of the composite samples offshore, it is possible to regard the marine tin placers as potentially containing sapphire resources as yet untested.

Some initial basalt sampling has taken place towards finding a source for the sapphires. Pleonaste spinels has been found in the basalt and the nodules and, for the first time, xenocrystic blue apatites, but to date no sapphires or zircons.

As a direct result of this work, Mineral Holdings has taken out a Special Exploration Licence 22/99 for gemstones covering 3600sq. km. in N E Tasmania and arranged an exploration joint venture with GTN Resources of New South Wales.

## **EL 19/93 & T2/MEL - Ringarooma Bay- Annual Report**

### **1.0 Introduction**

EL 19/93 was granted to Mineral Holdings Australia Pty Ltd on 28th April 1997 for a maximum of 5 years to 4th April 2002 over an area of 18sq km at Ringarooma Bay to cover the extension into State Waters of the tin-bearing palaeochannel of the Ringarooma River.

Subsequently, two adjacent ELs were applied for to secure additional areas-landwards and seawards- of potential for alluvial tin. T2-MEL was applied for on 19th May 1997 covering some 48 sq km in Commonwealth Waters under the Offshore Minerals Act 1994 and was granted for four years from 30th March 1998.

EL 20/97 was applied for on 20th May 1997 to secure the extensions of the palaeochannel both offshore around EL 19/93 and T2-MEL and onshore to connect up with the Retention Licences 8715 and 8723 at Fosters Marshes and to cover the Bowlers Lagoon area suspected of concealing a former branch of the Ringarooma River. On granting on 20th January 1998, EL 20/97 was amalgamated into EL 19/93 to give a combined area of 52 sq km expiring on 4th April 2002 (Plan 1).

Subsequently, EL 38/97 was granted on 6th March 1998 to the south of the RLs at Aberfoyle Hill to cover 4 sq km containing old alluvial tin workings to prospect for bentonite, tin and gemstones.

These licences held by Mineral Holdings Australia Pty Ltd consolidate the potential alluvial tin resources in the Ringarooma Bay region both onshore and offshore and allow exploration to proceed in a coherent manner with subsequent economies of scale.

The land classifications covering the licences are given in Plan 4.

### **2.0 Previous Exploration**

The Ringarooma Tin Project of Mineral Holdings Australia Pty Ltd consists of the tin-bearing palaeochannel of the Ringarooma River in NE Tasmania. Previous exploration as summarised by MacArthur (1995) has shown that the onshore and offshore components of the channel contain indicated resources of 109M cu m at 64g tin/ cu m and 16M cu m at 227g tin/ cu m respectively. In total offshore, there is an inferred resource of 130M cu m of potential tin wash (Plans 2 & 3).

Additional values of minerals in the wash offshore include rutile and zircon averaging 55 g/cu m and 110 g/cu m respectively. Ilmenite is expected to be at similar concentrations as zircon. Gold has been recovered in the past from the wash onshore

by the Dorset Dredge at 3 mg/cu m while a composite sample from one onshore drill hole assayed 6 mg/ cu m. Monazite(rare earths), topaz and sapphire are present but remain unquantified.

Historically since the 1870s, the Ringarooma catchment has produced over 40,000 tonnes of tin from onshore alluvial mines at Aberfoyle, Pioneer, Endurance and Briseis and a number of smaller deposits.

The onshore resource is currently held by MHA under Retention Licences 8715 (6 sq km) and 8723 (7 sq km) and the offshore resource by the same company under Exploration Licences EL19/93 and T2-MEL. The extension of the palaeochannel and associated structures into Commonwealth Waters contains the bulk of the known tin resources.

While awaiting the availability of a suitable dredge to carry out a bulk sampling program in 1998, Mineral Holdings has investigated the seabed with abalone divers using 15 foot boats equipped with GPS for navigation. The results are fully described in the previous two annual reports and will only be summarised here.

Grab sampling by abalone divers of active seabed sediments has outlined a 4sq km area of greater than 100g/t Sn (and up to 694g/t) centred on 147deg 52mins E and 40deg 50mins S and called the "**Palaeochannel Prospect**". The area outlined sits on the interpreted palaeochannel and also extends to the west into a region not previously considered prospective.

No additional figures can be added to the resource inventory until a drilling program has confirmed appropriate grades to basement. Because of the small grab sample size, these tin contents are indications only rather than contributing to resource figures.

The zone defined by the  $> 0.3$  and  $< 1.2\%$  TiO<sub>2</sub> contour is now referred to as the "**Old Shoreline Prospect**," lies inshore at about 15m water depth and has been extended by the recent sampling to 4km in strike length and 500m in width. The zone may be subject to reworking and concentrating in a bar parallel to shore with heavy minerals being added in the present sediment build up. The prospect has been drilled by 15 BHP-Utah holes but only tin analyses were carried out with poor results.

The seabed sampling program has provided additional information on the sediments, structures, bedrock, vegetation and depth of the seabed.

Following concern about the radioactivity of the heavy mineral suite, particularly cassiterite, a study was carried out by AMDEL on a concentrate previously sluiced some years ago from the Great Northern Plains. The full results are contained in the annual report to May 1999 on Retention Licences 8715 and 8723.

The conclusion was that the uranium and thorium are almost exclusively present in discrete grains of monazite, xenotime and zircon and that the other minerals (particularly cassiterite) have not acquired U and Th from contact or association with these minerals in the alluvial deposits. There would therefore be no problem with

radioactivity associated with the separation, stockpiling or transporting of cassiterite or ilmenite in any future operation.

### 3.0 Current Exploration

Mineral Holdings has planned a bulk sampling program in Ringarooma Bay to raise up to 8 samples of heavy mineral-bearing sediment, each sample in the 5 cu m (7-8 tonne) class. The equipment to be used by the Marcon Dredging Company is a Pneuma pump mounted on a barge towed by a tug. The samples will be contained in up to 70 bulker bags.

The program was rescheduled to begin on April- May but has been delayed due to mobilisation of equipment, alterations to the barge, the lack of suitable breaks in the seasonal weather patterns and the non availability of the Government tug. At the time of writing, we remain on two days' notice to proceed.

The attached table 1 contains the eight best drill intersections of Ocean Resources from the work carried out in the 1960s. These will be the main targets of the sampling although their positions are known only approximately. In addition, the best area of concentration of cassiterite outlined in the recent seabed sampling as well as the Old Shoreline Prospect found during the same exercise will also be considered as targets.

As far as the priority goes, the richest drill localities will be sampled first in case of an interruption to the program due to sea conditions or technical problems in an effort to secure a good supply of tin for further metallurgical studies.

The plateau area is the main tin resource and is contained within T2-MEL (the Commonwealth licence) so that two thirds of the sites should be there (Plan 2). The palaeochannel which connects the plateau to the shore runs through the State licence 19/93 and the remainder of the sites should be included here to look for variability in the tin resource and to satisfy work commitments.

Two possible sites have been chosen to follow up the tin-rich, seabed sampling---

- site 319      147deg 52.50mins E; 40deg 49.50mins S    in 28m water
- site 122/7    147deg 51.85mins E; 40deg 49.60mins S    in 23m water

One site has been chosen to follow up the best intersection in titanium minerals in the middle of the Old Shoreline Prospect and the palaeochannel at---

- site 367      147deg 53.40mins E; 40deg 51.10mins S    in 7.6m water

These three sites will be accommodated depending on how successfully the main part of the program is running. As well, there may be problems with the operation of the pump in shallow water (less than 10m), if not safety constraints, with vessels within 1km of the shore in shallow water. On this basis, the shoreline sample may not be possible.

The resultant bulk samples will be subject to heavy mineral concentration in a suitable plant followed by mineral separation and beneficiation studies.

As another method of investigation and to potentially increase the value of the tin placers, it was decided to estimate the gemstone content of the alluvials particularly the sapphire content. Also, as a result of the global association of diamonds with sapphires, it was decided to scan for diamonds and indicator minerals in the hope that a positive result would make the alluvial project more attractive to potential joint venturers. No diamonds have yet been found from the early results but the study is continuing.

As a prelude to complete evaluation of the placers by drilling, excavator sampling and concentrating in an alluvial treatment plant, Mineral Holdings has conducted a reconnaissance sampling program in NE Tasmania for sapphires and other gems in sands and gravels in the active sediments in creeks, in the sands and gravels exposed in the old tin mines (although this would not normally be untreated tin wash) and also in the middlings and tails of former tin mine treatment plants.

This has resulted in work being conducted mostly outside the existing alluvial tin tenements (ELs 19/93 and 38/97, RLs 8715 and 8723 and T2-MEL) where the heavy mineral placers are not readily accessible for sampling being either under water or under metres of barren overburden. So the sampling of necessity has taken place up the palaeoslopes in the old tin workings on the plains around Gladstone or in the drainages there or in the mountains around the Weldborough and Derby headwaters. This information in the high catchments is of direct bearing on the possible contents of the heavy minerals and gems in the downstream alluvials. However, material was included from the present licences, EL 19/93 and T2-MEL, in the shape of two composite samples prepared from the recent seabed sampling by Mineral Holdings.

In addition, some work was carried out on the hard rock source of the sapphires.

#### **4.0 Results**

The results from each phase of the work are described in turn.

##### **4.1 Tin and gem concentrates, NE Tasmania**

Initial mineralogical assessment was carried out on tin and gem concentrates, residues and tails held by Mineral Holdings from their previous work mainly on the Great Northern Plains area of NE Tasmania. The aim was to confirm the main mineral species and to search for diamonds or their indicator minerals. The work was carried out by Independent Diamond Laboratories of Perth, WA operated by mineralogists experienced in diamond exploration and led by Mr John Towie.

The smaller samples (IA, 4, 5 and 6) were observed directly and the larger ones (S1, S2, and S3) had to be sieved, subjected to heavy liquids and magnetically separated and the appropriate fractions (mostly the non magnetic) then observed.

The samples proved to be various combinations of pleonaste (spinel-hercynite), corundum, zircon, topaz, and cassiterite with lesser amounts of rutile, ilmenite, gahnite (zinc spinel), chromite, epidote, anatase, leucosene, tourmaline, diopside, orthopyroxene, almandine, monazite, gold and rock fragments.

No diamonds, pyropes or chrome diopsides were observed but sample S2 had chromites and both S1 and S2 had microilmenites which were probed to test their kimberlitic affinity. Sixteen grains were studied, five ilmenites and eleven chromites. It was concluded that it is unlikely on chemical grounds that the chromites or ilmenites are related to kimberlites but that they are similar to those from basaltic rocks including diatremes which are common in the Eastern States. One chromite (PM16), having the highest chrome content and a different morphology, was described as possibly having some association with diamonds. The other "chromites" are really chrome spinel or pleonaste with PM 14 being a picotite.

All imenites have MgO less than 10% which virtually rules out a kimberlite origin.

The results of the mineralogical observations and the chemical analyses are given in Appendix 1.

To further investigate whether diamonds and/or indicator minerals were present in the sands and gravels of the Ringarooma Basin, a scan was carried out on the old Dorset Dredge tin dressing shed tailings on the Great Northern Plains. A sample of tailings (0.67kg) representing a concentration of minerals with a middling range of specific gravities was screened by Mr L Rhodes and the fractions sent to IDL for mineralogical analyses.

Minerals observed after heavy liquid treatment were topaz, pleonaste, zircon, ilmenite and cassiterite with lesser amounts of corundum, gahnite (zincian spinel), garnet (almandine, spessartine and grossular), florencite (probably monazite), leucosene, anatase, biotite, tourmaline, amphibole, and clino- and ortho-pyroxene.

Six microilmenites were picked out as probably kimberlitic and three diopsides as possibly lamprophyric. The sapphires (26 grains of +1mm) were classified as 50% grey stars with the remainder as blue including several pale yellow green and one white. No diamonds were identified.

Probe analyses (DD1) were carried on 5 microilmenites and 5 gahnites (Appendix 2).

The microilmenites are possibly kimberlitic with MgO up to 7.95% (higher than usual for the Eastern States) although the presence of Mn and an absence of Cr is a downgrading factor. The gahnites are low in Mg and probably not related to base metal mineralisation.

#### 4.2 Sediment Composites, Ringarooma Bay

The study then progressed to mineralogical scans of the sediments in Ringarooma Bay to check for diamonds, sapphires and indicator minerals. Two composite samples were

made up- one of the main palaeochannel prospect (Composite 1- 57.6kg) and the other of the old shore line prospect (Composite 2- 26kg)- by taking half of each seabed sample in each of the two prospect groups and aggregating those within each group.

The two samples were treated as before and then the non magnetic fractions observed by IDL. The heavy mineral assemblages were topaz, clinopyroxene, amphibole, pleonaste, biotite and tourmaline with lesser amounts of rutile, almandine and rock fragments.

Composite 1 (palaeochannel) also had cassiterite, spessartine, magnetite, ilmenite, picotite, pyrite and phosphate and significantly two blue sapphire grains (+0.3mm). Composite 2 (old shoreline) also had anatase, leucoxene and epidote.

One microilmenite and one chromite were probed from composite 1 with no significant results (all results in Appendix 2). No diamonds were seen.

#### 4.3 Sapphires in mine tailings

This section deals with the sapphire types and size distribution currently remaining in the tailings of the main alluvial mines- Dorset Dredge, Endurance and Pioneer.

The three samples of tailings each in the range 25-35kg were located at the appropriate mine dressing sheds in the Sth Mt Cameron- Pioneer area using a geiger counter to identify the best tailing concentrations to sample in detail by following the radioactive signal from monazite.

The samples were sent to IDL for tabling, heavy liquid treatment, magnetic separation, observation and identification (Appendix 3) and are summarised as follows-

Dorset Dredge-136 sapphires (including 21(15%) black/brown stars); 84 rubies

-total 10.476 carats; largest stone 0.25ct, blue; total grade 308ct/t

Endurance -190 sapphires (including 65(34%) black/brown stars); 18 rubies

-total 12.984ct; largest stone 0.22ct, blue; total grade 403ct/t

Pioneer -204 sapphires (including 19(9%) black/brown stars); 25 rubies

- total 8.235ct; largest stone 0.69ct, black star; total grade 298ct/t

These numbers are produced by counting the -4mm to +1mm fraction. The bulk of the sapphires are blue to indigo with between 9 and 34% being black/brown star sapphires. A few grains are described as yellow/green corundum. The ruby is coloured strawberry to orange red to crimson. The ruby was checked through IDL by probing six grains all of which were found to be zircon. It is therefore likely that most of the grains classified as ruby will turn out to be zircon as has been the experience in the alluvial tin mines in north eastern Tasmania (Bottrill, 1996). One pale pink stone from the north east has been identified as ruby by an experienced gemmologist (Boyd Sweeney, pers. comm.).

The background minerals identified in the non-magnetic fraction of the three samples were mainly topaz, zircon and pleonaste with lesser cassiterite, almandine and rutile.

The gems in the -4mm to +1mm fraction have been individually weighed by IDL to produce graphs of the gem population as found in the tails of the three mines (Appendix 3).

The number (cumulative) of stones plotted against carats per stone in all three cases shows a gradient change at 0.1 carats and a cut off at 0.3 carats (0.7 in the case of Pioneer). This also decreases the gradient in the number against grade plot. This reveals that this is not a natural alluvial population and that the larger stones above 0.3 carats (equivalent to a 2.5mm diameter corundum grain) have been mostly removed during the treatment of the sands and gravels. This was initially thought to be by scavenging of the larger gemstones by the miners during the processing. However, it was eventually realised that the tails being assessed were from the larger mines which were designed to produce sand-sized cassiterite and so had a 1/8th inch screens (3mm) to remove the oversize which would pass into the waste disposal areas and be lost along with the larger corundums. Only the smaller mines operating with sluice and streaming boxes would allow observation and collection of larger sapphires such as in the Sth Mt Cameron area (pers comm- K Morrison).

#### 4.4 Regional Survey of Sapphires

The focus of exploration then changed to consider the regional occurrence and variability of sapphires within the active sands and gravels of the present drainage as well as the tails and wash from some of the smaller mines.

The sample sites were chosen by a retired alluvial tin miner, Mr Ron Lawry, who is now an active sapphire fossicker and who purposely selected sites with a reasonable probability of having sapphires (Plan 5). This survey was not designed to be a comprehensive, unbiased test of all drainages in the region.

The sands and gravels samples were dug out of trap sites in the drainage and all were in the 10-20 kg range. Logs of the +5mm oversize are contained in Appendix 8.

The samples were then screened and the -5mm +1.5mm fraction examined and hand picked for sapphires under a binocular microscope by Mr L Rhodes. The sapphires were weighed as were all sediment fractions and the grade of the sapphires calculated as grams per tonne of the original sediment. Some sapphires, mostly black, were recovered by magnetic separation to remove the spinel (variously called blackjack or pleonaste).

The results are expressed in a series of ten tables (RC 1-10, Appendix 4) along with the tin concentration from assay and the presence of gold grains where noticed during panning of the fine fraction. The sapphires are presented as number of grains, total mass by weighing and head value as grams per tonne. The sapphires from some of the samples were sent to IDL for confirmation and classifying (Appendix 5).

The creek gravels are in the range 1.1-167g/t (5.5- 835ct/t) and average 27.08g/t (135.4ct/t).

Grouping the above to creeks in the mountains (proximal) compared with creeks towards the plains (distal) gives a range of 1.2-89.7g/t (6-835ct/t) and average of 50.3g/t (251.5ct/t) for the proximal creeks. The range is 1.1-50.5g/t (5.5-252.5ct/t) with an average of 11.6g/t (58ct/t) for the distal creeks.

Seven samples from different sites in the Wyniford River show the variation in one river. The grades range from 0-50.5g/t (0-252.5ct/t) averaging 10.8g/t (54ct/t).

Tails from the tin mines range 0.18-3.2g/t (0.9-16ct/t) averaging 1.47g/t (7.33ct/t).

Untreated wash from the Dry Gut mine went 1.3g/t (6.5ct/t) and in situ wash 7km from St Helens gave 3.9g/t (19.5ct/t).

A cleaner jig bed from Summers' mine at Sth Mt Cameron was cleaned out and went 398g/t, yielding 326 sapphires (33.692 carats). It is difficult to calculate a head grade in this case as the operators are unsure how much material produced that sapphire yield. However, the material currently being treated is not primary or maiden wash but a tail from previous operations.

To gauge the possibility of darker sapphires being overlooked and mistaken for pleonaste spinel, two composite parcels of blackjack each within the range 2.5-3.5 kg were provided by Mr Ron Lawry and sent to IDL for magnetic separation as, compared with corundum, spinel has some magnetism. Sample 2 yielded four star sapphires grey brown to grey blue in colour, greater than 2mm in size and in the range 0.2- 0.9 carats (Appendix 6).

#### **4. 5 Source of sapphires**

Some initial work was carried out on the potential hard rock source of the sapphires with the basalts being considered the main possibility as in the established alluvial fields elsewhere in the Eastern States. There is at least one known mine in the world based on lode or in-situ sapphires at Yogo Gulch in Montana where sapphires occur in Tertiary age lamprophyres dykes (Mychaluk, 1995). The sapphires are mainly mined from the deeply-weathered dyke material.

Basalt quarries in the region (plotted on Mineral Resource Tasmania's CONMAT database) and other easily accessible basalt occurrences were checked and sampled for sapphires and other favourable indicators like lherzolitic or feldspathic nodules or spinel grains. A data base of nodule occurrences in basalt was made available by John Everard of MRT.

The quarries sampled were Fieldwick's, Weldborough (MR 581,100mE; 5,435,800mN); Kapai, Branxholm (MR 557,000mE; 5,442,500mN) and Briggs', West Scottsdale (MR 540,600mE; 5,440,600mN).

Other localities sampled were Breises tin mine, Derby (MR 567,600mE; 5,444,500mN); Grey's Hill, Branxholm (MR 564,300mE; 5,440,100mN); Tower Hill, Weldborough (MR 579,100mE; 5,434,700mN) and nearby Groses property (MR 578,700mE; 5,434,200mN).

Nine samples selected for further examination are summarised in Appendix 7. All samples other than the Kapaï quarry sample had ultramafic nodules or spinel grains. The Weldborough area basalts also had feldspar nodules. Small spinel grains up to several millimeters across were also found at Groses property at the last named locality and at Grey's Hill, Branxholm.

Ultramafic nodules are particularly noticeable in loose basalt boulders under the road bridge over the Ringarooma River at Derby and throughout the nearby main dumps of basalt boulders, from the Briseis mine, where the nodules reach about 1% by volume of the basalt. Here the nodules are weathering out selectively leaving cavities from which olivine (peridot) and other grains can be easily picked out.

Thin sections were cut for most of the above samples and five were submitted for petrological and mineral analyses (Appendix 7) with the emphasis on the search for corundum. The ultramafic nodules (lherzolites) were found to contain olivine (forsterite) and pyroxene - both enstatite and diopside, and irregularly shaped or amoeboid, dark brown spinels classified after probing as chromian spinel - a variety of pleonaste with some chromium.

From the Tower Hill samples, several highly rounded, xenocrystic grains up to 1-2mm had low birefringence and high relief, were length fast with etched surfaces and had a slight blue colour when held up to sunlight. They were thought to be sapphires but on probing were found to be apatites (Appendix 7). The grains were in the groundmass of the basalt (945a) except for one in another sample (945b) which was in the border of a feldspar nodule. This feldspar was checked by probe and proved to be oligoclase with an intermixed rim of fine grained andesine and sanidine.

Fieldwick's basalt (937) contains 5-10% of opaque grains which were found to be ulvospinel and hence the cause of the strong magnetic signature of the rock.

## **5.0 Interpretation**

The work described in this report has focussed on the evaluation of the tin placers for gemstones particularly sapphires in the hope that these would increase the value of the alluvial ground to the point where it would become economic to mine.

Bulk testing of the tin alluvials for total heavy mineral and gem content remains difficult as the targets are under tens of meters of overburden onshore or water offshore.

As a result, the concept has been to examine the material most available to Mineral Holdings both within the company's existing exploration licences and elsewhere in NE Tasmania particularly up the palaeoslope where gems are known so that inferences can

be made about what may be present in the concealed placers down catchment both onshore and offshore.

The mineralogical investigation produced information on the gem and other heavy mineral content of the following materials -

- 1) heavy mineral concentrates already held by Mineral Holdings from previous work on the Great Northern Plains area,
- 2) sediments in the offshore tenements in Ringarooma Bay in EL 19/93 and T2-MEL,
- 3) middlings and tails in the former tin treatment plants, and
- 4) active sediments in the present drainage, and sediments treated or untreated in the old alluvial tin mines,
- 5) the possible hard rock source of the sapphires.

### **5.1 Heavy mineral concentrates**

The results from above show that sapphire, zircon and topaz, as well as cassiterite, are widespread in the old alluvial mines and treatment plants and confirm the written and verbal reports from the old tin mining days. There was no systematic production of gems in the early days and so there are no records of grades, size and quality.

### **5.2 Sediments in Ringarooma Bay**

Results from 2 above- show that no diamonds or indicator minerals were found in the two composites of offshore seabed sampling in Ringarooma Bay. Significantly, composite 1 from the palaeochannel contained two small +0.3mm blue sapphires which at least proved that sapphires can reach the offshore environment. Also, coarse cassiterite occurs (sample 19- 66% between 1-2mm) in places and is nearly twice the specific gravity of corundum. This, taken along with the occurrence of coarse sand, gravel and cobbles in the stratigraphy, shows that transporting energies of the river were great enough at times to distribute these heavies well down the palaeochannel into the present offshore situation. This indicates the possibility that larger sapphires may exist in the tin placers in Ringarooma Bay.

### **5.3 Middlings and tails from the main tin mines**

The reports from IDL on the Pioneer, Endurance and Dorset Dredge material mostly record the sapphires in the range -4 to +1mm although numerous smaller ones are present (eg Pioneer). The sapphires are described as mostly blue to indigo blue, some of which are stars (15-94% of the blue population), a variable amount ( 9-34%) are black to brown stars, a few are yellow/green (1-3%) with an occasional white. The "Tasmanian" ruby, in the same size range, described as strawberry to orange red to crimson, turned out on testing to be zircon. The cumulative frequency versus carats

per stone graphs show that these are not natural populations and that they have had their larger stones removed which accords with these mines having everything above 3mm (+1/8th inch) passing over the screens to the waste ponds. Anecdotal evidence suggests larger stones were found in the range 5 to 10mm in the smaller mines in the Sth Mt Cameron area which used sluice and streaming boxes to recover tin. No grade estimates of sapphire in untreated tin wash are possible from these situations.

A substantial number of sapphires (326) were found in Summers' alluvial tin mine near Sth Mt Cameron (Table RC-4). The gems were recovered from material discarded from the bed of the cleaner jig. Once again, the stones are less than about 3mm in size as the screen in the primary jig has a 3mm aperture and all larger material will go out to the tail. IDL classified the sample (#35) and by weighing the products, the following breakdown was evident for the parcel of 33.692 carats-

- non gem corundum 53%,
- blue sapphire 14%,
- blue star sapphire 10%,
- black star sapphire 22%, and
- green sapphire 1%.

Some of the black sapphires were difficult to pick out against the pleonaste spinel which had to be removed by magnet. Some of these sapphires have been photographed and attempts made to reproduce, with only partial success, the true colour of the stones. Plate 1a shows the non gem corundum, Plate 1b shows 4.030 carats of blue sapphire and Plate 1d shows 5.451 carats of black star sapphire (scale in millimeters). No estimates are possible on the sapphire head grade of the ground treated to provide the sapphires in the jig bed and it is important to remember that the head material is itself a tail from a previous operation to extract cassiterite. There is therefore little possibility that the above percentages will prove typical for the placers as a whole given the facts that the material has already been processed once, that the larger stones if any have been removed and that the mineral content of placers is inherently variable.

No diamonds were found in the course of the investigation and indicator minerals examined and analysed- picroilmenites, diopsides and chromites -had compositions more typical of basalts than kimberlites and lamproites.

The heavy mineral assemblage of the placers in which the sapphires are found has already been described above and their suggested derivation is as follows (after Yim, 1991) -

basalt- pleonaste, zircon, ilmenite, leucoxene, anatase, magnetite, pyroxene, olivine

granite- topaz, cassiterite, ilmenite, zircon, monazite, tourmaline, biotite, amphibole

quartz veins- gold

metasediments- almandine, grossular

pegmatites- spessartine, gahnite

dolerite- chromite

#### 5.4 Stream sediments and alluvial tin mine sediments

The results of this survey as expressed on Plan 5 confirm that sapphires are well represented in the currently active sediments of the Weld River and tributaries, the northerly drainages flowing into the Ringarooma River near Derby and Branxholm and the Wyniford River.

Sapphires have been shown to be common in the palaeo- placers of the alluvial tin mines at Pioneer, Endurance and the Great Northern Plains (Dorset Dredge) presumably deposited by the ancestral Ringarooma River.

The Boobyalla and Little Boobyalla Rivers were believed to be active in the past from the sapphires found in the Monarch Mine and anecdotally at Banca Mine. Indeed, the main drainage from the Blue Tier flowed through here prior to diversion by the younger Winnaleah basalts to produce the Ringarooma River which also captured parts of the Great Musselroe catchment (Yim, 1991).

Only one sapphire has been found in the Musselroe River but this river and the Boobyallas are difficult to sample due to being sand-choked, particularly in their lower reaches, as is the Ringarooma. Sapphires have also been found in the palaeo- gravels of the Georges River which flows easterly towards St Helens.

Considering the results from 4 above, it is still difficult to estimate the possible sapphire grades of the tin placers in the mountains, down on the plains and offshore because only two possible instances of possible untreated tin-bearing wash were found.

It might be expected based on dilution alone that the average values of the placers on the plains would be less than those of the proximal creeks in the mountains, more than the tails of the former tin mines and be something like the values for the Dry Gut and St Helens maiden wash.

This could mean average values in the range of 5-20 carats per tonne of sapphires in the distal tin placers on the plains and perhaps offshore. This compares with an estimate of 5-10 carats per tonne by an experienced sapphire hunter for the tin placers in the proximal creeks in the mountains. However, the grades of placers are notoriously variable depending not just on dilution but more importantly on the efficiency of reworking and deposition down the palaeoslope.

Considering the existing sapphire mines in New South Wales and Queensland where grades are between 15 and 50g/bank cubic metre, the above estimates in the

Ringarooma placers would have to be increased by several times before they could be considered viable on sapphire content alone.

Translating this estimate to potential dollar values in the ground is difficult because it is dependant critically on the presence of individual stones of a size and quality to be marketed as gems.

The following values of rough stones of good colour and clarity are based on information provided by GTN Resources and Cobra for sapphires.

+ 7.5mm	say 10ct	at \$12/carat
6.5-7.5mm	say 7ct	at \$8/carat
5.5-6.5mm	say 4ct	at \$5/carat
4.75-5.5mm	say 2ct	at \$2/carat
3-4.75mm	say 0.5ct	at \$1.5/carat
2-3mm	say 0.2ct	at \$1/carat

We know that the range in size of sapphires from the Summers Tin Mine is about 1.5 - 3mm but any larger ones would have gone to the tail because of the 1/8th inch screen in the primary jig so that may not be the true population. It is not certain that any of these sapphires qualify even for the smallest category above. However, it only takes one marketable sapphire (on average per cubic metre) from the above categories to raise the value of the ground based on its average onshore tin value of 44.8 cents per cu m (MacArthur Report 1995) from between 50 percent and 200 times. For instance, taking a conservative estimate of say \$2.50/bcm for the sapphire content would increase the value of the ground by a factor of five.

Large sapphires have been said to be present in some tin mines (eg Banca) and also to have been recovered from sluice boxes in the Sth Mt Cameron mines. On the other hand, there may be no marketable stones in the average run of mine tonnages and so no increase in the value of the ground from this commodity may occur. In the absence of systematic bulk testing of the ground, we will never be sure.

Reports of recent trends by Thai buyers to market a greater volume of smaller stones in the 2-5mm range is an encouraging sign for the valuation of the Ringarooma placers.

The main placer materials change with distance down the drainage as expressed in the logging of the +5mm clasts in the following way.

Weldborough area-	mainly granite or metasedimentary clasts, then quartz, up to 30% basalt, up to 10% dolerite
Derby/Branxholm area-	metasedimentary clasts dominant, then quartz, 5-10% basalt, trace granite
Wyniford River area-	mainly granite, then quartz, then metasediment, up to 1% dolerite

- Mt Cameron area- quartz, then granite, then metasediment, then cemented grit/conglomerate, trace dolerite
- Gt Nth Plains area- mainly metasediment, then quartz, then cemented grit

Whereas the full range of clast types is represented in the upper catchment at Weldborough, progressive attrition down the drainage destroys the softer rocks such as basalt, dolerite and granite so that in the lower reaches of the plains only the most durable rocks survive as pebbles and cobbles such as metasediment and quartz.

In the case of the gemstones, corundum (sapphire) has the greatest transportation resistance and is therefore most widespread while olivine (peridot) has the least which explains its absence in any of the heavy mineral assemblages studied and its existence in the Ringarooma river further downstream of the Mutual tin mine is problematical. Pleonaste, topaz and zircon in resistance are somewhere in between the two extremes already mentioned (Yim, 1991).

### 5.5 Sapphire source

The results from 5 above show that the alkali basalts have inclusions and nodules of two types -ultramafic (lherzolitic), and feldspathic (plagioclase with sanidine rims)-as well as spinels in the nodules or as individual grains in the basalt. Apatite grains of 1 to 2mm have been identified in the basalt for the first time. No corundum or zircon (or diamond) has yet been seen in situ in the basalts.

However, the heavy mineral assemblage of zircon, corundum, spinel and ilmenite which is widespread in the creeks draining the basalts is the zircospilic assemblage so typical of other sapphire fields in Eastern Australia (NSW and Qld) and overseas where all of these minerals have been found in situ in the basalts or associated tuffs (Hollis, 1984; Yim, 1991; Bottrill, 1996; Roberts and Sutherland, 1992; Pecover and Coenraads, 1989; and Sutherland et al, 1998). The association of corundum and feldspar (anorthoclase) in composite grains is recorded from central Queensland (Guo et al, 1996) which led to the examination of the feldspar nodules mentioned above.

Diamonds are a feature of some of the sapphire fields also which led to the search for diamonds and indicator minerals in NE Tasmania so far without success.

The zircospilic heavy mineral association including some of the largest sapphires are found in active sands and gravels in the Weld River catchment above Moorina and the Weldborough basalts are considered to be source (Yim et al, 1985). Yim has dated coarse, rounded, detrital zircons at 46.7Ma, the same age as the Blue Tier basalts and has found the same type of zircons in soils overlying the basalts in Le Fevre Road.

In 1988, Totteny Pty Ltd briefly evaluated the basalts for the presence of sapphire-bearing pyroclastics following the recognition that the major sapphire sources in NSW were the tuffs and agglomerates at the base of the basalts (Morrison, 1988). Geological mapping by Mineral Resources Tasmania (McClenaghan, 1982) has recorded a lower agglomerate and tuff unit under the basalts at Weldborough Pass. This unit is of variable thickness but reaches 150m on the south side of the Pass. It is

interpreted as a volcanic centre. This was the focus of Totteny's exploration but persistently poor exposure of deeply weathered rock, disappointing results from stream sediment sampling and doubt about gemstone grades in the creek sediments from amateur prospectors caused them to abandon their licence after the first year. They concluded that if sapphires were ever to be produced it would be from the placers in combination with alluvial tin.

## 6.0 Conclusions

1. Mineralogical examination of the concentrates, middlings and tails of the old alluvial tin mines is consistent with the historical record that cassiterite, sapphire, zircon and topaz are widespread in the placer deposits of the Great Northern Plains.

2. Other minerals identified as common in the tin placers are spinel (pleonaste) and ilmenite, with lesser amounts of rutile, anatase, leucoxene, monazite, gold, zincian spinel (gahnite), chromite, garnet (almandine, spessartine and grossular), biotite, tourmaline, epidote, amphibole, pyroxenes, and rock fragments.

3. The characterisation of the corundum recovered from the dressing sheds of the main mines, Dorset Dredge, Endurance and Pioneer, in the 1-4mm size range shows that 530 sapphires in total were recovered and 127 zircons. Black/brown star sapphires make up 20% (105) of the total number of sapphires. The largest stone (a black star) is 0.69carats. The total yield of sapphires and zircons is 31.695 carats.

4. The corundum recovered from the cleaner jig bed at Summers tin mine at Sth Mt Cameron has a total weight of 6.7383g or 33.692 carats. The classification of the corundum is 14% blue sapphire and 10% blue star sapphire, 22% black star sapphire and 53% non gem corundum.

5. Statistical treatment of the sapphires show that these are not natural populations in that the larger sapphires are missing consistent with the removal of all +3mm material by screening in the cassiterite recovery process in the former alluvial tin mines. Also, in the case of Summers mine, the plant feed is really a tail having already been treated once in a previous mining operation.

6. An estimate of the possible sapphire content of the tin placers is attempted based on the grades in the active stream sediments as well as the tails and wash from the tin mines. Average values in the range 5-20 carats per tonne are predicted for the tin placers on the Great Northern Plains and offshore although because of the small number of samples of wash actually accessible and measured (two), this is largely guesswork and highly speculative. However, because of the unit value of sapphires, the gemstones have the potential to increase the value of the tin placers by several times if not orders of magnitude.

7. Fluvial energies, presumably at times of lower sea level, have been capable of transporting sand, gravel and cobbles down palaeoslope into the present offshore sites.

Relatively dense cassiterite (SG 6.8-7.1), some of it relatively coarse at 1-2mm, is present in the offshore placers. It has been found that the present seabed sediments have traces of sapphires in the +0.3mm size. As energy levels appear high enough to transport corundum (SG 4.0), there is every reason to regard the offshore tin placers as legitimate targets for deposits of larger sapphires.

8. While comparisons with other sapphire fields in Eastern Australia would suggest that diamonds are a possibility for NE Tasmania, none have been identified as yet either in alluvials or in hard rock. Indicator minerals have chemistries which are allied more to basalts than kimberlites or lamproites.

9. Initial work on the basalts as the hard rock source of the sapphires has not found corundum or zircon in situ. Pleonaste spinels have been found in the basalts and ultramafic nodules. Xenocrystic apatite grains have been identified for the first time in the basalts and feldspar nodules. Ulvospinel have been found as an essential part of the magnetic basalts. No systematic searching has yet been carried out on the tuffs and agglomerates below some of the basalts because of poor exposure and access but they are regarded as the best theoretical source of the sapphires.

#### **7.0 Future Program**

The planned and long delayed dredging program leading to up to eight bulk samples will be completed on the tin placers in Ringarooma Bay.

Attempts will continue to attract a joint venture partner for the alluvial tin licences T2/MEL, ELs 19/93 and 38/97, and RLs 8715 and 8723 and also for the smaller ELs covering the residual tin resources at Pioneer, Endurance and Monarch. The consolidation of these licences covering most of the proven alluvial tin resources offers the best chance of attracting a partner to further explore and develop the region.

As a result of the exploration work described in this report, Mineral Holdings has applied for a special exploration licence for gemstones covering 3600 sq km in NE Tasmania. A joint venture has successfully been arranged with GTN Resources of Sydney, a company which has developed the expertise to mine and market sapphires in Eastern Australia. Mineral Holdings looks forward to the first commercial test of the sapphire fields of NE Tasmania.

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**PLANS 1-5, TABLE 1 and PLATE 1**

**APPENDIX 1-8**

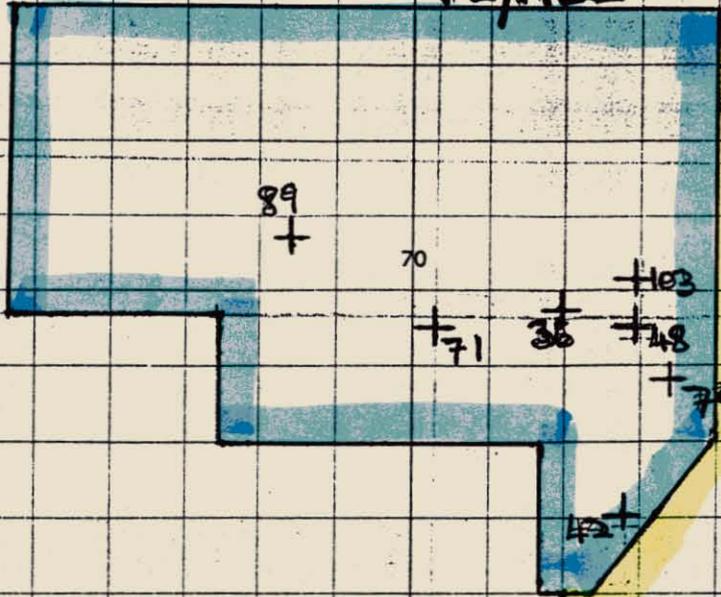
58190 000mN

90

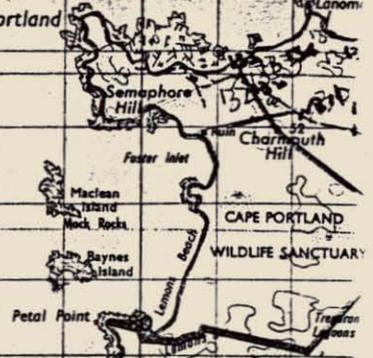
RESERVE

T2/MEL

655021



Cape Portland



19/93

EL 19/93

R I N G A R O O M A

B A Y

80

80

SCOTSDALE  
RINGAROOMA

Tomahawk Island  
Tomahawk Point

Tomahawk  
Tomahawk Point

70

74  
Campbells  
Point

RL 8715

RL 8723

# PLAN 1. MINERAL TENEMENTS

Scale 1:100,000

89+ POTENTIAL BULK SAMPLING MHA

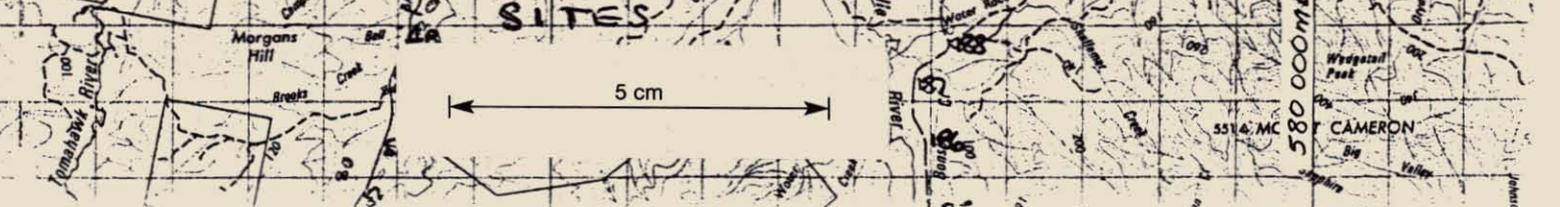
SITES

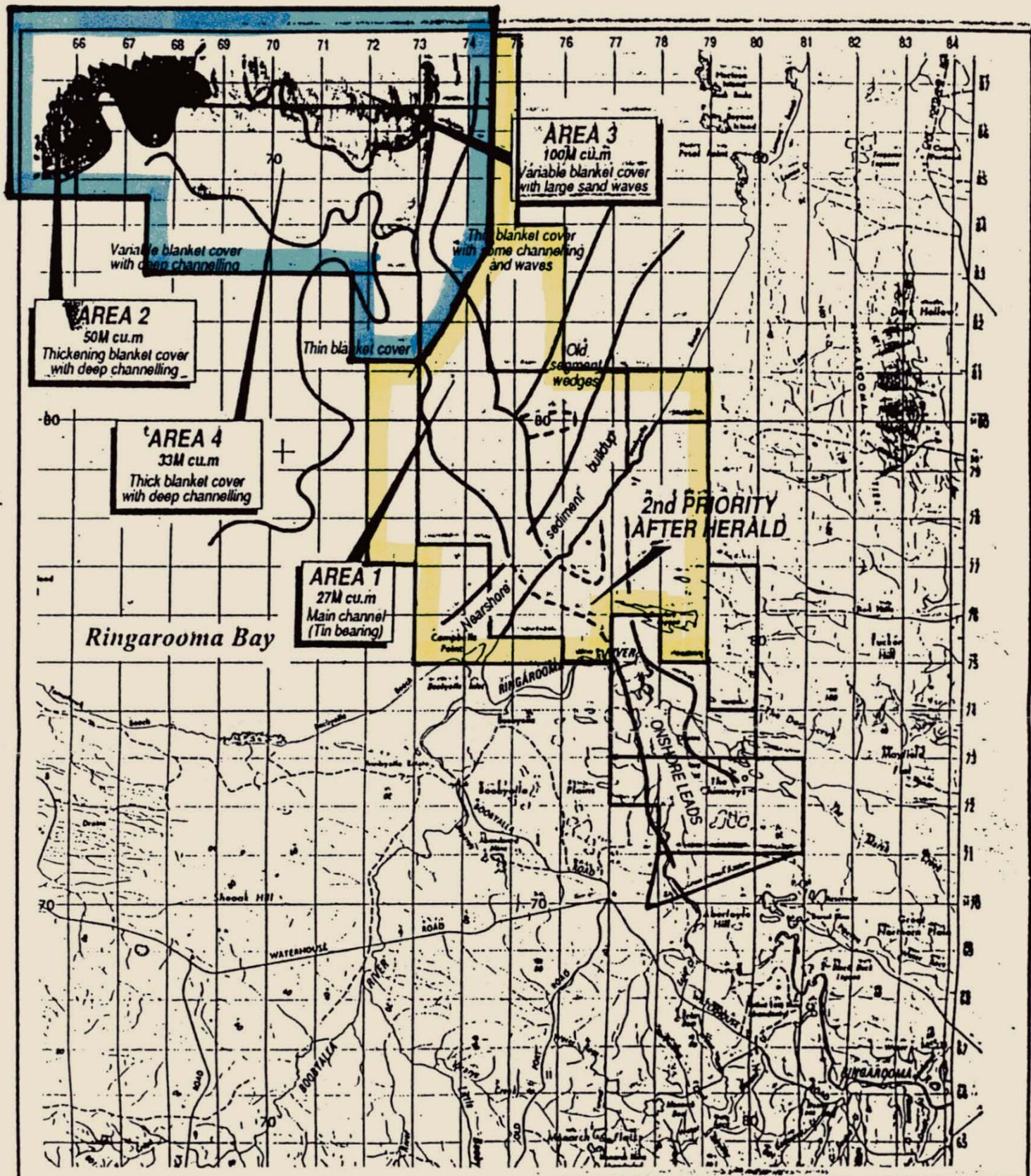
5 cm

Morgans Hill

580 000ME

5514 MC CAMERON





Scale 1:100,000

EL19/93

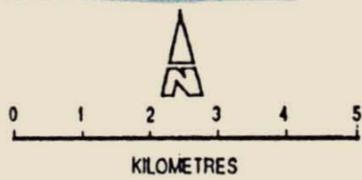
PLAN 2



T2-MEL

THE RINGAROOMA ALLUVIAL TIN PROPERTY  
OFFSHORE TARGET ZONES

Figure 2

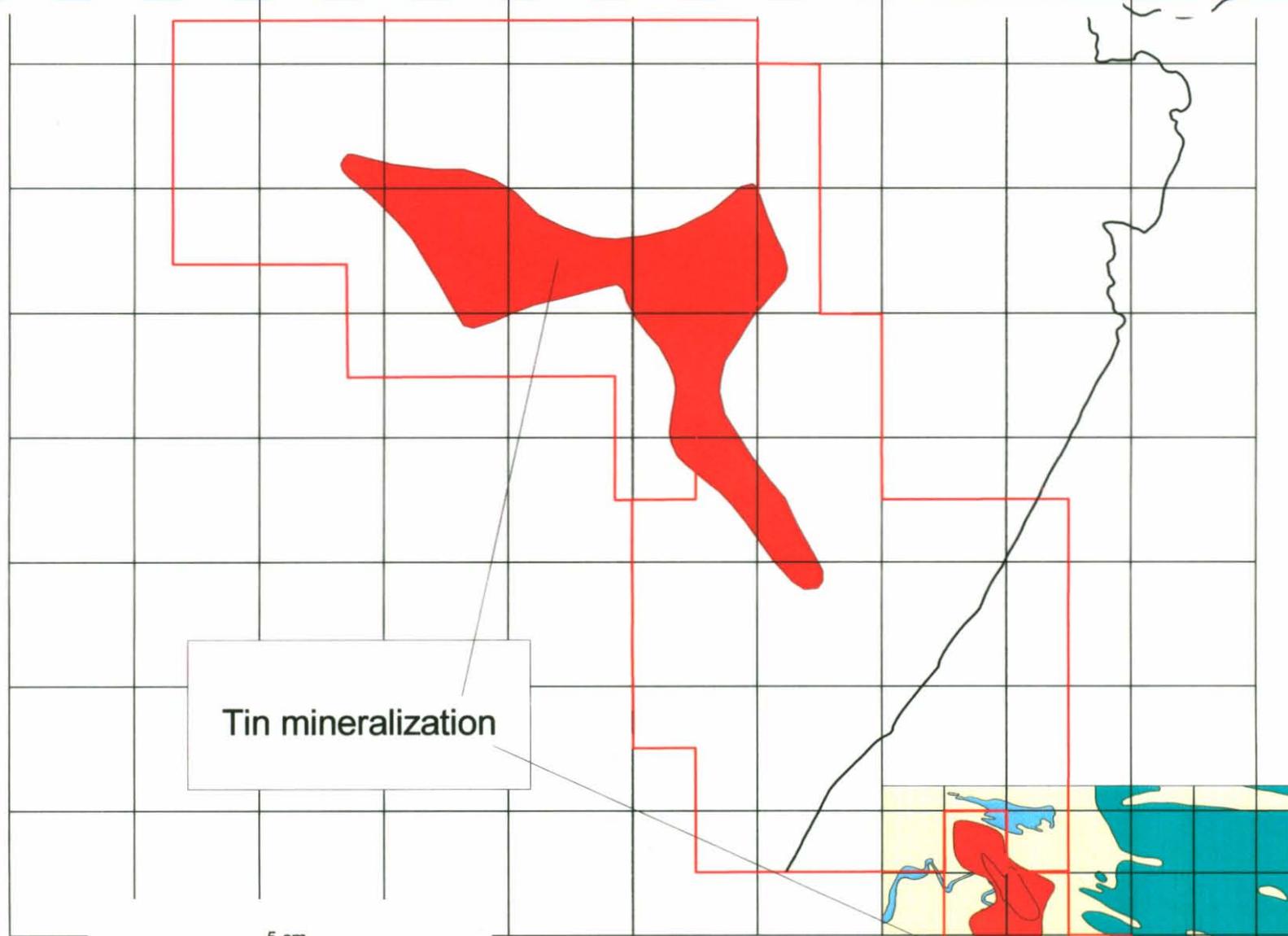


Compiled by: N. MacArthur  
Drawn by: Roz Davies

Date: July, 1994

5 cm

658000



Tin mineralization

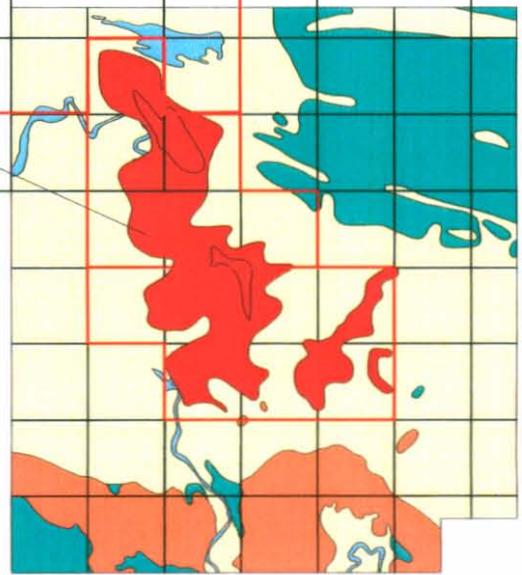
5 cm

0 2 4 6 8 Kilometers

1:100,000

**Ringarooma Tin Project**  
Mineral Holdings Australia Pty Ltd

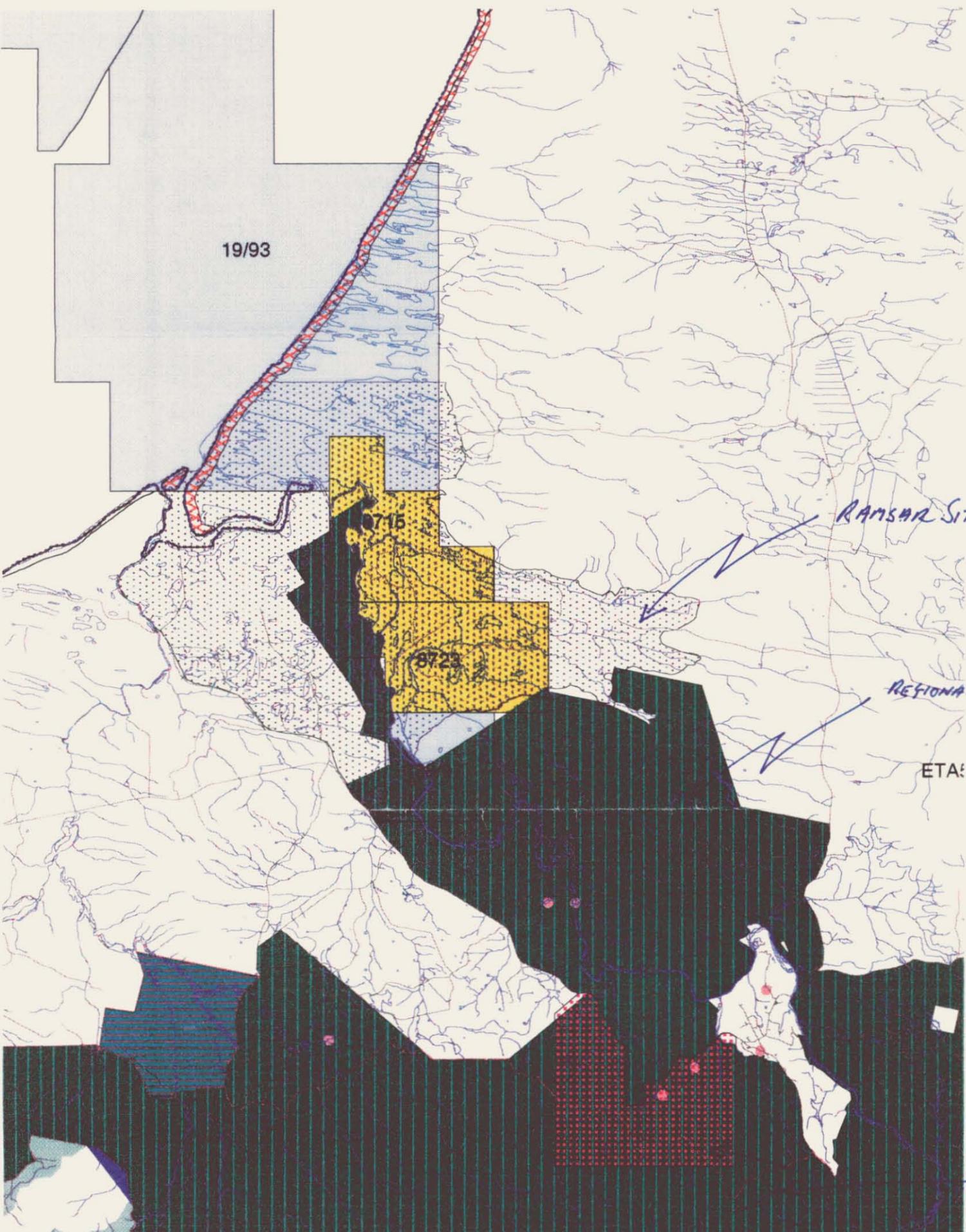
**PLAN 3**



658023

Level 2 in New South Wales Act EPA & BCA — 16th July  
+ MARINE RESERVES / ALL COMMONWEALTH WATERS.  
Regulators { DPWIC  
ENVIRONMENT AUSTRALIA.

658024



5 cm

PLAN 4  
1:80,000

FOSSICKING AREA

	Hole No	Tin Content(g/cu m)	Inters Depth (m) from sed surface	Total Depth (m) to bedrock	Water Depth (m)	Sediment Type	Location
CHANNEL AREA	2	114	0.9	9.2	25.5	medium sand with gravel	147deg 53.21min E 40deg 49.74min S
	42	129	2.12	4.8	28.8	med-coarse sand with pebbles	147deg 51.86min E 40deg 48.57min S
	48	197	1.06	3.8	34	no log	147deg 51.92min E 40deg 47.20min S
	103	235	5.75	7.9	34	medium sand with silt	147deg 51.89min E 40deg 46.86min S
PLATEAU AREA	36	137	2.7	7.3	34	fine sand with pebbles	147deg 51.25min E 40deg 47.11min S
	71	111	1.21	6.7	35	coarse sand	147deg 50.00min E 40deg 47.20min S
	79	186	3.32	7	33	coarse sand with pebbles	147deg 52.19 min E 40deg 47.57 min S
	89	321	4.27	10.3	35	fine-med sand with gravel	147deg 48.68 min E 40deg 46.61 min S

Table ① --- BULK SAMPLING SITES---RINGAROOMA BAY

658025

(a)



(b)



PLATE 1

(c)



(d)



PLATE 1



658029

**DIAMOND INDICATOR DATA**

Job No: 280

Sample No:

1A

**Processing Weights-**

Initial: 13.92 g

+2mm: - kg

After Tabling: - kg

After TBE: - g

Date: 26/2/99

Positive Negative Positive(Other) 

size/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	-0.3	Fractions Analysed(X)	Observed Only(O)
Crush-Roll,Jaw									
Table									
Heavy Liquid									
Mag Separator									

**KIMBERLITE/LAMPROITE INDICATORS**

size/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	+0.2	+0.1	Wear	Kimb.
DIAMOND										
CHROME DIOPSIDE										
CHROMITE										
PHLOGOPITE										
PICROILMENITE										
PYROPE										

**DETAILED DESCRIPTIONS**

Mineral	Size	Description

**OTHER MINERALS (VOL.% after Heavy Liquid)**

ALMANDINE	ORTHOPYX	SPINEL/hercynite	P	APATITE	
ANDRADITE	CLINOPYX	MAGNETITE		MONAZITE	
GROSSULAR	AMPHIBOLE	LEUCOXENE	F	PHOSPHATE	
SPESSARTINE	BIOTITE				
	PREHNITE	LIMONITE		ROCK FRAGS.	
ANDALUSITE	CORUNDUM	S PYRITE(pseudo)			
KYANITE	HEMATITE	PYRITE		ZIRCON	F
SILLIMINITE	ILMENITE	BARITE		TITANITE	
STAUROLITE	RUTILE	O ANHYDRITE		TOPAZ	A
EPIDOTE	ANATASE	CASSITERITE	C		
TOURMALINE	BROOKITE	MAGNESITE			

P = &gt;50% A = 20-50% C = 10-20% S = 1-10% O = 20grains-1% F = 5-20grains T = 1-5grains

Mineralogist/Observer: JES/LG

Date Completed: 26/2/99



INDEPENDENT DIAMOND LABORATORIES PTY LTD

ACN 005 948 185

**DIAMOND INDICATOR DATA**  
Job No: 280

Sample No: 4

**Processing Weights-**  
Initial: 8.08 g  
+2mm: kg  
After Tabling: kg  
After TBE: g  
Date Started: 26/2/99

Positive

Negative

Positive(Other)

size/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	-0.3	Fractions Analysed(X) Observed Only(O)
Crush-Roll,Jaw								/mm +2 +1 +0.8 +0.5 +0.4 +0.3 -0.3
Table								ALL X
Heavy Liquid								M4
Mag Separator								M3

**KIMBERLITE/LAMPROITE INDICATORS**

size/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	+0.2	+0.1	Wear	Kimb.
DIAMOND										
CHROME DIOPSIDE										
CHROMITE										
PHLOGOPITE										
PICROILMENITE										
PYROPE										

**DETAILED DESCRIPTIONS**

Mineral	Size	Description

**OTHER MINERALS (VOL.% after Heavy Liquid)**

ALMANDINE	ORTHOPYX	SPINEL	APATITE
ANDRADITE	CLINOPYX	MAGNETITE	MONAZITE
GROSSULAR	AMPHIBOLE	LEUCOXENE	PHOSPHATE
SPESSARTINE	BIOTITE		
	PREHNITE	LIMONITE	ROCK FRAGS.
ANDALUSITE	CORUNDUM	P PYRITE(pseudo)	
KYANITE	HEMATITE	PYRITE	ZIRCON
SILLIMINITE	ILMENITE	BARITE	TITANITE
STAUROLITE	RUTILE	ANHYDRITE	TOPAZ
EPIDOTE	ANATASE	CASSITERITE	
TOURMALINE	BROOKITE	MAGNESITE	

P = >50% A = 20-50% C = 10-20% S = 1-10% O = 20grains-1% F = 5-20grains T = 1-5grains

Mineralogist/Observer: MES/LG

Date Completed: 26/2/99

**INDEPENDENT DIAMOND LABORATORIES PTY LTD**  
ACN 005 948 185

**DIAMOND INDICATOR DATA**

Job No: 280

Sample No: 5

**Processing Weights-**

Initial: 10.33 g  
 +2mm: kg  
 After Tabling: kg  
 After TBE: g  
 Date Started: 26/2/99

Positive

Negative

Positive(Other)

size/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	-0.3	Fractions Analysed(X) Observed Only(O)
Crush-Roll, Jaw								/mm
Table								+2
Heavy Liquid								+1
Mag Separator								+0.8
								+0.5
								+0.4
								+0.3
								-0.3

**KIMBERLITE/LAMPROITE INDICATORS**

size/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	+0.2	+0.1	Wear	Kimb.
DIAMOND										
CHROME DIOPSIDE										
CHROMITE										
PHLOGOPITE										
PICROILMENITE										
PYROPE										

**DETAILED DESCRIPTIONS**

Mineral	Size	Description

**OTHER MINERALS (VOL.% after Heavy Liquid)**

ALMANDINE	ORTHOPYX	SPINEL	APATITE
ANDRADITE	CLINOPYX	MAGNETITE	MONAZITE
GROSSULAR	AMPHIBOLE	LEUCOXENE	PHOSPHATE
SPESSARTINE	BIOTITE		
	PREHNITE	LIMONITE	ROCK FRAGS.
ANDALUSITE	CORUNDUM	P PYRITE(pseudo)	
KYANITE	HEMATITE	PYRITE	ZIRCON
SILLIMINITE	ILMENITE	BARITE	TITANITE
STAUROLITE	RUTILE	ANHYDRITE	TOPAZ
EPIDOTE	ANATASE	CASSITERITE	
TOURMALINE	BROOKITE	MAGNESITE	

P = >50% A = 20-50% C = 10-20% S = 1-10% O = 20grains-1% F = 5-20grains T = 1-5grains

Mineralogist/Observer: MES/LG

Date Completed: 26/2/99



**INDEPENDENT DIAMOND LABORATORIES PTY LTD**

ACN 005 948 185

658032

## DIAMOND INDICATOR DATA

Job No: 280

Sample No:

6

## Processing Weights-

Initial: 6.25 g  
 +2mm: kg  
 After Tabling: kg  
 After TBE: g  
 Date Started: 26/2/99

Positive Negative Positive(Other) 

size/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	-0.3	Fractions Analysed(X)	Observed Only(O)
Crush-Roll,Jaw									
Table									
Heavy Liquid									
Mag Separator									

## KIMBERLITE/LAMPROITE INDICATORS

size/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	+0.2	+0.1	Wear	Kimb.
DIAMOND										
CHROME DIOPSIDE										
CHROMITE										
PHLOGOPITE										
PICROILMENITE										
PYROPE										

## DETAILED DESCRIPTIONS

Mineral	Size	Description

## OTHER MINERALS (VOL.% after Heavy Liquid)

ALMANDINE	ORTHOPYX	SPNL/HERCY?	APATITE
ANDRADITE	CLINOPYX	MAGNETITE	MONAZITE
GROSSULAR	AMPHIBOLE	LEUCOXENE	PHOSPHATE
SPESSARTINE	BIOTITE		
	PREHNITE	LIMONITE	ROCK FRAGS.
ANDALUSITE	CORUNDUM	C PYRITE(pseudo)	
KYANITE	HEMATITE	PYRITE	ZIRCON P
SILLIMINITE	ILMENITE	BARITE	TITANITE
STAUROLITE	RUTILE	ANHYDRITE	TOPAZ C
EPIDOTE	ANATASE	CASSITERITE	
TOURMALINE	BROOKITE	MAGNESITE	

P = >50% A = 20-50% C = 10-20% S = 1-10% O = 20grains-1% F = 5-20grains T = 1-5grains

Mineralogist/Observer: MES/LG

Date Completed: 26/2/99



INDEPENDENT DIAMOND LABORATORIES PTY LTD

ACN 005 948 185

658033

## DIAMOND INDICATOR DATA

Job No: 280

Sample No:

S1

## Processing Weights-

Initial: 0.560 kg

+2mm: - kg

After Sieving: 0.396 kg

After TBE: 161 g

Date Started: 23/2/99

Positive Negative Positive(Other) 

size/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	-0.3	Fractions Analysed(X) Observed Only(O)							
Crush-Roll,Jaw								/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	-0.3
Sieve		x	x	x	x	x	x	NM	x	x	x	0	0	0	
Heavy Liquid		x	x	x	x	x									
Mag Separator		x	x	x	x	x									

## KIMBERLITE/LAMPROITE INDICATORS

size/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	+0.2	+0.1	Wear	Kimb.
DIAMOND										
CHROME DIOPSIDE										
CHROMITE										
PHLOGOPITE										
PICROILMENITE				1						See Below
PYROPE										

## DETAILED DESCRIPTIONS

Mineral	Size	Description
ILMENITE	1+0.5	Rounded blocky grain with rough pocked surface. Possibly kimberlitic. Probe Test Needed.
GOLD	1 +0.3	Alluvial
		The paramagnetic fraction (M3) is dominated by ilmenite with some chrome spinel (quick visual check given).

## OTHER MINERALS (VOL.% after Heavy Liquid)

## Non Magnetic Fraction

ALMANDINE		ORTHOPYX		Spinel/Gahnite	F	APATITE	
ANDRADITE		CLINOPYX		MAGNETITE		MONAZITE	
GROSSULAR		AMPHIBOLE		LEUCOXENE	T	PHOSPHATE	
SPESSARTINE		BIOTITE		DIOPSIDE	T		
		PREHNITE		LIMONITE		ROCK FRAGS.	F
ANDALUSITE		CORUNDUM	S	PYRITE(pseudo)			
KYANITE		HEMATITE		PYRITE		ZIRCON	C
SILLIMINITE		ILMENITE		BARITE		TITANITE	
STAUROLITE		RUTILE	O	ANHYDRITE		TOPAZ	P
EPIDOTE	T	ANATASE	T	CASSITERITE	A		
TOURMALINE	O	BROOKITE		MAGNESITE			

P = &gt;50% A = 20-50% C = 10-20% S = 1-10% O = 20grains-1% F = 5-20grains T = 1-5grains

Mineralogist/Observer: MTM/JES/LG

Date Completed: 9/3/99



INDEPENDENT DIAMOND LABORATORIES PTY LTD

ACN 005 948 185

658034

**DIAMOND INDICATOR DATA**

Job No: 280

Sample No:

S2

**Processing Weights-**

Initial: 0.221 kg  
 +2mm: - kg  
 After Sieving: 0.055 kg  
 After TBE: 54 g  
 Date Started: 23/2/99

Positive Negative Positive(Other) 

size/mm	+2	+1	+8	+5	+4	+3	-3	Fractions Analysed(X) Observed Only(O)
Crush-Roll,Jaw								
Sieve		x	x	x	x	x	x	NM
Heavy Liquid		x	x	x	x	x		
Mag Separator		x	x	x	x	x		

**KIMBERLITE/LAMPROITE INDICATORS**

size/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	+0.2	+0.1	Wear	Kimb.
DIAMOND										
CHROME DIOPSIDE										
CHROMITE					21					See Below
PHLOGOPITE										
PICROILMENITE					4					See Below
PYROPE										

**DETAILED DESCRIPTIONS**

Mineral	Size	Description
CHROMITE	18 +0.4	Type B. Mainly dull, frosted, brownish surfaces, some dull matte, generally rounded euhedral to anhedral. Many show cokey rim around interior. Possibly kimberlitic. Probe test needed
CHROMITE	3 +0.4	Type C. One is an intergrowth. Shiny, smooth, uneven surfaces. Euhedral to anhedral. Not kimberlitic
ILMENITE	4 +0.4	Rounded, blocky, trace leucoxene. Possibly picroilmenite. Probe test needed.
		The paramagnetic fraction (M3), is mainly Ilmenite, some Cr spinel and a trace of almandine.

**OTHER MINERALS (VOL.% after Heavy Liquid)****Non Magnetic Fraction**

ALMANDINE		ORTHOPYX	T	GAHNITE	F	APATITE	
ANDRADITE		CLINOPYX		MAGNETITE		MONAZITE	
GROSSULAR		AMPHIBOLE		LEUCOXENE		PHOSPHATE	
SPESSARTINE		BIOTITE		DIOPSIDE			
		PREHNITE		LIMONITE		ROCK FRAGS.	
ANDALUSITE		CORUNDUM	S	PYRITE(pseudo)			
KYANITE		HEMATITE		PYRITE		ZIRCON	C
SILLIMINITE		ILMENITE		BARITE		TITANITE	
STAUROLITE		RUTILE	O	ANHYDRITE		TOPAZ	A
EPIDOTE		ANATASE		CASSITERITE	A		
TOURMALINE		BROOKITE		MAGNESITE			

P =>50% A = 20-50% C = 10-20% S = 1-10% O = 20grains-1% F = 5-20grains T = 1-5grains

Mineralogist/Observer: MTM/JES/MES

Date Completed: 11/3/99

**INDEPENDENT DIAMOND LABORATORIES PTY LTD**

ACN 005 948 185

658035

## DIAMOND INDICATOR DATA

Job No: 280

Sample No:

S3

## Processing Weights-

Initial: 0.240 kg

+2mm: - kg

After Sieving: - kg

After TBE: 64 g

Date Started: 23/2/99

Positive Negative Positive(Other) 

size/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	-0.3	Fractions Analysed(X) Observed Only(O)							
Crush-Roll,Jaw								/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	-0.3
Sieve		x	x	x	x	x	x	NM	x	x	x	x	x	x	
Heavy Liquid		x	x	x	x	x									
Mag Separator		x	x	x	x	x									

## KIMBERLITE/LAMPROITE INDICATORS

size/mm	+2	+1	+0.8	+0.5	+0.4	+0.3	+0.2	+0.1	Wear	Kimb.
DIAMOND										
CHROME DIOPSIDE										
CHROMITE										
PHLOGOPITE										
PICROILMENITE										
PYROPE										

## DETAILED DESCRIPTIONS

Mineral	Size	Description
		No diamonds or kimberlitic indicators were noted in the non-magnetic fraction, which was observed once, grain by grain, completely, & also had a portion re-checked.
		The paramagnetic fraction (M3) is dominated by ilmenite (A quick visual check was given).

## OTHER MINERALS (VOL.% after Heavy Liquid)

## Non Magnetic Fraction

ALMANDINE	ORTHOPYX		SPINEL	F	APATITE	
ANDRADITE	CLINOPYX	T	MAGNETITE		MONAZITE	T
GROSSULAR	AMPHIBOLE		LEUCOXENE		PHOSPHATE	
SPESSARTINE	BIOTITE		DIOPSIDE			
	PREHNITE		LIMONITE		ROCK FRAGS.	
ANDALUSITE	CORUNDUM	O	PYRITE(pseudo)			
KYANITE	HEMATITE		PYRITE		ZIRCON	C
SILLIMINITE	ILMENITE	T	BARITE		TITANITE	
STAUROLITE	RUTILE	O	ANHYDRITE		TOPAZ	A
EPIDOTE	ANATASE	T	CASSITERITE	A		
TOURMALINE	BROOKITE		MAGNESITE			

P = &gt;50% A = 20-50% C = 10-20% S = 1-10% O = 20grains-1% F = 5-20grains T = 1-5grains

Mineralogist/Observer: LK/MTM

Date Completed: 10/3/99



INDEPENDENT DIAMOND LABORATORIES PTY LTD

ACN 005 948 185

**MINERAL HOLDINGS AUSTRALIA LTD****Electron Microprobe Study**

March 1999

**“S” Series: Morphology Groupings**

	<u>Grains &amp; Mount No.</u>		<u>Morphology Type</u>
S1	Picroilmenite 1 PM 1	Rounded blocky grain with rough pocked surface	Possibly Kimberlitic
S2	Picroilmenite 4 PM2-5	Rounded blocky grains. PM 2 has rough pocked surface. PM 5 has an even pitted surface with satin sheen effect.	Possibly Kimberlitic
S2	Chromite 6 PM 6-11	Dull frosted brownish surfaces, anhedral, sub-rounded to rounded	Possibly Kimberlitic
S2	Chromite 2 PM 12-13	Dull matte texture, sub-angular to sub-rounded, subhedral	Possibly Kimberlitic
S2	Chromite 1 PM 14	Rounded, shiny, rough uneven surface, anhedral	Not Kimberlitic
S2	Chromite 1 PM 15	Even matte surface, slightly shiny, euhedral intergrowth	Not Kimberlitic
S2	Chromite 1 PM 16	Even matte surface, shiny euhedral fragment with bevelled edges, submetallic fracture (marginally more interesting morphology)	Probably Not Kimb.

# MINERAL HOLDINGS AUSTRALIA LTD

## Electron Microprobe Data: Chromian Spinel

Spinel Report IDL260399

Sample Number	Group	Mount	Sequence	SiO2	TiO2	Al2O3	Cr2O3	Fe2O3(c)	FeO	V2O3	MnO	MgO	ZnO	NiO	K2O	Na2O	CaO	Nb2O5	Sum Ox%
S2	Poss Kimb	MT1	6	0.03	0.16	47.03	20.75	2.48	10.23	0.12	0.03	19.13	0.06	0.29	0	0	0	0.13	100.46
S2	Poss Kimb	MT1	7	0.04	0.59	44.78	19.64	3.95	13.37	0.14	0.13	16.9	0.1	0.27	0	0	0	0.08	99.99
S2	Poss Kimb	MT1	8	0.11	0.65	42.4	21.25	5.22	12.81	0.12	0.16	17.02	0.07	0.3	0.01	0.01	0	0	100.13
S2	Poss Kimb	MT1	9	0.13	0.69	34.89	30.98	2.35	14.18	0.16	0.06	15.39	0.01	0.3	0	0	0	0.03	99.19
S2	Poss Kimb	MT1	10	0.1	0.7	33.97	30.87	4.89	12.68	0.03	0.09	16.39	0.03	0.28	0	0	0	0.04	100.09
S2	Poss Kimb	MT1	11	0.01	0.46	43.76	20.25	4.09	15.6	0.28	0.14	15.14	0.19	0.24	0.01	0.02	0.01	0.02	100.21
S2	Poss Kimb	MT1	12	0.12	0.33	60.07	2.09	5.49	10.58	0.06	0.09	19.93	0.15	0.3	0.01	0.01	0.01	0	99.24
S2	Poss Kimb	MT1	13	0.13	0.81	30.6	33.95	5.48	12.81	0.15	0.06	16.07	0.11	0.29	0	0	0.02	0.01	100.48
S2	Not Kimb	MT1	14	0.85	1.55	2.87	0.44	55.48	31.75	0.21	0.16	0.04	0	0.04	0	0	0.05	0	93.42
S2	Not Kimb	MT1	15	0.18	1.37	32.19	33.56	1.06	15.37	0.15	0.06	14.68	0.02	0.36	0	0	0	0	99.01
S2	Not Kimb	MT1	16	0	0.04	4.49	68.84	0	18.75	0.04	0.21	9.11	0.17	0.03	0.02	0.02	0	0.05	101.79
				Si	Ti	Al/Al IV	Al VI	Cr	Fe3+	Fe2+	V	Mn2+	Mg	Zn	Ni	K	Na	Ca	Nb
S2	Poss Kimb	MT1	6	0.001	0.003	0	1.493	0.442	0.05	0.23	0.003	0.001	0.768	0.001	0.006	0	0	0	0.002
S2	Poss Kimb	MT1	7	0.001	0.012	0	1.457	0.429	0.082	0.309	0.003	0.003	0.695	0.002	0.006	0	0	0	0.001
S2	Poss Kimb	MT1	8	0.003	0.014	0	1.389	0.467	0.109	0.298	0.003	0.004	0.705	0.002	0.007	0	0.001	0	0
S2	Poss Kimb	MT1	9	0.004	0.015	0	1.194	0.711	0.051	0.344	0.004	0.002	0.666	0	0.007	0	0	0	0
S2	Poss Kimb	MT1	10	0.003	0.015	0	1.153	0.703	0.106	0.305	0.001	0.002	0.704	0.001	0.006	0	0	0	0
S2	Poss Kimb	MT1	11	0	0.01	0	1.441	0.447	0.086	0.365	0.006	0.003	0.63	0.004	0.005	0	0.001	0	0
S2	Poss Kimb	MT1	12	0.003	0.006	0	1.831	0.043	0.107	0.229	0.001	0.002	0.768	0.003	0.006	0	0	0	0
S2	Poss Kimb	MT1	13	0.004	0.018	0	1.051	0.782	0.12	0.312	0.004	0.001	0.698	0.002	0.007	0	0	0.001	0
S2	Not Kimb	MT1	14	0.034	0.047	0	0.136	0.014	1.682	1.07	0.007	0.005	0.002	0	0.001	0	0	0.002	0
S2	Not Kimb	MT1	15	0.005	0.03	0	1.119	0.783	0.023	0.379	0.004	0.002	0.645	0	0.009	0	0	0	0
S2	Not Kimb	MT1	16	0	0.001	0	0.177	1.824	0	0.525	0.001	0.006	0.455	0.004	0.001	0.001	0.001	0	0.001
				Sum Cat#	XCr	XFe2+	YFe3+	Cr/(Cr+	Fe2+)										
S2	Poss Kimb	MT1	6	3	22.841	23.079	2.537	0.23	0.23										
S2	Poss Kimb	MT1	7	3	22.729	30.745	4.166	0.23	0.31										
S2	Poss Kimb	MT1	8	3	25.158	29.694	5.556	0.25	0.30										
S2	Poss Kimb	MT1	9	3	37.33	34.078	2.629	0.37	0.34										
S2	Poss Kimb	MT1	10	3	37.869	30.272	5.402	0.38	0.30										
S2	Poss Kimb	MT1	11	3	23.689	36.639	4.359	0.24	0.37										
S2	Poss Kimb	MT1	12	3	2.282	22.952	5.399	0.02	0.23										
S2	Poss Kimb	MT1	13	3	42.672	30.912	6.147	0.43	0.31										
S2	Not Kimb	MT1	14	3	9.243	99.787	91.815	0.09	1.00										
S2	Not Kimb	MT1	15	3	41.162	37.019	1.219	0.41	0.37										
S2	Not Kimb	MT1	16	2.998	91.143	53.59	0	0.91	0.54										

668099

# MINERAL HOLDINGS AUSTRALIA LTD

## Electron Microprobe Data: Ilmenite

Ilmenite Report IDL260399

Sample Number	Group	Mount	Sequence	SiO2	TiO2	Al2O3	Cr2O3	Fe2O3(c)	FeO(c)	V2O3	MnO	MgO	ZnO	NiO	K2O	Na2O	CaO	Nb2O5	Sum Ox%
S1	Poss Kimb	MT1	1	0	51.54	0.39	0.09	5.63	35.5	0.29	0.47	5.81	0.05	0	0	0.01	0	0.07	99.85
S2	Poss Kimb	MT1	2	0.01	52.05	0.28	0.03	4.92	34.65	0.4	0.53	6.4	0.02	0	0.01	0.02	0.06	0	99.4
S2	Poss Kimb	MT1	3	0	52.05	0.27	0.04	3.38	38.31	0.3	0.54	4.31	0.04	0.03	0	0.03	0.05	0.01	99.36
S2	Poss Kimb	MT1	4	0	52.4	0.2	0.03	3.44	39.91	0.28	0.56	3.63	0	0.01	0	0.03	0.02	0.02	100.55
S2	Poss Kimb	MT1	5	0	48.89	0.53	0.11	9.47	33.54	0.35	0.59	5.42	0.06	0	0	0.02	0.02	0	99.01

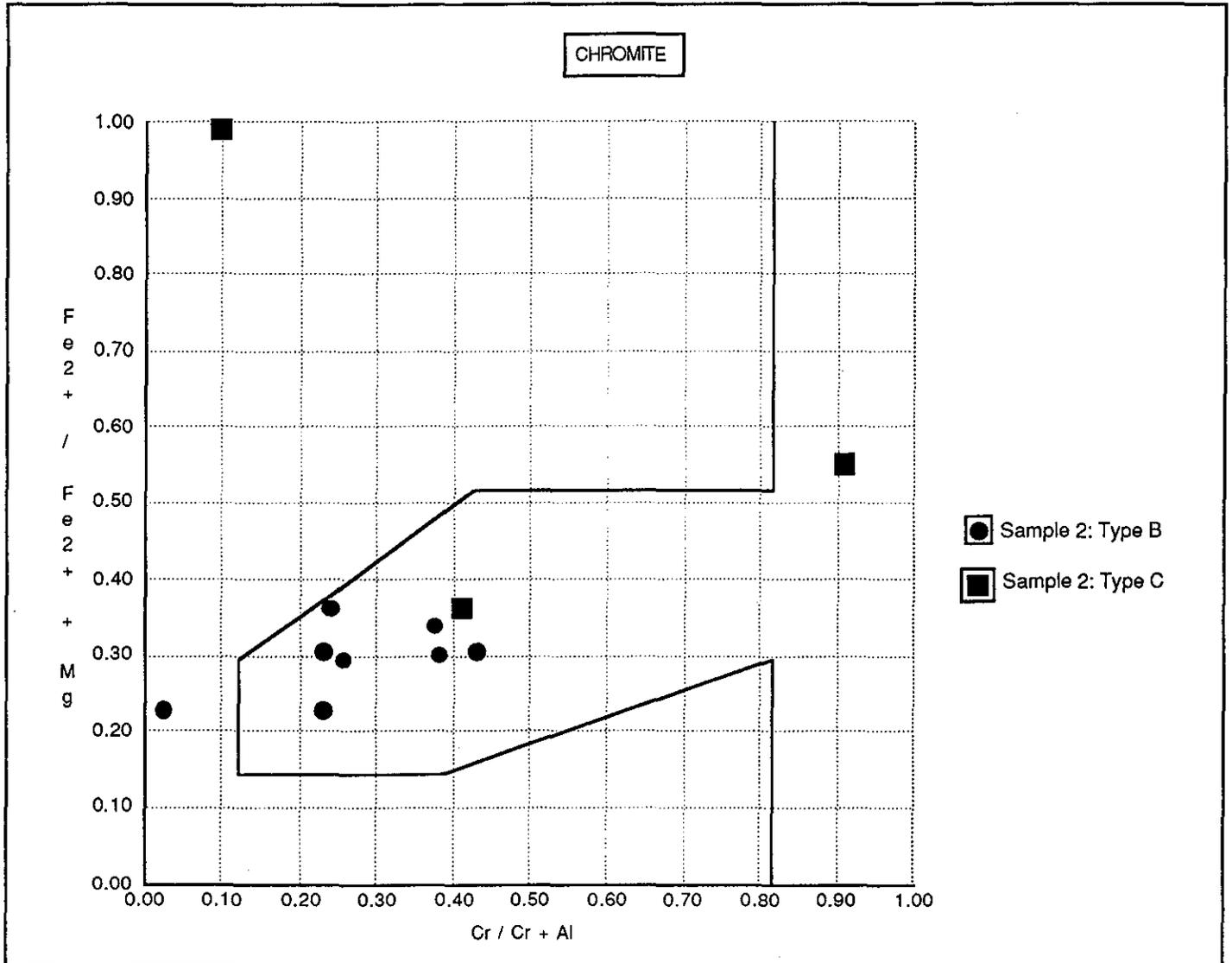
Sample Number	Group	Mount	Sequence	Si	Ti	Al/Al IV	Al VI	Cr	Fe3+	Fe2+	V	Mn2+	Mg	Zn	Ni	K	Na	Ca	Nb	Sum Cat#
S1	Poss Kimb	MT1	1	0	0.939	0	0.011	0.002	0.103	0.719	0.006	0.01	0.21	0.001	0	0	0	0	0.001	2
S2	Poss Kimb	MT1	2	0	0.947	0	0.008	0.001	0.09	0.701	0.008	0.011	0.231	0	0	0	0.001	0.001	0	2
S2	Poss Kimb	MT1	3	0	0.962	0	0.008	0.001	0.063	0.787	0.006	0.011	0.158	0.001	0.001	0	0.002	0.001	0	2
S2	Poss Kimb	MT1	4	0	0.963	0	0.006	0.001	0.063	0.815	0.006	0.012	0.132	0	0	0	0.002	0	0	2
S2	Poss Kimb	MT1	5	0	0.901	0	0.015	0.002	0.175	0.687	0.007	0.012	0.198	0.001	0	0	0.001	0.001	0	2

Sample Number	Group	Mount	Sequence	Ilmenite	Geikielit	Pyro-	Hematit	XMg
S1	Poss Kimb	MT1	1	72.662	21.188	0.967	5.183	0.226
S2	Poss Kimb	MT1	2	70.986	23.369	1.107	4.538	0.248
S2	Poss Kimb	MT1	3	79.71	15.976	1.145	3.168	0.167
S2	Poss Kimb	MT1	4	82.29	13.349	1.169	3.192	0.14
S2	Poss Kimb	MT1	5	69.789	20.095	1.253	8.863	0.224

658033

# Sample 2

## Chromian Spinel Plot



# Grain Study

For

## MINERAL HOLDINGS AUSTRALIA LTD

### SUMMARY OF CONCLUSIONS

#### Chromite

*Chromite grains from Sample 2 were studied individually on the basis of their surface morphology features and classified accordingly (see "Mineral Holdings Australia Ltd: March 1999 Electron Microprobe Study").*

*The chromites were classified as:*

- B possibly kimberlitic morphology*
- C non-kimberlitic morphology*

*Selected grains were analysed by electron microprobe. The analyses have been represented on a standard "cr vs mg" diagram showing the two main morphology groups (B and C) distinguished by separate symbols.*

#### RESULTS

1. The most interesting grain on the plot was also selected as being distinctive in the sample (PM 16). It was not like the other grains and had a somewhat interesting morphology.
2. The other grains are either not true chromites, or have low Cr. While many of them plot within a field to which kimberlitic types are restricted, the field is not exclusive to kimberlites and their related rocks (e.g. lamproites). Some lamproites have a broad range of values in their chromite suite, including low Cr varieties. Such low Cr types are also found in certain basaltic rocks. It is therefore unlikely that these grains have a kimberlitic affinity.

#### RECOMMENDATIONS

- \* Follow up is recommended in relation to the chromite from PM 16. If it comes from a locality known to host diamonds then there could be some association.
- \* The balance of the chromites are not interesting from a diamond perspective, and no follow-up is suggested.

#### Ilmenite

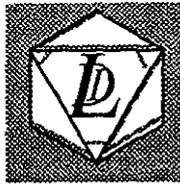
*Ilmenite grains were selected from Samples 1 and 2. These are described in "Mineral Holdings Australia Ltd: March 1999 Electron Microprobe Study". In general they showed a possibly kimberlitic morphology.*

#### RESULTS

The MgO content ranges between 3.63 and 5.81. This range is borderline for kimberlitic varieties. To be certain of a kimberlitic origin MgO should exceed 10%.

#### RECOMMENDATIONS

- \* Sample 1 and 2 ilmenites are possibly related to a kimberlitic source. However, a common known source of low-Mg picro-ilmenite in the Eastern States are basaltic diatremes, some of which were described in earlier literature as "kimberlite".
- \* As with the PM 16 chromite, follow up is recommended, especially if the samples are known to come from a locality with diamonds.



# Laboratory Report

for

## Mineral Holdings Aust. Pty Ltd

May 1999

Samples

~~A,B,C,D,E,F~~ 31-50/52-88 (EL 7/97 Nine Mile Beach  
King Island)  
Composite 1 & 2 (TAMEL, EL 19/93 Ringarooma Bay)  
Dorset Dredge Tailings

---

**INDEPENDENT DIAMOND LABORATORIES PTY LTD**

ACN 005 948 185

UNIT 2, 50 Westchester Road  
MALAGA 6090  
AUSTRALIA

Job No: 287

Date: 15 June 1999

Telephone 61 8 9249 9188  
Facsimile 61 8 9249 9686

email: [idl@omen.net.au](mailto:idl@omen.net.au)  
Homepage: [www.omen.com.au/~idl](http://www.omen.com.au/~idl)

**DIAMOND INDICATOR DATA**

Sample No: **Composite 1**

Job No: **287**

Date Started: 29/4/99  
 Processing Weights  
 Initial: 57.6 kg  
 +2mm: 6.036 kg  
 After Tabling: 11.99 kg  
 After TBE: 61 g +2mm: 13 g

Positive

Negative

Positive (Other)

Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3	Fractions Analysed(x)	Observed only(o)	Scanned only(s)					
Crush								Ø/mm	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1
Table		x	x	x	x	x	x	NM	x	x	x	x	x		
HL	x	x	x	x	x	x		M4	x	x	x	x	x		
Mag		x	x	x	x	x		M3	x	x	x	x	x		

**Kimberlite, Lamproite Indicators**

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1	Wear/km	Kimberlitic?
Diamond										
Chrome Diopside										
Chromite						1			<5	Poss.
Phlogopite										
Picroilmenite					1	4			3-8	See Below
Pyrope										
Diopside				1	1	5			0-5	Prob. Not

**Detailed Descriptions**

Mineral	Size/mm	Description
Chromite	1+0.3	Subhedral fragment, One slightly concave X'tal face, frosted to submetallic, Cokey fracture.
Picroilmenite	1+0.4	Anhedral, Rounded, Pitted, Curved fracture, Brittle.
A-Poss. Kimb.		
Picroilmenite	4+0.3	Anhedral, Rounded, Pitted, Slight cleavage, Probably Mn ilmenite.
B-Prob. Not Kimb.		
Diopside	1+0.4	Anhedral, Rounded to angular with saw tooth terminations, Ribbed, Pale green, Translucent, Cr bearing.
Topaz	1+2	White
Sapphire	2+0.3	Blue
Garnet	≈8+0.5	RI>1.77

**Other Minerals (Volume% after Heavy Liquid-HL)**

Almandine	O	Orthopyroxene		Spinel		Apatite	
Andradite		Clinopyroxene	A	Magnetite	T	Monazite	
Grossular		Amphibole	A	Leucosene		Phosphate	T
Spessartine	O	Biotite	S	Pleonaste	S	Picotite	T
		Prehnite		Limonite		Rock Fragments	O
Andalusite		Corundum		Pyrite(psuedo)			
Kyanite		Hematite		Pyrite	T	Zircon	F
Sillimanite		Ilmenite	T	Barite		Titanite	
Staurolite		Rutile	F	Anhydrite		Topaz	P
Epidote		Anatase					
Tourmaline	O	Brookite		Magnesite		Cassiterite	O

P >50%    A 20-50%    C 10-20%    S 1-10%    O 20grains-1%    F 5-20grains    T 1-5grains

**DIAMOND INDICATOR DATA**

Sample No: **Composite 2**

Job No: 287

Date Started: 29/4/99  
 Processing Weights  
 Initial: 26 kg  
 +2mm: 0.059 kg  
 After Tabling: 1.568 kg  
 After TBE: 4 g +2mm 0 g

Positive

Negative

Positive (Other)

Ø/mm	Fractions Analysed(x), Observed only(o), Scanned only(s)						
	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3
Crush							
Table		x	x	x	x	x	x
HL	x	x	x	x	x	x	
Mag		x	x	x	x	x	

**Kimberlite, Lamproite Indicators**

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1	Wear/km	Kimberlitic?
Diamond										
Chrome Diopside										
Chromite										
Phlogopite										
Picroilmenite										
Pyrope										
Diopside					1				1-2	Prob. Not

**Detailed Descriptions**

Mineral	Size/mm	Description
Diopside	1+0.4	Anhedral, Irregular, Subrounded, Ribbed, Green, Subtranslucent Little or no chrome

**Other Minerals (Volume% after Heavy Liquid-HL)**

Almandine	T	Orthopyroxene	Spinel	Apatite	
Andradite		Clinopyroxene	A Magnetite	Monazite	
Grossular		Amphibole	A Leucosene	T Phosphate	
Spessartine		Biotite	S Pleonaste	F	
		Prehnite	Limonite	Rock Fragments	F
Andalusite		Corundum	Pyrite(psuedo)		
Kyanite		Hematite	Pyrite	Zircon	
Sillimanite		Ilmenite	Barite	Titanite	
Staurolite		Rutile	T Anhydrite	Topaz	A
Epidote	T	Anatase	T		
Tourmaline	S	Brookite	Magnesite		

P >50%    A 20-50%    C 10-20%    S 1-10%    O 20grains-1%    F 5-20grains    T 1-5grains

Mineralogist/Observed: JG/IT

Date Completed: 20/4/00

UWA, Centre for Microscopy  
and Microanalysis

Composite 1 Sample  
Ringarooma Bay.

Sample Description	Comp. 1 cmt	Sample Description	Comp. 1 micro Gp.A
Mineral	SP	Mineral	IL
Ox no	4	Ox no	3
TiO2	0.00	TiO2	54.60
Al2O3	20.52	Al2O3	0.00
Cr2O3	51.28	Cr2O3	0.00
V2O3	0.00	V2O3	0.00
FeO	14.47	Nb2O5	0.00
MnO	0.00	FeO	39.14
MgO	12.73	MnO	0.50
ZnO	0.00	MgO	6.64
NiO	0.00	CaO	0.00
		ZnO	0.00
Oxide total	99.00	NiO	0.00
		Oxide total	100.88
Fe2O3*	0.00	Fe2O3*	1.06
FeO*	14.47	FeO*	38.19
Total*	99.00	Total*	100.99
Ti	0.000	Ti	0.981
Al	0.755	Al	0.000
Cr	1.265	Cr	0.000
Fe3+	0.000	Fe3+	0.019
V	0.000	V	0.000
Fe2+	0.378	Nb	0.000
Mn	0.000	Fe2+	0.763
Mg	0.592	Mn	0.010
Zn	0.000	Mg	0.236
Ni	0.000	Ca	0.000
Cation total	2.990	Zn	0.000
		Ni	0.000
Mg No	61.05	Cation total	2.010
Ulvospinel	0.00	Mg No	23.65
Spinel	37.37	XTiO3	98.10
Chromite	62.63	Hematite	1.90
Magnetite	0.00	Ilmenite	74.14
100Cr/(Cr+Al)	62.6	Pyrophanite	0.98
100Fe/(Fe+Mg)	38.9	Geikielite	22.97

658045

## DIAMOND INDICATOR DATA

Sample No: Dorset Dredge tailings

Job No: 287

Date Started: 10/5/99

Positive 

Processing Weights SEE ATTACHED

Initial: 0.67 kg

Negative 

+2mm: kg

After Tabling: kg

Positive (Other) 

After TBE: 393 g incl. +0.3mm

Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3	Fractions Analysed(x). Observed only(o). Scanned only(s)							
Crush								Ø/mm	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1
Table								NM	o	o	x	x	x		
HL	x	x	x	x	x	x	x	M4	o	o		o	o		
Mag				x	x	x		M3	o	o	x	x	x		

## Kimberlite, Lamproite Indicators

	Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1	Wear/km	Morphology
Diamond											
Chrome Diopside											
Chromite											
Phlogopite											
Picroilmenite					1	2	3			5-10	Prob. Kimb.
Pyrope											
Diopside							3			<2	Poss. Lamp.

## Detailed Descriptions

Mineral	Size/mm	Description
Picroilmenite		Anhedral, Blocky and rounded or angular shards, All have rounded abrasion pitted surfaces, Conchoidal fracture.
Diopside		Anhedral, One with saw tooth ends, Angular, Two contain <1% Cr <sub>2</sub> O <sub>3</sub> , Probably Lamprophyric eg. Melilitite
Pleonaste		Kimberlitic morphology ie. Source is probably lamprophyre.
Gahnite	<0.5mm	Subhedral to Irregular, Slight abrasion rounding, 2-8km from source.
Sapphire	26+1mm 0.385g 1@0.055g	50% are grey star sapphire, Several are pale yellow-green and one is white, Remainder are blue.

## Other Minerals (Volume% after Heavy Liquid-HL)

Almandine	O	Orthopyroxene	T	Pleonaste	A	Apatite	
Andradite		Clinopyroxene	T	Magnetite		Monazite	
Grossular	F	Amphibole	F	Leucosene	F	Phosphate	
Spessartine	F	Biotite	T	Gahnite	O	Florencite	F
		Prehnite		Limonite		Rock Fragments	
Andalusite		Corundum	O	Pyrite(psuedo)			
Kyanite		Hematite		Pyrite		Zircon	C
Sillimanite		Ilmenite	C	Barite		Titanite	
Staurolite		Rutile	S	Anhydrite		Topaz	P
Epidote		Anatase	T			Cassiterite	S
Tourmaline	T	Brookite		Magnesite			

P &gt;50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: LG/MES/NJT

Date Completed: 18/5/99

 Independent Diamond Laboratories Pty Ltd

**HEAVY MINERAL DATA**Sample No: **Dorset Dredge tailings**

Job No: 287

Date Started: 10/5/99

Positive (Economic Minerals) **Processing Weights**

Initial: kg

Negative 

+2mm: kg

After Tabling: kg

Positive (Other) 

After TBE: g

Ø/mm	Fractions Analysed(x), Observed only(o), Scanned only(s)						
	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3
Crush							
Table							
HL	x	x	x	x	x	x	x
Mag				x	x	x	

**Significant Minerals Vol% of Concentrate**

	Sieve/mm	2.36	2	1.18	0.6*	0.425	0.3	0.15	0.075	<0.075
Cassiterite						T	T	T		
Ilmenite						5	20	50	T	
Magnetite							T	1	T	0.5
Pleonaste		100	99	90	3?	30	15	15	10	
Rutile						1	1	5	40	30
Sapphire			2							
Topaz			T	5	75	60	55	30		
Zircon					20	1	1	5	50	70
Weight of Concentrate/g		22	55.6	101	58.5	75.3	79.9	176	38.5	1

Mineral	Size/mm	Grade	Description
Pleonaste	>0.6<1.180		Appears to have been removed.

**Other Minerals (Volume% after Heavy Liquid)**

Almandine	O	Orthopyroxene	T	Pleonaste	A	Apatite	
Andradite		Clinopyroxene	T	Magnetite		Monazite	
Grossular	F	Amphibole	F	Leucoxene	F	Phosphate	
Spessartine	F	Biotite	T	Gahnite	O	Florencite	F
		Prehnite		Limonite		Rock Fragments	
Andalusite		Corundum	O	Pyrite(psuedo)			
Kyanite		Hematite		Pyrite		Zircon	C
Sillimanite		Ilmenite	C	Barite		Titanite	
Staurolite		Rutile	S	Anhydrite		Topaz	P
Epidote		Anatase	T			Cassiterite	S
Tourmaline	T	Brookite		Magnesite			

P &gt;50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer LG/MES/NJT

Date Completed: 18/5/99

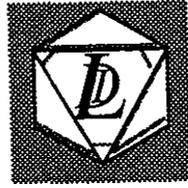
Independent Diamond Laboratories Pty Ltd

UWA, Centre for Microscopy  
and Microanalysis

Sample Description	DD1 picro #1	DD1 picro #2	DD1 picro #3	DD1 picro #4	DD1 picro #5	Sample Description	DD1 gahnite #1	DD1 gahnite #2	DD1 gahnite #3	DD1 gahnite #4	DD1 gahnite #5
Mineral	IL	IL	IL	IL	IL	Mineral	SP	SP	SP	SP	SP
Ox no	3	3	3	3	3	Ox no	4	4	4	4	4
TiO2	54.27	50.90	53.32	54.15	53.41	TiO2	0.00	0.00	0.00	0.00	0.00
Al2O3	0.31	0.30	0.00	0.00	0.27	Al2O3	56.47	56.32	55.81	55.49	56.07
Cr2O3	0.00	0.00	0.00	0.00	0.00	Cr2O3	0.00	0.00	0.00	0.00	0.00
V2O3	0.48	0.00	0.00	0.35	0.40	V2O3	0.00	0.00	0.00	0.00	0.00
Nb2O5	0.00	0.00	0.00	0.00	0.00	FeO	11.31	9.37	9.08	8.81	14.90
FeO	36.73	42.92	39.83	38.27	37.77	MnO	0.00	0.00	0.19	0.19	0.28
MnO	0.29	0.38	0.27	0.49	0.58	MgO	0.25	0.25	0.26	0.34	0.67
MgO	7.95	4.97	5.82	6.76	7.39	ZnO	32.07	34.52	35.32	34.68	27.18
CaO	0.00	0.00	0.00	0.00	0.00	NiO	0.00	0.00	0.00	0.00	0.00
ZnO	0.00	0.00	0.00	0.00	0.00	Oxide total	100.10	100.46	100.66	99.51	99.10
NiO	0.00	0.00	0.00	0.00	0.00	Fe2O3*	0.20	0.44	1.17	0.83	0.63
Oxide total	100.03	99.47	99.24	100.02	99.82	FeO*	11.13	8.97	8.02	8.07	14.33
Fe2O3*	0.46	2.56	1.12	0.72	1.04	Total*	100.12	100.50	100.78	99.59	99.16
FeO*	36.31	40.62	38.82	37.62	36.83	Ti	0.000	0.000	0.000	0.000	0.000
Total*	100.08	99.73	99.35	100.09	99.92	Al	1.996	1.990	1.974	1.981	1.986
Ti	0.974	0.944	0.979	0.980	0.966	Cr	0.000	0.000	0.000	0.000	0.000
Al	0.009	0.009	0.000	0.000	0.008	Fe3+	0.004	0.010	0.026	0.019	0.014
Cr	0.000	0.000	0.000	0.000	0.000	V	0.000	0.000	0.000	0.000	0.000
Fe3+	0.008	0.047	0.021	0.013	0.019	Fe2+	0.279	0.225	0.201	0.204	0.360
V	0.009	0.000	0.000	0.007	0.008	Mn	0.000	0.000	0.005	0.005	0.007
Nb	0.000	0.000	0.000	0.000	0.000	Mg	0.011	0.011	0.012	0.015	0.030
Fe2+	0.725	0.838	0.793	0.757	0.741	Zn	0.710	0.764	0.782	0.775	0.603
Mn	0.006	0.008	0.006	0.010	0.012	Ni	0.000	0.000	0.000	0.000	0.000
Mg	0.283	0.183	0.212	0.242	0.265	Cation total	3.000	3.000	3.000	3.000	3.000
Ca	0.000	0.000	0.000	0.000	0.000	Mg No	3.85	4.73	5.46	6.99	7.69
Zn	0.000	0.000	0.000	0.000	0.000	Ulvospinel	0.00	0.00	0.00	0.00	0.00
Ni	0.000	0.000	0.000	0.000	0.000	Spinel	99.78	99.50	98.68	99.06	99.28
Cation total	2.013	2.028	2.010	2.010	2.017	Chromite	0.00	0.00	0.00	0.00	0.00
Mg No	28.06	17.90	21.08	24.25	26.34	Magnetite	0.22	0.50	1.32	0.94	0.72
XTiO3	97.38	94.38	97.94	98.03	96.57	100Cr/(Cr+Al)	0.0	0.0	0.0	0.0	0.0
Hematite	0.83	4.75	2.06	1.30	1.89	100Fe/(Fe+Mg)	96.2	95.3	94.5	93.0	92.3
Ilmenite	69.64	76.89	76.86	73.52	70.31						
Pyrophanite	0.56	0.73	0.54	0.97	1.12						
Geikielite	27.17	16.76	20.53	23.54	25.14						

Derset Inridge tail (DD1)

658047



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# Laboratory Report

for

**MINERAL HOLDINGS  
AUSTRALIA PTY. LTD**

**Samples**

**No. 1 DORSET DREDGE  
ENDURANCE  
PIONEER**

**INDEPENDENT DIAMOND LABORATORIES PTY LTD**

ACN 005 948 185

UNIT 2, 50 Westchester Road  
MALAGA 6090  
AUSTRALIA

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Telephone 61 8 9249 9188  
Facsimile 61 8 9249 9686

Job No: 298

email: [idl@omen.net.au](mailto:idl@omen.net.au)  
Homepage: [omen.com.au/~idl](http://omen.com.au/~idl)

Date: 30 July 1999

**MACRODIAMOND DATA**

Sample No: **No. 1 DORSET DREDGE**

Job No: 298

<b>Processing Weights</b>		Date Started: 18/6/99	
Initial:	34.0 kg	After Tabling	7.334 kg
		After TBE:	4.307 kg
+2mm:	2.302 kg	NM:	1.737 kg

Positive (Diamond)

Negative

Positive (Other)

**Size Fraction Digested:**

	>16	>8	>4	>2	>1	>0.8	>0.5
Mill							
Table							
Mag				x	x	x	x
HL				x	x	x	x
X'ray							

Fractions Analysed(x) Observed only(o) Scanned only(s)							
Ø/mm	>16	>8	>4	>2	>1	>0.8	>0.5
NM				x	o	o	
ALL	o	o	o				

**Gem Recovery**  
Sapphire/Ruby

Sieve Size/mm	>16	>8	>4	>2	>1	>0.8	>0.5
Number				19	201		

Descriptions	>16	>8	>4	>2	>1	>0.8	>0.5
<b>Individual Stone Size/carats</b>							
Largest(Blue):				0.25			

Total Weight/carats = 10.476ct.  
Grade(based on +1mm): 308ct./t

<b>Morphology:</b>	Octahedron						
	Dodecahedron						
	Macle						
	Combination						
	Shape						
	Fragment						
	Twinned						
	Rounded						
	Resorbed						
<b>Colour:</b>	Blue			17	71		
	"Tasmanian" Ruby			2	82		
	Black/Brown(Star)				21		
	Yellow/Green				7		
	Star				26		
<b>Inclusions:</b>							
<b>Background Minerals:</b>	(Non Mag)	TPz	Zrn	Spnl	Cdm		
		P	S	S	C		

**Comments: Indicators:** Sapphire: Blue sapphire is blue to indigo.  
Ruby: Strawberry to crimson.  
Non black star sapphires are blue.

Mineralogist/Observer: JT/LG

Date Completed: 29/6/99

	Independent Diamond Laboratories Pty Ltd
	ACN 005 948 185 <span style="float: right;">34912</span>

658050

## MACRODIAMOND DATA

Sample No:

ENDURANCE

Job No: 298

Processing Weights Date Started: 18/6/99  
 Initial: 32.2 kg After Tabling 15.79 kg  
 After TBE: 10.666 kg  
 +2mm: 2.598 kg NM: 7.895 kg

Positive (Diamond) Negative Positive (Other) 

Size Fraction Digested:

	>16	>8	>4	>2	>1	>0.8	>0.5	Fractions Analysed(y) Observed only(o) Scanned only(s)							
Mill								Ø/mm	>16	>8	>4	>2	>1	>0.8	>0.5
Table								NM	x	x	x	x	o	40%	
Mag				x	x	x	x	ALL	x	x	x				
HL				x	x	x	x								
X'ray															

Gem Recovery  
Sapphire/RubySieve Size/mm  
Number

>16	>8	>4	>2	>1	>0.8	>0.5		
			30	178				

Descriptions	>16	>8	>4	>2	>1	>0.8	>0.5		
Individual Stone Size/carats									
Largest(Blue):				0.22					

Total Weight/carats = 12.984

Grade(based on +1mm): 403ct./t

<b>Morphology:</b>	Octahedron								
	Dodecahedron								
	Macle								
	Combination								
	Shape								
	Fragment								
	Twinned								
	Rounded								
	Resorbed								
<b>Colour:</b>	Blue			25	98				
	"Tasmanian" Ruby				18				
	Black/Brown(Star)			5	60				
	Yellow/Green				2				
	Star			9	92				
<b>Inclusions:</b>									
<b>Background Minerals:</b>	(Non Mag)	Tpz	Zrn	Pleo	Alm	Crdrn	Rut		
		P	S	S	T	S	T		

Comments:

Sapphire: Blue sapphire is blue to indigo.

Ruby: Strawberry to crimson.

Non black star sapphires are blue.

Mineralogist/Observer: JT/LG/LK

Date Completed: 1/7/99



Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

34912

658051

**MACRODIAMOND DATA**

Sample No:

**PIONEER**

Job No: 298

Processing Weights Date Started: 18/6/99  
 Initial: 27.6 kg After Tabling 9.112 kg  
 After TBE: 3.557 kg  
 +2mm: 4.008 kg NM: 2.269 kg

Positive (Diamond) Negative Positive (Other) 

Size Fraction Digested:

	>416	>28	>4	>2	>1	>0.8	>0.5	Fractions Analysed(x) Observed only(o) Scanned only(s)							
Mill								Ø/mm	>16	>8	>4	>2	>1	>0.8	>0.5
Table								NM				x	0	0	
Mag				x	x	x	x	ALL	0	0	0				
HL				x	x	x	x								
X'ray															

Gem Recovery  
Sapphire/RubySieve Size/mm  
Number

>16	>8	>4	>2	>1	>0.8	>0.5		
			9	220	~150			

Descriptions	>16	>8	>4	>2	>1	>0.8	>0.5		
<b>Individual Stone Size/carats</b>									
Largest(Black Star):				0.69					

Total Weight/carats = 8.235ct.

Grade(Based on =1mm): 298ct./t

<b>Morphology:</b>	Octahedron								
	Dodecahedron								
	Macle								
	Combination								
	Shape								
	Fragment								
	Twinned								
	Rounded								
	Resorbed								
<b>Colour:</b>	Blue				7	174			
	"Tasmanian" Ruby					25			
	Black/Brown(Star)				2	17			
	Yellow/Green					4			
	Star					26			
<b>Inclusions:</b>									
<b>Background Minerals:</b>	(Non Mag)	Tapz	Zrn	Cass	Spnl	Crdm			
		P	S	O	T	S			

Comments: Indicators:

Sapphire: Blue to Indigo blue.

Ruby: Orange-red to crimson.

Only the largest(Black Star sapphire)has been weighed. There is a big jump between this and the next size down indicating a non alluvial size distribution.

Mineralogist/Observer: JT/LG

Date Completed: 29/6/99

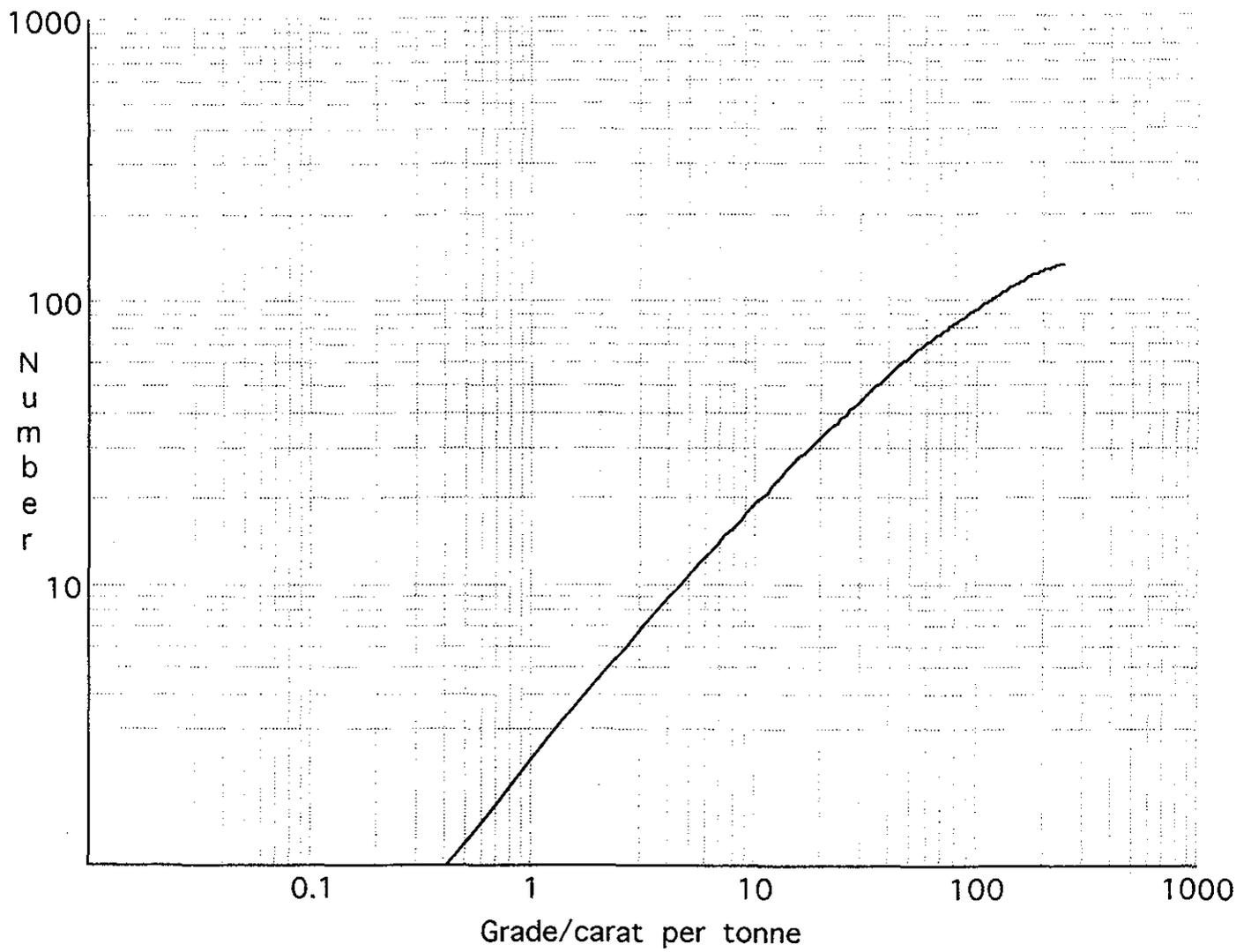


Independent Diamond Laboratories Pty Ltd

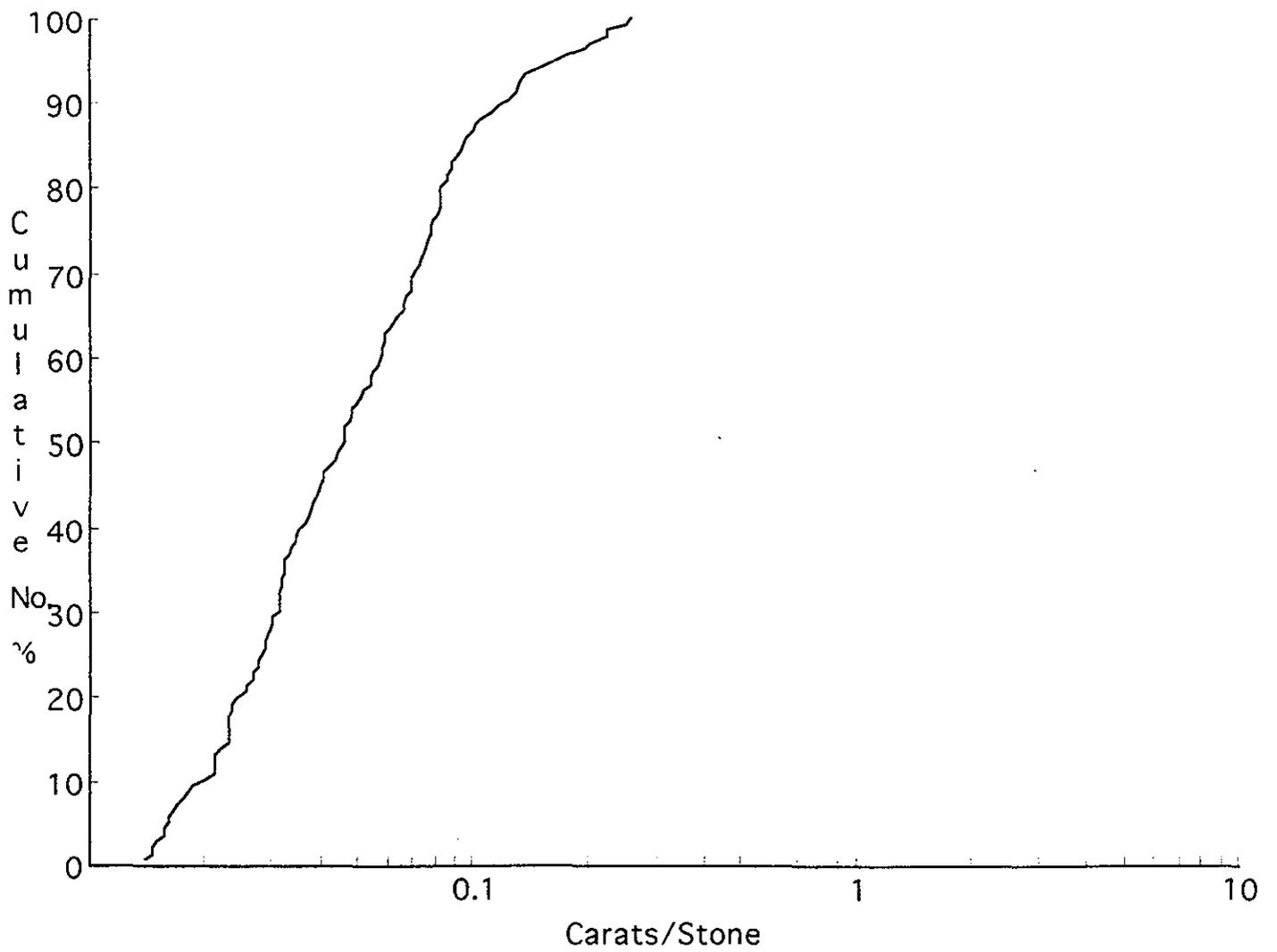
ACN 005 948 185

34912

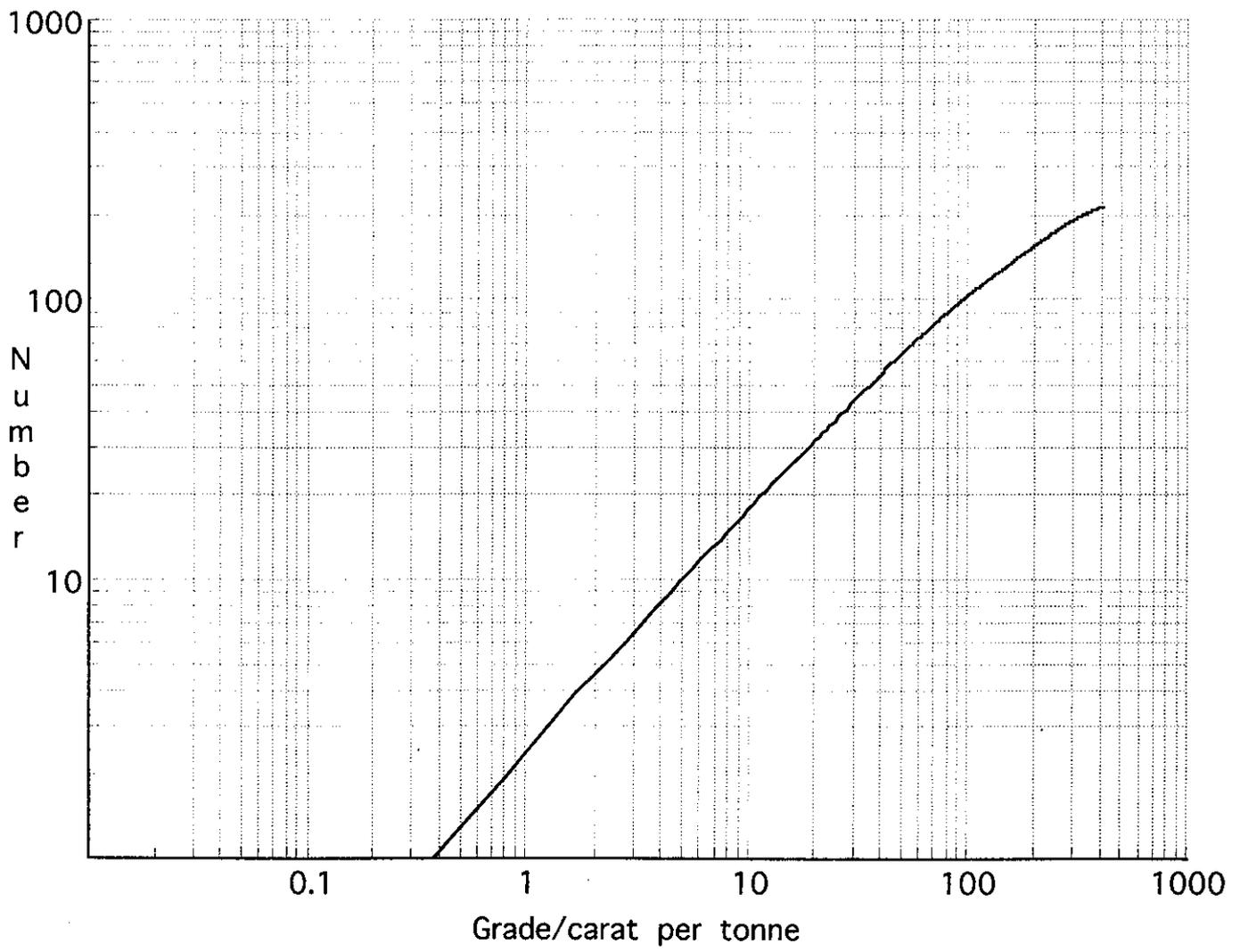
Dorset Dredge



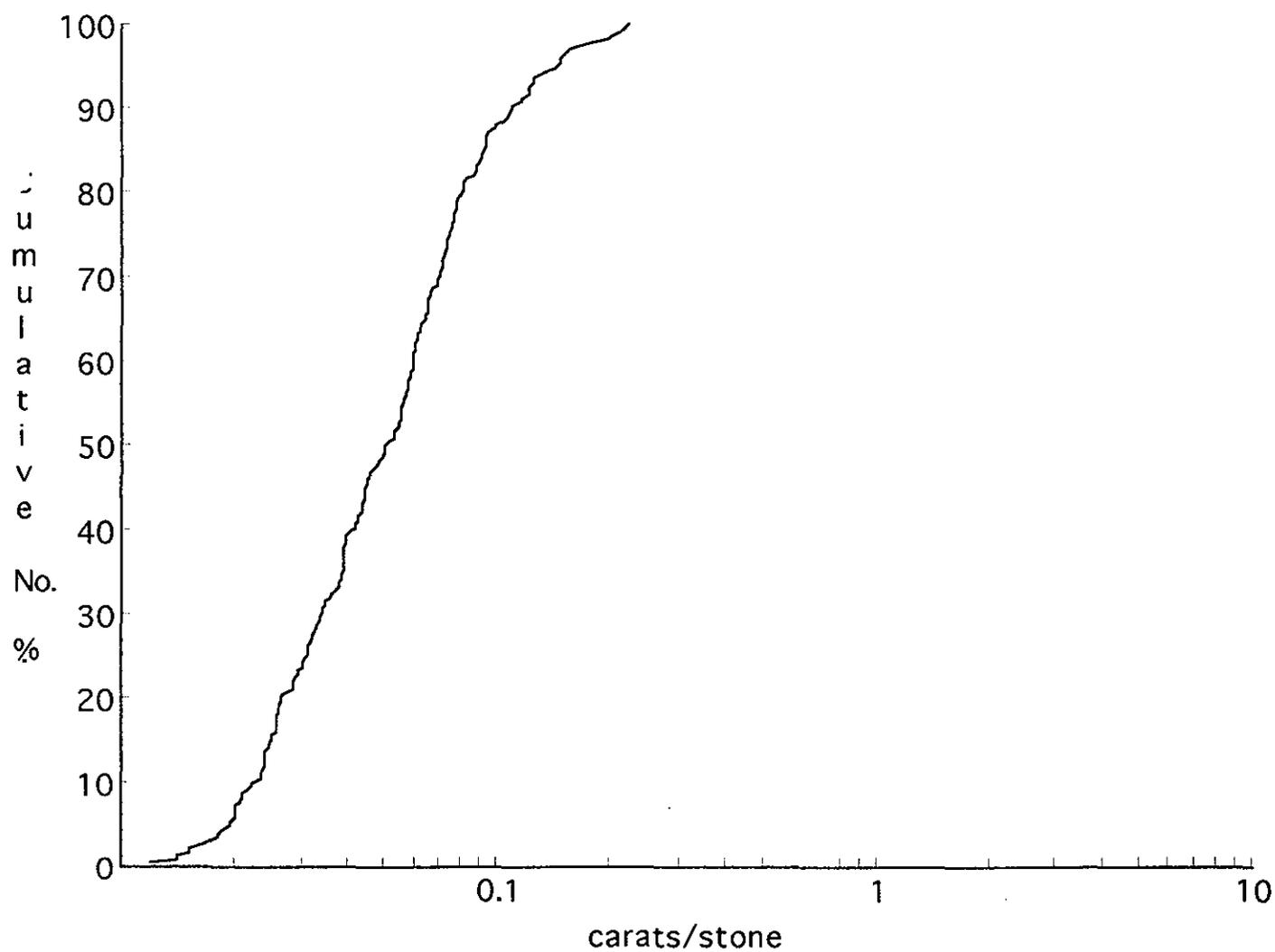
Dorset Dredge



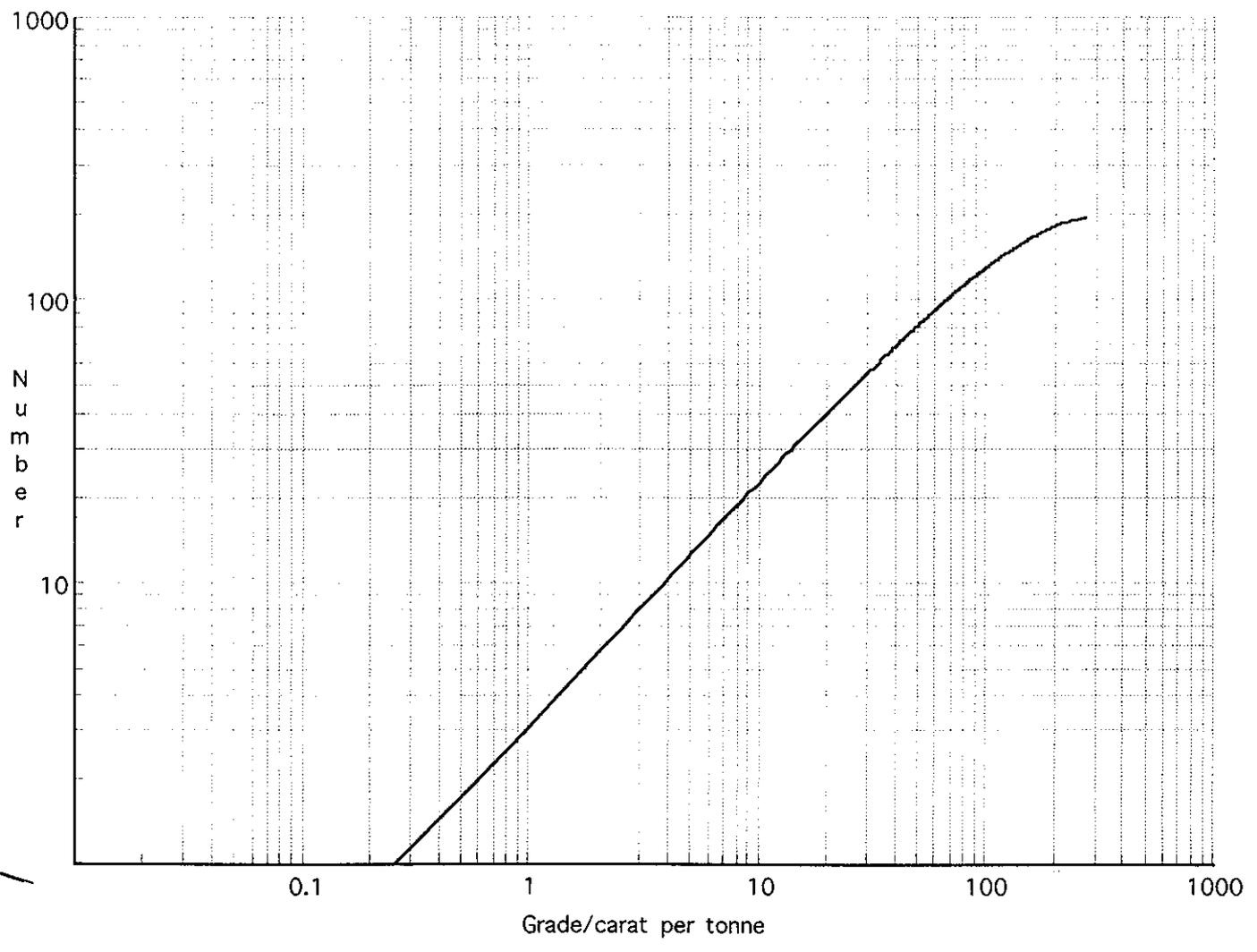
Endurance



Endurance



Pioneer



Pioneer

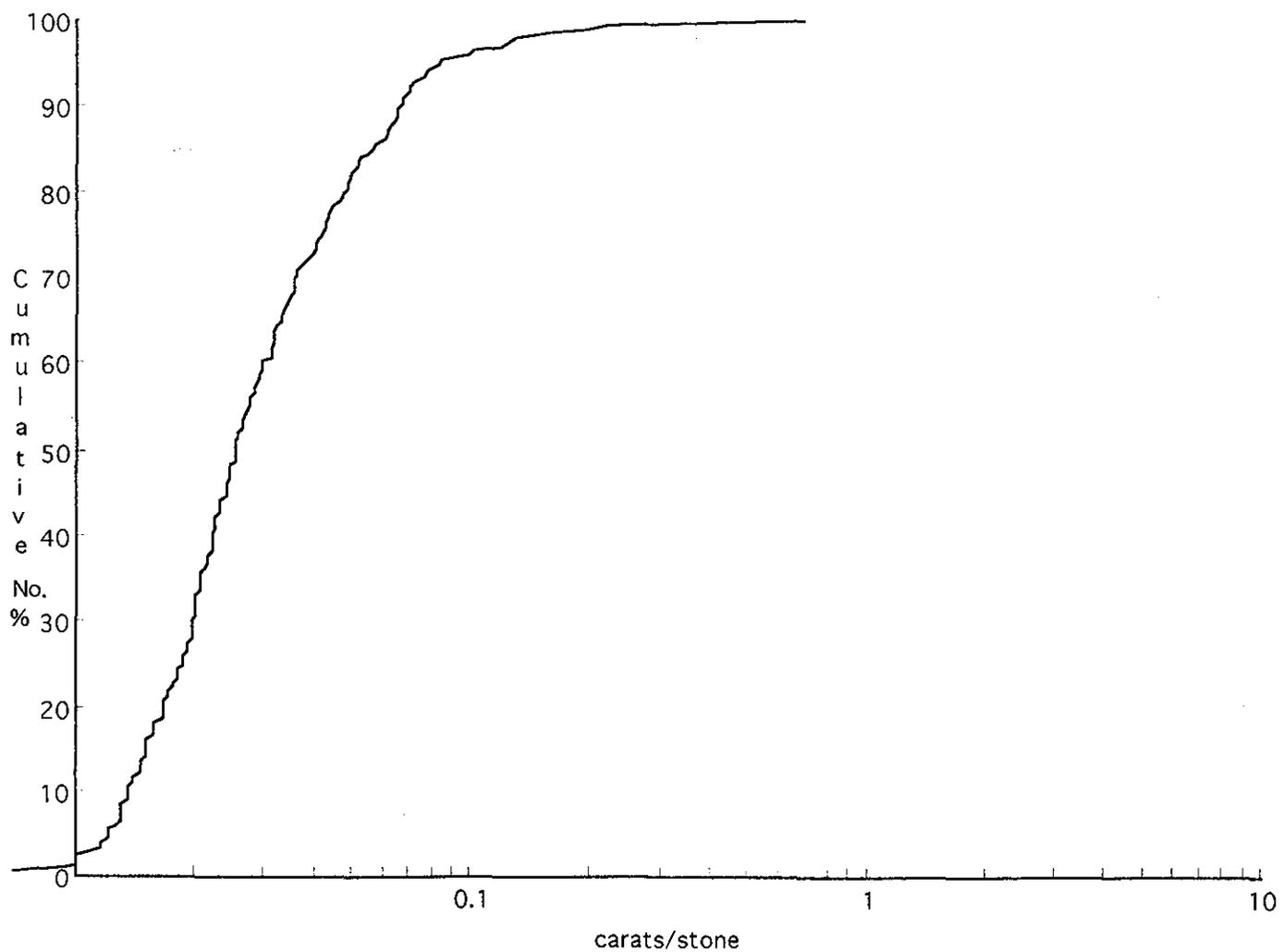


TABLE RC-1

SAMPLES FROM MINESITES AND STREAMBEDS  
IN THE RINGAROOMA CATCHMENT

SAMPLE NO.	SITE	Sn g/t	<u>SAPPHIRES</u>			GOLD
			NUMBER	MASS	HEAD VALUE g/t	
1	Canary Mine	0.12%				*
2	McGregor Mine Tailings	157	2	0.0119	0.5	*
3	Fly by Night Creek	175				*
4	Mt. Cameron Creek	0.75%				
5	Galloways Creek	525	2	0.0268	5.7	
6	Star Hill Mine Tailings	1.33%				*
7	Tributary to Hardens Ravine	0.27%				
8	Delta Mine Tailings	187	5	0.0507	3.2	*
9	Delta Mine Feed	395				
10	Dugard Mine Tailings	465				
11	Monarch Mine Tailings	0.26%	2	0.0194	2.1	
12	Dry Gut Mine Feed	494	1	0.0108	1.3	
13	Amber Creek	468				
14	Amber Hill Mine Tailings	364				*
15	Star Creek	0.86%	1	0.0148	1.4	
16	Black Creek	3.20%	12#	0.3920	167	*
17	Branxholm Creek	1.01%				
18	Hardens Ravine	0.66%	1	0.0088	1.1	*
19	Main Creek	671	1	0.0121	1.2	*
20	Arbor Mine Tailings	172	1	0.0094	1.0	

\* Gold present

# Includes sapphires recovered by John Towie after magnetic separation to remove the spinel

TABLE RC-2

SAMPLES FROM MINESITES AND STREAMBEDS  
IN THE RINGAROOMA CATCHMENT

SAMPLE NO.	SITE	Sn g/t	SAPPHIRES			GOLD
			NUMBER	MASS	HEAD VALUE g/t	
21	Monarch Mine Tailings North	71	1	0.0027	0.18	
22	Monarch Mine Tailings South	201	2	0.0209	1.81	
23	Amber Hill Mine Tailings	3				
24	Amber Creek Workings Tailings (?)	303				*
25	Wyniford River	0.11%	4	0.0953	10.5	

\* Gold present

TABLE RC-3

SAMPLES FROM MINESITES AND STREAMBEDS  
IN THE RINGAROOMA CATCHMENT

SAMPLE NO.	SITE	Sn g/t	<u>SAPPHIRES</u>			GOLD
			NUMBER	MASS	HEAD VALUE g/t	
26	Ruby Flat Mine Tailings	213				
27	Pearce Creek	0.30%				
28	Main Creek (Derby)	291	9	0.1537	9.8	
29	Weld River (Moorina)	0.95%	7	0.3713	32.0	
30	Spinel Creek	0.20%	39#	1.5368	89.7	
31	7km from St. Helens	0.14%	21	0.0575	3.9	

\* Gold present

# Includes sapphires recovered by John Towie after magnetic separation to remove the spinel

TABLE RC-4

SAMPLES FROM MINESITES AND STREAMBEDS  
IN THE RINGAROOMA CATCHMENT

SAMPLE NO.	SITE	Sn g/t	SAPPHIRES			GOLD g/t
			NUMBER	MASS	HEAD VALUE	
32	Ruby Creek, South Mt. Cameron	0.19%	13	0.0998		
33	Campbells Creek, South Mt. Cameron	0.14%				
34	Ah Kow Creek, Gladstone	0.28%				
35	Shane Summers' Mine, cleaner jig tails	1.77%	326#	6.7383	398	
36	Banca Creek	0.32%				
37	Banca Mine Tailings	0.19%				
38	Black Creek, at highway crossing	0.13%				
39	Cascade River, below Mt. Paris dam	25	1?	0.0127	0.7	
40	Minnie Jessup Creek	76				
41	Main Creek - top end	146	1?	0.0320	2.3	

# Includes sapphires recovered by John Towie after magnetic separation to remove the spinel.

? Grains to be confirmed to be sapphires by John Towie. Grain found in 39 may be a brown sapphire. Grain found in 41 may be a black star sapphire.

TABLE RC-5SAMPLES FROM MINESITES AND STREAMBEDS  
IN THE RINGAROOMA CATCHMENT

SAMPLE NO.	SITE	Sn g/t	SAPPHIRES			GOLD
			NUMBER	MASS g	HEAD VALUE g/t	
42	Wyniford River	0.11%	33	0.8024	50.5	*
43	Wyniford River	589	9	0.1322	7.3	
44	Wyniford River	0.22%	22	0.2837	16.1	
45	Wyniford River	99				
46	Wyniford River	668	1	0.0334	1.7	
47	Wyniford River	20				
48	Wyniford River	291				

\* 5 specks of gold seen

TABLE RC-6

SAMPLES FROM MINESITES AND STREAMBEDS  
IN THE RINGAROOMA CATCHMENT

SAMPLE NO.	SITE	Sn g/t	<u>SAPPHIRES</u>		GOLD g/t
			NUMBER	MASS g	
49	Gressons wash	822			
50	Gressons tails (top)	136			
51	Gressons tails (bottom)	0.12%			
52	Black Creek	0.16%	8	0.2904	21.0
53	Black Creek	0.19%	9	0.2576	12.6

TABLE RC-7

SAMPLES FROM MINESITES AND STREAMBEDS  
IN THE RINGAROOMA CATCHMENT

SAMPLE NO.	SITE	Sn g/t	SAPPHIRES			GOLD
			NUMBER	MASS g	HEAD VALUE g/t	
54	Spinel Creek	0.20%	19	0.4225	27.4	
55	Spinel Creek	984	20	0.6829	44.1	
56	Spinel Creek	541	72	2.0872	114.2	
57	Spinel Creek	902	45	1.3539	66.6	
58	Spinel Creek	259	2	0.0266	1.8	
59	Western tributary to Spinel Creek	0.19%	29	0.5524	28.7	
60	Main Creek	0.17%	35	1.4152	71.3	
61	Main Creek	0.33%	14	0.6750	41.3	

All results include sapphires recovered by John Towie after magnetic separation to remove the spinel.

TABLE RC-8SAMPLES FROM MINESITES AND STREAMBEDS  
IN THE RINGAROOMA CATCHMENT

SAMPLE NO.	SITE	Sn g/t	<u>SAPPHIRES</u>			GOLD
			NUMBER	MASS g	HEAD VALUE g/t	
62	Cascade River	946	13	0.2261	13.6	
63	Moorina wash	0.15%	7	0.1588	8.1	*
81	Creek past McGregors	981	3	0.0254	2.3	
82	McGregors wash (1)	57				
83	McGregors wash (2)	55				*

\* Gold present

TABLE RC-9

SAMPLES FROM MINESITES AND STREAMBEDS  
IN THE RINGAROOMA CATCHMENT

SAMPLE NO.	SITE	Sn g/t	<u>SAPPHIRES</u>			GOLD
			NUMBER	MASS g	HEAD VALUE g/t	
64	Rio Grande Creek	98	-			
65	Frome River	579	-			
66	Gully in old mine workings near Frome River	0.11%	-			
67	Wickborg Creek	241	-			
68	Weld River, Weldborough	632	22	0.5008	21	
69	North Georges River	8	-			
70	South Georges River	<4				

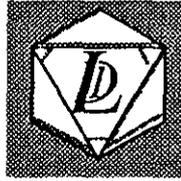
TABLE RC-10

SAMPLES FROM MINESITES AND STREAMBEDS IN THE  
RINGAROOMA CATCHMENT

Sample No.	Site	Sn g/t	Sapphires number	mass g	head value g/t	Gold
71	Amber Creek above bridge	177				
72	Ah Kow Creek	25				
73	Gressons mine tailings	556				
74	Motts Creek	19				
75	Sapphire Creek	0.30%				
76	Endurance mine jig ragging dump	1.24%	3	0.0536	2.8	
77	Crystal Creek	459				
78	Creek to Grays Hill	534				
79	Main Creek headwaters	0.84%	10	0.2969	19.5	
80	Musselroe River	104				
84	Old Cascade River bed, Derby	#	1?	0.0065	0.5	*
85	Musselroe River below Vern Woods' mine	0.14%	1	0.0977	10.3	
86	Weld River 1.5km below Weldborough	0.11%	4	0.1581	9.2	
87	Weld River below Spinel Creek	332	9	0.5461	23.6	
88	Weld River above Spinel Creek	281	3	0.1611	7.0	
89	Spinel Creek above Weld River	0.11%	38	1.2053	73.2	

# Sample lost at the University  
? Not certain that the grain is a sapphire  
\* Gold present

Appendix (S) 858068



# Laboratory Report

for

**TOMINEX PTY LTD**

**Samples**

**BLACK CREEK - SHANE SUMMERS - SPINEL CREEK**

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**INDEPENDENT DIAMOND LABORATORIES PTY LTD**

ACN 005 948 185

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MALAGA WA 6090  
AUSTRALIA

Telephone 61 8 9249 9188  
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email: [idl@iinet.net.au](mailto:idl@iinet.net.au)  
Homepage: [www.omen.com.au/~idl](http://www.omen.com.au/~idl)

Job No. 329

31 January 2000

**HEAVY MINERAL DATA**

Sample No:

**16 BLACK CREEK**

Job No: **329**

Date Started:	22/12/99		
Processing Weights			
Initial:	0.773 kg		
+2mm:	kg		
After Tabling:	kg	Mags:	0.345 kg
After TBE:	g	NM:	288 g

Positive (Economic Minerals)

Negative

Positive (Other)

Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3	Fractions Analysed (y)	Observed only (o)	Scanned only (s)					
Crush								Ø/mm	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1
Table								NM	x	x	x				
HL	x	x	x	x	x	x	x	M4							
Mag	x	x	x	x	x	x	x	M3							

**Economic Minerals Vol% of Concentrate**

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1	Wear/km
Sapphires									See Below

**Detailed Descriptions**

Mineral	Size/ct.	Grade	Description
Star Sapphires	0.3775		Grey.
	0.3255		Greyish blue.
	0.248		Greyish brown.
Blue Sapphire	0.0775		Blue with grey bands, Slightly milky.

**Other Minerals (Volume% after Heavy Liquid-HL) (NON MAG ONLY)**

Almandine		Orthopyroxene		Spinel		Apatite	
Andradite		Clinopyroxene		Magnetite		Monazite	
Grossular		Amphibole		Leucosene		Phosphate	
Spessartine		Biotite					
		Prehnite		Limonite		Rock Fragments	
Andalusite	F	Corundum	A	Pyrite(pseudo)			
Kyanite		Hematite		Pyrite	T	Zircon	
Sillimanite		Ilmenite		Barite		Titanite	
Staurolite		Rutile	T	Anhydrite			
Epidote		Anatase				Pleonaste	P
Tourmaline		Brookite		Magnesite		Cassiterite	T

P >50%    A 20-50%    C 10-20%    S 1-10%    O 20grains-1%    F 5-20grains    T 1-5grains

Mineralogist/Observer: JT/MES

Date Completed: 23/12/99

	<p><b>Independent Diamond Laboratories Pty Ltd</b></p>
	<p>ACN 005 948 185 <span style="float: right;">35095</span></p>

658070

**HEAVY MINERAL DATA**

Sample No:

**30 SPINEL CREEK**Job No: **329**

Date Started: 22/12/99

Positive (Economic Minerals) **Processing Weights**

Initial: 0.952 kg

Negative 

+2mm: kg

After Tabling: kg Mags: 0.688 kg

Positive (Other) 

After TBE: g NM: 95 g

Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3	Fractions Analysed(x)	Observed only(o)	Scanned only(s)					
Crush								Ø/mm	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1
Table								NM	x	x	x				
HL	x	x	x	x	x	x	x	M4							
Mag	x	x	x	x	x	x	x	M3							

**Economic Minerals Vol% of Concentrate**

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1		Wear/km
Sapphires										See Below

**Detailed Descriptions**

Mineral	Size/ct.	Grade	Description
Blue Sapphires	0.140 0.1045	0.0565 0.0865	Somewhat Pale.
Blue Star Sapphires	0.0985 0.2570 0.1265		Half are dark blue.
Black Star Sapphires	0.1670 0.0810		Golden brown asterism.

**Other Minerals (Volume% after Heavy Liquid-HL) (NON MAG ONLY)**

Almandine		Orthopyroxene		Spinel	P	Apatite	
Andradite		Clinopyroxene		Magnetite		Monazite	
Grossular		Amphibole		Leucoxene		Phosphate	
Spessartine		Biotite					
		Prehnite		Limonite		Rock Fragments	F
Andalusite		Corundum	C	Pyrite(psuedo)			
Kyanite		Hematite		Pyrite		Zircon	C
Sillimanite		Ilmenite		Barite		Titanite	
Staurolite		Rutile		Anhydrite			
Epidote		Anatase				Pleonaste	C
Tourmaline		Brookite		Magnesite			

P &gt;50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: JT/MES

Date Completed: 23/12/99



Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

35095

658071

**HEAVY MINERAL DATA**

Sample No:

**35 Shane Summers Mine**

Job No: 329

-5+1.5mm Middlings

Date Started: 29/12/99

Positive (Economic Minerals) 

## Processing Weights

Negative 

Initial: 1.158 kg

+2mm: kg

After Tabling: kg

Positive (Other) 

Non Mag After TBE 132 g \*Rare Earth Magnet

Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3	Fractions Analysed(s)	Observed only(o)	Scanned only(s)					
Crush								Ø/mm	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1
Table								NM	o						
HL	x	x	x	x	x	x	x	M4							
Mag	x	x	x	x	x	x	x	M3							

**Economic Minerals Vol% of Concentrate**

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1	Wear/km
Blue Sapphire	1	12							3- 10
Blue Star Sapphire		12							3- 10
Black Star Sapphire	5	33							3- 10
Green Sapphire		1							<5
Total:	6	58							

**Detailed Descriptions**

Mineral	Size/ct	Grade	Description
Blue	0.942		+2mm=0.277ct ( may be a blue star )
Blue Star	0.791		
Black Star	2.432		1+2mm=0.183ct ( largest )
Green	0.072		
Total:	4.236		

**Other Minerals (Volume% after Heavy Liquid-HL) Non Mag only**

Almandine	Orthopyroxene	Spinel	Apatite
Andradite	Clinopyroxene	Magnetite	Monazite
Grossular	Amphibole	Leucosene	Phosphate
Spessartine	Biotite	Pleonaste	20%
	Prehnite	Limonite	Rock Fragments
Andalusite	Corundum	50% Pyrite(psuedo)	
Kyanite	Hematite	Pyrite	Zircon 25%
Sillimanite	Ilmenite	Barite	Titanite
Staurolite	Rutile	Anhydrite	
Epidote	Anatase		
Tourmaline	Brookite	Magnesite	

P &gt;50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: JT/JV

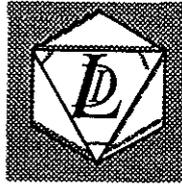
Date Completed: 30/12/99



Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

35095



# Laboratory Report

for

## MINERAL HOLDINGS AUST. PTY LTD

### Samples

54-57 Spinel Creek  
59 West Trib. to Spinel Creek  
60-61 Main Creek

~~\*Spinel Analysis Data(\*Job No. 335)~~  
~~\*Chromite Plot~~

---

INDEPENDENT DIAMOND LABORATORIES PTY LTD  
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email: [idl@iinet.net.au](mailto:idl@iinet.net.au)  
Homepage: [diamondlab.com.au](http://diamondlab.com.au)

Job No. 341

28 April 2000

## HEAVY MINERAL DATA

Sample No: **54 Spinel Creek**Job No: **341**

Date Started: 6/4/00

## Processing Weights

Initial: 0.384 kg

+2mm: kg

After RE Sep: 0.096 kg

After TBE: 40 g

Positive (Economic Minerals) Negative Positive (Other) 

Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3	Fractions Analysed(x)	Observed only(o)	Scanned only(s)					
Crush								Ø/mm	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1
RE	x	x	x	x	x	x	x	NM	o	o	o	o	o		
HL	x	x	x	x	x	x	x	M4							
Mag								M3							

## Economic Minerals Vol% of Concentrate

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1		Wear/km
Sapphire		6								
Black Star Sapphire	2									

## Detailed Descriptions

Mineral	Size/mm	Size/ct	Description
Sapphire	6 +1		Blue to blue grey, Asterism in all.
Black Star Sapphire	2 +2	0.177 0.090	Black strong bronze asterism.
	Total =	0.55	

## Other Minerals (Volume% after Heavy Liquid-HL) NM Only

Almandine		Orthopyroxene		Spinel	C	Apatite	
Andradite		Clinopyroxene		Magnetite		Monazite	
Grossular		Amphibole	T	Leucoxene		Phosphate	
Spessartine	T	Biotite					
		Prehnite		Limonite	O	Rock Fragments	
Andalusite		Corundum	F	Pyrite(psuedo)			
Kyanite		Hematite		Pyrite		Zircon	F
Sillimanite		Ilmenite		Barite		Titanite	
Staurolite		Rutile		Anhydrite		Cassiterite	F
Epidote	T	Anatase				Pleonaste	P
Tourmaline		Brookite		Magnesite			

P &gt;50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: JT/MES/BS

Date Completed: 19/4/00



Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

35174

## HEAVY MINERAL DATA

Sample No: 55 Spinel Creek

Job No: 341

Date Started: 6/4/00  
 Processing Weights  
 Initial: 0.429 kg  
 +2mm: kg  
 After RE Sep: 0.049 kg  
 After TBE: 37 g

Positive (Economic Minerals) Negative Positive (Other) 

Ø/mm	Fractions Analysed (y) Observed only (o) Scanned only (s)						
	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3
Crush							
RE	x	x	x	x	x	x	x
HL	x	x	x	x	x	x	x
Mag							

## Economic Minerals Vol% of Concentrate

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1		Wear/km
Sapphire	1		1							<5

## Detailed Descriptions

Mineral	Size/mm	Size/ct	Description
Sapphire	1 +2mm	0.3405	Blue. Subhedral. Very pale blue.
	1 +0.8mm		
	Total =	0.3785	

## Other Minerals (Volume% after Heavy Liquid-HL) NM Only

Almandine		Orthopyroxene		Spinel		Apatite	
Andradite		Clinopyroxene		Magnetite		Monazite	
Grossular		Amphibole		Leucosene		Phosphate	
Spessartine		Biotite					
		Prehnite		Limonite		Rock Fragments	F
Andalusite	T	Corundum	C	Pyrite(psuedo)			
Kyanite		Hematite		Pyrite		Zircon	F
Sillimanite		Ilmenite		Barite		Titanite	
Staurolite		Rutile		Anhydrite			
Epidote		Anatase				Pleonaste	P
Tourmaline		Brookite		Magnesite		Picotite	F

P >50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: JT/MES/LK

Date Completed: 19/4/00



Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

35174

**HEAVY MINERAL DATA**

Sample No: **56 Spinel Creek**

Job No: **341**

Date Started: 6/4/00  
 Processing Weights  
 Initial: 0.819 kg  
 +2mm: kg  
 After RE Sep: 0.124 kg  
 After TBE: 49 g

Positive (Economic Minerals)   
 Negative   
 Positive (Other)

Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3	Fractions Analysed(x)	Observed only(o)	Scanned only(s)
Crush										
RE	x	x	x	x	x	x	x	NM	o	o
HL	x	x	x	x	x	x	x	M4		
Mag								M3		

**Economic Minerals Vol% of Concentrate**

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1		Wear/km
Sapphire		6	1	1						
Black Star Sapphire	1	1								

**Detailed Descriptions**

Mineral	Size/mm	Size/ct	Description
Sapphire		0.255	Blue.
Black Star Sapphire	1 +2	0.288	Larger is black with grey asterism, Smaller is grey with grey asterism.
	Total =	0.562	

**Other Minerals (Volume% after Heavy Liquid-HL) NM Only**

Almandine		Orthopyroxene		Spinel		Apatite	
Andradite		Clinopyroxene		Magnetite		Monazite	
Grossular		Amphibole		Leucosene		Phosphate	
Spessartine	T	Biotite					
		Prehnite		Limonite		Rock Fragments	F
Andalusite		Corundum	O	Pyrite(psuedo)			
Kyanite		Hematite		Pyrite		Zircon	F
Sillimanite		Ilmenite		Barite		Titanite	
Staurolite	T	Rutile		Anhydrite			
Epidote		Anatase				Pleonaste	P
Tourmaline	T	Brookite		Magnesite			

P >50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: JT/MES/LG

Date Completed: 19/4/00



Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

35174

**HEAVY MINERAL DATA**

Sample No:

**57 Spinel Creek**Job No: **341**

Date Started: 6/4/00

## Processing Weights

Initial: 0.574 kg

+2mm: kg

After RE Sep: 0.077 kg

After TBE: g

Positive (Economic Minerals) Negative Positive (Other) 

Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3	Fractions Analysed(x)	Observed only(o)	Scanned only(s)					
Crush								Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2
RE	x	x	x	x	x	x	x	NM	x	0	0	0	0	0	0
HL								M4							
Mag								M3							

**Economic Minerals Vol% of Concentrate**

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1		Wear/km
Sapphire	2	3	1							
Black Star Sapphire	1	2								

**Detailed Descriptions**

Mineral	Size/mm	Size/ct	Description
Sapphire	2 +2	0.163	Variable colour, blue to clear. One with asterism.
	3+1	0.2015	
	1+0.8		
Black Star Sapphire	1 +2	0.823	Black with weak grey asterism.
	2 +1		Grey with grey and bronze asterism.
	Total =		1.3835

**Other Minerals (Volume% after Heavy Liquid-HL) NM Only**

Almandine		Orthopyroxene		Spinel		Apatite	
Andradite		Clinopyroxene		Magnetite		Monazite	
Grossular		Amphibole		Leucosene		Phosphate	
Spessartine		Biotite					
Cassiterite		Prehnite		Limonite		Rock Fragments	
Andalusite	T	Corundum	O	Pyrite(psuedo)			
Kyanite		Hematite		Pyrite		Zircon	O
Sillimanite		Ilmenite		Barite		Titanite	
Staurolite		Rutile		Anhydrite		Cassiterite	O
Epidote		Anatase				Pleonaste	P
Tourmaline		Brookite		Magnesite			

P &gt;50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: JT/MES/LK

Date Completed: 19/4/00



Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

35174

658077

**HEAVY MINERAL DATA**Sample No: **59 West Trib. to Spinel Ck**Job No: **341**

Date Started: 6/4/00

**Processing Weights**

Initial: 0.753 kg

+2mm: kg

After RE Sep: 0.157 kg

After TBE: 78 g

Positive (Economic Minerals) Negative Positive (Other) 

Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3	Fractions Analysed(y)	Observed only(o)	Scanned only(s)					
Cmsh								Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2
RE	x	x	x	x	x	x	x	NM	0	0	0	0	0	0	
HL	x	x	x	x	x	x	x	M4							
Mag								M3							

**Economic Minerals Vol% of Concentrate**

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1		Wear/km
Sapphire	1	5								

**Detailed Descriptions**

Mineral	Size/mm	Size/ct	Description
Sapphire	1 +2 5+1	0.373	Blue, One with asterism.
	Total =	0.547	
Zircon	2 +1		Bright red.

**Other Minerals (Volume% after Heavy Liquid-HL) NM Only**

Almandine		Orthopyroxene		Spinel		Apatite	
Andradite		Clinopyroxene		Magnetite		Monazite	
Grossular		Amphibole		Leucosene		Phosphate	
Spessartine		Biotite					
Cassiterite		Prehnite		Limonite		Rock Fragments	O
Andalusite		Corundum	O	Pyrite(psuedo)			
Kyanite		Hematite		Pyrite		Zircon	F
Sillimanite		Ilmenite		Barite		Titanite	
Staurolite		Rutile		Anhydrite		Cassiterite	T
Epidote		Anatase				Pleonaste	P
Tourmaline		Brookite		Magnesite			

P &gt;50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: JT/MES/LG

Date Completed: 19/4/00



Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

35181

**HEAVY MINERAL DATA**

Sample No: **60 Main Creek**

Job No: **341**

Date Started: 6/4/00  
 Processing Weights  
 Initial: 0.467 kg  
 +2mm: kg  
 After RE Sep: 0.157 kg  
 After TBE: g

Positive (Economic Minerals)

Negative

Positive (Other)

Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3	Fractions Analysed(x)	Observed only(o)	Scanned only(s)					
Crush								Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2
RE	x	x	x	x	x	x	x	NM	0	0	0	0	0	0	0
HL								M4							
Mag								M3							

**Economic Minerals Vol% of Concentrate**

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1		Wear/km
Sapphire	2	2	1							
Black Star Sapphire	1									

**Detailed Descriptions**

Mineral	Size/mm	Size/ct	Description
Sapphire	2 +2 2 +1 1 +0.8		Blue, two have asterism.
Black Star Sapphire	1 +2	0.168	Grey with bronze asterism.
	Total =	0.587	

**Other Minerals (Volume% after Heavy Liquid-HL) NM Only**

Almandine	Orthopyroxene	Spinel	Apatite
Andradite	Clinopyroxene	Magnetite	Monazite
Grossular	Amphibole	Leucosene	T Phosphate
Spessartine	Biotite		
Cassiterite	Prehnite	Limonite	Rock Fragments T
Andalusite	Corundum	O Pyrite(psuedo)	
Kyanite	Hematite	Pyrite	Zircon T
Sillimanite	Ilmenite	Barite	Titanite
Staurolite	Rutile	Anhydrite	
Epidote	Anatase		Pleonaste P
Tourmaline	Brookite	Magnesite	

P >50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: JT/MES/LG

Date Completed: 19/4/00



Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

35174

**HEAVY MINERAL DATA**

Sample No: **61 Main Creek**

Job No: **341**

Date Started: 6/4/00  
 Processing Weights  
 Initial: 0.380 kg  
 +2mm: kg  
 After RE Sep: 0.195 kg  
 After TBE: g

Positive (Economic Minerals)

Negative

Positive (Other)

Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3	Fractions Analysed(x)	Observed only(o)	Scanned only(s)					
Crush								Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2
RE	x	x	x	x	x	x	x	NM	x	0	0	0	0	0	
HL								M4							
Mag								M3							

**Economic Minerals Vol% of Concentrate**

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1		Wear/km
Sapphire		1								
Blue Star Sapphire	1									
Black										

**Detailed Descriptions**

Mineral	Size/mm	Size/ct	Description
Sapphire	1 +1mm		Blue.
Black Star Sapphire		0.581	Black, Bronze asterism.
	Total =	0.689	

**Other Minerals (Volume% after Heavy Liquid-HL) NM Only**

Almandine	Orthopyroxene	Spinel	Apatite
Andradite	Clinopyroxene	Magnetite	Monazite
Grossular	Amphibole	Leucosene	Phosphate
Spessartine	Biotite		
Cassiterite	Prehnite	Limonite	Rock Fragments
Andalusite	Corundum	O Pyrite(psuedo)	
Kyanite	Hematite	Pyrite	Zircon O
Sillimanite	Ilmenite	Barite	Titanite
Staurolite	Rutile	Anhydrite	Cassiterite F
Epidote	Anatase		Pleonaste P
Tourmaline	Brookite	Magnesite	

P >50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: JT/MES/LK

Date Completed: 19/4/00



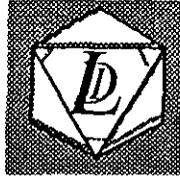
Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

35174

658030

Appendix (6)



# Laboratory Report

for

**TOMINEX PTY LTD**

**Samples**

- (1) MAIN CREEK/SPINEL CK
  - (2) MAIN CREEK, DERBY/BRACKSHOLM, SPINEL CK
- 

**INDEPENDENT DIAMOND LABORATORIES PTY LTD**  
ACN 005 948 185

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AUSTRALIA

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Homepage: [www.omen.com.au/~idl](http://www.omen.com.au/~idl)

Job No. 332

31 January 2000



## HEAVY MINERAL DATA

Sample No:

2

Job No: 332

Date Started: 20/1/00

## Processing Weights

Initial: 3.19 kg

+2mm: kg

After Mag: 1.690 kg

After TBE: 543 g

Positive (Economic Minerals)

Negative

Positive (Other)

Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3	Fractions Analysed(s)	Observed only(o)	Scanned only(s)					
Crush								Ø/mm	>2	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1
Table								NM	x						
Mag	x	x	x	x	x	x	x	M4							
								M3							

## Economic Minerals Vol% of Concentrate

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1		Wear/km
Sapphire	4									<10

## Detailed Descriptions

Mineral	Size/ct.	Grade	Description
Sapphire	0.8355 0.2385 0.2280 0.2005		1/2 is grey brown with asterism. 1/2 is white. Grey blue with asterism. Grey blue with asterism. Grey blue with asterism.
Polished Pleonaste	1 +5mm		Rock tumbler job.

## Other Minerals (Volume% after Heavy Liquid-HL)

Almandine		Orthopyroxene		Spinel(Pleonaste)	P	Apatite	
Andradite		Clinopyroxene		Magnetite		Monazite	
Grossular		Amphibole		Leucosene		Phosphate	
Spessartine		Biotite					
		Prehnite		Limonite		Rock Fragments	
Andalusite		Corundum	T	Pyrite(psuedo)			
Kyanite		Hematite		Pyrite		Zircon	
Sillimanite		Ilmenite		Barite		Titanite	
Staurolite		Rutile		Anhydrite			
Epidote		Anatase				Cassiterite	
Tourmaline	T	Brookite		Magnesite			

P &gt;50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: JT/BS

Date Completed: 20/1/00



Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

35084

**BASALT SAMPLING FOR NODULES AND GEMSTONES**

- Sample 935** Main Creek gravels,  
ultramafic nodule in basalt- minor spinel (interstitial)
- Sample 937** Fieldwick's quarry, Weldborough  
porphyritic basalt with olivine grains (phenocrysts)
- Sample 938** Fieldwick's quarry, Weldborough  
porphyritic basalt as above  
feldspathic? nodules (anorthoclase?), occ composite with pyroxene  
amygdaloidal zeolites
- Sample 940** Breises tin mine, Derby, under bridge  
ultramafic nodules, abundant- olivine, pyroxene aggregates  
some amydales, also 1007 lower Cascade Rd and 1008 main  
boulder heaps north of river
- Sample 941** Grey's Hill, Branxholm  
some glassy resistant grains?, one spinel (conchoidal fracture)
- Sample 943** Kapai quarry, west of Branxholm  
amygdaloidal olivine basalt,  
some larger phenos (resorbed) with cleavage (plagioclase?)
- Sample 944** West Scottsdale quarry, Briggs property  
amygdaloidal basalt with ultramafic nodules,  
large olivine grains and other dark grains
- Sample 945** Weldborough- top of tower hill  
amygdaloidal basalt with olivine phenos and nodules?  
occ large plagioclase? grain
- Sample 946** Weldborough- Grose property  
pile of basalt boulders in paddock  
individual spinel grains with conchoidal fracture  
other grains and occ ultramafic nodule



# MINERAL RESOURCES TASMANIA

## Mineralogy of some basalt xenoliths and xenocrysts, NE Tasmania

An unpublished report for Mineral Holdings Pty Ltd

R.S. Bottrill

19/05/00

Mineral Resources Tasmania

### Introduction

Five polished thin sections of basalt from northeast Tasmania were submitted for the analysis and identification of various minerals in the matrix and xenoliths.

The samples submitted were:

945a	Weldborough Pass
945b	Weldborough Pass
940	Breises Mine
944	West Scottsdale
945-937	Fieldwick's quarry

These minerals were analysed by the Cameca SX-50 electron microprobe, with EDS and WDS spectrometers, at the Central Science Laboratory, University of Tasmania.

### Results

#### *Sample 945a (Weldborough)*

This basalt contained numerous lherzolite xenoliths and various xenocrysts. Some of the xenoliths were partly altered to carbonates and zeolites (cowlesite?, analysis 9, Table 6). The xenoliths are olivine rich, with lesser pyroxenes (not analysed). There are a number of highly rounded xenocrystic grains up to ~2mm in size, with low birefringence, high relief and etched surfaces. These were found on analysis to be apatites (hydroxylapatite to fluorapatite, possibly carbonate-bearing; analyses 7&8, Table 1).

**Sample 945b (Weldborough)**

This basalt contained coarse-grained felsic xenoliths, partly altered to fine grained, micrographic intergrowths of feldspar and mafics. The coarse feldspar in the xenolith was found to be plagioclase (oligoclase, analysis 3, Table 3). The finer feldspar in the rim include andesine and sanidine (analyses 5, 6, Table 3), indicating unmixing of high temperature feldspars. The xenolith also contains a rounded/amoeboid grain of apatite (hydroxylapatite; analysis 2, Table 1) and limonite spots pseudomorphous after an iron sulphide.

**Sample 940 (Brieses)**

This basalt contained large lherzolite xenoliths. The xenoliths are olivine rich (forsterite, analysis 12, Table 4), with lesser pyroxenes (diopside and enstatite; analyses 11 & 14, Table 2) and dark brown amoeboid chromian spinel (analyses 10 & 15, Table 5).

**Sample 944 (West Scottsdale)**

This basalt contained a large lherzolite xenolith. The xenolith is olivine rich (forsterite, analysis 18, Table 4), with lesser pyroxenes (diopside and enstatite; analyses ~~11 & 14~~, Table 2) and dark brown amoeboid chromian spinel (analysis ~~17~~, Table 5). 17

16

**Sample 937 (Fieldwicks Quarry)**

This basalt contained pervasive fine-grained opaques in the matrix. These were found on analysis to be ulvospinel (analysis 19, Table ~~4~~), although some may have exsolved magnetite and ilmenite. 5

R S Bottrill  
MINERALOGIST-PETROLOGIST

Table 1: Apatite analyses

Point	#2	#7	#8
Sample	945	945	945
Label	dd945b-cnd?-ap	dd945a-ap1	dd945a-ap2
SiO2	0.13	0.11	0.13
Fe2O3	0.50	0.21	1.66
MnO	0.21	0.20	0.17
MgO	0.07	0.13	0.13
CaO	56.96	55.55	54.77
Na2O	0.27	0.24	0.26
P2O5	40.40	41.13	40.68
SO3	0.00	0.00	0.00
La2O3	0.09	0.16	0.19
Ce2O3	0.12	0.17	0.08
SrO	0.58	0.72	0.46
BaO	0.45	0.47	0.55
K2O	0.01	0.00	0.00
F	1.10	2.04	1.24
Cl	0.37	0.34	0.54
H2O(c)	1.17	0.73	1.05
O=F	0.46	0.86	0.52
O=Cl	0.08	0.08	0.12
Sum Ox%	101.89	101.25	101.25
Structural formulae			
Ca	10.271	10.028	9.905
Fe3+	0.064	0.026	0.210
Mn2+	0.031	0.029	0.024
Mg	0.018	0.032	0.032
La	0.006	0.010	0.012
Ce	0.007	0.010	0.005
Sr	0.057	0.071	0.045
Ba	0.030	0.031	0.036
K	0.003	0.000	0.000
Na	0.087	0.077	0.086
sum cations	10.574	10.314	10.355
P	5.757	5.866	5.812
Si	0.021	0.018	0.022
S	0.000	0.000	0.000
sum anions	5.778	5.884	5.834
F	0.584	1.087	0.663
Cl	0.105	0.097	0.156
OH	1.311	0.815	1.181
sum (F,Cl,OH)	2.000	1.999	2.000
Sum Cat#	18.350	18.198	18.189
Mineral	hydroxylapatite	fluorapatite	hydroxylapatite

Table 2: Pyroxene analyses

Point	#11	#14	#17
Sample	940	940	944
Label	dd940-opx	dd940-cpx2	dd944-cpx1
SiO <sub>2</sub>	55.13	52.15	53.55
TiO <sub>2</sub>	0.10	0.43	0.13
Al <sub>2</sub> O <sub>3</sub>	3.80	4.98	3.35
Cr <sub>2</sub> O <sub>3</sub>	0.34	0.68	0.48
Fe <sub>2</sub> O <sub>3</sub> (c)	0.37	1.95	1.57
FeO(c)	5.84	0.62	1.01
MnO	0.16	0.10	0.13
MgO	33.37	15.66	18.54
CaO	0.41	22.29	20.81
Na <sub>2</sub> O	0.00	1.20	0.71
K <sub>2</sub> O	0.00	0.00	0.00
Sum Ox%	99.52	100.05	100.29
Structural formulae			
Si	1.910	1.888	1.922
Al (iv)	0.090	0.112	0.078
sum T	2.000	2.000	2.000
Al (vi)	0.066	0.100	0.064
Cr	0.009	0.019	0.014
Ti	0.002	0.012	0.004
Fe <sup>3+</sup>	0.010	0.053	0.042
Fe <sup>2+</sup>	0.169	0.019	0.030
Mg B	0.744	0.797	0.846
sum B	1.000	1.000	1.000
Mg A	0.980	0.048	0.146
Mn <sup>2+</sup>	0.005	0.003	0.004
Ca	0.015	0.865	0.800
Na	0.000	0.084	0.050
K	0.000	0.000	0.000
Sum A	1.000	1.000	1.000
Sum Cat#	4.000	4.000	4.000
mol% Wo(Ca)	0.795	50.028	43.905
mol% En(Mg)	90.334	48.886	54.430
mol% Fs(Fe <sup>2+</sup> )	8.871	1.086	1.665
XMg	0.911	0.978	0.970
Mineral	enstatite	diopside	diopside

Table 3: Feldspar analyses

Point	#3	#5	#6
Sample	945	945	945
	dd945b-	dd945b-	dd945b-
Label	fsp1-crs	fsp2	fsp3
SiO2	60.02	63.43	56.72
TiO2	0.05	0.17	0.04
Al2O3	24.36	19.78	26.38
Fe2O3	0.12	0.07	0.38
MnO	0.00	0.00	0.00
MgO	0.00	0.00	0.01
CaO	5.24	0.66	7.63
SrO	0.60	0.00	0.68
BaO	0.13	0.00	0.07
Na2O	7.28	3.29	6.17
K2O	1.55	11.81	1.05
Rb2O	-	-	-
P2O5	0.04	0.00	0.07
Sum Ox%	99.38	99.21	99.20
Structural formulae			
Si	2.706	2.923	2.579
P	0.001	0.000	0.003
Ti	0.002	0.006	0.001
Al (iv)	1.294	1.074	1.413
sum T	4.003	4.003	3.996
Fe3+	0.004	0.002	0.013
Mn2+	0.000	0.000	0.000
Mg	0.000	0.000	0.001
Ca	0.253	0.032	0.372
Sr	0.016	0.000	0.018
Ba	0.002	0.000	0.001
Na	0.636	0.294	0.544
K	0.089	0.694	0.061
Rb	-	-	-
sum A	1.000	1.022	1.010
Sum Cat#	5.004	5.027	5.005
Ab	63.88	28.79	54.61
An	25.41	3.18	37.34
Or	8.92	68.03	6.13
Celsian	0.22	0.00	0.12
Rb-Feld	0.00	0.00	0.00
Sr-Feld	1.57	0.00	1.80
Mineral	oligoclase	sanidine	andesine

Table 4: Olivine analyses

Point	#12	#18
Sample	940	944
	dd940-ol	dd944-opx
Label	on spl1	
SiO2	40.56	40.36
TiO2	0.01	0.00
Al2O3	0.02	0.00
Cr2O3	0.00	0.19
FeO	9.60	10.42
MnO	0.17	0.13
MgO	48.26	47.95
CaO	0.03	0.03
NiO	0.38	0.00
Sum Ox%	99.03	99.08
Structural formulae		
Si	1.004	1.001
Ti	0.000	0.000
Al	0.001	0.000
Cr	0.000	0.004
Fe2+	0.199	0.216
Mn2+	0.004	0.003
Mg	1.780	1.773
Ca	0.001	0.001
Ni	0.008	0.000
Sum Cat#	2.996	2.997
Fa	0.100	0.109
Fo	0.900	0.891
Mineral	Forsterite	Forsterite

Table 5: Spinel analyses

Point	#10	#15	#16	#19
Sample	940	940	944	937
		dd940-	dd944-	dd937-
Label	dd940-spl	spl2	spl1	ilm1
SiO <sub>2</sub>	0.03	0.01	0	0.12
TiO <sub>2</sub>	0.09	0.11	0.05	23.15
Al <sub>2</sub> O <sub>3</sub>	56.79	56.18	55.04	4.02
Cr <sub>2</sub> O <sub>3</sub>	12.75	13.00	14.67	1.77
Fe <sub>2</sub> O <sub>3</sub> (c)	0.05	0.85	0	54.1
FeO	11.07	10.68	11.5	14.68
V <sub>2</sub> O <sub>3</sub>	0.05	0.05	0.05	0
MnO	0.00	0.09	0.04	0.74
MgO	19.43	19.73	18.88	2.89
CaO				0.13
ZnO	0.14	0.10	0.16	0.18
NiO	0.50	0.33	0.26	0.1
Sum Ox%	100.90	101.12	100.66	101.93

## Structural formulae

Si	0.001	0	0	0.005
Al (iv)	1.732	1.712	1.696	0.173
Cr	0.261	0.266	0.303	0.051
V	0.001	0.001	0.001	0.000
Fe <sup>3+</sup>	0.001	0.017	0.000	1.490
Fe <sup>2+</sup>	0.002	0.002	0.000	0.283
sum tet	1.998	1.998	2.001	2.000
Ti	0.002	0.002	0.001	0.638
Fe <sup>2+</sup>	0.240	0.231	0.252	0.168
Mn <sup>2+</sup>	0.000	0.002	0.001	0.023
Mg	0.750	0.761	0.736	0.158
Ca				0.005
Zn	0.003	0.002	0.003	0.005
Ni	0.010	0.007	0.005	0.003
sum oct	1.003	1.003	0.997	0.999
Sum Cat#	3.000	3.000	2.999	3.000

XFe <sup>2+</sup>	23.93	23.03	25.28	16.78
XMg	74.78	75.87	73.82	15.77
YFe <sup>3+</sup>	0.05	0.85	0.00	74.48
YCr	13.06	13.31	15.14	2.55

Mineral      spinel      spinel      spinel      ulvospinel

Table 6: Zeolite analysis

Point	#9
	945
	dd945a-
Label	ze
SiO <sub>2</sub>	46.83
Al <sub>2</sub> O <sub>3</sub>	25.17
Fe <sub>2</sub> O <sub>3</sub>	0.07
MgO	0.06
CaO	11.84
Na <sub>2</sub> O	0.66
K <sub>2</sub> O	1.36
Sum Ox%	92.59

## Structural formulae

Si	3.061
Al	1.939
Al+Si	5.000
Fe <sup>3+</sup>	0.004
Mg	0.006
Ca	0.829
Na	0.084
K	0.114
Sum Cat#	1.037

Mineral      ?Cowlesite

## Basalt Sample Locations

Sample No	Site	Type	AMG East	AMG North
132935	Main Creek	basalt nodule in gravels		
132937	Fieldwick's Quarry Weldborough Pass	porphyritic basalt	581000	5435800
132938	Fieldwick's Quarry Weldborough Pass	as above with feldspathic nodules	581000	5435800
132940	Breises Tin Mine Derby	ultramafic nodules in basalt	567600	5444500
132941	Grey's Hill Branxholm	basalt with spinel	564300	5440100
132943	Kapai Quarry Branxholm	amygdaloidal olivine basalt	557000	5442500
132944	Briggs' Quarry West Scottsdale	amygdaloidal basal &ultramafic nodules	540600	5440600
132945	Tower Hill Weldborough Pass	amygdaloidal basal and nodules	579100	5434700
132946	Groses' Block Weldborough Pass	basalt boulders with spinel	578700	5434200

**Logs of oversize (+ 5mm) from gravel sampling, NE Tasmania**

- Sample 1- Canary Tail  
60% quartzite metasediment, 30% quartz, 10% feruginous grit, 1% dark hornfels; pebbles to 5cm
- Sample 3- Fly By Night Creek  
70% hornfelsed sediment, 30% vein quartz, angular fragments to 5cm
- Sample 4- Mt Cameron Creek  
95% white quartz, 5% granite, trace grit, cobbles to 7cm
- Sample 5- Galloway Creek  
80% vein quartz and crystal, 15% metasediment and fg grit, 5% granite, pebbles to 4cm
- Sample 7- Tributary to Hardens Ravine from Star Hill  
60% micaceous granite, irregular fragments to 9cm  
30% white to yellow quartz (quartzite), rounded to 4cm  
10% tabular feruginous grit fragments to 12cm
- Sample 9- Delta Mine Wash  
60% rounded sandstone pebbles and cobbles to 11cm  
40% grey to white quartz (quartzite), pebbles to 6cm  
trace brown feruginous grit
- Sample 12- Dry Gut Wash  
50% metasediment pebbles, rounded to 7cm  
50% white quartz pebbles to 4cm, one block angular to 11cm  
trace black pebbles to 1cm, hornfels?
- Sample 13- Amber Creek, Lanca Road  
70% granite derived feruginous gravel (cemented), irregular to blocky to 11cm,  
20% granite, irregular to blocky to 8cm,  
10% white quartz clasts, rounded to 4cm
- Sample 14- Amber Hill Tailings  
70% grey metasediments, some quartz veined, rounded to 15cm  
25% white quartz pebbles, rounded to 6cm  
5% feruginous quartz grit
- Sample 15- Star Creek, Gladstone Road  
70% white quartz and yellowish to pinkish siliceous vein material, angular, blocky or tabular,  
30% irregular granite fragments, weathering  
trace brown to yellow hornfelsed metasediment, rounded quartz pebbles and grit

largest fragment to 10cm, blocky

- Sample 16- Black Creek  
95% dark metasediment, 5% vein quartz, trace blackjack, pebbles to 3.5cm
- Sample 17- Branxholm Creek  
85% metasediment, 10% ?basalt, 5% vein quartz, trace black jack, pebbles to 4cm
- Sample 19- Main Creek  
40% metasediment, 40% fg granite, 15% basalt, 5% vein quartz, cobbles to 10cm (basalt sample 132935 + one nodule with olivine?)
- Sample 20- Arba Mine Tailings  
80% white quartzite and quartz, pebbles rounded to 4cm  
20% grey to black metasediments, pebbles rounded to 3cm  
trace feruginous grit, dolerite
- Sample 23- Amber Mine Tailings  
no oversize +5mm, all just quartz and other granules  
must have been already sized
- Sample 24- Amber Creek Works/Tailings  
80% microgranite mainly, also cg granite, angular to rounded blocks to 13cm,  
20% white, yellow to glassy quartzite, angular to rounded clasts to 8cm,
- Sample 25- Wyniford River  
50% vein quartz, 50% granite, cobbles to 8cm
- Sample 26- Ruby Flat Mine Tailings  
80% metasediment, 10% granite, 5% quartz, 5% ?basalt  
angular blocks to 10cm
- Sample 27- Pearse Creek  
90% metasediment, 10% quartz, trace granite containing cassiterite,  
trace grit, cobbles to 7cm
- Sample 28- Main Creek  
40% metasediment, 40% vein quartz, 20% granite, cobbles to 8cm
- Sample 29- Weld River  
40% vein quartz, 30% microgranite, 15% cg granite, 5% basalt  
cobbles to 9cm
- Sample 30- Spinel Creek  
50% basalt, 30% granite, 15% quartz, 15% metasediment

- pebbles to 7cm
- Sample 31- St Helens (7km)  
100% yellow to white quartz with black partings (?tourmaline)  
trace grit, pebbles to 8cm
- Sample 32- Ruby Creek  
40% granite, 30% quartz, 30% quartzite, trace quartz crystal,  
angular fragments to 10cm
- Sample 33- Cambells Creek  
80% granite, irregular blocks and fragments to 11cm  
10% subrounded quartz pebbles to 4cm  
10% blocky to rounded, hornfelsed dark sediment to 5cm
- Sample 34- Ah Kow Creek  
40% quartzite, 20% granite, 20% dolerite, 20% feruginous grit,  
1% conglomerate, rounded to angular, blocky and irregular clasts to  
11cm
- Sample 35- Summers Mine  
80% yellow to white quartz (quartzite), pebbles to 7cm  
20% cemented conglomerate, gravel to grit to 10cm  
trace black hornfels
- Sample 36- Banca ~~Mine~~ *Creek*  
50% white to yellow quartz (quartzite), blocky, to 11cm  
30% angular granite, 20% irregular, cemented gravel and grit
- Sample 37- Banca Mine  
45% blocky white quartz to 6cm, 45% rounded white to pink quartz to  
6cm, 10% granite and derived grit
- Sample 38- Black Creek  
60% metasediment, 40% orange vein quartz, iron stained, trace granite,  
one basalt, vesicular fragment, blocks to 10cm
- Sample 39- Cascade River  
99% yellow, white to glassy quartz (trace black partings)  
1% granite grit, pebbles to 6cm, mainly rounded to blocky
- Sample 40- Minnie Jessup Creek  
95% dense blocky to tabular, metasediment to 10cm  
5% granite, blocky to 10cm, trace quartz, dolerite
- Sample 41- Main Creek  
80% granite, 20% quartzite, trace basalt (?dolerite also),  
angular blocks to 12cm

- Sample 42- Wyniford River  
50% granite (occasional grit), 30% yellow quartz (quartzite),  
20% white quartz, trace dark hornfels, plus one green dolerite pebble  
(132936), pebbles and angular fragments to 11cm
- Sample 43- Wyniford River  
50% granite, cg to microgranite, 35% yellow quartz, 15% white quartz,  
pebbles and cobbles to 10cm

- Sample 44- Wyniford River  
50% fg-cg granite, 50% light brown to white quartz with trace rutile needles as inclusions,  
gravel, pebbles and cobbles to 12cm
- Sample 45- Wyniford River  
95% fg-cg granite, white to light brown quartz, four fragments dolerite,  
up to rounded cobbles to 14cm
- Sample 46- Wyniford River  
98% fg -cg granite, 2% white quartz, two pebbles dolerite,  
gravel. pebbles and cobbles to 16cm
- Sample 47- Wyniford River  
98% fg-cg granite, cobbles to 13cm, 1% white quartz, 1% dolerite
- Sample 48- Wyniford River  
98% fg-cg granite, small irregular frags to cobbles to 13cm  
1% white quartz, 1% dolerite
- Sample 49- Gressons Wash  
90% quartz, granules to irregular pebbles to angular frags to 4cm,  
10% feruginous, cemented, quartz grits, irreg frags to 6cm,  
trace granite
- Sample 50- Gressons Tailings  
95% quartz, granules, irreg frags and pebbles to 5cm,  
5% feruginous, quartz grits, irreg frags to 5cm
- Sample 51- Gressons Tailings  
60% granite, gravel to 1cm, occasional frags to 5cm,  
30% ferug qtz grit to 6cm, 10% brown to white qtz frags to 8cm
- Sample 52- Black Creek  
80% metased -hornfels, light brown to black, up to cobbles to 11cm  
10% light brown to white qtz, rounded to 7cm,  
5% angular, brown to black basalt with olivine phenos, frags to 8cm  
5% dark brown, ferug qtz grit to 8cm
- Sample 53- Black Creek  
90% metased- hornfels, black, brown grey, pebbles and cobbles to  
12cm, 10% white to light brown quartz, several plag phyric basalts  
blocks to 8cm, one granite cobble
- Sample 54- Spinel Creek  
30% granite, rounded to 7cm, 30% metased, flakey to 10cm,  
30% quartz, 10% basalt, trace dolerite (basalt sample 927)

- Sample 55- Spinel Creek  
40% granite, irreg slabs to 11cm, 30% metased, flakey and rounded to 8cm, 20% quartz, 10% dolerite, trace basalt (dolerite sample 928)
- Sample 56- Spinel Creek  
40% granite, rounded to 9cm, 25% metased, rounded to 11cm, 20% quartz, 15% basalt, trace dolerite (basalt sample 929)
- Sample 57- Spinel Creek  
60% granite and quartz gravel, occ. rounded granite clast to 13cm, basalt, irregular, angular to 6cm, 10% metased to 8cm (basalt sample 930)
- Sample 58- Spinel Creek  
70% granite and quartz gravel, 30% blocks basalt to 12cm, trace metased
- Sample 59- Spinel Creek, west trib  
60% granite and quartz gravel, occ rounded clasts to 10cm 30% basalt, rounded clasts to 10cm, 10% metased, rounded clasts to 11cm, (basalt sample 951)
- Sample 60- Main Creek  
60% cg granite gravel to rounded clasts of 12cm, 30% qtz clasts to 6cm, 10% metased cobbles to 7cm, trace basalt
- Sample 61- Main Creek  
60% cg granite, some fg variants, cobbles to 12cm, 35% white to yellow qtz, chunky to 6cm 10% metased, pebbles to 5cm, trace basalt
- Sample 62- Cascade River (932)  
50% basalt, black, angular to 10cm, porphyritic, some nodules 20% qtz grit, cemented, angular flakes to 8cm 20% rounded sediment pebbles to 8cm, some with qtz veins 10% qtz, rounded granules to blocks up to 5cm
- Sample 63- Moorina Wash  
60% grey sediment pebbles and cobbles to 18cm, minor qtz veins 30% angular, grey granite frags to 3cm 10% pale yellow opaque qtz, small, rounded granules to blocks to 8cm

- Sample 64- Rio Grande Creek  
75% blocky to rounded, grey basalt?  
20% granite, cg granite and yellow microgranite, the latter rounded up to 8cm, the former smaller and irregular to less than 1cm  
  
basalt? phenos include dark to black grains; plus ocelli  
unusual type, black when chipped  
not typical angularity or colour  
funny basalt, lamprophyre or other igneous rock (630073)
- Sample 65- Frome River  
80% yellow, mg granite; irreg blocks to 13cm, mostly 0.5 to 5mm  
15% yellow qtz, blocky frags to 10cm, little rounding  
5% rounded dolerite pebbles to 6cm, trace basalt
- Sample 66- Old Mine Workings, Frome River (in gully)  
90%cg granite, irreg blocks to 15cm, some with micro granite contacts  
7% yellow to white angular qtz to 11cm  
3% rounded dolerite pebbles to 6cm  
(black spinels plus other qtz rock- 630074)
- Sample 67- Wickborg Creek  
95% yellow granites; fg mainly, some cg, granules to irreg blocks and pebbles to 15cm  
4% white qtz frags to 8cm, 2 pieces agate  
1% dolerite pebbles to 5cm
- Sample 68- Weld River, Weldborough  
50% basalt, angular blocks and pebbles to 12cm  
25% qtz, white, rounded to blocky to 5cm  
20% granite, mainly fg, pebbles and irreg frags to 8cm  
5% dolerite, pebbles to 12cm, trace qtz grit
- Sample 69- North Georges River  
70% grey sediment pebbles and cobbles to 10cm  
25% cg granite, irreg pebbles to 6cm  
5% dark basalt blocks and angular frags to 11cm
- Sample 70- South Georges River  
60% cg granite pebbles and flakes to 7cm  
40% grey sediment pebbles to 10cm  
few qtz pebbles to 3cm, trace basalt
- Sample 71- Amber Creek, above bridge (1001)  
90% cg granite, rounded blocks to 13cm, fg angular frags and tablets to 9cm  
10% white qtz blocks and pebbles to 5cm

- Sample 72- Ah Kaw Creek (1002), above where it enters Mt Cameron Creek  
irreg to rounded, white qtz to 7cm  
trace granite granules and cemented qtz grit
- Sample 73- Gressons mine tails  
80% cemented, ferug qtz grit, flakes to 8cm  
20% irreg to rounded, yellow to white qtz to 7cm
- Sample 74- Motts Creek  
60% fg granite, angular, tabular frags in 1-2cm range, occ flakes to 13cm  
40% yellow to white qtz to 1cm, occ yellow blocks and frags to 9cm
- Sample 75- Sapphire Creek (1005)  
50% qtz in granules (5% yellow irreg flakes to 6cm, with some white and some chalcedonic)  
45% cg granite granules  
5% cemented, ferug qtz grit
- Sample 76- Endurance Mine  
mainly jig bed ragging
- Sample 77- Crystal Creek (below Tin Dish Creek)  
85% granite pebbles and granules to 9cm, cg and fg  
15% white qtz, angular to subrounded to 5cm  
trace yellow grey sediment, basalt
- Sample 78- Creek to Grays Hill (942)  
95% brown to grey sediment pebbles to 8cm  
5% qtz, mainly granules, occ block to 10cm  
trace granite to 10cm, cemented qtz grit, basalt
- Sample 79- Main Creek headwaters (954)  
40% cg granite granules, some blocks to 7cm  
30% qtz granules, some blocks yellow qtz to 5cm  
30% brown grey sediment pebbles to 7cm  
trace dolerite, basalt
- Sample 80- Musselroe River  
95% cg, fg granite pebbles and blocks to 10cm  
5% white qtz, mostly rounded to 8cm  
trace grey sediment, fresh angular dolerite

- Sample 81- Creek past MacGregors (947, Aberfoyle?)  
50% granite granules, occ frags to 3cm  
25% qtz, white pebbles to 8cm  
25% yellow grey sediment to 7cm, trace cemented, ferug grit
- Sample 82- MacGregors Wash (948, Taylors cut)  
50% yellow metasediment, pebbles to 5cm  
50% yellow to white qtz, pebbles and blocks to 6cm  
trace cemented grit
- Sample 83- MacGregors wash (949, Taylors cut)  
70% qtz pebbles to 8cm  
30% metasediment pebbles to 6cm
- Sample 84- Old Cascade River Bed, Derby  
90% cg,fg granites, granules to irreg flakes to 10cm  
5% dark grey sediment pebbles to 5cm  
5% qtz, yellow pebbles to 5cm, trace basalt
- Sample 85- Musselroe River, below Vern Woods Mine  
85% irreg blocks, cg granite to 10cm down to granules  
5% white qtz pebbles to 4cm  
5% grey tablets of sheeted qtz to 8cm  
5% white to yellow, metasediment pebbles
- Sample 86- Weld River, 1.5km below Weldborough  
70% dark basalt (other types also), rounded blocks and frags to 11cm  
20% granite granules,  
5% yellow blocky qtz to 5cm  
5% dolerite pebbles to 12cm, trace metasediment pebbles
- Sample 87- Weld River, below Spinel Creek  
90% black to brown basalt, subrounded blocks to 15cm  
5% fg granite, subrounded blocks to to 8cm  
5% qtz , yellow, subrounded clasts to 7cm, trace metasediment pebbles
- Sample 88- Weld River,above Spinel Creek  
97%black to brown basalt types, blocky to angular clasts to 14cm  
3% cg granite, mainly granules, one clast at 17cm  
(630075- basalt petrog)
- Sample 89- Spinel Creek, above Weld River  
85% black basalt, blocky clasts to 13cm  
5% cg, fg granite, granule to subrounded clasts to 7cm  
5% yellow qtz, blocky subrounded clasts to 5cm  
5% yellow metasediment, pebbles to 8cm, trace dolerite

## Stream Sediment and Minesite Sample Locations

658100

Sample No	Site	Type	AMG East	AMG North
1	Canary Mine	Tailings	580900	5469950
2	McGregor Mine	Tailings	580350	5470200
3	Fly by Night Creek	Sediment	584200	5465000
4	Mt Cameron Creek	Sediment	584150	5464700
5	Galloways Creek	Sediment	581800	5465750
6	Star Hill Mine	Tailings	587700	5465150
7	Hardens Ravine Trib	Sediment	586800	5464900
8	Delta Mine	Tailings	577650	5471250
9	Delta Mine	Feed	577650	5471250
10	Dugard Mine	Tailings	574700	5470900
11	Monarch Mine	Tailings	576250	5464900
12	Dry Gut Mine	Feed	578400	5469950
13	Amber Creek	Sediment	587700	5460400
14	Amber Hill Mine	Tailings	586100	5460200
15	Star of Hope Creek	Sediment	582300	5460300
16	Black Creek	Sediment	563700	5443000
17	Branxholm Creek	Sediment	562900	5442200
18	Hardens Ravine	Tailings	586100	5465200
19	Main Creek	Sediment	570500	5443800
20	Arbra mine	Tailings	563500	5442700
21	Monarch Mine North	Tailings	576050	5465100
22	Monarch Mine South	Tailings	576450	5464850
23	Amber Hill Mine	Tailings	588600	5460000
24	Amber Creek Works	Tailings?	588200	5460800
25	Wyniford River	Sediment	580600	5450750
26	Ruby Flat Mine	Tailings	563000	5439300
27	Pearce Creek	Sediment	562000	5440000
28	Main Creek	Sediment	570850	5443400
29	Weld River	Sediment	573800	5445500
30	Spinel Creek	Sediment	576300	5438550
31	St Helens 7km	Wash	598400	5428550
32	Ruby Creek	Sediment	580500	5458350
33	Cambells Creek	Sediment	582400	5460450
34	Ah Kow Creek	Sediment	584000	5464850
35	Summers Mine	Jig Tail	581300	5457300
36	Banca Creek	Sediment	567500	5457800
37	Banca Mine	Tailings	567000	5458400
38	Black Creek	Sediment	563950	5442750
39	Cascade River	Sediment	571400	5436500
40	Minnie Jessup Creek	Sediment	572450	5436700
41	Main Creek	Sediment	573850	5438500
42	Wyniford River	Sediment	581000	5450250
43	Wyniford River	Sediment	580750	5449550
44	Wyniford River	Sediment	580750	5449000
45	Wyniford River	Sediment	580500	5448500
46	Wyniford River	Sediment	580400	5447650
47	Wyniford River	Sediment	580000	5447000
48	Wyniford River	Sediment	580000	5446500
49	Gressons Mine	Wash	574700	5459250
50	Gressons Mine	Tailings Top	574700	5459250
51	Gressons Mine	Tailings Bot	574700	5459250
52	Black Creek	Sediment	563900	5443550
53	Black Creek	Sediment	563700	5443000
54	Spinel Creek	Sediment	576200	5438450
55	Spinel Creek	Sediment	576100	5438350
56	Spinel Creek	Sediment	576050	5438250
57	Spinel Creek	Sediment	575950	5438100

## Stream Sediment and Minesite Sample Locations

658101

58	Spinel Creek	Sediment	575550	5437100
59	Spinel West Trib	Sediment	575400	5438000
60	Main Creek	Sediment	572750	5440850
61	Main Creek	Sediment	572700	5440600
62	Cascade River	Sediment	567500	5444000
63	Moorina	Wash	573800	5445500
64	Rio Grande Creek	Sediment	576650	5439300
65	Frome River	Sediment	579100	5441000
66	Frome River Workings	Tailings?	579100	5441000
67	Wickborg Creek	Sediment	579350	5441000
68	Weld River	Sediment	576150	5439800
69	North Georges River	Sediment	580000	5431000
70	South Georges River	Sediment	580400	5427450
71	Amber Creek	Sediment	587900	5459900
72	Ah Kow Creek	Sediment	584000	5464850
73	Gressons Mine	Tailings	574700	5459250
74	Motts Creek	Sediment	574750	5458700
75	Sapphire Creek	Sediment	581150	5460450
76	Endurance Mine	Jig Bed	579650	5459150
77	Crystal Creek	Sediment	584000	5436100
78	Grays Hill Creek	Sediment	562700	5441350
79	Main Creek	Sediment	573850	5438950
80	Musselroe River	Sediment	589100	5450900
81	Creek Past McGregors	Tailings?	579500	5468800
82	McGregors Mine	Wash	580600	5470200
83	McGregors Mime	Wash	580650	5470150
84	Cascade River	Sediment	567500	5444000
85	Musselroe River	Sediment	589700	5456650
86	Weld River	Sediment	576250	5441000
87	Weld River	Sediment	576350	5438700
88	Weld River	Sediment	576550	5438500
89	Spinel Creek	Sediment	576300	5438550



**ALLUVIAL TIN IN NORTH EASTERN TASMANIA**  
*(C.A. Bacon)*

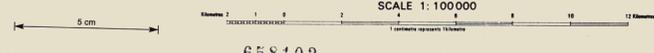
TCR 00:4483

- Largely alluvial workings
- × Largely eluvial / hardrock workings

**PLAN 5** STREAM SEDIMENT AND MINESITE SAMPLES

Sapphires found: — Catchment boundary: - - - - -

Plan modified by Mineral Holdings Australia Pty Ltd



Dept. of Mines, Tas.

658102

Drafting: R.M. Turvey