# HEEMSKIRK PROJECT

# ZEEHAN CASSITERITE DEPOSITS

# MINERAL RESOURCE REPORT

**For**

# STELLAR RESOURCES LIMITED

| | |
|---|---|
| Job No. | 1534_M |
| Doc No. | 2745 |
| Date: | May 2011 |
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## Grid Convention Used in This Report

In this report, all coordinates are based on the Australian Geodetic Datum 1966 known as AGD66.

This is the older datum which was generally in use prior to 31 March 2003.

The elevations used in this report are referred to as RLs and are heights above sea level plus 1000m.

## Zeehan Montana Mine and Montana Western Mine

The Zeehan Montana mine referred to in places in this report is the mine just north of Main St and just east of the Zeehan to Granville Harbour Road and Zeehan to Trial Harbour Road junction. This is the mine which was accessed by the Montana No 2 Shaft.

The Montana Western mine is a separate mine just to the west of the Granville Harbour Road about 5 kilometres from Zeehan and is not referred to in this report.

## Abbreviations used in this report

| | |
|---|---|
| Aberfoyle | Any of the Aberfoyle and Cominco group of companies including, for example, Aberfoyle Ltd, Aberfoyle Exploration Pty Ltd and Cominco Exploration Pty Ltd. |
| EL | Exploration Licence |
| Gippsland | Any of the Gippsland group of companies, for example, Gippsland Oil and Minerals N.L. and Gippsland Ltd |
| JORC | Joint Ore Reserve Committee (of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geosciences and Minerals Council of Australia) |
| MRT | Mineral Resources Tasmania |
| Placer | Placer Prospecting Pty Ltd |
| RL | Retention Licence |
| Stellar | Stellar Resources Ltd |
| Western Metals | Western Metals Limited |

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# EXECUTIVE SUMMARY

The Queen Hill, Zeehan Montana and Severn tin deposits are deposits of cassiterite in shear zones and as replacement deposits. Tin occurs principally as cassiterite and is associated with base metal sulphides, pyrite and pyrrhotite.

The Queen Hill mineralisation outcrops, strikes more or less north-south, dips about 60$^{o}$ to the east, has a strike length of over 300m, a width of 1 to 50m and a down dip extent of over 300m.

The Zeehan Montana mineralisation is known below a depth of 75m below surface, strikes just north of east, dips about 55$^{o}$ to the south, has a strike length of just over 100m, a width of 1 to 15m and a down dip extent of over 300m.

The Severn mineralisation is known below a depth of 120m below surface, strikes north-south, dips from 70$^{o}$ to 20$^{o}$ to the east, has a strike length of about 400m, a width of 1 to 50m and a down dip extent of over 400m.

The mineralisation in the Zeehan Cassiterite Deposits is of two styles:

- Mineralisation in faults with cassiterite associated with siderite, quartz, galena, sphalerite, and minor chalcopyrite, pyrite, stannite and fluorite. This is the style of mineralisation associated with Clarke's Lode and Stormsdown Lode.
- Replacement mineralisation with cassiterite associated with siderite, quartz, pyrite and pyrrhotite with minor sericite and fluorite or sellaite. This is the style of mineralisation associated with replacement of beds in the Montana volcanics at Queen Hill, perhaps in the replacement of the Poverty Point beds at Zeehan Montana and in the replacement of the dolomite in the Success Creek at Severn

The estimates of mineral Resources were made using diamond drill hole assays within the interpreted mineralisation. All samples were composited to 1 metre lengths and no top-cuts were applied. Bulk densities were based on estimated sulphur grade, where this was available, or were set to 3.3 tonnes per cubic metre for Queen Hill, 3.9 tonnes per cubic metre for Zeehan Montana and 3.2 tonnes per cubic metre for Severn. The grade estimates of the Mineral Resources were made using an inverse distance squared algorithm.

The Mineral Resources were based on a cut-off grade of 0.6% Sn which was based on a tin price of US$30,000 per tonne and reasonable assumptions for exchange rate, costs and modifying factors including mining recovery, mining dilution and metallurgical recovery.

All tonnages are dry metric tonnes.

| Mineral Resources | | |
|---|---|---|
| **0.6% Sn cut-off grade** | | |
| **Indicated Mineral Resources** | | |
| Queen Hill | 1,600,000 tonnes | 1.2% Sn |
| All Indicated Mineral Resources | 1,600,000 tonnes | 1.2% Sn |
| | | |
| **Inferred Mineral Resources** | | |
| Zeehan Montana | 360,000 tonnes | 1.6% Sn |
| Severn | 2,400,000 tonnes | 0.9% Sn |
| All Inferred Mineral Resources | 2,760,000 tonnes | 1.0% Sn |
| | | |
| **Indicated + Inferred Mineral Resources** | | |
| All Mineral Resources | 4,360,000 tonnes | 1.1% Sn |

**Mick McKeown**

**Mining Consultant**

**Bill Frazer**

**Managing Director**

# 1 INTRODUCTION

Stellar Resources Ltd (Stellar) is in Joint Venture with Gippsland Limited (Gippsland) on Retention Licence (RL) 5/1997 on the western outskirts of Zeehan in Tasmania. RL 5/1997 covers ground containing cassiterite mineralisation in at least three known deposits: Queen Hill, Zeehan Montana and Severn. Stellar owns 60% of the Joint Venture and is the operator on the RL.

Stellar also holds Exploration Licences (EL) 46/2003 and 49/2004 near RL 5/1997. EL 49/2004 is north of Zeehan to Zeehan and EL 46/2003 is near Granville Harbour (see Figure 1-1)

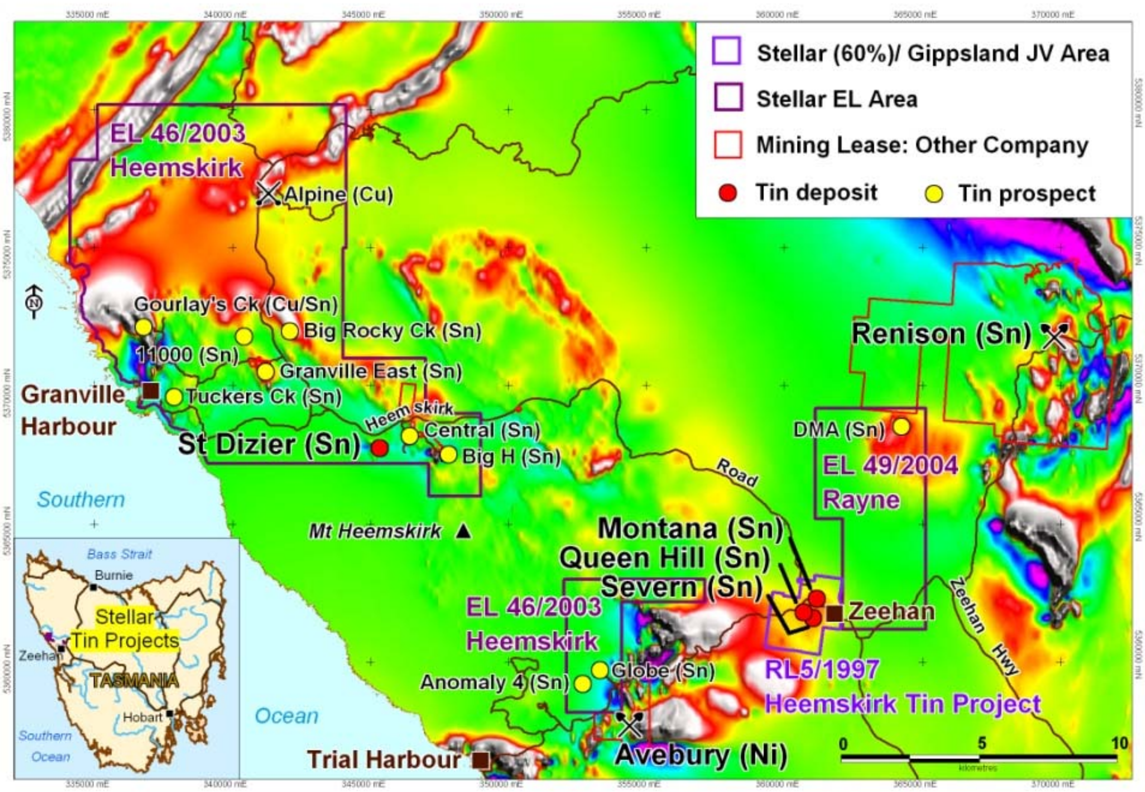



**Figure 1-1 Location of Retention Licence 5/1997 and Exploration Licences 46/2003 and 49/2004.**

In 2010, Stellar drilled six diamond drill holes on Queen Hill on RL 5/1997 and intends to continue with exploration of the deposits on RL 5/1997 and, if feasible, development of the cassiterite deposits (see Figure 1-2).

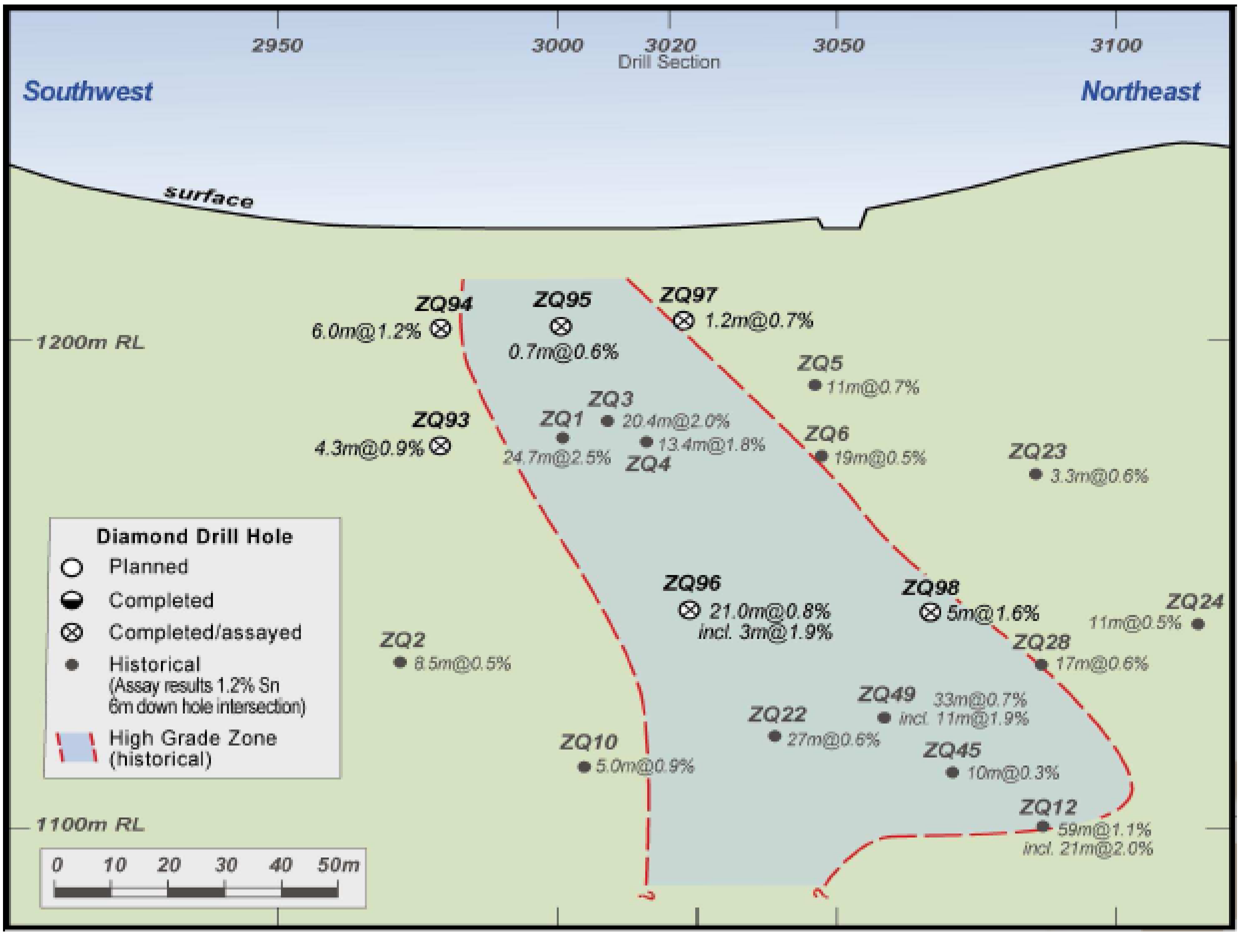



**Figure 1-2 Intersections of Queen Hill mineralisation in Stellar diamond drilling.**

The area covered by RL 5/1997 has been subjected to prospecting, mining and exploration since the discovery of the Zeehan Mineral Field in 1883:

- 1883 to 1963: Prospecting and early mining.
- 1963 to 1997: Modern exploration. This began in the mid-1960s, first by Placer Prospecting Pty Ltd (Placer) and then by Gippsland who intersected the Queen Hill cassiterite lodes in 1971. Exploration in this period continued as a joint Venture with Aberfoyle, more or less continuously up until 1982 but with little effort from 1982 to 1997.
- 1997 to 2010: No work was undertaken on that tenement after Retention Licence 5/1997 was granted in 1997.
- 2010 onwards: Resource Development. In 2010, Stellar began exploration with the aim of mining the Zeehan cassiterite deposits.

There is a large quantity of data and information available:

- 1883 to 1963: The records from this period are restricted to reports made by the Tasmania Mines Department but there were many surface and underground workings in this period many of which were later mapped and several of which can still be located.
- 1963 to 2010: Reports of exploration since 1963 are held in the Mineral Resources Tasmania (MRT) library and MRT's Tiger Database. Western Metals Limited created a

digital database of the assay results of the Gippsland and Aberfoyle diamond drilling. This database is available and was used during the estimates of the Mineral Resources for this report. Nearly all the drill core drilled by Gippsland and Aberfoyle survives in good condition in core sheds in Zeehan.

This report is a report of estimates of the Mineral Resources at the three known deposits on RL 5/1997 at Queen Hill, Zeehan Montana and Severn and includes recommendations for future exploration on the RL. New interpretations of the geology and mineralisation were made for the Queen Hill and Severn deposits and these are explained and described.

# 2 GEOLOGY

## 2.1 Regional Geology

In Tasmania, primary tin deposits are associated with the intrusion of Devonian-Carboniferous granite, for example, the deposits at Renison, Cleveland, Mt Bischoff, Aberfoyle, Storeys Creek and Anchor. The deposits are hosted in sedimentary and low grade metamorphic rocks of late Precambrian and Cambrian age. In particular, the larger deposits are hosted in part by rocks of the Cambrian Crimson Creek Formation or its stratigraphic equivalent, notably in the Renison, Cleveland and Mt Bischoff deposits.

Granite outcrops as the Heemskirk granite near Trial Harbour and Granville and as the small Pine Hill granite about 2km south of Renison. Granite has been intercepted in diamond drill holes beneath the Renison mineralisation.

Granitic porphyry dykes occur throughout the Zeehan mineral field, most of them in the western part of the field (Twelvetrees and Ward, 1910). It is logical to infer the presence of granite beneath Zeehan and geophysical interpretations suggest that the granite is at a depth of about 1km (for example, Leaman and Richardson, 1989).

To date, the largest tin mines in Tasmania have been Renison with over 200,000 tonnes of contained tin metal production and Mt Bischoff with about 40,000 tonnes of contained tin metal production.

Renison Bell is about 15km north-north-east of Zeehan. The tin mineralisation at Renison Bell is hosted in quartzite, shales, siltstones, cherts and dolomites of the Precambrian Success Creek Group, a sequence of the Upper Oonah Formation, and volcaniclastics, shales and siltstones of the Cambrian Crimson Creek Formation. Three styles of mineralisation occur at Renison:

- Fault fill mineralisation: quartz, pyrrhotite and arsenopyrite with cassiterite within fault zones;
- Replacement mineralisation: massive pyrrhotite with cassiterite in replaced dolomite beds; and
- Crackle breccia mineralisation: quartz, tourmaline and pyrrhotite with cassiterite in an extremely brecciated quartzite.

The first two styles account for the overwhelming majority of ore mined to date at Renison.

At Queen Hill, Zeehan Montana and Severn, both fault fill and replacement mineralisation have been identified hosted in rocks of the Oonah and Crimson Creek Formations.

## 2.2 Local Geology

### 2.2.1 Zeehan Geology

The Zeehan mineral field was discovered in 1883 and the silver-lead-zinc deposits on the field were worked until the 1960s. The silver-lead-zinc deposits occurred principally as lodes, that is fault fill, and less commonly as limestone replacement deposits.

Silver-lead-zinc lode deposits occur on RL 5/1997 and were mined in the past.

Small lodes were worked on and around Queen Hill for silver, lead and zinc, notably for this report, Clarke's Lode on Queen Hill itself. Cassiterite mineralisation has been identified at Queen Hill associated with lodes.

The lodes in the Zeehan Montana mine, which is just to the north of Queen Hill, were mined for silver and lead and, up until 1962, this mine had the highest output of any of the Zeehan mines (Blissett, 1962). Cassiterite mineralisation has been identified at Zeehan Montana.

The Severn cassiterite mineralisation is not known to outcrop.

The Zeehan silver-lead-zinc lodes occupy narrow fault zones principally in the Oonah and Crimson Creek Formations. The lodes are generally from 0.25m to 5m thick, tending to be narrower rather than thicker. The lodes strike NNW to NNE, are generally less than 100m in strike length and dip steeply to the east. The principal minerals in Zeehan lodes are silver bearing galena, sphalerite, pyrite, siderite and quartz. (Burrett and Martin, 1989).

The Zeehan lodes are offset by later cross-cutting faults, known in the past as slides. It has been suggested by some that these faults are later, even Tertiary, thrust faults.

### 2.2.2 Project Geology

The geology around Queen Hill is shown in Figure 2-1and the mine sequence assumed for this report is shown in Table 2-1

At surface, the progression from west to east across the Queen Hill and Severn areas is up sequence from undifferentiated Oonah Formation, through Montana volcanics, Queen Hill beds, including the massive quartzite unit, Undifferentiated Oonah Formation, then Crimson Creek Formation (refer to line AA' in Figure 2-1). This sequence youngs to the east and implies no overturning of stratigraphy.

There has been a suggestion, by Aberfoyle, that the Montana volcanics are actually an overturned section of Crimson Creek Formation and that, consequently, Queen Hill itself occupies a position near the centre of an anticline. For this report, this view has not been adopted because:

- The rock types in the Montana volcanics and the Crimson Creek Formation are different. The Montana volcanics consist of spilitic lava flows and pyroclastic bands (Blissett, 1962). The Crimson Creek Formation consists of a series of volcaniclastics, shales and siltstones and while lavas have been reported in the Crimson Creek Formation they are rare.
- The Crimson Creek formation is much thicker than the Montana volcanics: see Figure 2-1. The Crimson Creek Formation has a thickness of 5,000m ((Brown, 1989). Having said this, it could be that faulting has reduced its thickness just west of Queen Hill to something about 250m but this is unlikely.
- The Montana volcanics are lensoid in shape and are completely enclosed by rocks of the Oonah Formation: see Figure 2-1 (also, see Anderson, 1989).

There are several Zeehan silver-lead-zinc lodes at Queen Hill and Zeehan Montana. At Queen Hill, the two lodes of interest are Clarke's Lode and Stormsdown Lode. The lines of outcrop of these lodes were digitised by the author from Anonymous, 1972. In Figure 2-2, they are shown together with the bedrock tin anomaly, based by the author on data from Simpson, 1978. Note the correspondence between the lode locations and the bedrock tin anomaly.

Clarke's Lode is intimately associated with the Queen Hill tin mineralisation which has been tested by diamond drilling. Stormsdown lode has not yet been effectively tested by drilling.

The Queen Hill and Zeehan Montana, tin mineralisation occurs both within the shear zones and as replacement of some beds in contact with the shears (see Figure 2-3).

At Severn, tin mineralisation occurs as replacement mineralisation in the hangingwall of a steeply dipping fault (see **Figure 2-4**).

**Table 2-1 Queen Hill and Severn – mine sequence**

<table>
<tr><th>Age</th><th>Stratigraphic name</th><th>Units in Mine Sequence</th></tr>
<tr><td>Permian</td><td>Zeehan Glacial Formation</td><td>Zeehan Glacial Formation</td></tr>
<tr><td>Devonian</td><td>Heemskirk granite</td><td>Heemskirk granite</td></tr>
<tr><td rowspan="2">Devonian</td><td>Bell shale</td><td>Bell shale</td></tr>
<tr><td>Florence quartzite</td><td>Florence quartzite</td></tr>
<tr><td>Silurian</td><td>Crotty quartzite</td><td>Crotty quartzite</td></tr>
<tr><td>Ordovician</td><td>Gordon limestone</td><td>Gordon limestone</td></tr>
<tr><td>Cambrian</td><td>Crimson Creek Formation</td><td>Crimson Creek Formation</td></tr>
<tr><td rowspan="2">Precambrian</td><td rowspan="2">Success Creek Group</td><td>Poverty Point beds</td></tr>
<tr><td>Undifferentiated Success Creek Group</td></tr>
<tr><td rowspan="4">Precambrian</td><td rowspan="4">Oonah Formation</td><td>Undifferentiated Oonah Formation</td></tr>
<tr><td>Queen Hill beds</td></tr>
<tr><td>Montana volcanics</td></tr>
<tr><td>Undifferentiated Oonah Formation</td></tr>
</table>

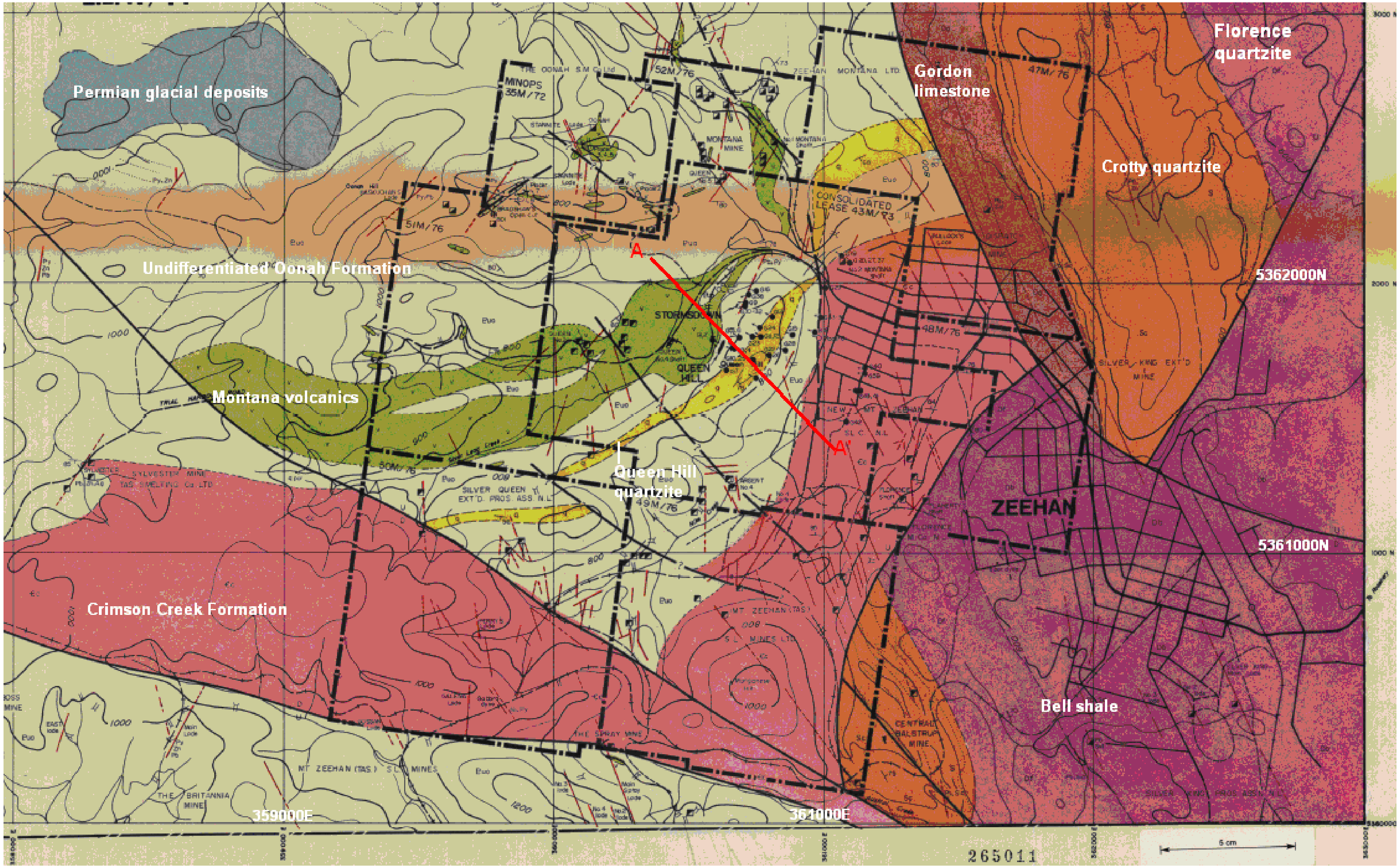



**Figure 2-1 Queen Hill area – local geology**
***(78-1261, page 11)***

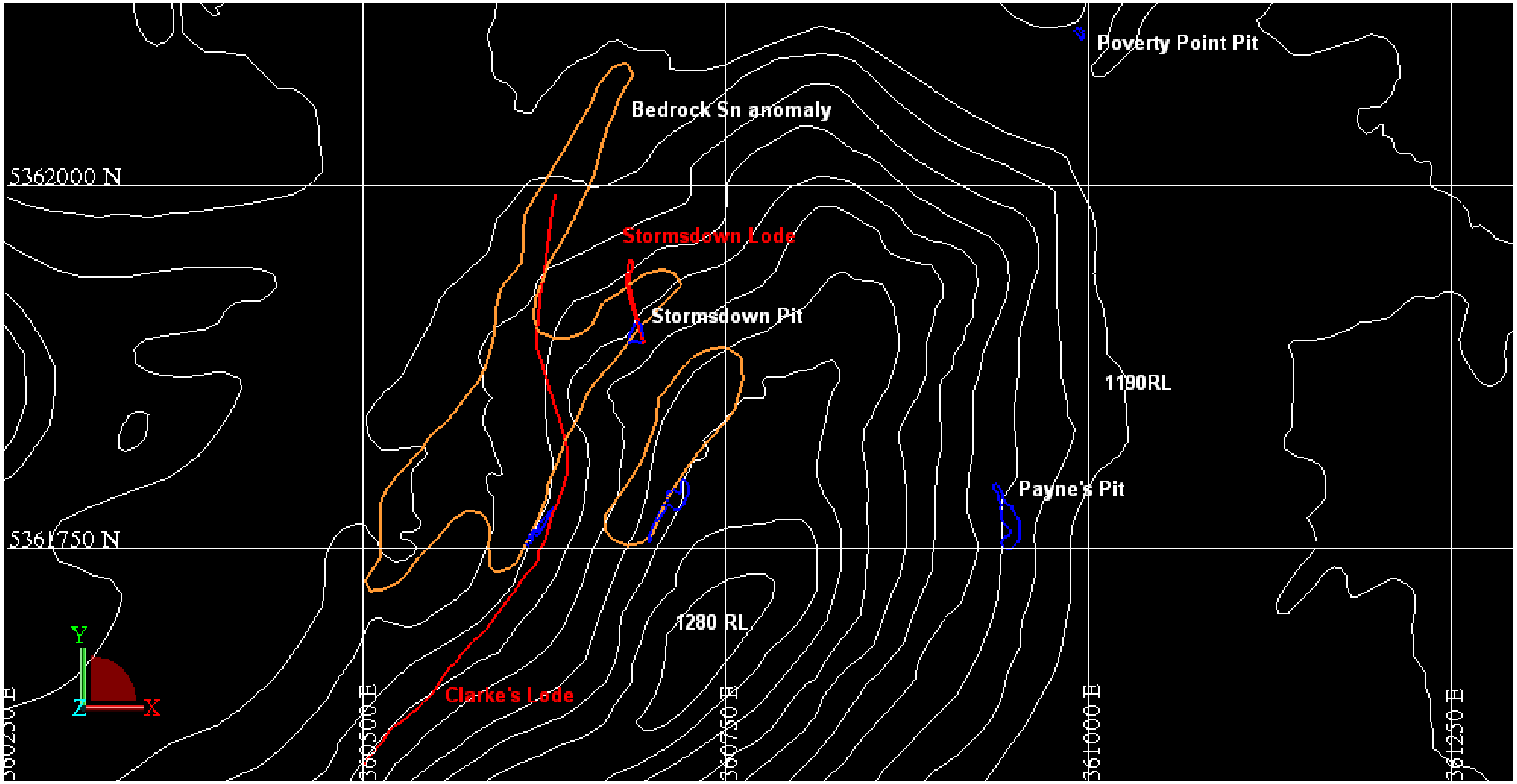



**Figure 2-2 Queen Hill area – surface contours**

Surface contours (white), important lode positions at surface (red), some pit locations (blue) and bedrock tin anomaly (brown).

The bedrock tin anomaly encloses bedrock samples assaying >0.05%Sn

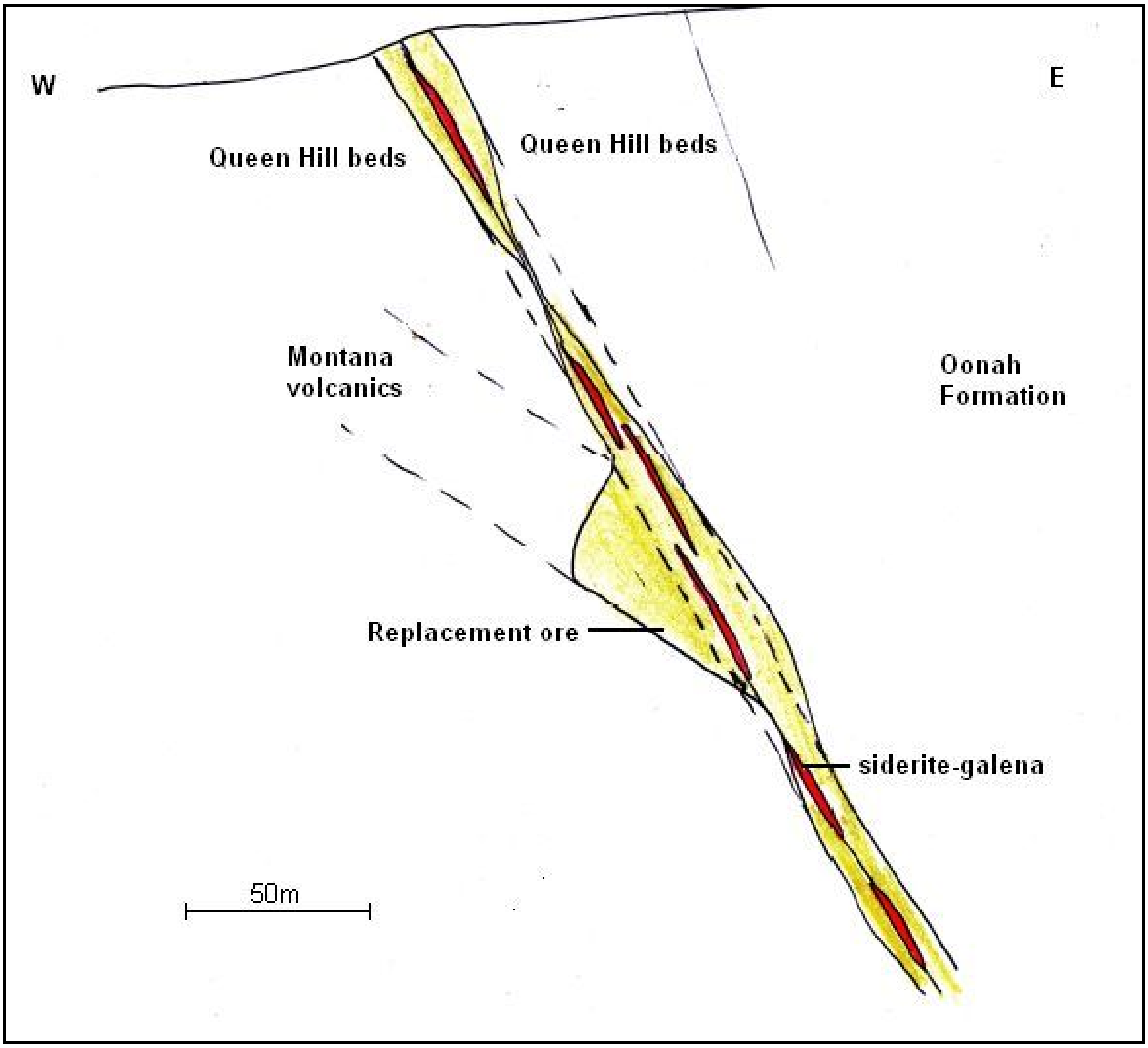



**Figure 2-3 Queen Hill mineralisation model – sketch cross-section looking north.**

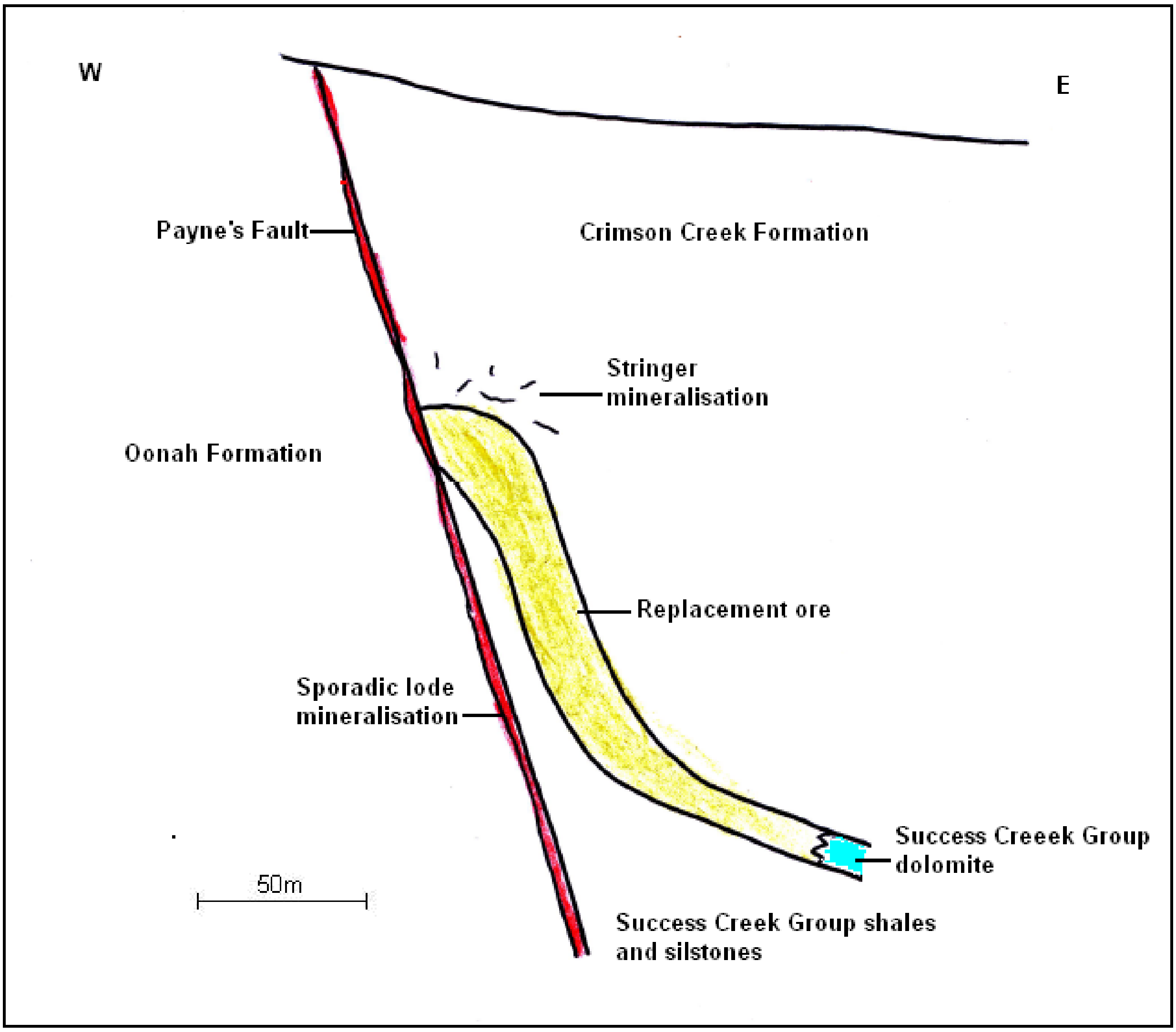



**Figure 2-4 Severn mineralisation model – sketch cross-section looking north.**

### 2.2.3 Geological Interpretation

In the past, the Queen Hill, Zeehan Montana and Severn tin deposits were described as steeply dipping, semi-conformable replacement style mineralisation within dolomitic host rock (for example, in Anderson, 1989 and Young, 1990, reference 97-4071). At Queen Hill, the host rock was described as being enclosed by Montana volcanics and at Severn, the host rock was described as occurring in the hangingwall of a fault zone in Crimson Creek Formation.

The geological interpretation for this report does not conform with the interpretation that the Queen Hill mineralisation is all replacement style and that the mineralisation occurs entirely within the Montana volcanics.

Nevertheless, the geological interpretation for this report does agree that the Severn mineralisation is mostly replacement style mineralisation which occurs in the hangingwall of a fault zone in the Crimson Creek Formation. The Severn mineralisation has been re-interpreted as replacing a bed, or series of beds, which have been folded into a north-south striking, easterly plunging anticline which is truncated on the west by a fault, referred to here as Payne's fault (see below).

As a general rule, it was assumed for the interpretation made for this report that the tin mineralisation can be reasonably well defined by assays >0.1% Sn. This feature was used in interpretations made by Aberfoyle in the past and the use of this Sn assay limit is supported by:

- Examination of the assays down drill holes: there appear to be points on the hangingwall and footwall of mineralisation within which nearly all Sn assays are generally >0.1% Sn and beyond which nearly all Sn assays are <0.1% Sn.
- The coherent shape of the mineralisation which results from using this Sn assay limit.
- The basic statistics of the Sn assays within the Queen Hill and Severn mineralisation (See 5.1.1 Queen Hill Statistics and 5.1.3 Severn Statistics).

At **Queen Hill and Zeehan Montana**, tin mineralisation occurs associated with shears and often carries anomalous levels of copper, lead, zinc and silver in addition to tin. This is also the situation at Renison where the copper, lead, zinc and silver are also taken to be markers of fault zones (for example, see Newnham, 1975 and Morland, 1989).

At Queen Hill, mineralisation occurs both within the shear zones and as replacement of some beds in contact with the shears. As expected, the beds which have been replaced are generally dolomitic, for example, rocks described as dolomite or dolomitic volcanics. Mineralisation directly associated with shears carries anomalous levels of copper, lead, zinc and silver in addition to tin.

At outcrop, the Queen Hill tin mineralisation is associated with Clarke's Lode. A separate smaller lode to the east of Clarke's Lode, known as Stormsdown Lode remains untested.

The interpretation of the Queen Hill mineralisation was guided by:

- The results of diamond drilling: 40 diamond drill holes pass through the interpreted mineralisation.
- Basic surface geological interpretation.
- The location of the Queen Hill and Stormsdown pits.
- Surface mapping of the lodes at the surface and in underground workings
- The geochemical anomaly of Sn grades in bedrock sampling.

The interpreted shape of the Queen Hill mineralisation is based on a reasonably large amount of data, including the results from 40 diamond drill holes which intersect the mineralisation (see Table 2-2). The interpreted mineralisation has a strike length of over 300m, a width of about 1 to 50m and a down dip extent of over 300m. The dip on the mineralisation is generally about $60^o$ to the east.

The shape appears reasonably robust on a large scale but may change on a large scale if extensions to the mineralisation are discovered and on a small scale as more data becomes available. The most likely changes to the shape on a small scale will be due to the identification of faults which may transect the mineralisation with local offsets to the shape.

Pinching on some sections is probably due to faulting on a local scale, compare with mapping of trenches west of Zeehan Montana and underground mapping of Queen Hill.

The Queen Hill mineralisation intercepts were flagged as “Queen_Hill” in a field named min_zone in the Sample table of the database RL051997_200905_02_DDHdatabase.ddb.

At **Zeehan Montana** the tin mineralisation has been intersected in 7 holes on 2 sections only. At present, the mineralisation all appears to be principally shear hosted. The interpreted mineralisation has a strike length of just over 100m, a width of about 1 to 15m and a down dip extent of over 300m. The mineralisation appears to strike just north of east and dips at about $55^{o}$ to the south.

At **Severn**, tin mineralisation occurs as replacement mineralisation in the hangingwall of a steeply dipping fault. At surface, the fault marks the contact between Crimson Creek Formation to the east and the Oonah Formation to the west. The fault strikes more or less north-south and there is a small prospecting pit, known as Payne’s pit, on the fault near 5,361,750N 360,950E. The fault is referred to in this report as Payne’s Fault.

The Severn mineralisation principally occurs as replacement of some beds in contact with Payne’s fault. As expected, the beds which have been replaced are generally dolomitic and the have been referred to as part of the Poverty Point sequence which is thought to be an equivalent of the Success Creek Formation which occurs at the top of the Oonah Formation just below the overlying Crimson Creek Formation.

The interpretation of the Severn mineralisation was guided by:

- The results of diamond drilling: 10 diamond drill holes pass through the interpreted mineralisation.
- Basic surface geological interpretation.
- The location of Payne’s pit.
- The extent of the Severn magnetic anomaly.

The Severn magnetic anomaly was first identified in a ground magnetic survey conducted by Aberfoyle in 1976 (see Figure 2-9). In the first instance, the ground magnetic anomaly was tested by diamond drill hole G39 which was aimed at the magnetic high of the anomaly. G39 was drilled at a shallow dip, collaring at $-41^{o}$ and ending at $-26^{o}$ at a down-hole depth of 328m. G39 made a long intersection of low to high grade tin mineralisation.

A subsequent aeromagnetic survey of the Zeehan area was flown and the high of the magnetic anomaly from this aerial survey was about 100m north of its location in the ground survey (see Figure 2-10 and Figure 2-11). Hole G72 passed through the plan position of the aeromagnetic high at about 250m vertically below the surface and intersected 28.0m down-hole at 0.65% Sn (see Table 2-4) including 8.0m down-hole at 1.93% Sn.

The interpreted shape of the Severn mineralisation:

- is consistent with the current geological model of the area, that is, takes the geology into account rather than being solely based on Sn assays;
- is coherent, that is, the interpreted shape from cross-section to cross-section is consistent;
- contains the bulk of the anomalous Sn assays;
- appears to reflect the extent of the Severn magnetic anomaly (see Figure 2-12).

There may be waste bands included within the currently interpreted Severn mineralisation envelope (see 5.1.3 Severn Statistics).

The Severn mineralisation is known over a strike length of about 400m and down-dip for over 400m; the true width of the mineralisation ranges from about 1m to 40m. The dip on the mineralisation varies from about 70$^{o}$ to 20$^{o}$ to the east.

The shape of the Severn mineralisation could change on a large scale and is likely to change on a small scale as more data becomes available.

The Queen Hill mineralisation intercepts were flagged as “Severn” in a field named min_zone in the Sample table of the database RL051997_200905_02_DDHdatabase.ddb.

**Table 2-2 Queen Hill intercepts (*queen_hill_intercepts1.str*)**

| Hole No | Depth from | Depth to | Intercept length | %Sn |
|---|---|---|---|---|
| G01 | 39.32 | 77.42 | 38.1 | 1.69 |
| G01 | 103.43 | 107.59 | 4.16 | 0.36 |
| G01 | 107.9 | 108.97 | 1.07 | 0.25 |
| G02 | 88.09 | 88.7 | 0.61 | 0.16 |
| G02 | 99.36 | 107.9 | 8.54 | 0.49 |
| G03 | 65.84 | 85.95 | 20.11 | 1.98 |
| G04 | 69.49 | 82.91 | 13.42 | 1.81 |
| G05 | 56.69 | 59.13 | 2.44 | 2.10 |
| G05 | 59.44 | 64.01 | 4.57 | 0.40 |
| G06 | 66.45 | 85.65 | 19.2 | 0.52 |
| G07 | 78.94 | 82.91 | 3.97 | 0.29 |
| G08 | 116.43 | 122.83 | 6.4 | 0.24 |
| G10 | 171.3 | 184.1 | 12.8 | 0.39 |
| G11 | 140.82 | 162 | 21.18 | 0.46 |
| G11W | 143.87 | 171.6 | 27.73 | 0.60 |
| G12 | 168.86 | 228.3 | 59.44 | 1.12 |
| G13 | 196.9 | 203.61 | 6.71 | 0.80 |
| G14 | 192.02 | 203.91 | 11.89 | 0.27 |
| G15 | 234.09 | 263 | 28.91 | 0.56 |
| G15W2 | 237.78 | 249.15 | 11.37 | 0.23 |
| G16 | 114.6 | 118.87 | 4.27 | 0.30 |
| G18 | 291.08 | 303.28 | 12.2 | 1.11 |
| G22 | 184.4 | 206.04 | 21.64 | 0.25 |
| G22 | 206.65 | 236.83 | 30.18 | 0.52 |
| G23 | 106.22 | 113.69 | 7.47 | 0.38 |

| Hole No | Depth from | Depth to | Intercept length | %Sn |
|---|---|---|---|---|
| **G24** | 145.71 | 156.27 | 10.56 | 0.50 |
| **G25** | 147 | 149 | 2 | 0.12 |
| **G26** | 233 | 264 | 31 | 1.56 |
| **G28** | 245.5 | 247.9 | 2.4 | 0.37 |
| **G33** | 349.67 | 352.18 | 2.51 | 0.83 |
| **G34B** | 336.57 | 338.75 | 2.18 | 2.17 |
| **G45** | 173.75 | 195.75 | 22 | 0.19 |
| **G49** | 115.35 | 160.8 | 45.45 | 0.56 |
| **G49** | 173.4 | 201.4 | 28 | 0.43 |
| **G51B** | 217.5 | 255.5 | 38 | 0.73 |
| **G52** | 133.2 | 140.5 | 7.3 | 0.89 |
| **G61** | 222.7 | 239.85 | 17.15 | 0.95 |
| **G61** | 241.2 | 242.2 | 1 | 0.01 |
| **G62** | 200 | 255 | 55 | 0.63 |
| **G63** | 286.25 | 289.4 | 3.15 | 2.40 |
| **ZQ1093** | 74 | 80 | 6 | 0.69 |
| **ZQ1094** | 64 | 71 | 7 | 1.23 |
| **ZQ1095** | 61.55 | 62.7 | 1.15 | 0.43 |
| **ZQ1096** | 85.8 | 108 | 22.2 | 0.79 |
| **ZQ1097** | 53.2 | 59 | 5.8 | 0.24 |
| **ZQ1098** | 95 | 106 | 11 | 0.83 |
| **Total** | | | **699.23** | **0.79** |

**Table 2-3 Zeehan Montana intercepts *(montana_intercepts1.str)***

| Hole No | Depth from | Depth to | Intercept length | %Sn |
|---|---|---|---|---|
| **G19** | 105.46 | 109.73 | 4.27 | 0.38 |
| **G19** | 115.82 | 120.09 | 4.27 | 0.22 |
| **G20** | 131.98 | 148.74 | 16.76 | 0.57 |
| **G27** | 114.6 | 119.6 | 5.0 | 1.31 |
| **G37** | 178.2 | 178.6 | 0.4 | 0.60 |
| **G78** | 332.15 | 336.0 | 3.85 | 0.30 |
| **G86** | 248.0 | 255.0 | 7.0 | 0.35 |
| **G86W** | 248.0 | 255.0 | 7.0 | 0.48 |
| **Total** | | | **71.6** | **1.05** |

**Table 2-4 Severn intercepts**
***(severn_intercepts1.str)***

| Hole No | Depth from | Depth to | Intercept length | %Sn |
|---|---|---|---|---|
| **G39** | 196.5 | 231.05 | 34.55 | 0.51 |
| **G39** | 231.1 | 246.2 | 15.1 | 0.16 |
| **G41** | 230.0 | 236.0 | 6.0 | 0.69 |
| **G43** | 242.0 | 292.0 | 50.0 | 0.28 |
| **G65** | 217.8 | 267.75 | 49.95 | 0.72 |
| **G69** | 138.0 | 141.0 | 3.0 | 0.75 |
| **G72** | 282.5 | 310.5 | 28.0 | 0.65 |
| **G74** | 351.0 | 371.0 | 20.0 | 0.84 |
| **G81** | 437.0 | 464.0 | 27.0 | 0.65 |
| **G84** | 399.0 | 421.0 | 22.0 | 0.33 |
| **G87** | 326.0 | 354.0 | 28.0 | 0.53 |
| **Total** | | | **283.6** | **0.53** |

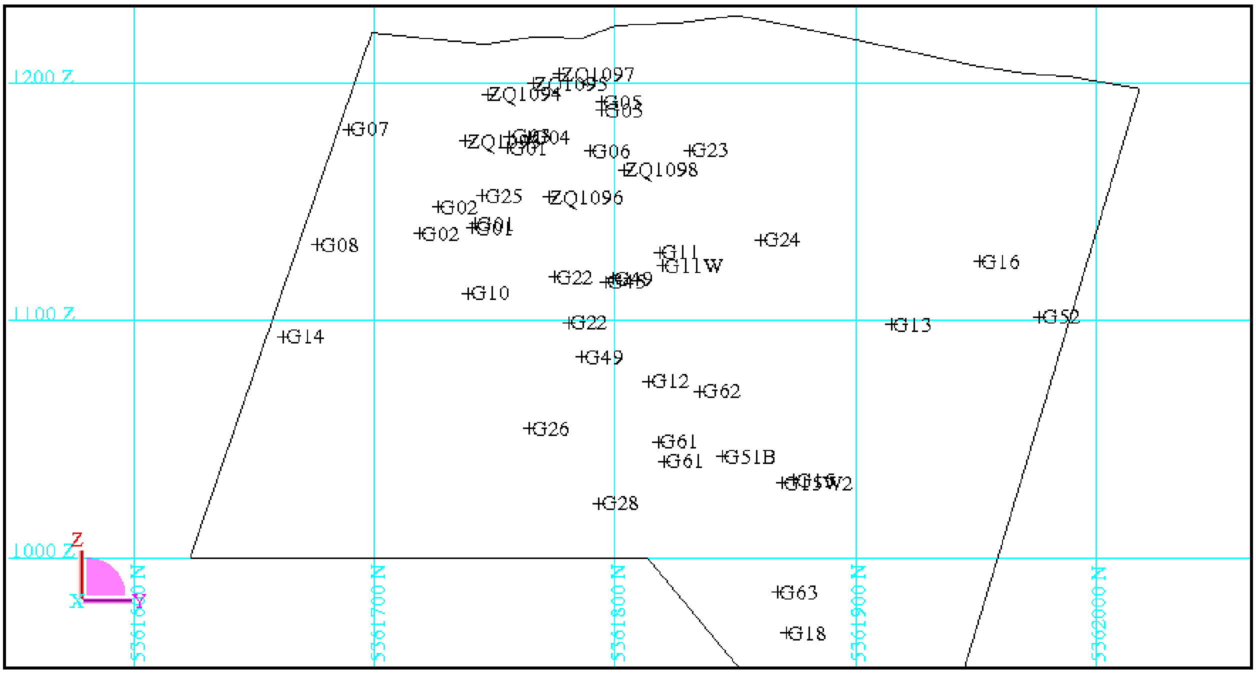



**Figure 2-5 Queen Hill deposit – longitudinal projection showing distribution of drill hole intercepts.**

**Holes G33 and G34 plot just off the bottom of the figure below G18.**

***(queen_hill_intercepts1.str)***

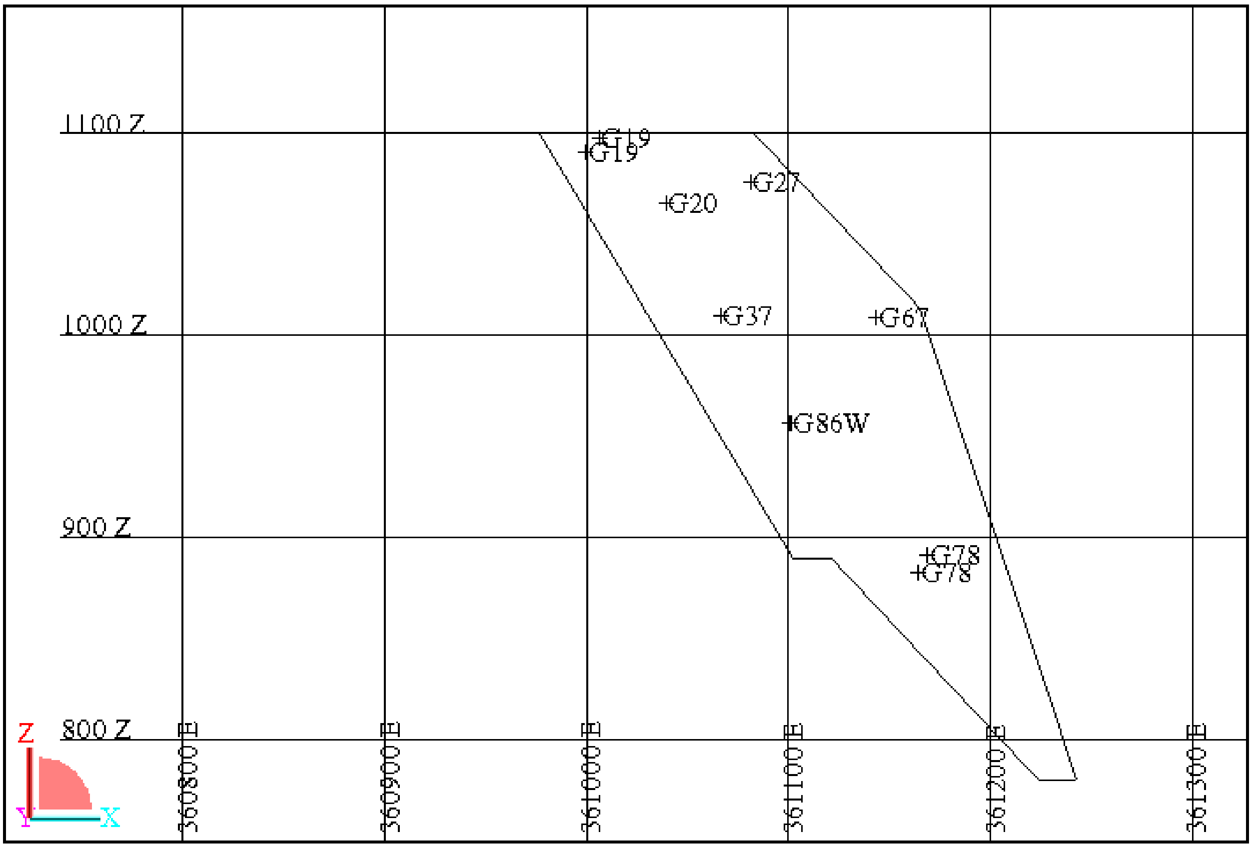



**Figure 2-6 Zeehan Montana – longitudinal projection showing distribution of drill hole intercepts.**

***(montana_intetcepts1.str)***

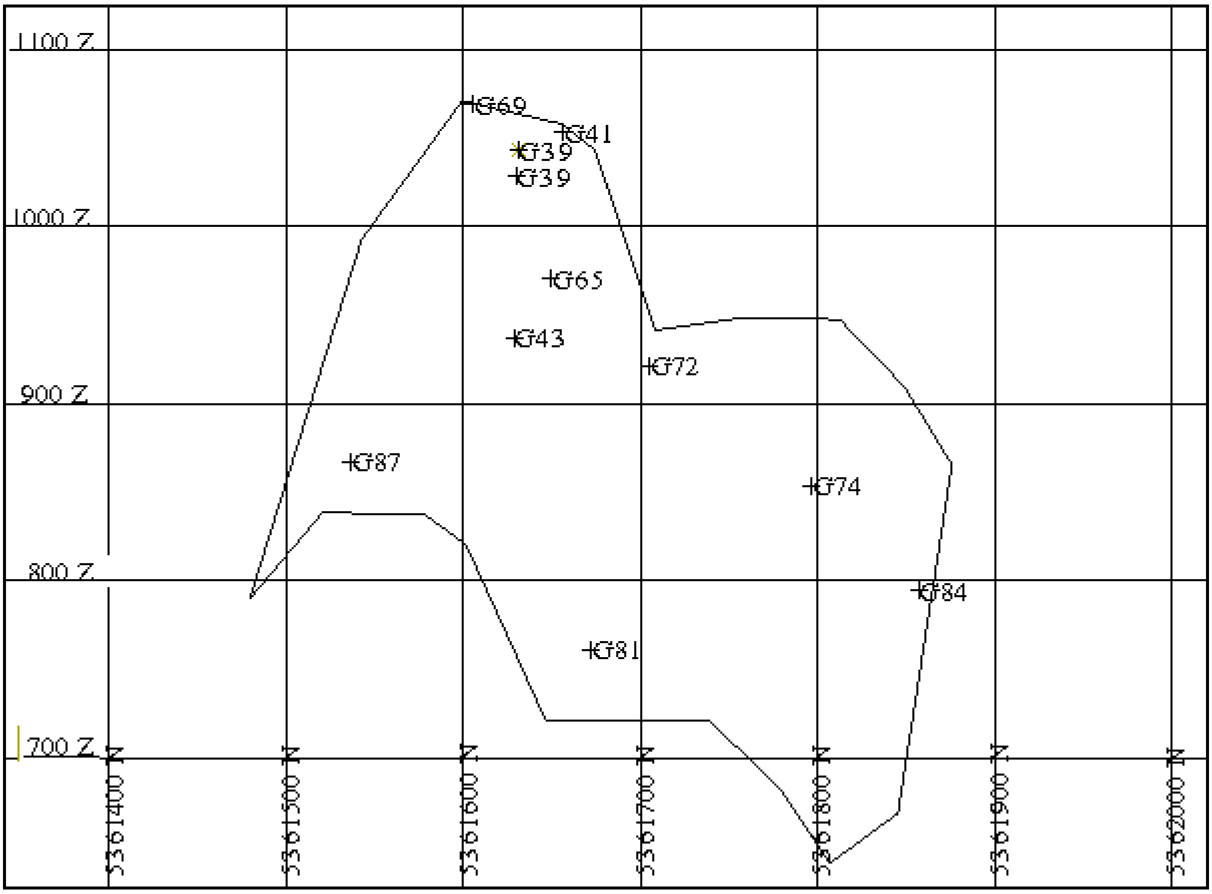



**Figure 2-7 Severn deposit – longitudinal projection showing distribution of drill hole intercepts.**

***(severn_intercepts1.str)***

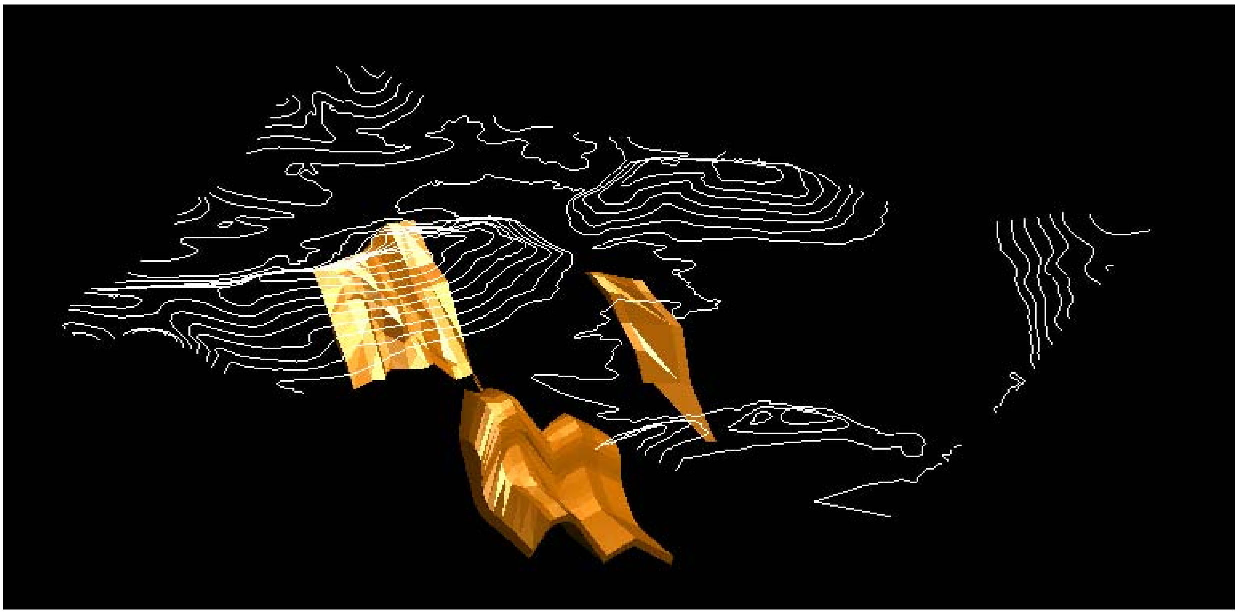


**Figure 2-8 Queen Hill, Zeehan Montana and Severn mineralisation oblique view looking north-west.**

**Queen Hill mineralisation is shown to the left outcropping behind Queen Hill; Zeehan Montana is to the right; Severn is at the centre, the top of Severn is about 100m below the surface.**

**Refer to the text for dimensions.**

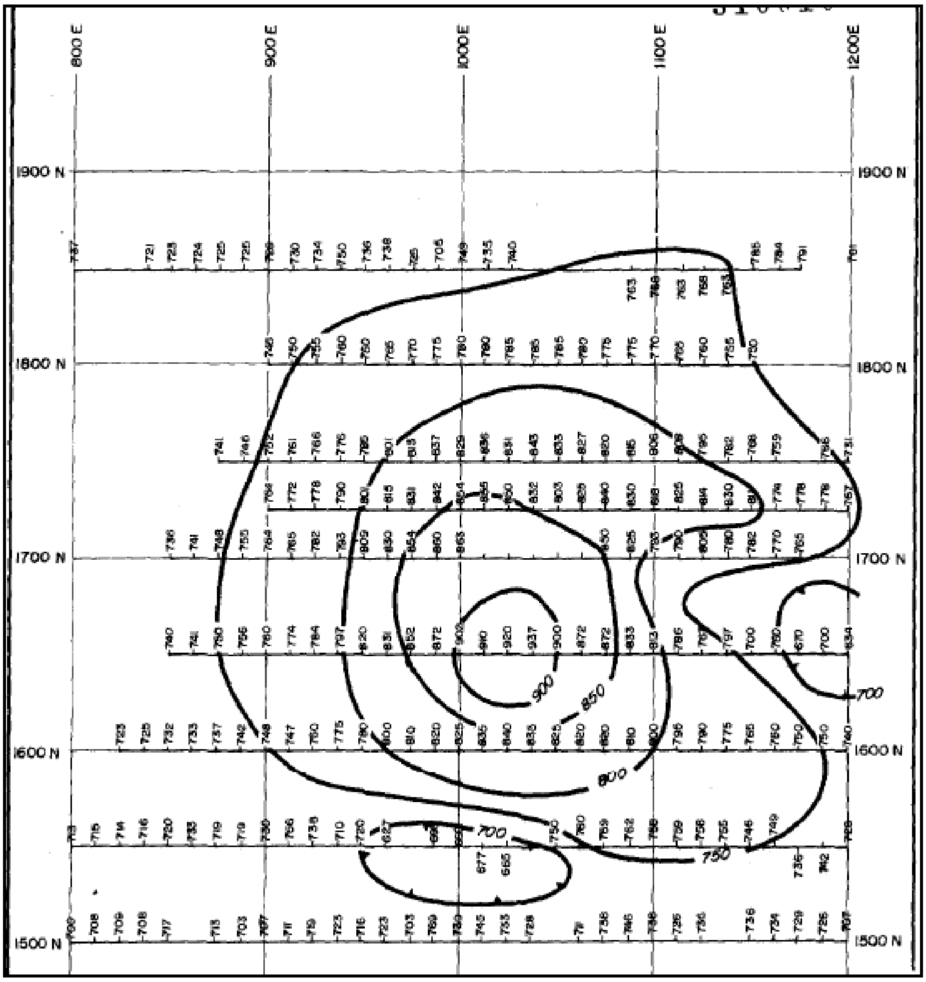



**Figure 2-9 Contours of magnetic intensity, June 1976.**

***(77-1214)***

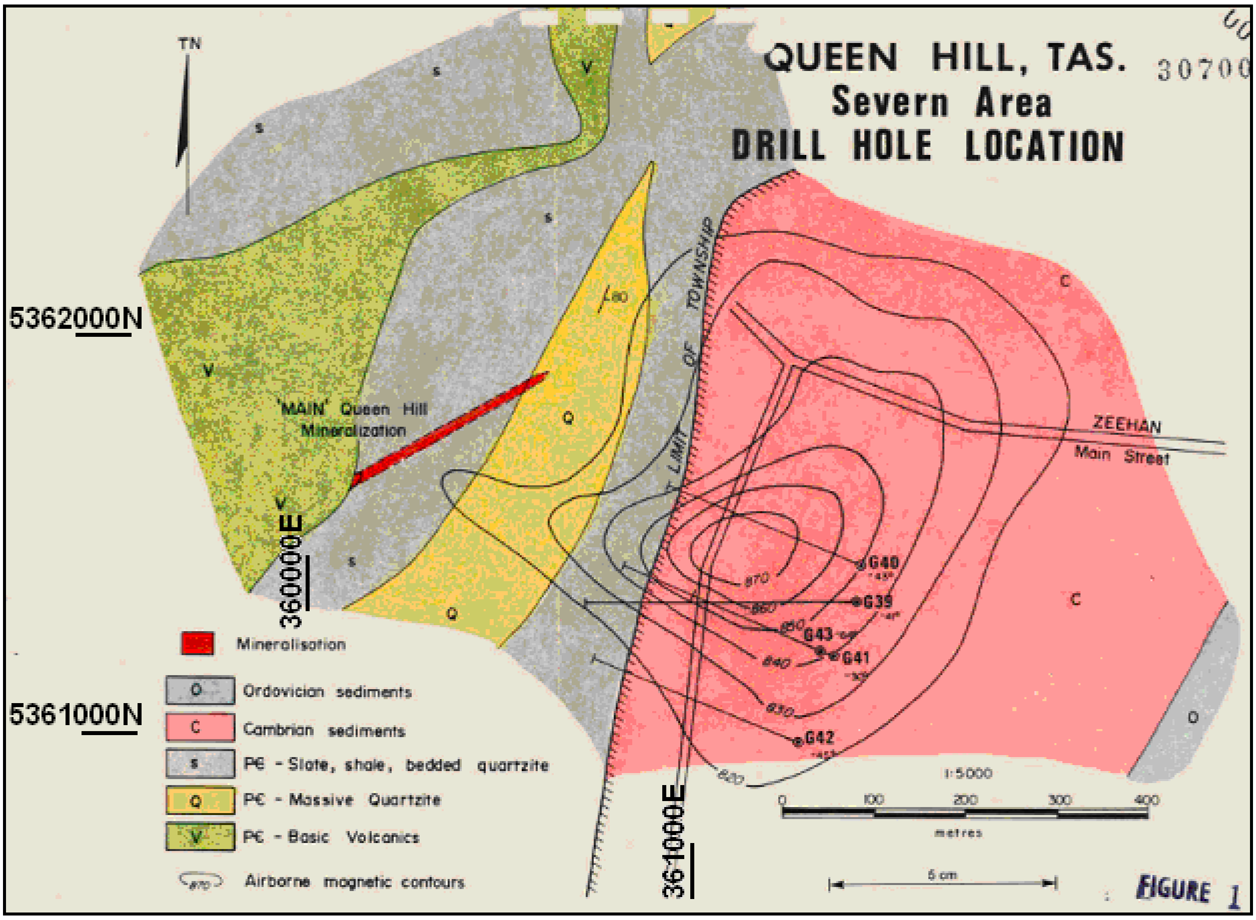



**Figure 2-10 Airborne magnetic contours.**

***(77-1217)***

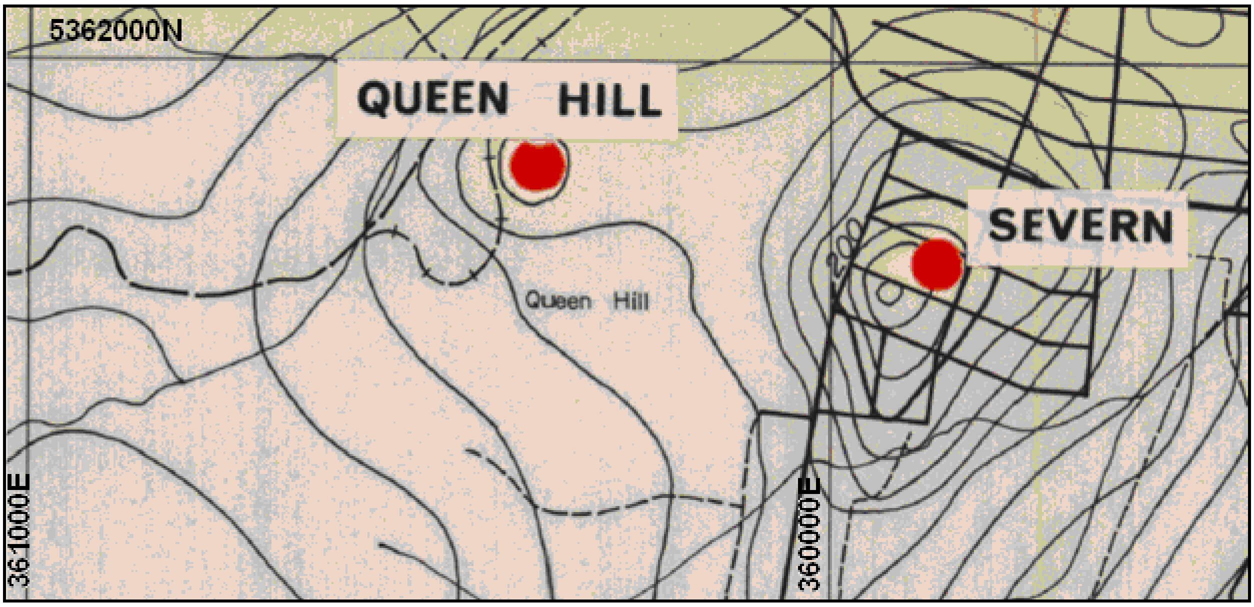



**Figure 2-11 Aeromagnetic contours 1978.**

***(78-1261)***

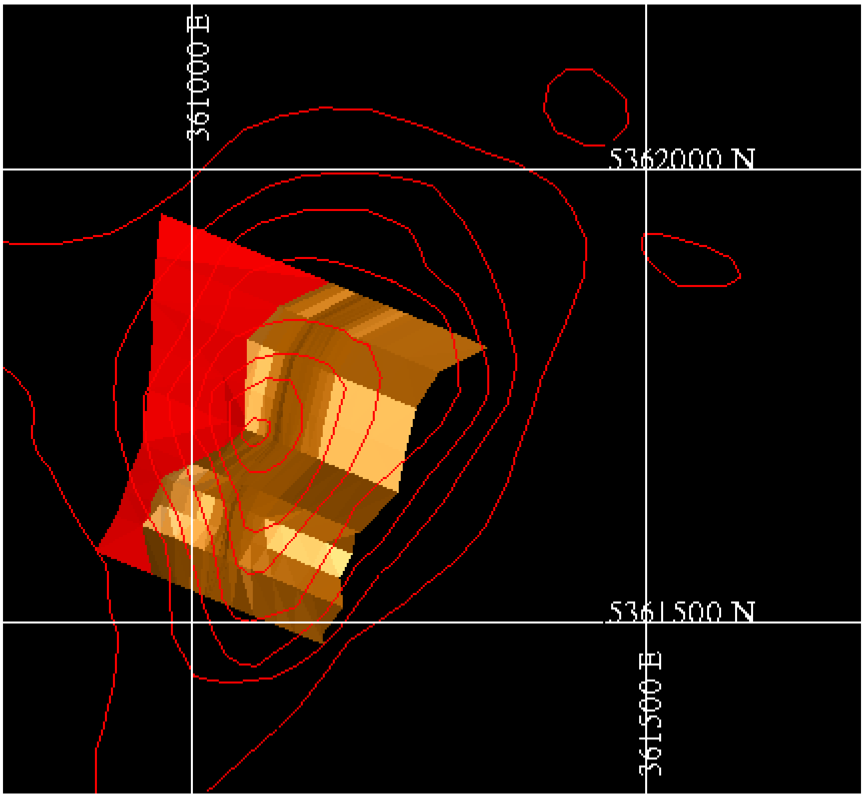



**Figure 2-12 Severn mineralisation and aeromagnetic anomaly: plan view.**

**Severn mineralisation in brown, Payne's Fault in red; aeromagnetic contours are as in Figure 2-12.**

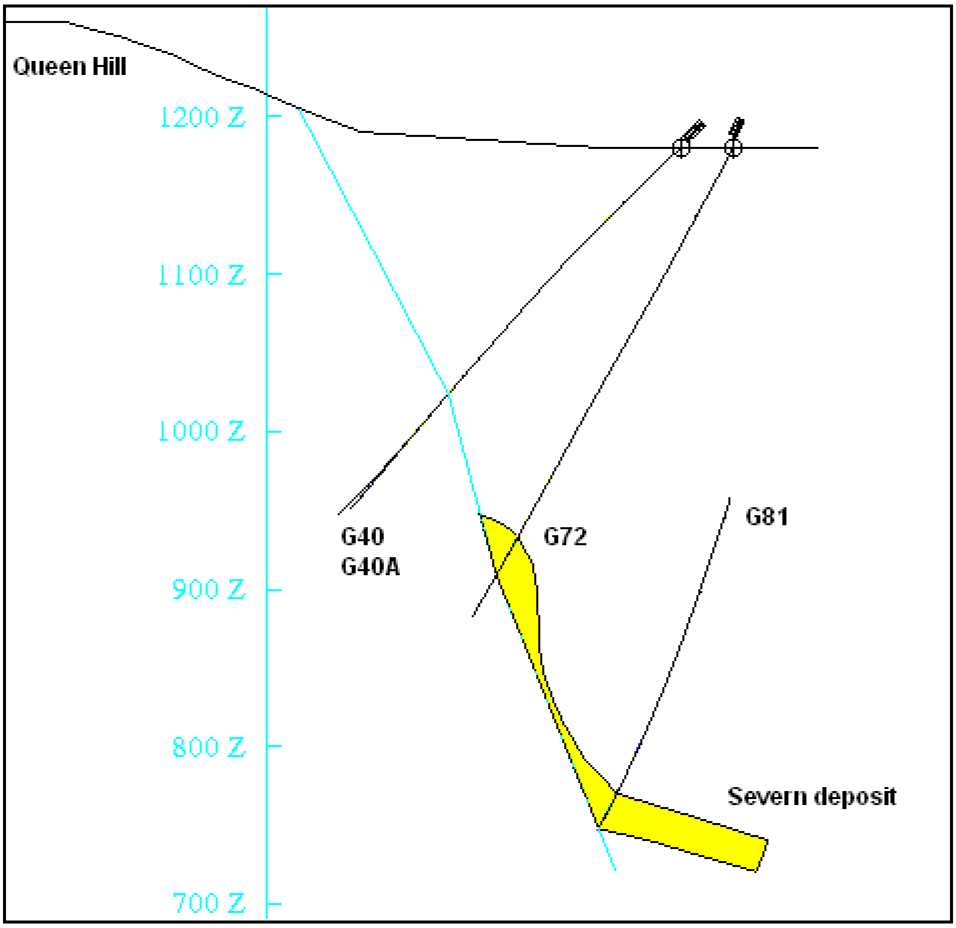



**Figure 2-13 Severn deposit – cross-section through G72 along bearing of G72, east to the right.**

### 2.2.4 Digital files

The most significant new digital files created for this report were:

- String files and a wireframe of surface contours created by the author based on a drawing in an Aberfoyle report by Palmer and Skey, 1982: contours.str/dtm.
- A string file of the surface geology as shown in an Aberfoyle report by Simpson, 1978: geology_trim1.str.
- A string file created by the author of the bedrock tin anomaly based on data in a report by Simpson, 1978: sn_geochem2.str.
- A string file of part of a drawing of ground magnetic contours included in Simpson, 1977: severn_mag1.str.
- A string file of a drawing of aerial magnetic contours included in Simpson and Yates, 1977: severn_mag2.str.

# 3 MINERALOGY OF THE MINERALISATION

At Zeehan and nearby Renison Bell, the principal tin bearing minerals are cassiterite and stannite:

- Cassiterite $SnO_2$ Sn 78.6%
- Stannite $Cu_2S.FeS.SnS_2$ Sn 28%, Cu 30%, Fe 13%, S 30%

Cassiterite was first identified on Queen Hill in the Stormsdown lode in 1937 (Blissett, 1962). The deposit was described as soft pyritic pug containing cassiterite.

Stannite is soluble in nitric acid and soluble Sn assays at Zeehan and Renison Bell are assays of tin occurring in stannite. Also note that stannite can only be present in samples which contain copper. Assays for soluble Sn have been routinely undertaken at Queen Hill by Aberfoyle and Stellar and at Severn by Aberfoyle where warranted by Cu assays.

**At Queen Hill, 316 samples have been assayed for soluble Sn and the average grade of the soluble Sn assays is <0.05% Sn (see**

Table 3-1). Of the assays, only 38 exceeded 0.05% = 50ppm soluble Sn. The higher soluble Sn assays all come from intersections in three diamond drill holes G23, G24 and G49 (see Figure 3-1).

To date, production from Queen Hill has included:

- 12.5 tonnes of cassiterite concentrates containing about 4 tonnes of tin from Stormsdown in 1938 and 1957-58.
- Bulk sampling by Aberfoyle of 1,800 tonnes of cassiterite-bearing sulphide ore from Queen Hill by Aberfoyle in 1980 (81-1521).
- Bulk sampling by Aberfoyle of 1,000 tonnes of cassiterite-bearing sulphide ore from the Stormsdown (81-1521).

Negligible amounts of stannite have been reported from Zeehan Montana and Severn, the average of composite assays from drill hole samples being less than 0.02% Soluble Sn (seeTable 5-3).

The mineralisation in the Zeehan Cassiterite Deposits is of two styles:

- Mineralisation in faults with cassiterite associated with siderite, quartz, galena, sphalerite, and minor chalcopyrite, pyrite, stannite and fluorite. This is the style of mineralisation associated with Clarke’s Lode and Stormsdown Lode.
- Replacement mineralisation with cassiterite associated with siderite, quartz, pyrite and pyrrhotite with minor sericite and fluorite or sellaite. This is the style of mineralisation associated with replacement of beds in the Montana volcanics at Queen Hill, perhaps in the replacement of the Poverty Point beds at Zeehan Montana and in the replacement of the dolomite in the Success Creek at Severn.

There are 14 petrological descriptions of the mineralisation at Queen Hill (attached as Appendix B). These are mostly of replacement style mineralisation. Tin is described in the samples examined predominantly as cassiterite with grain size generally being in the range 5 to 50 microns.

There are 12 petrological descriptions of the mineralisation at Severn (attached as Appendix C). These describe replacement style mineralisation and tin is described in the samples overwhelmingly as cassiterite with grain size being in the range 5 to 125 microns, that is, generally coarser than at Queen Hill.

Stellar has submitted samples from the recent drilling program at Queen Hill for metallurgical testing but the results of the tests are not yet to hand.

**Table 3-1 Queen Hill mineralisation – soluble Sn statistics *(queen_hill_solsn_assays1.str)***

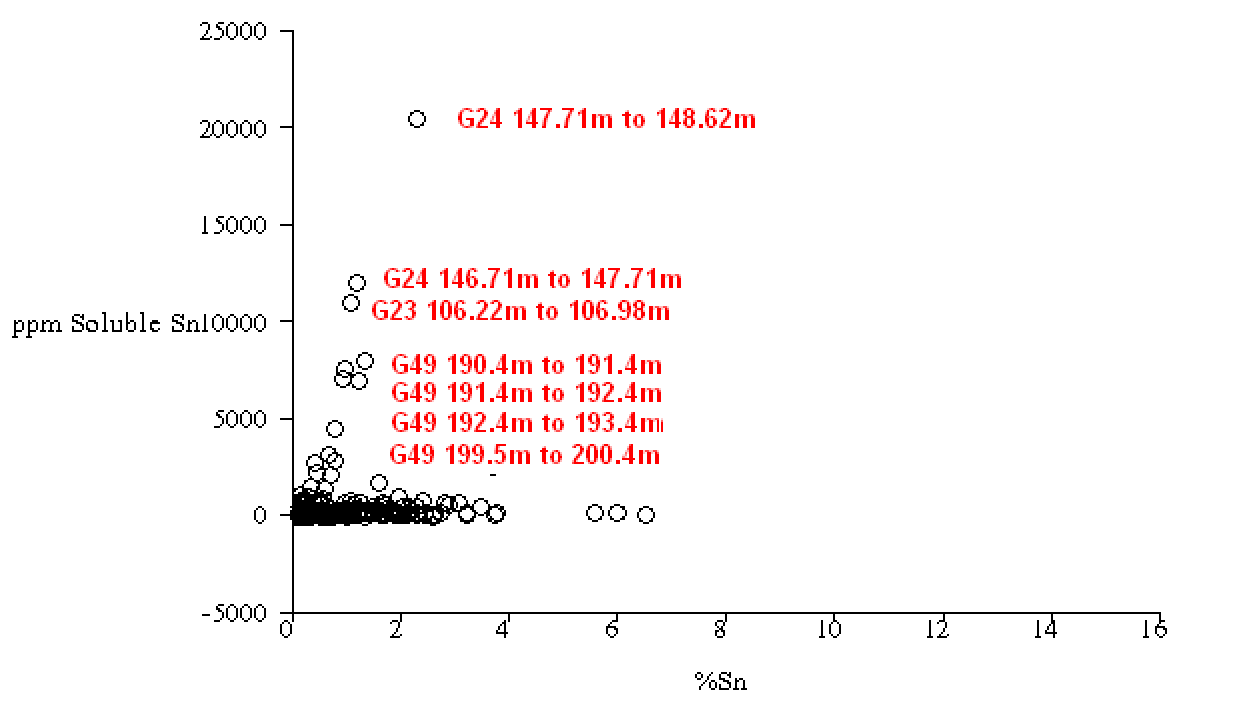
```
Output Filename: qh_assays_solsn
                                Statistics Report


File                       Queen Hill Solsn Assays1.str
-------------------------------------------------------
String range                                          1
Variable                                ppm Soluble Sn
Lower cut                                             0

Number of samples                                   316
Minimum value                                     0.000
Maximum value                                 20500.000

0.0 Percentile                                    0.000
10.0 Percentile                                   0.000
20.0 Percentile                                  20.000
30.0 Percentile                                  30.000
40.0 Percentile                                  50.000
50.0 Percentile (median)                         75.000
60.0 Percentile                                 115.000
70.0 Percentile                                 185.000
80.0 Percentile                                 267.000
90.0 Percentile                                 700.000
91.0 Percentile                                 790.000
92.0 Percentile                                 800.000
93.0 Percentile                                 807.500
94.0 Percentile                                 975.000
95.0 Percentile                                1450.000
96.0 Percentile                                2150.000
97.0 Percentile                                2962.500
98.0 Percentile                                6950.000
99.0 Percentile                                9500.000
100.0 Percentile                              20500.000

Mean                                            449.691
Variance                                    2932932.627
Standard Deviation                             1712.581
Coefficient of variation                          3.808
```




%Sn vs ppm Soluble Sn

**Figure 3-1 Queen Hill mineralisation – %Sn vs ppm soluble Sn**

***(queen_hill_solsn_assays1.str)***

# 4 DATABASE

## 4.1 Coordinate Convention

In this report, all coordinates are based on the Australian Geodetic Datum 1966 known as AGD66. This is the older datum which was generally in use prior to 31 March 2003.

The collar coordinates of the Stellar diamond drill holes were converted from GDA94 to AGD66 using the calculator on the Land Victoria website which can be accessed using this hyperlink: GDAit Online Coordinate Transformations (see Table 4-1).

**Table 4-1 Stellar diamond drill holes – collar coordinates**

| Hole No | GDA94 | | AGD66 | |
|---|---|---|---|---|
| | East | North | East | North |
| ZQ1093 | 360 771.29 | 5 361 910.70 | 360 659.730 | 5 361 727.90 |
| ZQ1094 | 360 769.82 | 5 361 911.39 | 360 658.26 | 5 361 728.59 |
| ZQ1095 | 360 780.13 | 5 361 933.06 | 360 668.57 | 5 361 750.26 |
| ZQ1096 | 360 787.28 | 5 361 947.38 | 360 675.72 | 5 361 764.58 |
| ZQ1097 | 360 785.30 | 5 361 948.02 | 360 673.74 | 5 361 765.22 |
| ZQ1098 | 360 821.30 | 5 361 972.36 | 360 709.74 | 5 361 789.56 |

The elevations used in this report are referred to as RLs and are heights above sea level plus 1000m.

## 4.2 Drilling Direction

Gippsland and Aberfoyle drilled 91 diamond drill holes in the Queen Hill, Zeehan Montana and Severn area between 1970 and 1989. The holes which made significant intersections into mineralisation have been listed above in Table 2-2, Table 2-3 and Table 2-4.

At Queen Hill, most holes were drilled on a bearing of about 290$^{o}$ from east to west or on a bearing of about 110$^{o}$ from west to east. At the time of drilling, the bearings of the holes were thought to be perpendicular to the strike of the mineralisation. However, the current interpretation of the mineralisation has a general north-south strike although there are variations in strike along strike (see Figure 2-2).

The dip of the Queen Hill mineralisation, although steep is to the east. This meant that several Aberfoyle holes did not intersect the mineralisation or made intersections with the mineralisation at unsatisfactory angles (for example, see hole G49 in Figure 4-1)

In future, drill holes at Queen Hill should be drilled from east to west and it would be practically useful if the holes were drilled on a bearing of 270$^{o}$.

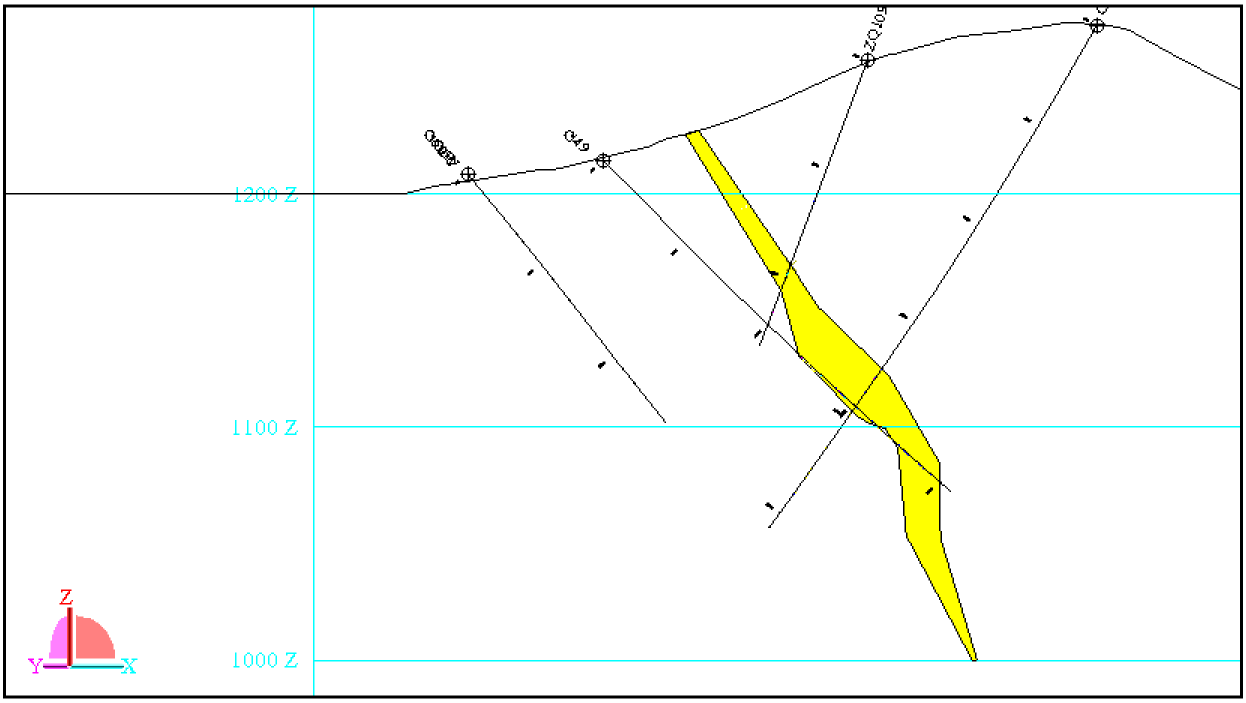



**Figure 4-1 Queen Hill – cross-section through G45 and G49**

## 4.3 Description of Database

### 4.3.1 Data Standards

Most of the data available for this report was compiled over the period 1970 to 2010. The principal first sources of data were diamond drill logs with assays and company reports by Gippsland, Aberfoyle and Stellar.

It is still possible for some of the existing data to be verified by duplicate testing or by other means, for example, recent assay data from the Stellar drilling program or survey data, and the verification of such data is discussed below (see 4.3.5 Core Recovery, 4.3.3 Diamond Drill Hole Surveys and 4.3.7 Assays).

However, other data cannot be verified by such methods and, as with much legacy data, must be accepted or rejected based on:

- the data itself,
- records of verification of data,
- the competence of those who collected the data.

For example, in the Aberfoyle **data itself** there are logs and assays for four drill holes where the original logs record unacceptable core recoveries. These were holes G30, G31, G32 and G38. These holes were drilled under the Stormsdown Pit and results from these holes were not used for any estimates made for this report, nor should they be used for any estimates in the future.

There are **records of verification of data** by Aberfoyle. For example, duplicate assays of drill core using different laboratories and different sub-sampling techniques are described in Aberfoyle reports (for example, see Sise, 1981).

In the 1970s, Aberfoyle was one of the leading tin producers in Australia with four operating tin mines: the Cleveland mine on the West Coast of Tasmania, the Storeys Creek and Aberfoyle mines in North-east Tasmania, and the Ardlethan mine in southern New South Wales. The author worked for Aberfoyle from 1970 to 1973 and was resident in Zeehan with Renison Limited from 1973 to 1981and was acquainted with many of the Aberfoyle staff involved in exploration around Zeehan. He knows of no reason to doubt **the competence of those who collected the data** on behalf of Aberfoyle.

As a general guide, defects in specific data and their effects on the database and the subsequent results which rely on the data are outlined in Table 4-2.

**Table 4-2 Defects in data and their impacts on subsequent results.**

| Defects | Impact on Data | Impact on Subsequent Results |
|---|---|---|
| No defects or remediable defects | None | None |
| Defects tolerable | Low | No material impact |
| Defects not acceptable | Data quality severely compromised | Results severely compromised |

### 4.3.2 The Database

The Access database used in the estimation of Mineral Resources for this report was provided by Stellar and was named RL051997_200905_02_DDHdatabase.mdb. The database was compiled by Western Metals from Aberfoyle and Gippsland drill logs.

The author added the results of the Stellar drill holes ZQ1093 to ZQ1098 to the database.

For convenience when using Surpac software, the trivial changes listed in Table 4-3 were made to the database by the author.

Note that nearly all the drill core from the Gippsland and Aberfoyle era is still available for inspection. The core is stored in racks in core sheds Zeehan and is in good to excellent condition.

**Table 4-3 Changes made to Aberfoyle data in database**

| Table | Field | Value | |
|---|---|---|---|
| | | Originally | After change |
| Sample | Sn_pct | -0.05 | 0.001 |
| | | -0.01 | 0.001 |
| | | -0.001 | 0.001 |
| | | -0.002 | 0.001 |
| | | -0.0004 | 0.001 |
| Sample | Sol_Sn_ppm | -5 | 1 |
| | | -10 | 1 |
| | | -20 | 1 |
| | | -50 | 1 |
| | | -100 | 1 |
| Sample | S_pct | -0.01 | 0.01 |
| | | -0.05 | 0.01 |
| | | 0.1 | 0.01 |
| Sample | Cu_ppm | -20 | 10 |
| | | -100 | 10 |

### 4.3.3 Diamond Drill Hole Surveys

Most drill hole collars were picked up by qualified Surveyors (see Table 4-4). The collars of the 8 holes not picked up were located by reference to a ground grid. All collars plot on the surface topography (see **Figure 4-2**).

Most holes were surveyed down-hole by Tropari or Down-hole camera. These methods are acceptable given that the only significantly abundant magnetic mineral in the area is pyrrhotite and its distribution is restricted to parts of the mineralisation.

For the purposes of this report, the survey data contains tolerable defects which would have no material effect on subsequent results.

**Table 4-4 Diamond drill hole collar surveys**

| Hole No | Collar Survey? | Comment | If not surveyed, does hole intersect interpreted Queen Hill or Severn mineralisation? |
|---|---|---|---|
| G01 to G05 | No | Located on ground grid | Queen Hill |
| G06 to G07 | Yes | Renison Ltd (78-1320) | |
| G08 | No | Located on ground grid | Queen Hill |
| G09 o G10 | Yes | Renison Ltd | |
| G11 | No | Located on ground grid | Queen Hill |
| G12 to G16 | Yes | Renison Ltd | |
| G17 | No | Located on ground grid | No |
| G18 | Yes | Renison Ltd | |
| G19 to G21 | No | Located on ground grid | No |
| G22 | No | Located on ground grid | Queen Hill |
| G23 to G26 | Yes | Renison Ltd | |
| G27 | No | Located on ground grid | No |
| G28 | Yes | Renison Ltd | |
| G29 to G32 | No | Located on ground grid | No |
| G33 to G36 | Yes | Renison Ltd | |
| G37 | No | Located on ground grid | No |
| G38 | Yes | Renison Ltd | |
| G39 to G92 | Yes | Renison Ltd and other Surveyors | |
| ZQ1093 to ZQ1098 | Yes | Len McKenzie, Licensed Surveyor | |

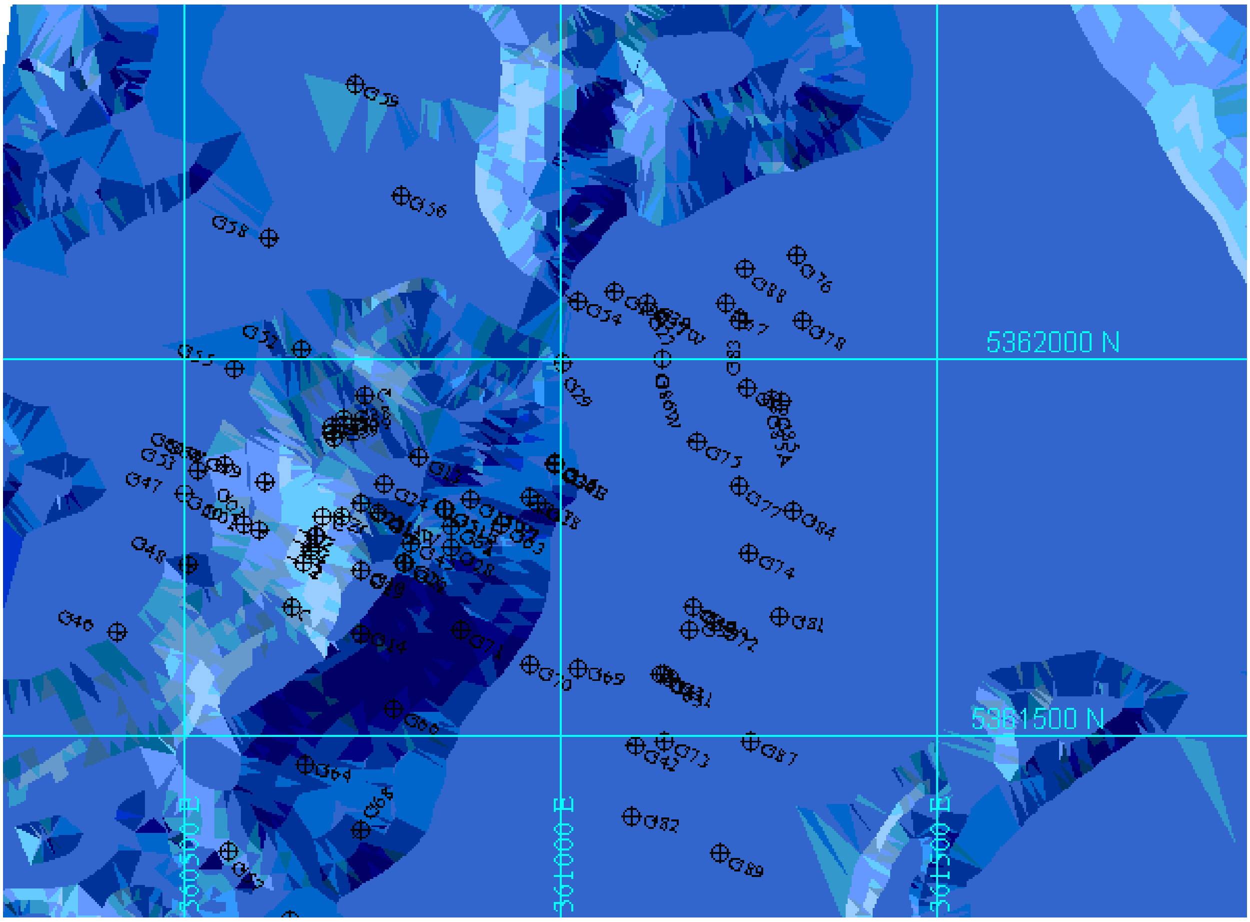



**Figure 4-2 Zeehan Cassiterite Project – diamond drill hole collars**

### 4.3.4 Core Sizes

Core sizes were recorded in drill logs and have been included in the database.

The core sizes in the drill holes in the mineralisation are listed in Table 4-5 to Table 4-7. The core sizes are mostly in the range from BQ with core diameter 36.4mm to NQ with core diameter 47.6mm with a few at larger sizes. These are commonly used core sizes in the drilling of hard rock tin mineralisation in Tasmania.

For the purposes of this report, the core sizes are acceptable.

**Table 4-5 Queen Hill core sizes in mineralisation.**
***(RL051997_200905_02_DDHdatabase.mdb)***

| Hole No | Depth from | Depth to | Core Size |
|---|---|---|---|
| **G01** | 39.32 | 77.42 | NQ |
| **G01** | 103.43 | 107.59 | NQ |
| **G01** | 107.9 | 108.97 | NQ |
| **G02** | 88.09 | 88.7 | NQ |
| **G02** | 99.36 | 107.9 | NQ |
| **G03** | 65.84 | 85.95 | NQ |
| **G04** | 69.49 | 82.91 | NQ |
| **G05** | 56.69 | 59.13 | NQ |
| **G05** | 59.44 | 64.01 | NQ |
| **G06** | 66.45 | 85.65 | NQ |
| **G07** | 78.94 | 82.91 | BQ |
| **G08** | 116.43 | 122.83 | BQ |
| **G10** | 171.3 | 184.1 | BQ |
| **G11** | 140.82 | 162 | BQ |
| **G11W** | 143.87 | 171.6 | BQ |
| **G12** | 168.86 | 228.3 | BQ |
| **G13** | 196.9 | 203.61 | BQ |
| **G14** | 192.02 | 203.91 | BQ |
| **G15** | 234.09 | 263 | BQ |
| **G15W2** | 237.78 | 249.15 | BQ |
| **G16** | 114.6 | 118.87 | NQ |
| **G18** | 291.08 | 303.28 | BQ |
| **G22** | 184.4 | 206.04 | NQ & BQ |
| **G22** | 206.65 | 236.83 | BQ |
| **G23** | 106.22 | 113.69 | NQ |

| Hole No | Depth from | Depth to | Core Size |
|---|---|---|---|
| **G24** | 145.71 | 156.27 | BQ |
| **G25** | 147 | 149 | BQ |
| **G26** | 233 | 264 | BQ |
| **G28** | 245.5 | 247.9 | BQ |
| **G33** | 349.67 | 352.18 | BQ |
| **G34B** | 336.57 | 338.75 | BQ |
| **G45** | 173.75 | 195.75 | HQ |
| **G49** | 115.35 | 160.8 | NQ |
| **G49** | 173.4 | 201.4 | NQ |
| **G51B** | 217.5 | 255.5 | BQ |
| **G52** | 133.2 | 140.5 | HQ |
| **G61** | 222.7 | 239.85 | HQ |
| **G61** | 241.2 | 242.2 | HQ |
| **G62** | 200 | 255 | HQ |
| **G63** | 286.25 | 289.4 | HQ |
| **ZQ1093** | 74 | 80 | PQ |
| **ZQ1094** | 64 | 71 | PQ |
| **ZQ1095** | 61.55 | 62.7 | PQ |
| **ZQ1096** | 85.8 | 108 | HQ |
| **ZQ1097** | 53.2 | 59 | HQ |
| **ZQ1098** | 95 | 106 | HQ |

**Table 4-6 Zeehan Montana core sizes in mineralisation.**
***(RL051997_200905_02_DDHdatabase.mdb)***

| Hole No | Depth from | Depth to | Core Size |
|---|---|---|---|
| **G19** | 105.46 | 109.73 | NQ |
| **G19** | 115.82 | 120.09 | NQ |
| **G20** | 131.98 | 148.74 | NQ |
| **G27** | 114.6 | 119.6 | BQ |
| **G37** | 178.2 | 178.6 | BQ |
| **G78** | 332.15 | 336.0 | NQ |
| **G86** | 248.0 | 255.0 | NQ |
| **G86W** | 248.0 | 255.0 | NQ |

**Table 4-7 Severn core sizes in mineralisation**
***(RL051997_200905_02_DDHdatabase.mdb)***

| Hole No | Depth from | Depth to | Core Size |
|---|---|---|---|
| **G39** | 196.5 | 231.05 | NQ |
| **G39** | 231.1 | 246.2 | NQ |
| **G41** | 230.0 | 236.0 | BQ |
| **G43** | 242.0 | 292.0 | BQ |
| **G65** | 217.8 | 267.75 | NQ |
| **G69** | 138.0 | 141.0 | NQ |
| **G72** | 282.5 | 310.5 | NQ |
| **G74** | 351.0 | 371.0 | BQ |
| **G77** | 339.0 | 340.0 | BQ |
| **G81** | 437.0 | 464.0 | NQ |
| **G87** | 326.0 | 354.0 | NQ |

#### 4.3.5 Core Recovery

Core recoveries were not explicitly recorded in Aberfoyle drill logs. Stellar have measured core recoveries for most of the intercepts of Queen Hill and Severn mineralisation and these are attached (see Appendix D).

In general, the core recoveries appear adequate. There do not seem to be any systematic core losses. While the recording of core recoveries is not ideal, the core recovery data is acceptable.

#### 4.3.6 Core Logging

Core has been well logged and with a level of detail to support the Mineral Resource estimates.

In addition, most of the core is available for reference.

#### 4.3.7 Assays

There are 4,485 assay records in the drill hole database: 4,286 attributable to Aberfoyle and 199 to Stellar. The names of the assays laboratories have been included in the drill hole database and those used by Gippsland and Aberfoyle were:

- AMDEL
- Analabs
- Cleveland Tin N.L
- Cominco
- Comlabs
- McPhar
- Spectrometer Services

There were 472 assay records for which the laboratory was not named.

Most of the assays would have been undertaken by dry powder XRF with wet chemical standardisation of the XRF assays (Mike Waters, former Chief Analyst, Cleveland tin N.L., pers comm.).

Most of the Aberfoyle assays were performed by commercial assayers or at the Cleveland tin mine. No record of standards are included in the database. Duplicate assays of drill core using different laboratories and different sub-sampling techniques were described in Aberfoyle reports (for example, see Sise, 1981) and, given the standing of Aberfoyle as an operating tin mining company (see 4.3.1 Data Standards), it is reasonable to conclude that the assays are acceptable.

Stellar did arrange for duplicate assaying of 76 samples from holes ZQ1093 to ZQ1098. The original assays were undertaken by Fused Bead XRF at the Burnie Research Laboratory and the checks by SGS. The correlation of the results from the two laboratories was very good (see Figure 4-3).

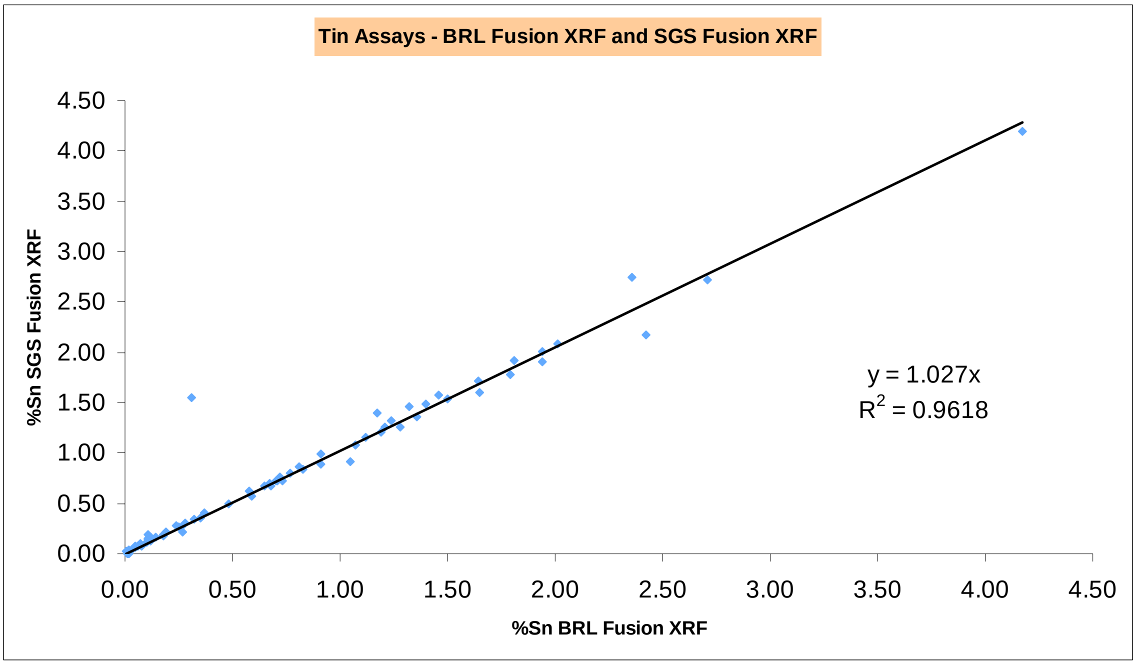



**Figure 4-3 Stellar fused bead Sn assays – comparison of repeated assays**

### 4.3.8 Specific Gravity

The database includes records of 1,222 samples for which specific gravity was estimated using the pycnometer method. The specific gravities range from 2.27 to 5.6/cm$^3$ gm with only 17 less than 2.6 gm/cm$^3$. Given the mineralogy of the material assayed, the results appear reasonable although those less than 2.6 gm/cm$^3$ are somewhat low but these represent only about 1% of the results.

For the purposes of this report, the specific gravity data is acceptable.

## 4.4 Database Audits and Reviews

For this report, the database was reviewed for:

- Holes which appeared to collar beyond the apparent limits of the drilling campaigns.
- Holes which appeared not to collar on the surface.
- Sn assays which exceeded those possible, that is exceeded the maximum assay for Sn in pure cassiterite.
- Assays which exceeded those mentioned in existing reports.
- Overlapping sample depths.
- Holes which had records which exceeded the final depth recorded in the Collar table.

There was none of any of these.

# 5 RESOURCE ESTIMATES

## 5.1 Basic Statistics

### 5.1.1 Queen Hill Statistics

All assays used for the estimate of the Mineral Resources of the Queen Hill mineralisation came from sampling of diamond drill core. The diamond drilling intercepts into the Queen Hill mineralisation which were used are listed in Table 2-2.

A histogram of the sample lengths of the raw assays showed that most assays were taken over lengths of 1.0m or less (see Figure 5-1). Consequently, all samples were composited to 1.0m in length.

The average grade of the composited Sn assays was 0.80% Sn (see Table 5-1) which is in very good agreement with the length weighted average grade of the raw Sn assays which was 0.79% Sn (see Table 2-2).

A histogram of the composited Sn assays was skewed to the left (see Figure 5-2). A histogram of log10(%Sn) was symmetrical and suggested that the Sn assays are log-normally distributed (see Figure 5-3).

A log-probability plot for the composited %Sn assays had inflection points at about 0.07% Sn and 1.0% Sn indicating that more than one population of Sn assays has been included in the data set and implying that, if the assay populations are spatially discrete, there may be the possibility of selectively defining the populations (see Figure 5-4).

There are S assays and specific gravity determinations for 82 samples of Queen Hill mineralisation. The average specific gravity of the samples was 3.3 gm/cm$^3$. A plot of specific gravity vs %S shows a scatter about a straight line (see Figure 5-16). The equation to the straight line is:

$$\text{specific gravity} = 2.9 + 0.025 * \%S$$

There is a poorer correlation between specific gravity and %S at Queen Hill than that at Severn. One explanation for this is that sulphur at Severn occurs principally as pyrrhotite whereas at Queen Hill there are many sulphur bearing minerals present including pyrite, galena and sphalerite.

A %Sn variogram in the horizontal plane had a nugget of 0.5 and a sill at 1.22, that is, the nugget effect accounted for about 40% of the variance. This level of nugget effect is typical of the style of cassiterite deposit at Queen Hill. The range of the spherical model fitted to the variogram was 10.0m. (See **Figure 5-6**)

At present, the sample data are too widely spaced to allow for useful variography.

**Table 5-1 Queen Hill composited assays – basic statistics *(queen_hill_comps1.str)***

| | average | minimum | maximum | variance | no of samples |
|---|---|---|---|---|---|
| **%Sn** | 0.80 | 0.003 | 8.623 | 1.22 | 689 |
| **ppm Soluble Sn** | 477 | 1 | 18700 | 2730508 | 277 |
| **ppm Cu** | 531 | 5 | 25946 | 3441629 | 683 |
| **ppm Pb** | 5169 | 8 | 260000 | - | 643 |
| **%S** | 16.8 | 0.01 | 41.8 | 90.5 | 429 |
| **SG** | 3.33 | 2.27 | 4.48 | 0.16 | 413 |

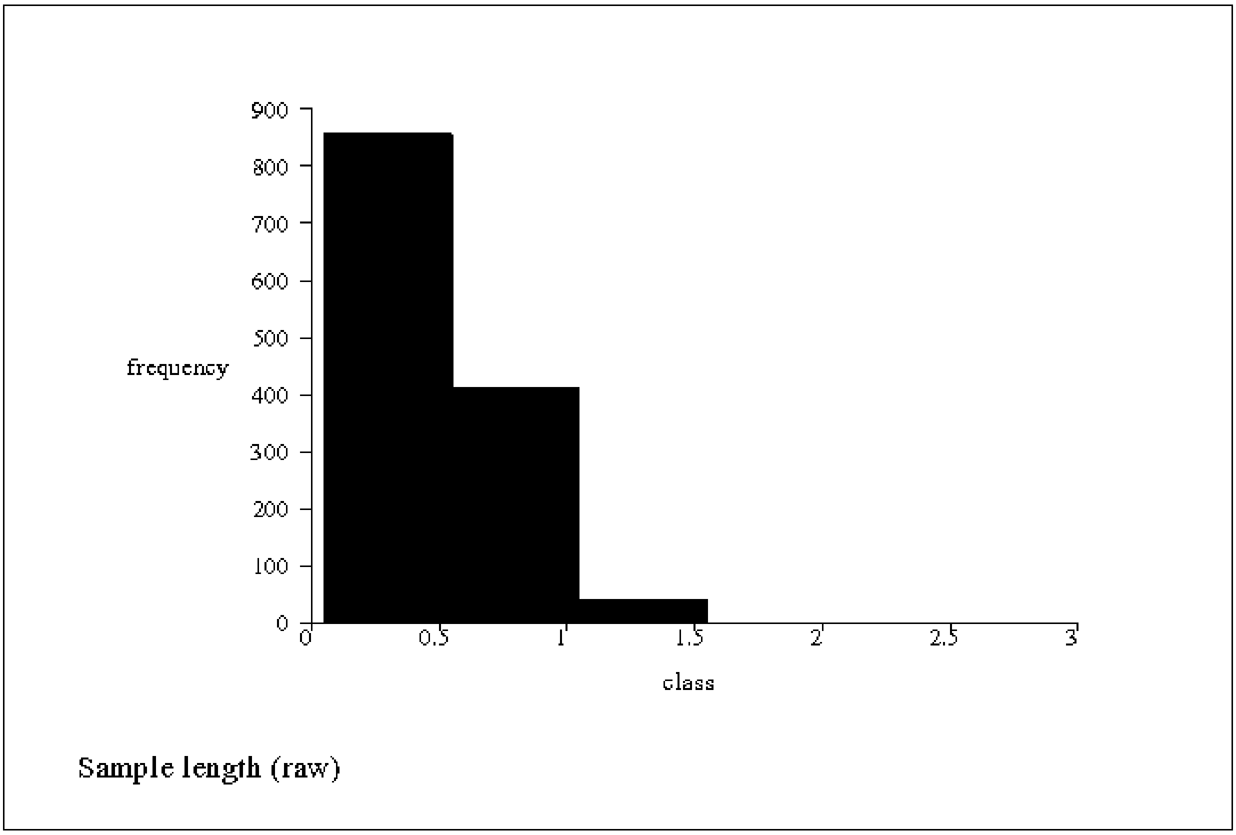



**Figure 5-1 Queen Hill raw assays – histogram of sample lengths. *(queen_hill_assays1.str)***

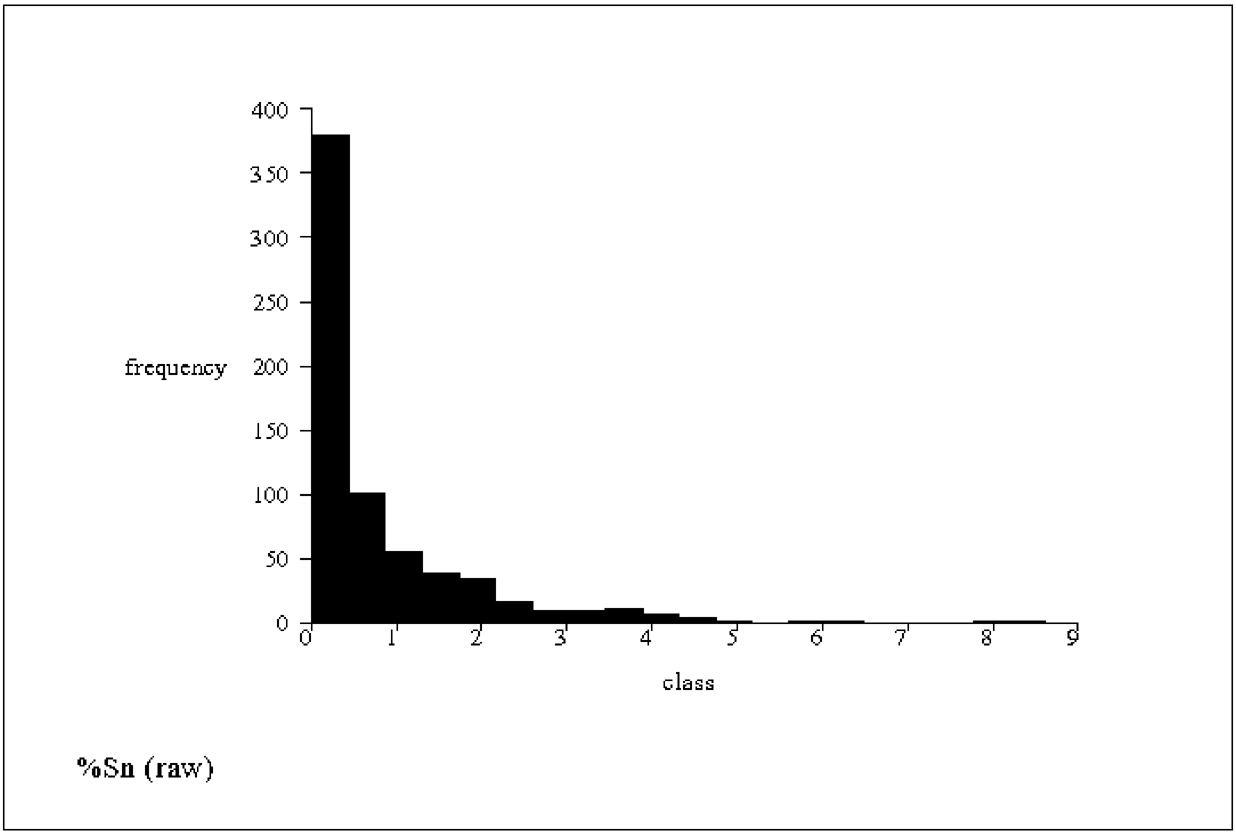



**Figure 5-2 Queen Hill composited assays – %Sn histogram.**

***(queen_hill_comps1.str)***

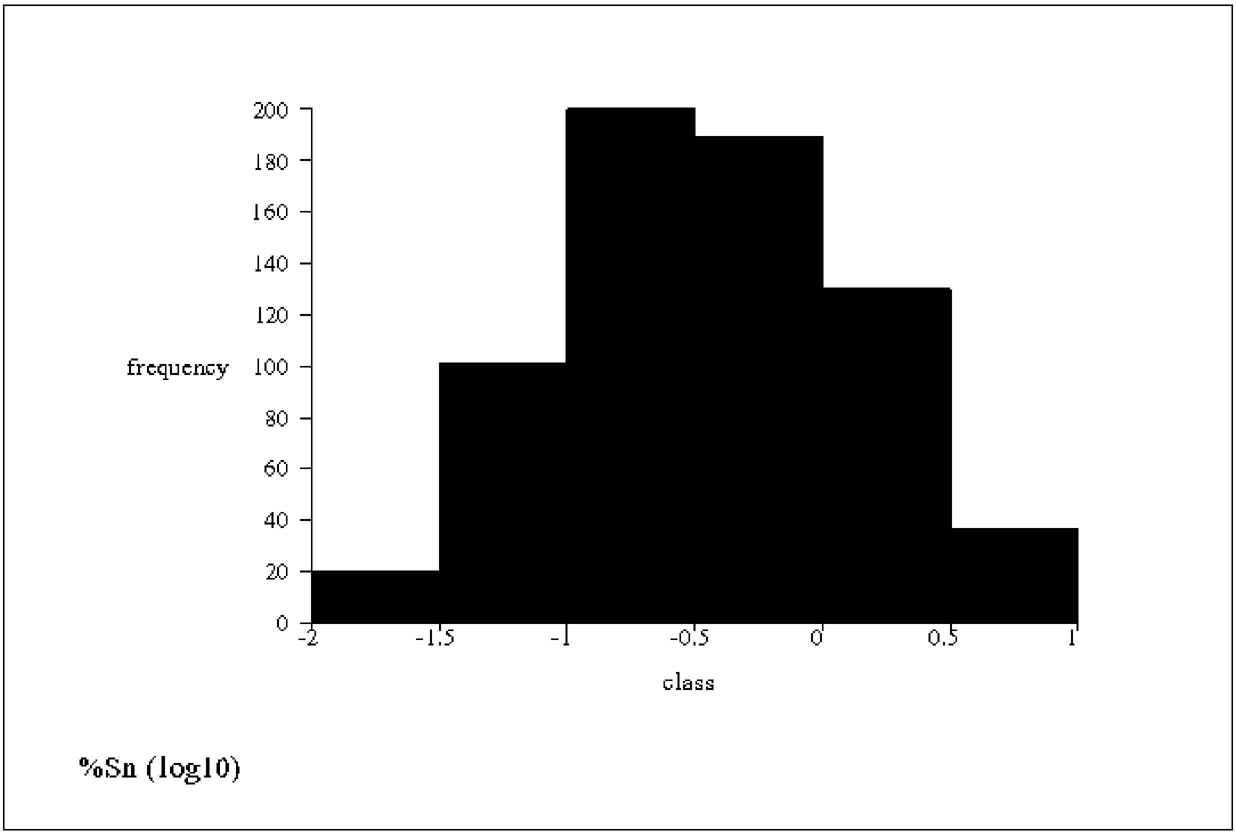



**Figure 5-3 Queen Hill composited assays – $\log_{10}$(%Sn) histogram.**
***(queen_hill_comps1.str)***

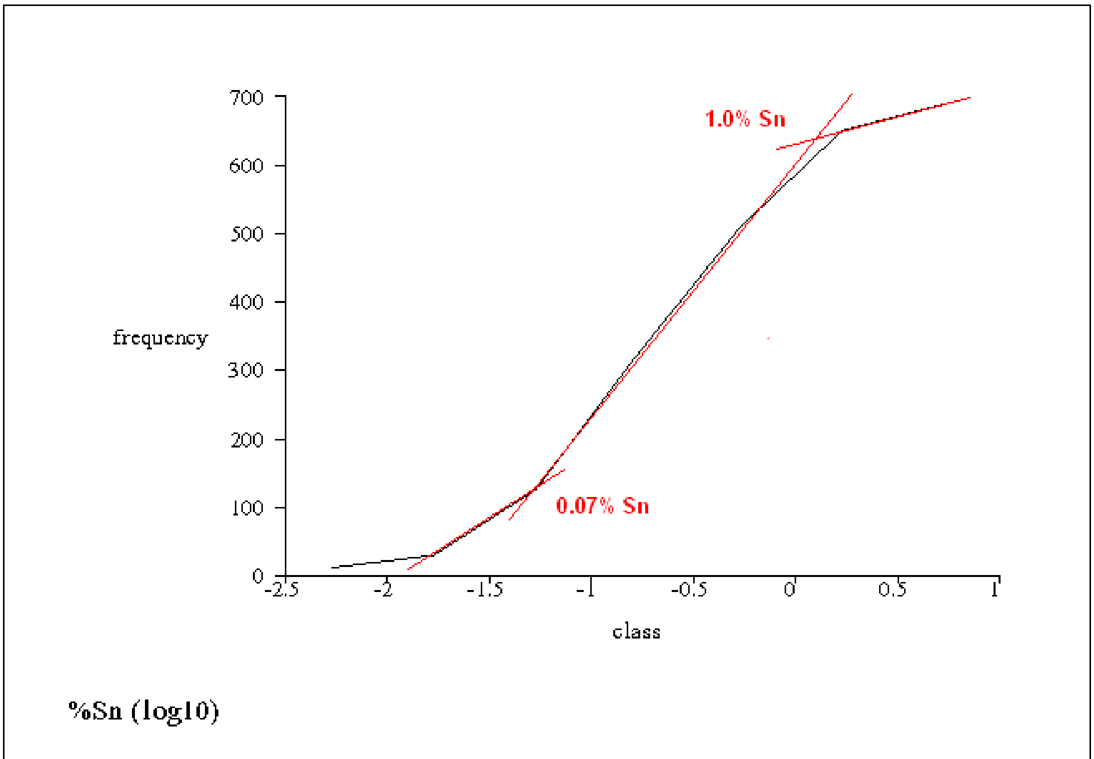



**Figure 5-4 Queen Hill composited assays – %Sn log probability plot.**
***(queen_hill_comps1.str)***

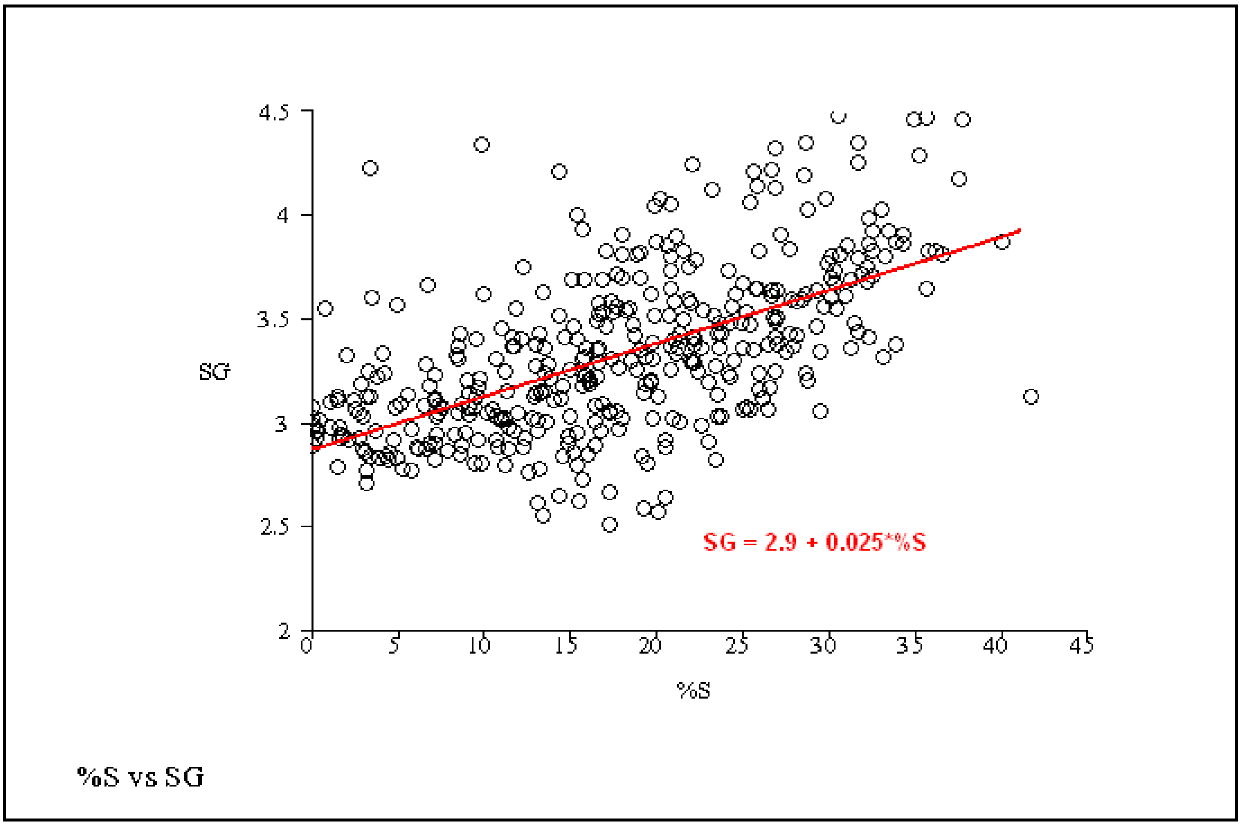



**Figure 5-5 Queen Hill composited assays – specific gravity vs %S**
***(queen_hill_comps1.str)***

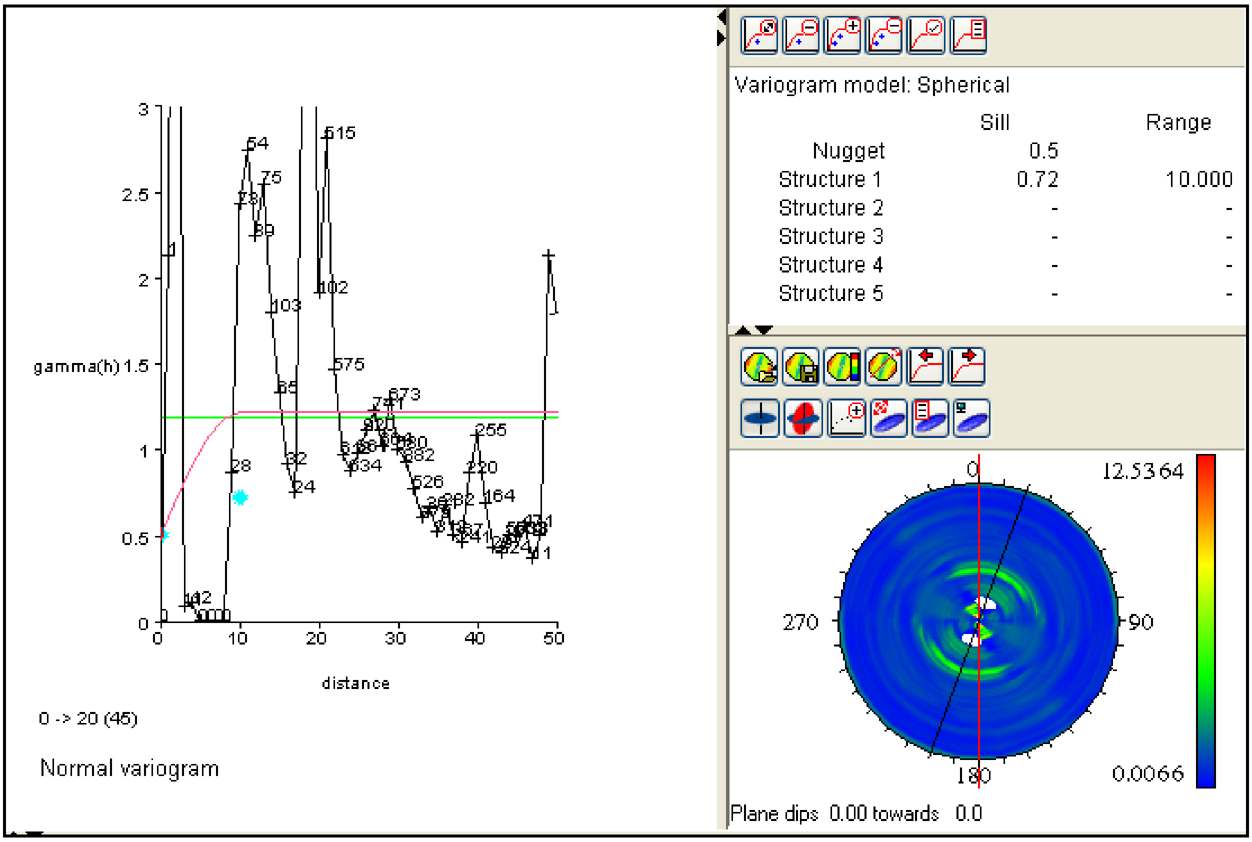



**Figure 5-6 Queen Hill variogram and variogram map in the horizontal plane**

### 5.1.2 Zeehan Montana Statistics

All assays used for the estimate of the Mineral Resources of the Zeehan Montana mineralisation came from sampling of diamond drill core. The diamond drilling intercepts into the Severn mineralisation which were used are listed in Table 2.3.

The length weighted average grade of the raw Sn assays of the intercepts was 1.05% Sn (see Table 2.3.).

A histogram of the sample lengths of the raw assays showed that most assays were taken over lengths of 1.0m (see Figure 5-7). Consequently, all samples were composited to 1.0m in length.

The average grade of the composited Sn assays was 1.06% Sn (see Table 5-2) which is in good agreement with the length weighted average grade of the raw Sn assays which was 1.05% Sn (see Table 2.3).

A histogram of the composited Sn assays was skewed to the left. A histogram of log10(%Sn) was more symmetrical, given the low number of samples involved, and suggested that the Sn assays are log-normally distributed (see Fig 5.10 ).

A log-probability plot for the composited %Sn assays had inflection points at about 0.08% Sn and 3.0% Sn indicating that more than one population of Sn assays has been included in the data (see Figure 5-10).

The average specific gravity of the samples was 3.2 gm/cm$^3$. A plot of specific gravity vs %S shows very good straight line correlation between the two values (see ). The equation to the straight line is:

$$\text{specific gravity} = 3.5 + 0.03 * \%S$$

At present, the sample data are too sparse to allow for useful variography.

**Table 5-2 Zeehan Montana composited assays – basic statistics *(montana_comps1.str)***

| | average | minimum | maximum | variance | no of samples |
|---|---|---|---|---|---|
| **%Sn** | 1.06 | 0.01 | 9.21 | 2.41 | 71 |
| **ppm Soluble Sn** | 187 | 1 | 400 | 10883 | 10 |
| **ppm Cu** | 182 | 10 | 1000 | 40706 | 71 |
| **ppm Pb** | 12472 | 100 | 199000 | - | 64 |
| **%S** | 17.9 | 0.85 | 29.7 | 54.6 | 13 |
| **SG** | 3.87 | 2.92 | 4.36 | 0.097 | 21 |

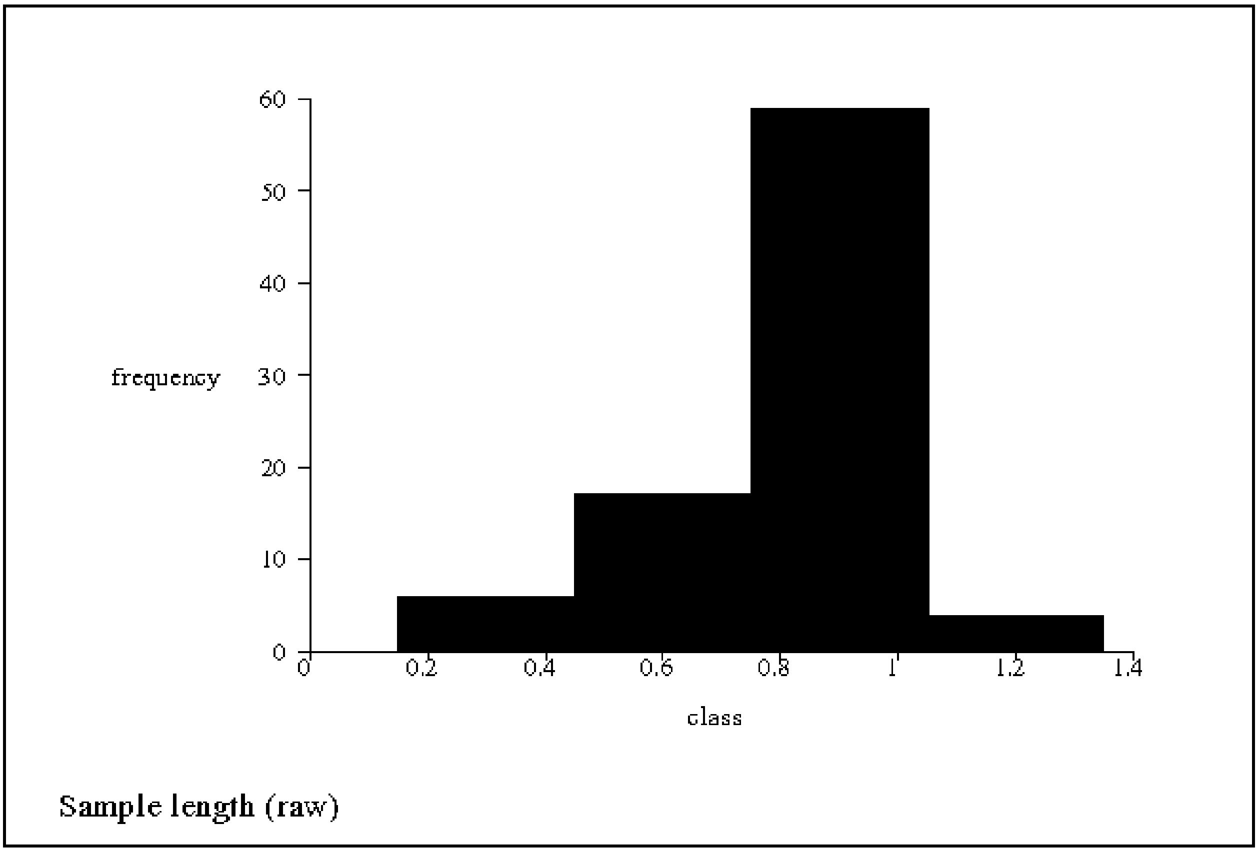



**Figure 5-7 Montana raw assays – histogram of sample lengths.**
***(montana_assays1.str)***

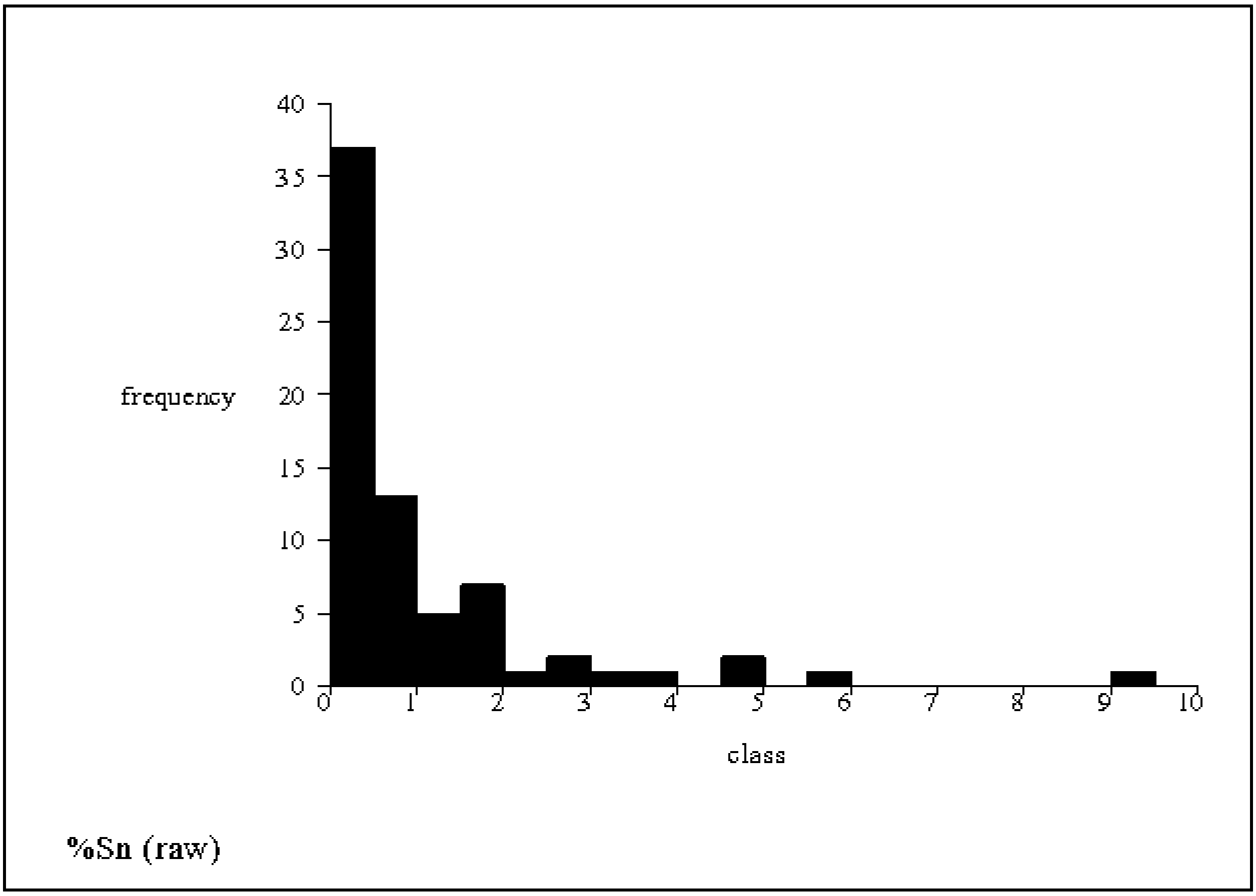



**Figure 5-8 Zeehan Montana composited assays – %Sn histogram. (montana_comps1.str)**

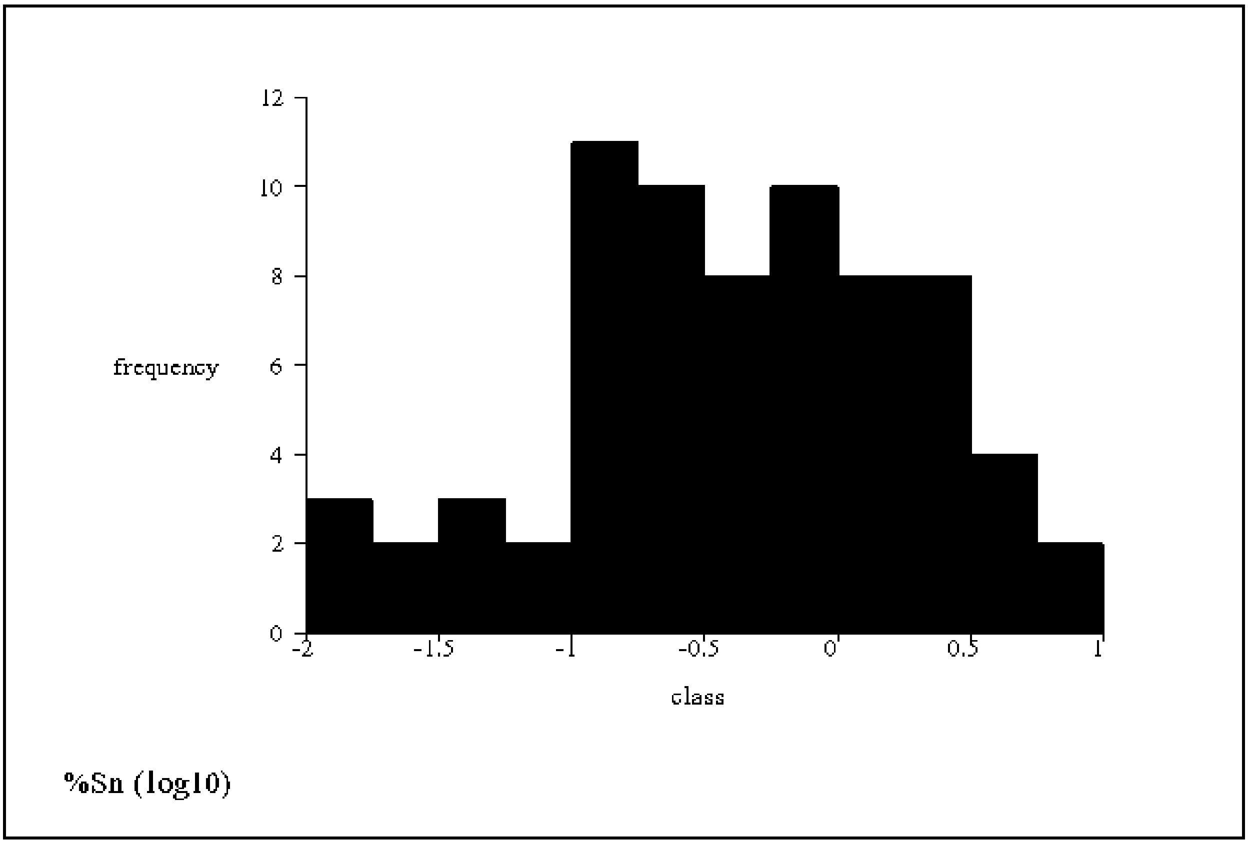



**Figure 5-9 Zeehan Montana composited assays – log10(%Sn) histogram.**
***(montana_comps1.str)***

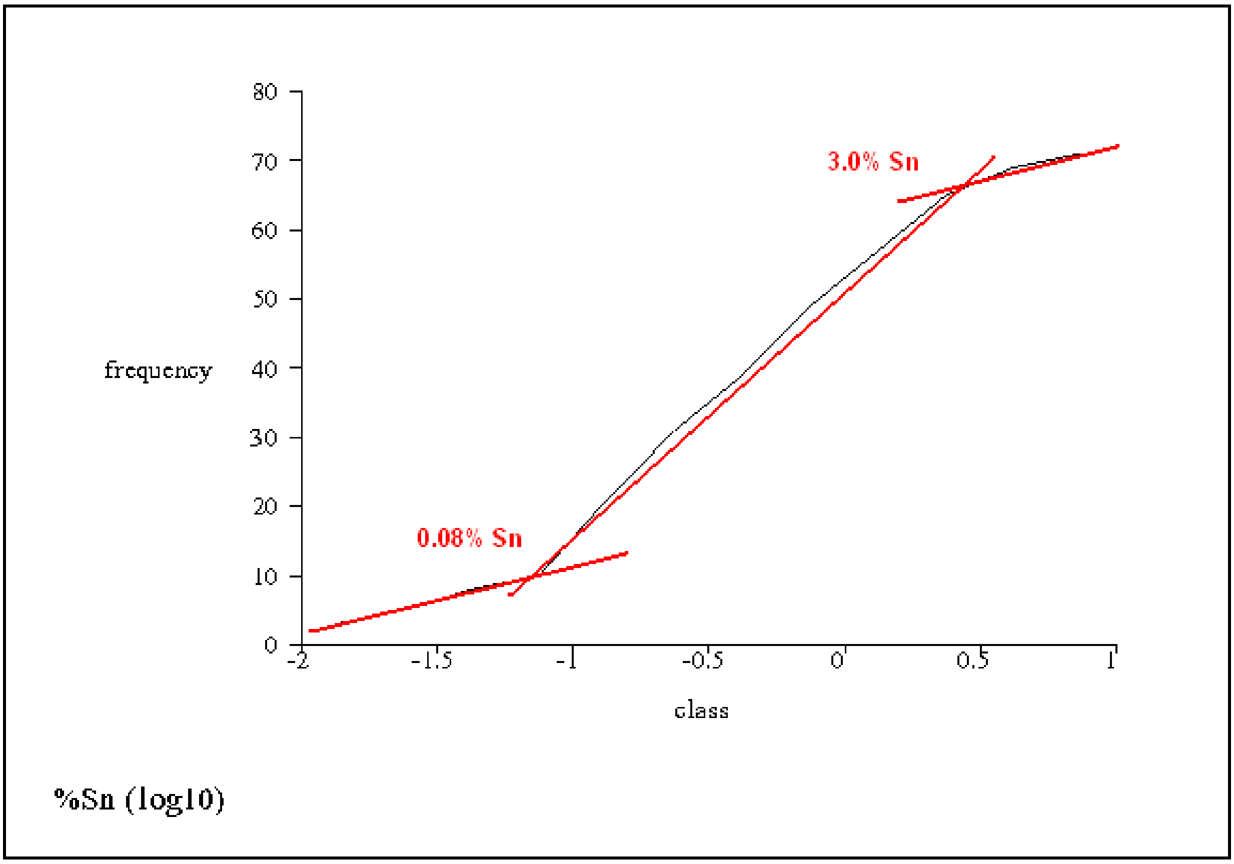



**Figure 5-10 Zeehan Montana composited assays – %Sn log probability plot.**
***(montana_comps1.str)***

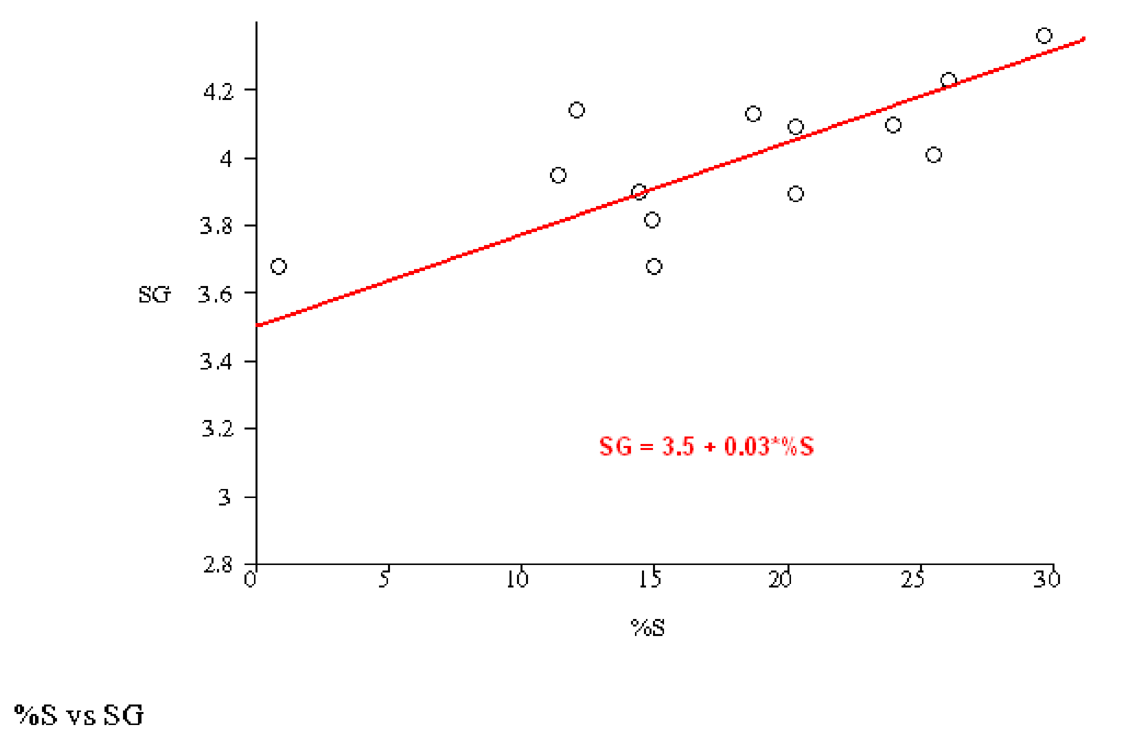



**Figure 5-11 Zeehan Montana composited assays – specific gravity vs %S.**

***(montana_comps1.str)***

### 5.1.3 Severn Statistics

All assays used for the estimate of the Mineral Resources of the Severn mineralisation came from sampling of diamond drill core. The diamond drilling intercepts into the Severn mineralisation which were used are listed in Table 2-4.

The length weighted average grade of the raw Sn assays of the intercepts was 0.53% Sn (see Table 2-4).

A histogram of the sample lengths of the raw assays showed that most assays were taken over lengths of 1.0m (see Figure 5-12). Consequently, all samples were composited to 1.0m in length.

The average grade of the composited Sn assays was 0.53% Sn (see

Table 5-3) which is in very good agreement with the length weighted average grade of the raw Sn assays which was also 0.53% Sn (see Table 2-4).

A histogram of the composited Sn assays was skewed to the left (see Figure 5-13). A histogram of log10(%Sn) was symmetrical and suggested that the Sn assays are log-normally distributed (see Figure 5-14).

A log-probability plot for the composited %Sn assays had inflection points at about 0.07% Sn and 0.8% Sn, however, more data is required to be definitive. Nevertheless, there are indications that more than one population of Sn assays has been included in the data set and implying that, if the assay populations are spatially discrete, there may be the possibility of selectively defining the populations (see Figure 5-15).

The average specific gravity of the samples was 3.2 gm/cm$^3$. A plot of specific gravity vs %S shows very good straight line correlation between the two values (see Figure 5-16). The equation to the straight line is:

$$\text{specific gravity} = 2.9 + 0.04 * \%S$$

A down-hole %Sn variogram had a nugget of 0.4 and a sill at 0.86, that is, the nugget effect accounted for about 45% of the variance. This level of nugget effect is typical of the style of cassiterite deposit at Severn. The range of the nested spherical model fitted to the variogram was 23.0m. (See Figure 5-17).

At present, the sample data are too widely spaced to allow for useful variography.

**Table 5-3 Severn composited assays – basic statistics *(severn_comps1.str)***

| | average | minimum | maximum | variance | no of samples |
|---|---|---|---|---|---|
| **%Sn** | 0.53 | 0.01 | 7.16 | 0.79 | 283 |
| **ppm Soluble Sn** | 175 | 1 | 1039 | 24674 | 81 |
| **ppm Cu** | 393418 | 10 | 2550 | 175324 | 160 |
| **ppm Pb** | 356 | 5 | 19000 | - | 95 |
| **%S** | 7.2 | 0.1 | 34.0 | 43.2 | 100 |
| **SG** | 3.21 | 2.77 | 4.30 | 0.061 | 92 |

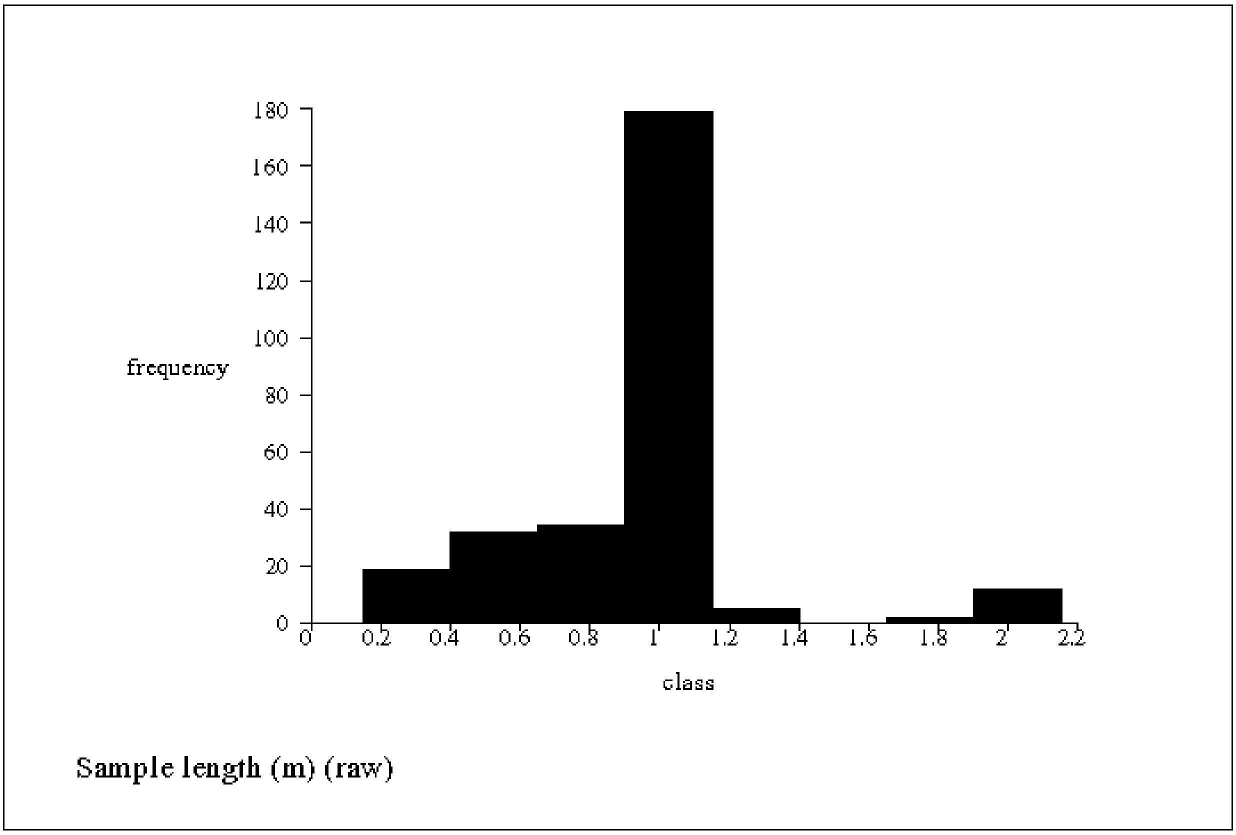



**Figure 5-12 Severn raw assays – histogram of sample lengths.**
***(severn_assays1.str)***

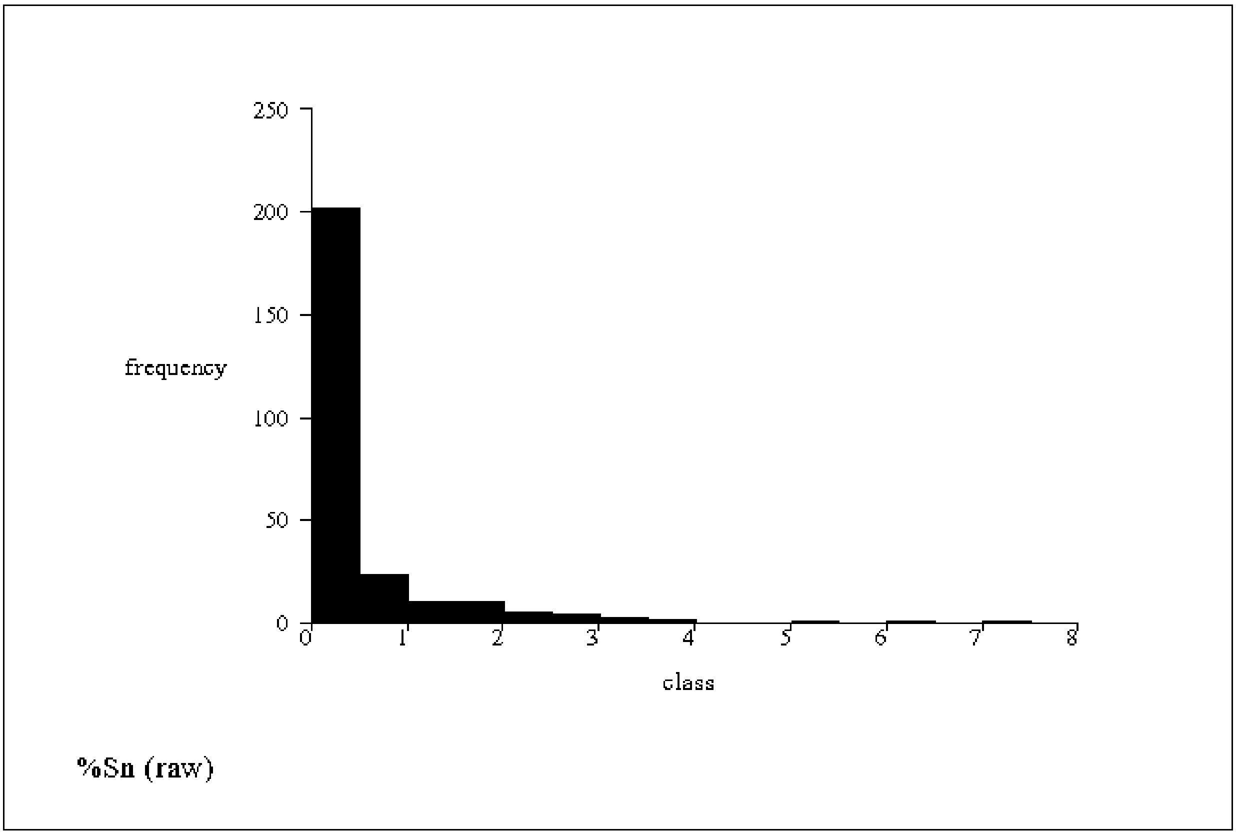



**Figure 5-13 Severn composited assays – %Sn histogram.**

***(severn_comps1.str)***

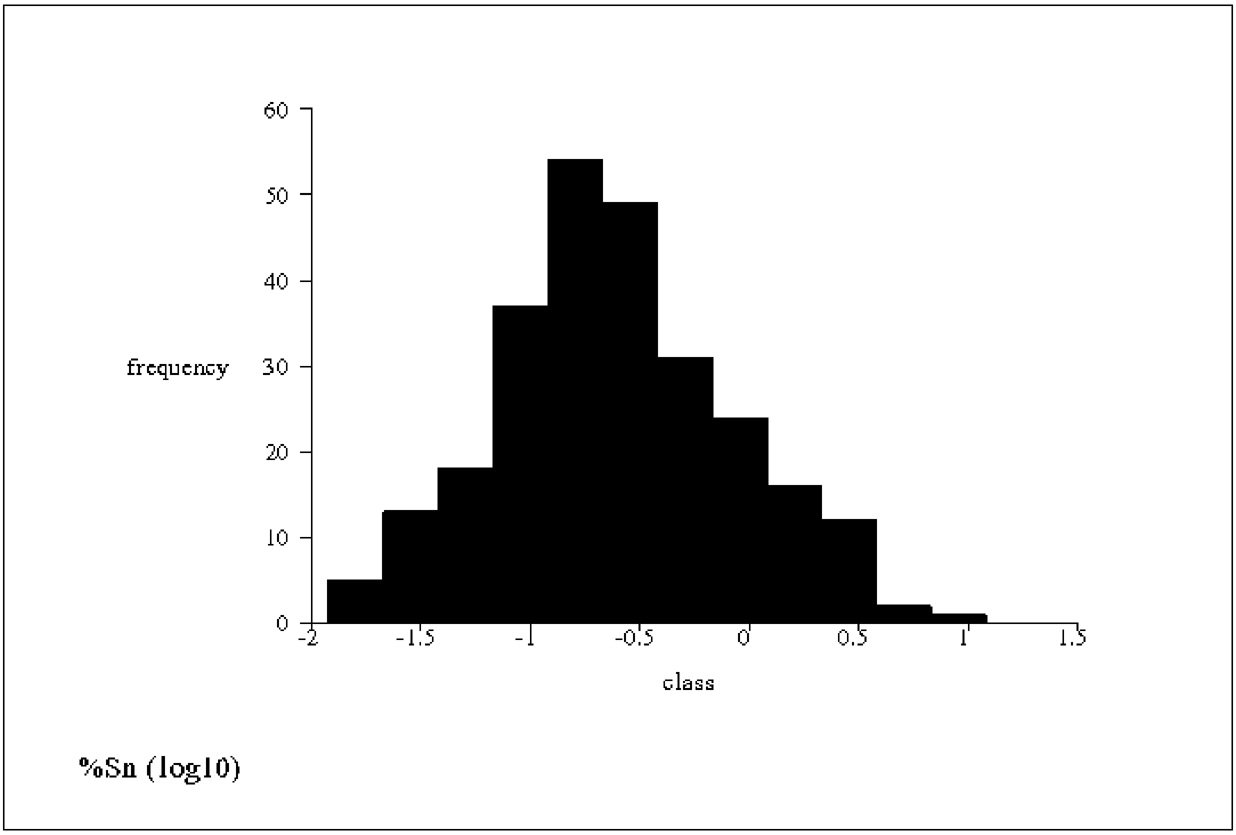



**Figure 5-14 Severn composited assays – $\log_{10}$(%Sn) histogram.**

***(severn_comps1.str)***

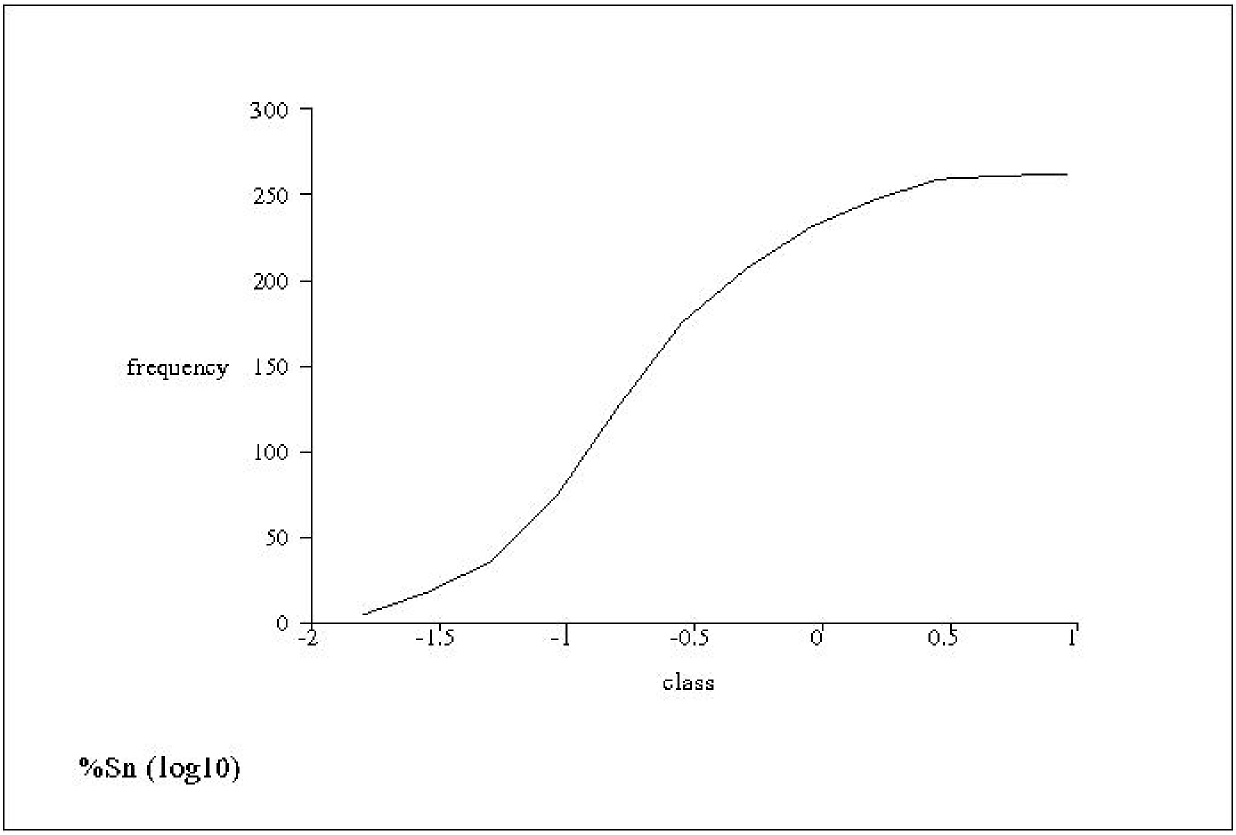



**Figure 5-15 Severn composited assays – %Sn log probability plot. (severn_comps1.str)**

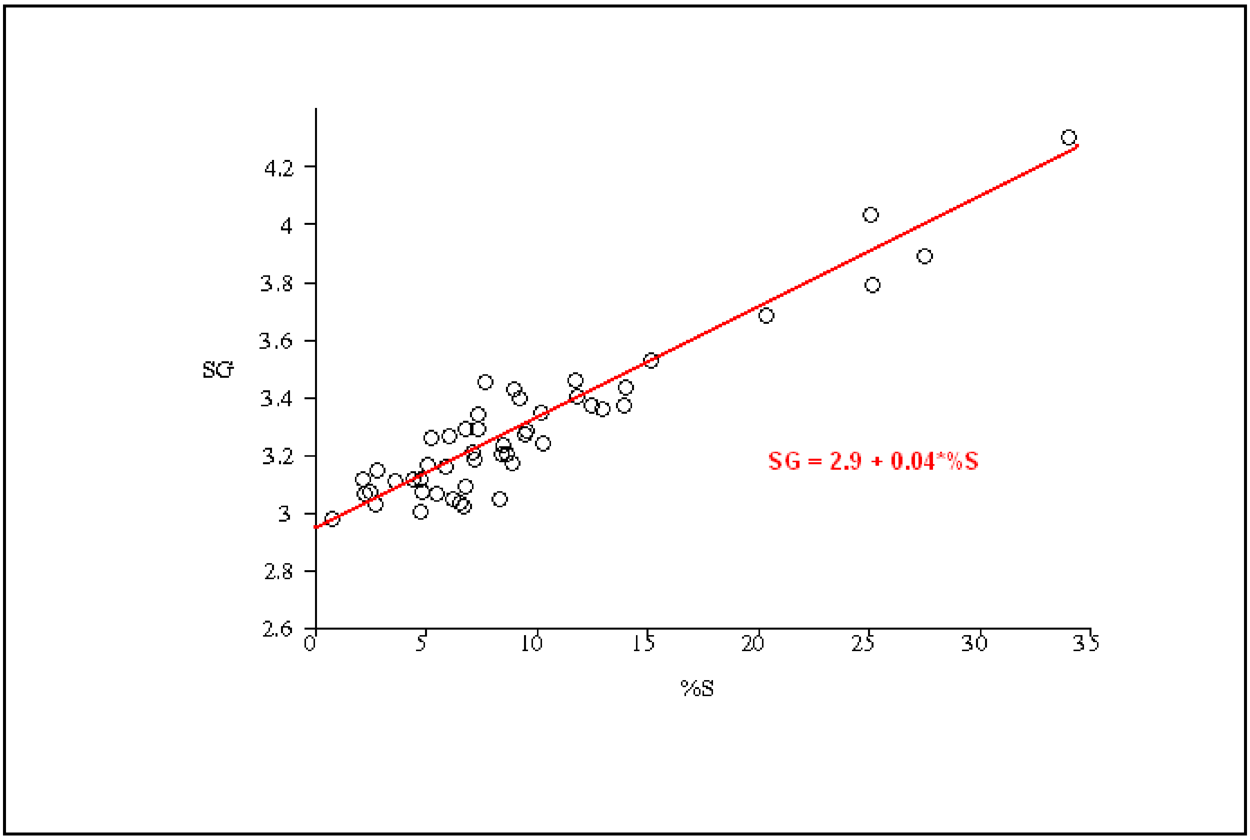



**Figure 5-16 Severn composited assays – specific gravity vs %S**

***(severn_comps1.str)***

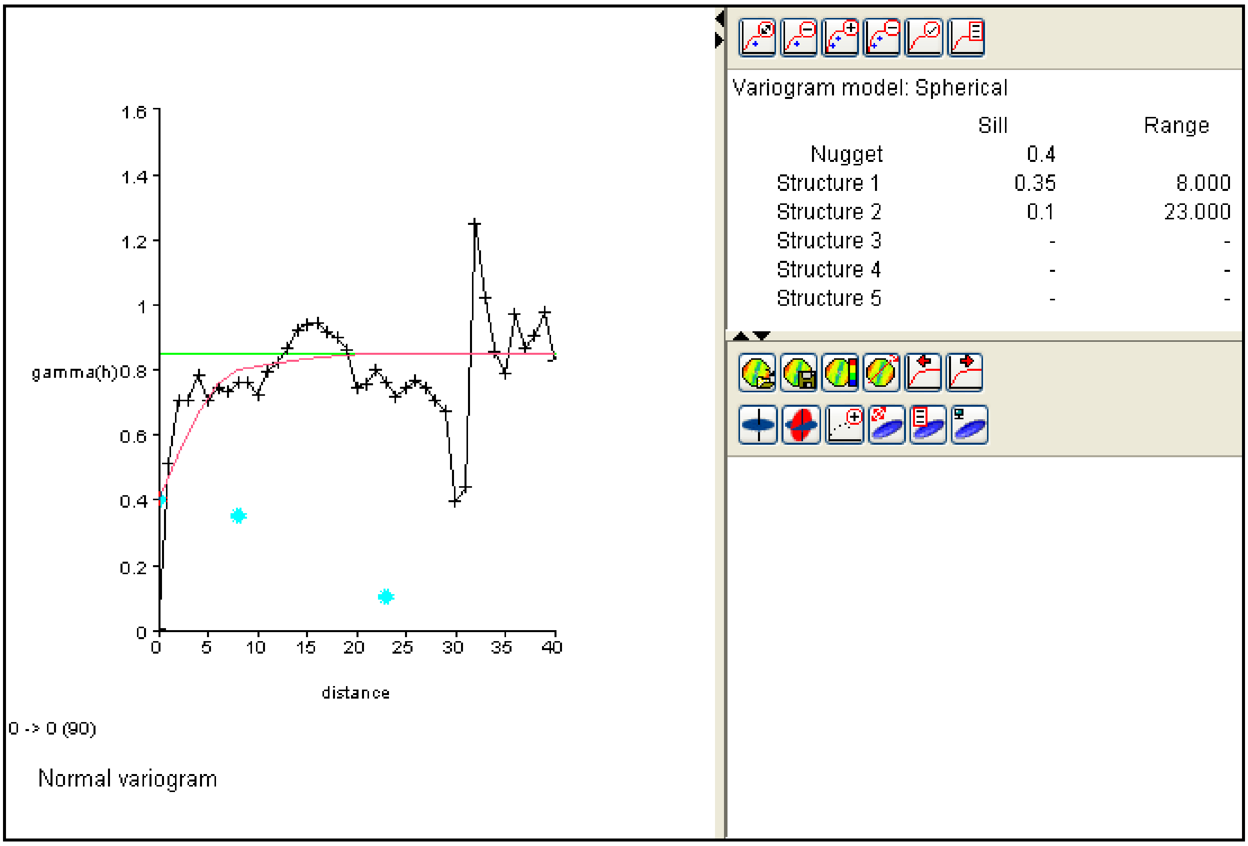



**Figure 5-17 Severn composited assays – %Sn down hole variogram (severn_comps1.str)**

## 5.2 Global Resource Estimates

### 5.2.1 Wireframes and Block Model Extents

Wireframes of the surface topography and of the Queen Hill, Zeehan Montana and Severn mineralisation were devised during interpretation of the geology. The wireframes were in Surpac format and were named:

- Topography contours.str/dtm
- Queen Hill queen_hill_sections2.str/dtm
- Zeehan Montana montana_sections1.str/dtm
- Severn severn_paynes_fault1.str/d

Block models were created using Surpac software. The block model extents and block dimensions are listed in Table 5-4. the block dimensions were appropriate given the shape and thickness of the mineralisation being modelled. The block size used was 10m X 10m X 10m and no sub-splitting was allowed.

**Table 5-4 Block model extents *(mozp1104.mdl)***

| Direction | Minimum | Maximum | Block size |
|---|---|---|---|
| X | 360,500m E | 361,300m E | 10m |
| Y | 5,361,400m N | 5,362,200m N | 10m |
| Z | 600m RL | 1,300m RL | 10m |

### 5.2.2 Queen Hill Global Resource

The wireframe of the Queen Hill mineralisation had a volume of 986,369m$^3$.

The volume of the blocks in the block model which represented the Queen Hill mineralisation was 989,000m$^3$ which is in good agreement with the volume of the wireframe.

In the block model, the density of rock outside the interpreted mineralisation was set at 2.7 tonnes/m$^3$; this was a reasonable general estimate given the range of rock types involved including quartzite, shale/slate, volcaniclastic and dolomite.

The density of the Queen Hill mineralisation was interpolated into the block model based %S assays using the relationship described above for specific gravity (see 5.1.1 Queen Hill Statistics and Figure 5-5). ). Given the generally massive state of the mineralisation, that is, the mineralisation is not porous and does not generally contain cavities, this was reasonable. The equation used was:

$$\text{bulk density} = 2.9 + 0.025{*}\%S$$

For blocks of mineralisation which had no S grade interpolated, the density was set at 3.3 tonnes/m$^3$.

All tonnage estimates are in dry tonnes.

S grades were interpolated into the blocks using an inverse distance squared method with a search radius of 50m.

Given the lack of definitive variography, it was not possible to interpolate Sn grades by Ordinary Kriging or any other geostatistically based technique, so Sn grades were interpolated into the block model using an inverse distance squared method with a 50m search radius using Surpac software.

Using a 50m search radius, there were just under 10% uninformed blocks in the block model:

- Informed blocks 894,000m$^3$
- Uninformed blocks 95,000m$^3$

Uninformed blocks are blocks which are more than 50m from a sample.

The global resource represented by the informed blocks was 2,948,000 tonnes at 0.78% Sn. There was good agreement between the average block model Sn grade of the global resource, the length weighted average Sn grade of the raw samples within the Queen Hill mineralisation, and the average Sn grade of the composited samples used for the interpolation (see 5.1.1 Queen Hill Statistics):

- Average block model Sn grade of global resource 0.78% Sn
- Length weighted average grade of raw samples 0.79% Sn
- Average grade of the composited samples 0.80% Sn

### 5.2.3 Zeehan Montana Global Resource

The wireframe of the Zeehan Montana mineralisation had a volume of 134,618$m^3$.

The volume of the blocks in the block model which represented the Zeehan Montana mineralisation was 139,000$m^3$ which is in good agreement with the volume of the wireframe.

In the block model, the density of rock outside the interpreted mineralisation was set at 2.7 tonnes/$m^3$; this was a reasonable general estimate given the range of rock types involved including quartzite, shale/slate, volcaniclastic and dolomite.

The density of Zeehan Montana mineralisation was interpolated into the block model based %S assays using the relationship described above for specific gravity (and. ). Given the generally massive state of the mineralisation, that is, the mineralisation is not porous and does not generally contain cavities, this was reasonable. The equation used was:

$$\text{bulk density} = 3.5 + 0.03*\%S$$

For blocks of mineralisation which had no S grade interpolated, the density was set at 3.9 tonnes/$m^3$.

All tonnage estimates are in dry tonnes.

S grades were interpolated into the blocks using an inverse distance squared method with a search radius of 50m.

Given the lack of definitive variography, it was not possible to interpolate Sn grades by Ordinary Kriging or any other geostatistically based technique, so Sn grades were interpolated into the block model using an inverse distance squared method with a search radius of 50m using Surpac software.

Using a 50m search radius there were under 5% uninformed blocks in the block model:

- Informed blocks 133,000$m^3$
- Uninformed blocks 6,000$m^3$

Uninformed blocks are blocks which are more than 50m from a sample.

The global resource represented by the informed blocks was 355,000 tonnes at 1.23% Sn. There was reasonable agreement between the average block model Sn grade of the global resource and the length weighted average Sn grade of the raw samples within the Zeehan Montana interpreted mineralisation, and the average Sn grade of the composited samples used for the interpolation (see ):

- Average block model Sn grade of Global resource 1.23% Sn
- Length weighted average grade of raw samples 1.05% Sn
- Average grade of the composited samples 1.06% Sn

The somewhat higher grade of the block model suggests that there is some clustering of the drill hole samples in a low grade part of the mineralisation.

### 5.2.4 Severn Global Resource

The wireframe of the Severn mineralisation had a volume of 2,742,805$m^3$.

The volume of the blocks in the block model which represented the Severn mineralisation was 2,707,000$m^3$ which is in good agreement with the volume of the wireframe.

In the block model, the density of rock outside the interpreted mineralisation was set at 2.7 tonnes/$m^3$; this was a reasonable general estimate given the range of rock types involved including quartzite, shale/slate, volcaniclastic and dolomite.

The density of Severn mineralisation was interpolated into the block model based %S assays using the relationship described above for specific gravity (see 5.1.3 Severn Statistics and Figure 5-16). Given the generally massive state of the mineralisation, that is, the mineralisation is not porous and does not generally contain cavities, this was reasonable. The equation used was:

$$\text{bulk density} = 2.9 + 0.04*\%S$$

For blocks of mineralisation which had no S grade interpolated, the density was set at 3.2 tonnes/$m^3$.

All tonnage estimates are in dry tonnes.

S grades were interpolated into the blocks using an inverse distance squared method with a search radius of 50m.

Given the lack of definitive variography, it was not possible to interpolate Sn grades by Ordinary Kriging or any other geostatistically based technique, so Sn grades were interpolated into the block model using an inverse distance squared method with a search radius of 100m using Surpac software.

Using a 100m search radius, there were just under 8% uninformed blocks in the block model:

- Informed blocks 2,492,000$m^3$
- Uninformed blocks 215,000$m^3$

Uninformed blocks are blocks which are more than 50m from a sample. The global resource represented by the informed blocks was 7,682,000 tonnes at 0.53% Sn. There was good agreement between the average block model Sn grade of the global resource, the length weighted average Sn grade of the raw samples within the Queen Hill mineralisation, and the average Sn grade of the composited samples used for the interpolation:

- Average block model Sn grade of Global resource 0.53% Sn
- Length weighted average grade of raw samples 0.55% Sn
- Average grade of the composited samples 0.55% Sn

#### 5.2.5 Previous Estimates

Previous estimates of the resources at Queen Hill, Zeehan Montana and Severn were made by Aberfoyle. These estimates were made prior to the introduction of the JORC Code and were not reported in accordance with the Code. The Code is not prescriptive about how resource or reserve estimates should be made but does prescribe how the estimates should be reported. Unfortunately, it is not possible to prepare a report of the older estimates, not because the estimates may be unreliable, but because it is not possible to ensure that such a report is transparent. The JORC Code defines transparency as:

> "Transparency requires that the reader of a Public Report is provided with sufficient information, the presentation of which is clear and unambiguous, to understand the report and is not misled." (JORC Code)

Because the old estimates cannot be reported in accordance with the JORC Code they are not mentioned in this report.

### 5.3 Mineral Resource Estimates

#### 5.3.1 Modifying Factors

A calculation of cut-off grade for the currently prevailing tin price of US$30,000 was made. The calculation is outlined in Table 5-5 together with the mining, metallurgical and realisation cost assumptions used.

The minimum block size in the block model was 10m X 10m X10m and, consequently, no minimum mining width below that block size has been applied.

The cut-off grade varies with tin price as shown in Table 5-6.

For this report, the Mineral Resources have been quoted at the cut-off grade calculated from a tin price of US$30,000 which was 0.6% Sn.

**Table 5-5 Mineral Resource – cut off grade calculation**

| Parameter | Value | Unit | Source |
|---|---|---|---|
| **Assumptions** | | | |
| Tin price US$ | 30,000 | US$ / tonne | London Metal exchange cash price 10 February 2011 |
| Exchange rate | 1.01 | US$ / A$1 | Reserve Bank of Australia 10 February 2011. |
| Realisation costs rate | 10 | % | Author's estimate based on Lewis, 1993. |
| Mining recovery | 90 | % | Author's estimate |
| Mill recovery | 65 | % | Author's estimate |
| Operating cost | 100 | A$ / tonne processed | Author's estimate |
| **Calculation** | | | |
| Tin price $A | 29,703 | A$ / tonne | = Tin price US$ / Exchange rate |
| Realisation costs | 2,970 | A$ / tonne | = Tin price A$ * Realisation costs rate |
| Gate price | 26,733 | A$ / tonne | = Tin price A$ - Realisation costs |
| Operating cost per tonne processed | 100 | A$ / tonne | Assumption above |
| Operating cost per tonne of resource mined | 100 | A$ / tonne | = Operating cost per tonne processed |
| Operating cost per tonne of resource in ground | 111 | A$ / tonne | = Operating cost per tonne of resource mined / Mining recovery |
| Cut-off grade | 0.6 | % Sn | = Operating cost per tonne of resource in ground / (gate price * mill recovery) |

**Table 5-6 Tin prices and cut-off grades**

| Tin price US$ per tonne | Resource Cut-off grade %Sn |
|---|---|
| $30,000 | 0.6 |
| $25,000 | 0.8 |
| $20,000 | 1.0 |

### 5.3.2 Mineral Resources

The grade-tonnage information for the **Queen Hill** global resource is listed in Table 5-7.

The Queen Hill Mineral Resource estimate was based on intercepts in 40 diamond drill holes (see Table 2-2 and Figure 2-5).

Hole spacing ranges from a few metres to over 50 metres and there are parts of the mineralisation where no holes have yet been drilled. The geological interpretation has been described above (2.2.3 Geological Interpretation). At the scale of the geological interpretation made, there is reasonable structural continuity from cross-section to cross-section and down-dip on each cross-section.

Grades were interpolated into the block model of the mineralisation using a 50m search radius (see 5.2.2 Queen Hill Global Resource) so those areas more than 50m from a drill were not included in the resource estimates.

The grade continuity is similar to that in other similar tin deposits. Although variography which would be useful for grade interpolation has not been possible, the nugget effect in the down-hole variogram which was prepared accounts for about 40% of the variance (see Figure 5-6). All intercepts contained some tin and most, significant tin (see Table 2-2).

Given the reasonable structural continuity, the apparent grade continuity and the number of intercepts, the Queen Hill Mineral Resource has been classified as Indicated:

> 21. An 'Indicated Mineral Resource' is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a reasonable level of confidence. It is based on exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are too widely or inappropriately spaced to confirm geological and/or grade continuity but are spaced closely enough for continuity to be assumed.

***(JORC Code)***

The Indicated Mineral Resource at Queen Hill, based on a 0.6% Sn cut-off grade is 1,600,000 tonnes at 1.2% Sn.

The grade-tonnage information for the **Zeehan Montana** global resource is listed in Table 5-8 .

The Zeehan Montana Mineral Resource estimate was based on intercepts in 7 diamond drill holes on two sections only (see Table 2-3 and Figure 2-6).

Hole spacing ranges from about 40 metres to over 100 metres. The geological interpretation has been described above (2.2.3 Geological Interpretation). There are too few intersections of the mineralisation to ensure that the apparent structural continuity in the interpretation is real.

Based on the grades of the intercepts of the mineralisation alone, there appears to be reasonable grade continuity within the interpreted mineralisation. All intercepts of mineralisation contained some tin and most, significant tin (see ).

Grades were interpolated into the block model of the mineralisation using a 50m search radius (see) so only a small area of the interpreted mineralisation which is more than 50m from a drill hole was not included in the resource estimates.

Given the reasonable structural continuity, the apparent grade continuity but taking into account the number of intercepts of the mineralisation and the need to elucidate the structure of the mineralisation, the Zeehan Montana Mineral Resource has been classified as Inferred:

> 20. An 'Inferred Mineral Resource' is that part of a Mineral Resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and assumed but not verified geological and/or grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability.

***(JORC Code)***

The Inferred Mineral Resource at Zeehan Montana, based on a 0.6% Sn cut-off grade is 360,000 tonnes at 1.6% Sn.

**The grade-tonnage information for the** Severn **global resource is listed in Table 5-9.**

Table 5-9The Severn Mineral Resource estimate was based on intercepts in 10 diamond drill holes (see Table 2-4 and Figure 2-7.

Hole spacing ranges from a few metres to over 150 metres and there are parts of the mineralisation where no holes have yet been drilled. The geological interpretation has been described above (2.2.3 Geological Interpretation). At the scale of the geological interpretation made, there is apparent structural continuity from cross-section to cross-section and down-dip on each cross-section.

Grades were interpolated into the block model of the mineralisation using a 50m search radius (see 5.2.4 Severn Global Resource) so those areas more than 50m from a drill hole which have not yet been drilled were not included in the resource estimates.

The grade continuity appears similar to grade continuity in other similar tin deposits. Although variography which would be useful for grade interpolation has not been possible, the nugget effect in the down-hole variogram which was prepared accounts for about 40% of the variance (see Figure 5-17). All intercepts contained some tin and most, significant tin (see Table 2-1).

Given the apparent structural continuity, the apparent grade continuity and the number of intercepts the Queen Hill Mineral Resource has been classified as Inferred:

> 20. **An 'Inferred Mineral Resource' is that part of a Mineral Resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and assumed but not verified geological and/or grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability.**

***(JORC Code)***

The Inferred Mineral Resource at Severn, based on a 0.6% Sn cut-off grade is 2,400,000 tonnes at 0.9% Sn.

**Table 5-7 Queen Hill global resource – grade-tonnage information *(queen_hill_gt_information.xls)***

| Cut-off grade %Sn | Tonnes above Cut-off grade | Grade above cut-off grade %Sn |
|---|---|---|
| **0.0** | 2,948,009 | 0.78 |
| **0.1** | 2,925,528 | 0.79 |
| **0.2** | 2,749,912 | 0.83 |
| **0.3** | 2,405,117 | 0.91 |
| **0.4** | 2,091,022 | 1.00 |
| **0.5** | 1,758,719 | 1.10 |
| **0.6** | **1,563,510** | **1.17** |
| **0.7** | 1,323,445 | 1.27 |
| **0.8** | 1,166,218 | 1.34 |
| **0.9** | 921,359 | 1.47 |
| **1.0** | 775,486 | 1.56 |
| **1.1** | 677,524 | 1.64 |
| **1.2** | 567,136 | 1.74 |
| **1.3** | 475,625 | 1.83 |
| **1.4** | 415,180 | 1.90 |
| **1.5** | 374,536 | 1.95 |
| **1.6** | 311,469 | 2.03 |
| **1.7** | 274,419 | 2.08 |
| **1.8** | 241,088 | 2.13 |
| **1.9** | 200,480 | 2.19 |
| **2.0** | 154,444 | 2.26 |
| **2.1** | 95,539 | 2.39 |
| **2.2** | 82,394 | 2.43 |
| **2.3** | 46,562 | 2.58 |
| **2.4** | 30,062 | 2.68 |
| **2.5** | 19,689 | 2.81 |
| **2.6** | 9,734 | 3.09 |
| **2.7** | 6,441 | 3.31 |
| **2.8** | 6,441 | 3.31 |
| **2.9** | 3,108 | 3.74 |
| **3.7** | 3,108 | 3.74 |

**Table 5-8 Zeehan Montana global resource – grade-tonnage information (montana_gt_information.xls)**

| Cut-off grade %Sn | Tonnes above Cut-off grade | Grade above cut-off grade %Sn |
|---|---|---|
| **0.0** | 526,019 | 1.23 |
| **0.1** | 526,019 | 1.23 |
| **0.2** | 487,019 | 1.31 |
| **0.3** | 483,119 | 1.32 |
| **0.4** | 451,030 | 1.39 |
| **0.5** | 374,102 | 1.59 |
| **0.6** | **354,471** | **1.64** |
| **0.7** | 323,271 | 1.74 |
| **0.8** | 299,871 | 1.82 |
| **0.9** | 288,171 | 1.86 |
| **1.0** | 276,471 | 1.90 |
| **1.1** | 264,771 | 1.94 |
| **1.2** | 241,371 | 2.01 |
| **1.3** | 210,171 | 2.12 |
| **1.4** | 182,871 | 2.24 |
| **1.5** | 139,971 | 2.47 |
| **1.6** | 120,471 | 2.62 |
| **1.7** | 116,571 | 2.65 |
| **1.8** | 116,571 | 2.65 |
| **1.9** | 116,571 | 2.65 |
| **2.0** | 116,571 | 2.65 |
| **2.1** | 100,562 | 2.75 |
| **2.2** | 96,542 | 2.78 |
| **2.3** | 92,530 | 2.80 |
| **2.4** | 84,493 | 2.84 |
| **2.5** | 80,494 | 2.86 |
| **2.6** | 80,494 | 2.86 |
| **2.7** | 64,450 | 2.91 |
| **2.8** | 40,341 | 3.00 |
| **2.9** | 28,268 | 3.06 |
| **3.0** | 16,177 | 3.16 |

| Cut-off grade %Sn | Tonnes above Cut-off grade | Grade above cut-off grade %Sn |
|---|---|---|
| **3.1** | 12,142 | 3.21 |
| **3.3** | 4,053 | 3.34 |

**Table 5-9 Severn global resource – grade-tonnage information**

***(severn_resource.xls, severn_gt_information.xls)***

| Cut-off grade %Sn | Tonnes above cut-off grade | Grade above cut-off grade %Sn |
|---|---|---|
| **0.0** | 7,951,416 | 0.50 |
| **0.1** | 7,575,471 | 0.52 |
| **0.2** | 6,177,744 | 0.60 |
| **0.3** | 5,196,274 | 0.68 |
| **0.4** | 4,226,489 | 0.75 |
| **0.5** | 3,503,866 | 0.81 |
| **0.6** | **2,391,235** | **0.94** |
| **0.7** | 2,233,363 | 0.96 |
| **0.8** | 2,134,284 | 0.97 |
| **0.9** | 1,445,802 | 1.02 |
| **1.0** | 600,178 | 1.15 |
| **1.1** | 413,105 | 1.19 |
| **1.2** | 72,016 | 1.40 |
| **1.3** | 29,876 | 1.66 |
| **1.4** | 17,082 | 1.90 |
| **1.5** | 13,882 | 2.01 |
| **1.6** | 10,405 | 2.15 |
| **1.7** | 6,672 | 2.42 |
| **1.8** | 6,672 | 2.42 |
| **1.9** | 6,672 | 2.42 |
| **2.0** | 6,672 | 2.42 |
| **2.1** | 6,672 | 2.42 |
| **2.2** | 3,472 | 2.71 |
| **2.3** | 3,472 | 2.71 |
| **2.4** | 3,472 | 2.71 |
| **2.5** | 3,472 | 2.71 |
| **2.6** | 3,472 | 2.71 |

| Cut-off grade %Sn | Tonnes above cut-off grade | Grade above cut-off grade %Sn |
|---|---|---|
| **2.7** | 3,472 | 2.71 |

## 5.4 Audits and Reviews

There have been no audits or reviews of Mineral Resource estimates for the mineralisation at Queen Hill, Zeehan Montana or Severn.

# 6 PROPOSED DRILLING

## 6.1 Proposed drilling

### 6.1.1 Introduction

The Mineral Resource at Queen Hill is currently classified as Indicated but also requires further drilling to allow detailed mining studies to be undertaken.

The Mineral Resource at Zeehan Montana is currently classified as Inferred and requires further drilling to confirm the current geological interpretation and to allow upgrading of the resource classification to Indicated so that more reliable mining studies can be undertaken.

The Mineral Resource at Severn is currently classified as Inferred and requires further drilling to confirm the current geological interpretation and to allow upgrading of the resource classification to Indicated so that more reliable mining studies can be undertaken.

In addition, there are six obvious potential areas for increasing the known resources:

- Inside the interpreted Queen Hill mineralisation.
- Beyond the interpreted Queen Hill mineralisation.
- Beyond the interpreted Zeehan Montana mineralisation.
- Inside the interpreted Severn mineralisation.
- Beyond the interpreted Severn mineralisation.

The areas which appear the most prospective are:

- Inside the interpreted Queen Hill mineralisation.
- Beyond the interpreted Queen Hill mineralisation.
- Beyond the Zeehan Montana mineralisation
- Inside the interpreted Severn mineralisation.

### 6.1.2 Inside the interpreted Queen Hill mineralisation

The geological interpretation of the Queen Hill deposit includes parts of the mineralisation which have not been drilled (see Figure 1-2). These parts of the interpretation were not included in the grade modelling or resource estimates and, consequently, uninformed blocks in the block model of the Queen Hill mineralisation accounted for about 10% of the volume of the wireframe of the interpreted mineralisation (see 5.2.2 Queen Hill Global Resource).

Drilling to confirm the geological interpretation at Queen Hill and to maintain an Indicated classification for Mineral Resources would require holes on about 50m centres (see 5.3.2 Mineral Resources) and such targets are suggested in Figure 6-1.

Nominal lengths for the suggested holes are listed in Table 6-1.

### 6.1.3 Beyond the interpreted Queen Hill mineralisation

The interpreted Queen Hill mineralisation is open to the north, south and down-dip. Of these, the possibility of a northern extension provides the primary target. The most northerly intersection to date was in G52 which intersected 7.3m down-hole at 0.89% Sn just short of 5,362,000N.

North of 5,362,000N there are results of geophysical surveys which suggest that the Queen Hill mineralisation continues to the north, for example, there are IP anomalies north of Queen Hill and Stormsdown but west of Zeehan Montana which suggest this (see Young, 1979 and Figure 6-3). Three holes are suggested to test beyond the interpreted mineralisation at about 1100m RL on lines coincident with the IP lines, that is along 5,362,100N, 5,362,250N and 5,362,400N. The nominal lengths of these holes are listed in Table 6-2.

## 6.2 Beyond the Interpreted Zeehan Montana Mineralisation

No drilling should be planned at Zeehan Montana until a review of all the existing data has been made with a view to confirming the current geological interpretation. Surface mapping and sampling may help to elucidate the interpretation.

## 6.3 Inside the Interpreted Severn Mineralisation

The geological interpretation of the Severn deposit includes parts of the mineralisation which have not been drilled (see. These parts of the interpretation were not included in the grade modelling or resource estimates and, consequently, uninformed blocks in the block model of the Severn mineralisation accounted for over 50% of the volume of the wireframe of the interpreted mineralisation (see 5.2.4 Severn Global Resource).

Drilling is required to confirm the current geological interpretation and to allow upgrading of the resource classification from Inferred to Indicated.

At present, it would appear that drilling to achieve an Indicated classification for Mineral Resources would require holes on about 50m centres (see 5.3.2 Mineral Resources). However, this would require many holes and, in the first instance, it suggested that holes on a more open pattern be drilled to enable closer spaced drilling to be efficiently focused later. These targets are shown in Figure 6-2.

Nominal lengths for the suggested holes are listed in Table 6-3.

## 6.4 Ranking Priorities for the Proposed Drill Targets

The drill targets were categorised using the following criteria:

- Metallurgical amenability: the simpler the anticipated metallurgical process and the higher the anticipated tin recovery the better: 2 or 1.
- Potential to increase the resource base: the potential to increase the tonnage in the resource base: 3 - high, 2 - medium, 1 - low.
- Potential to increase resource confidence: the potential to increase confidence in the resource classification or to increase confidence in the estimation of the grade of the resource: 3 - high, 2 - medium, 1 - low.

- Ranking for depth of hole: shallower holes are ranked above deeper holes: 3 – holes to 300m, 2 – holes deeper than 300m but shallower than 350m, 1 – holes deeper than 350m.

**Table 6-1 Inside Queen Hill – suggested diamond drill holes.**
**Refer to Figure 6-1.**

| Hole number | Length m | Priority for target | | | | |
|---|---|---|---|---|---|---|
| | | Ranking for metallurgical amenability | Ranking for potential to increase size of resource base | Ranking for potential to increase resource confidence | Ranking for depth of hole | Overall ranking |
| A | 325 | 1 | 2 | 2 | 2 | 8 |
| B | 300 | 1 | 1 | 2 | 3 | 6 |
| C | 325 | 1 | 1 | 2 | 2 | 4 |
| D | 325 | 1 | 1 | 2 | 2 | 4 |
| E | 350 | 1 | 1 | 2 | 1 | 2 |
| F | 300 | 1 | 1 | 2 | 3 | 6 |
| G | 300 | 1 | 1 | 2 | 3 | 6 |
| H | 325 | 1 | 1 | 2 | 2 | 4 |
| I | 325 | 1 | 1 | 2 | 2 | 4 |
| J | 350 | 1 | 1 | 2 | 1 | 2 |
| K | 325 | 1 | 3 | 2 | 2 | 12 |
| **Sub-total** | **3,550** | | | | | |

**Table 6-2 Beyond Queen Hill to the north – suggested diamond drill holes.**

| Hole number | Length m | Priority for target | | | | |
|---|---|---|---|---|---|---|
| | | Ranking for metallurgical amenability | Ranking for potential to increase resource base | Ranking for potential to increase resource confidence | Ranking for Depth of hole | Overall Ranking |
| L | 350 | 1 | 3 | 3 | 1 | 9 |
| M | 350 | 1 | 3 | 3 | 1 | 9 |
| N | 350 | 1 | 3 | 3 | 1 | 9 |
| **Sub-total** | **1,050** | | | | | |

**Table 6-3 Inside Severn – suggested diamond drill holes.**

**Refer to Figure 6-2.**

| Hole number | Length m | Priority for target | | | | |
|---|---|---|---|---|---|---|
| | | Ranking for metallurgical amenability | Ranking for potential to increase size of resource base | Ranking for potential to increase resource confidence | Ranking for Depth of hole | Overall Ranking |
| O | 350 | 2 | 1 | 3 | 1 | 6 |
| P | 300 | 2 | 1 | 3 | 3 | 18 |
| Q | 400 | 2 | 1 | 3 | 1 | 6 |
| R | 425 | 2 | 1 | 3 | 1 | 6 |
| S | 400 | 2 | 2 | 3 | 1 | 12 |
| T | 450 | 2 | 1 | 3 | 1 | 6 |
| U | 425 | 2 | 1 | 3 | 1 | 6 |
| **Sub-total** | **2,750** | | | | | |

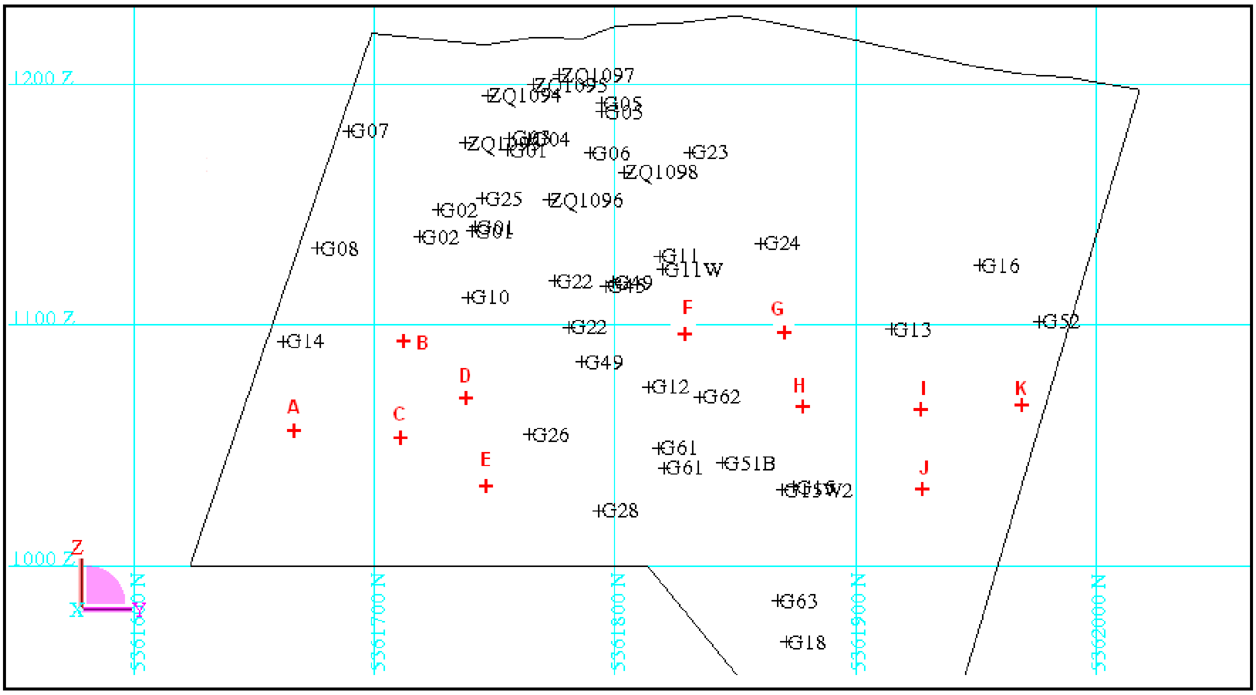



**Figure 6-1** **Queen Hill deposit – longitudinal projection showing distribution of diamond drill hole intercepts and suggested drilling targets.**

**Holes G33 and G34 plot just off the bottom of the figure below G18.**

***(queen_hill_intercepts1.str)***

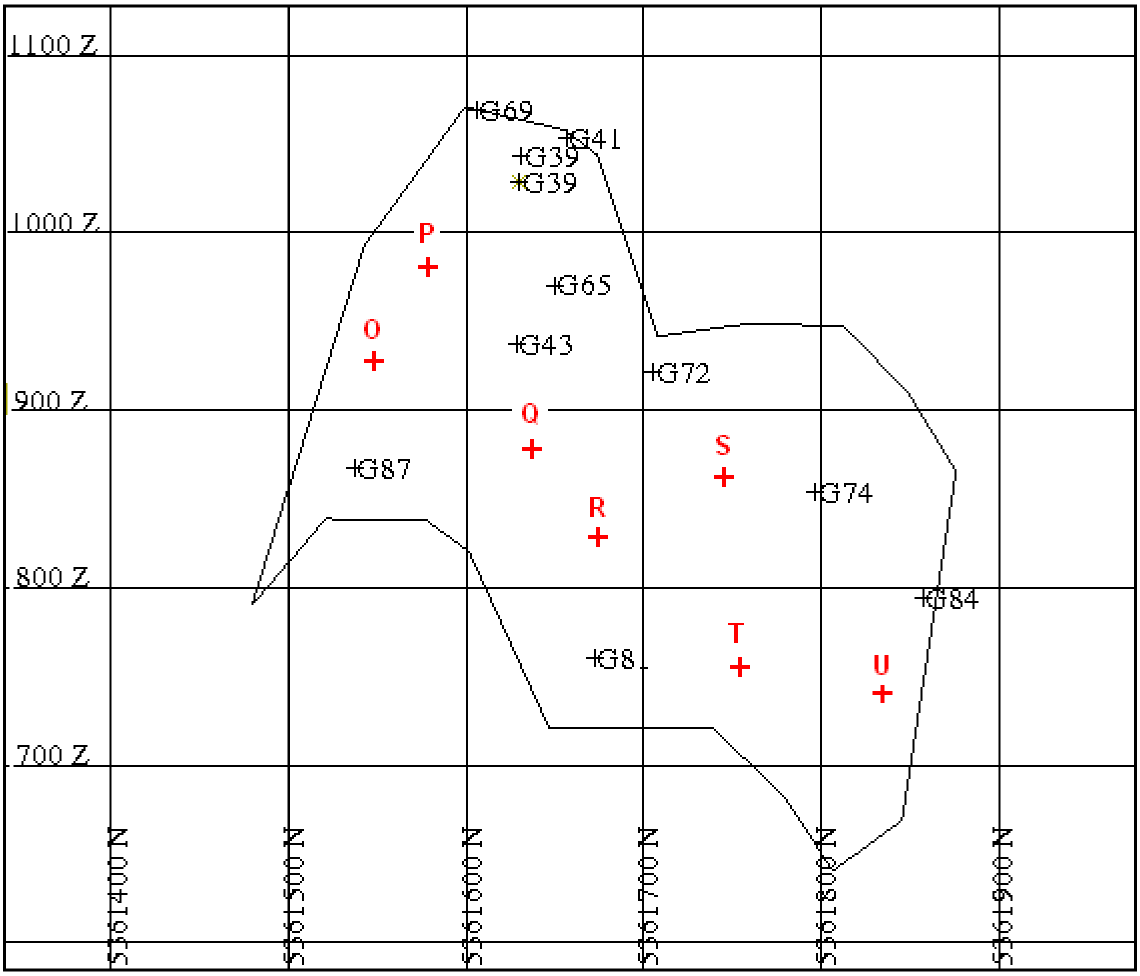



**Figure 6-2 Severn deposit – longitudinal projection showing distribution of diamond drill hole intercepts and suggested drilling targets.**

***(severn_intercepts1.str)***

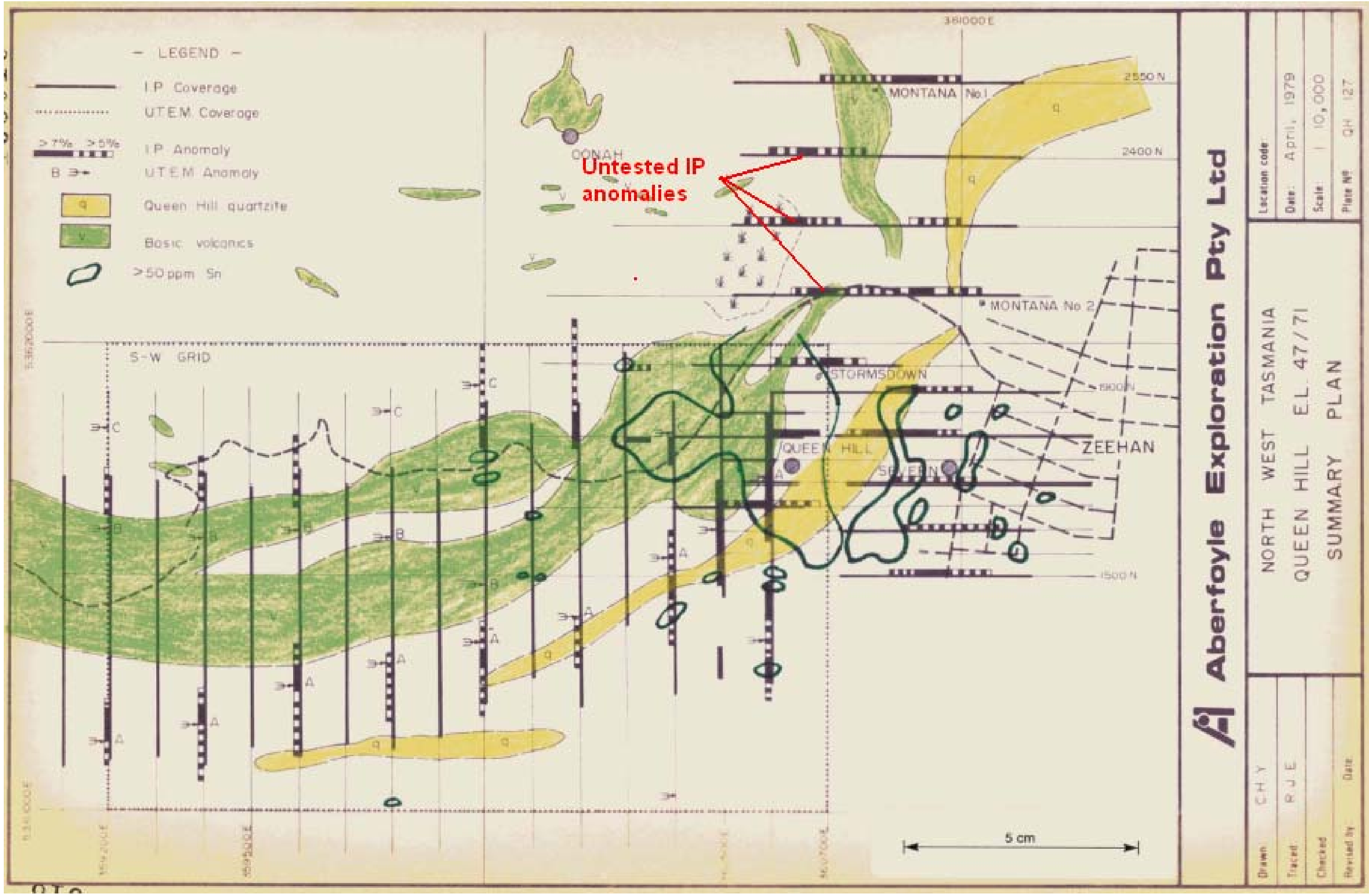



**Figure 6-3 Queen Hill area – IP results**

***(79-1362)***

# 7 JORC CRITERIA

The criteria nominated in the JORC Code are listed in Table 7-1.

**Table 7-1 Criteria in JORC Code**

| **Sampling Techniques and Data** | |
|---|---|
| Drill sample recovery. | 4.3.5 Core Recovery |
| Logging. | 4.3.6 Core Logging |
| Sub-sampling techniques and sample preparation. | 4.3.7 Assays |
| Quality of assay data and laboratory tests. | 4.3.7 Assays |
| Verification of sampling and assaying. | 4.3.7 Assays |
| Location of data points. | 4.3.3 Diamond Drill Hole Surveys |
| Data spacing and Distribution. | 2.2.3 Geological Interpretation |
| Orientation of data in relation to geological structure | 2.2.3 Geological Interpretation |
| Audits or reviews. | 4.4 Database Audits and Reviews |
| **Estimation and Reporting of Mineral Resources** | |
| Database integrity. | 4 DATABASE |
| Geological interpretation. | 2.2.3 Geological Interpretation |
| Dimensions. | 2.2.3 Geological Interpretation |
| Estimation and modelling techniques. | 5.2 Global Resource Estimates |
| Moisture. | 5.2.2 Queen Hill Global Resource<br>5.2.3 Zeehan Montana Global Resource<br>5.2.4 Severn Global Resource |
| Cut-off parameters. | 5.3.1 Modifying Factors |
| Mining factors or assumptions. | 5.3.1 Modifying Factors |
| Metallurgical factors or assumptions. | 5.3.1 Modifying Factors |

| Sampling Techniques and Data | |
|---|---|
| Bulk density. | 5.2.2 Queen Hill Global Resource<br>5.2.3 Zeehan Montana Global Resource<br>5.2.4 Severn Global Resource |
| Classification. | 5.3.2 Mineral Resources |
| Audits or reviews. | 5.4 Audits and Reviews |
| Discussion of relative accuracy/confidence | 5.3.2 Mineral Resources |

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# Appendix A
## Grid Conventions in Tasmania

http://www.utas.edu.au/spatial/locations/spadatum.html

# Locations in Tasmania

**A guide to map grid references, latitude/longitude, datums, GPS use and other basics of spatial data**

Introduction

Locations from maps

UTM system

UTM grid references

Latitude/ longitude

**Datums**

Conversions

The King Island problem

## Datums

The latitude/longitude system and the UTM system of grid lines are anchored to the real Earth in a very complicated way. The anchoring is based on an array of fixed points with known locations, plus a mathematical model of the Earth's shape.

The standard anchoring arrangement adopted around Australia in 1966 is called the **Australian Geodetic Datum 1966**, or **AGD66** for short. Maps based on this standard use the Australian Map Grid 1966, or AMG66. Until recently, all the gridded maps produced by the Tasmanian government used AMG66.

A different standard was recently adopted. It's called the **Geocentric Datum for Australia**, or **GDA94**, or **GDA**. The map grid based on GDA94, called the Map Grid of Australia 1994, or MGA94, is shifted by about 200 m relative to the AMG66 map grid. Tasmanian maps produced since 2003 have the new map grid.

# Appendix B
## Petrological Descriptions of Mineralised Intersections of Queen Hill Mineralisation

### Index to petrological descriptions of mineralised intersections of Queen Hill mineralisation

| Hole No | Depth from m | Depth to m | Intercept length m | Grade %Sn | Petrological Description | |
|---|---|---|---|---|---|---|
| | | | | | Depth m | Reference |
| **G01** | 39.32 | 77.42 | 38.1 | 1.69 | - | |
| **G01** | 103.43 | 107.59 | 4.16 | 0.36 | - | |
| **G01** | 107.9 | 108.97 | 1.07 | 0.25 | - | |
| **G02** | 88.09 | 88.7 | 0.61 | 0.16 | - | |
| **G02** | 99.36 | 107.9 | 8.54 | 0.49 | - | |
| **G03** | 65.84 | 85.95 | 20.11 | 1.98 | - | |
| **G04** | 69.49 | 82.91 | 13.42 | 1.81 | 75.2 | 80-1423 |
| **G05** | 56.69 | 59.13 | 2.44 | 2.10 | - | |
| **G05** | 59.44 | 64.01 | 4.57 | 0.40 | - | |
| **G06** | 66.45 | 85.65 | 19.2 | 0.52 | 84.4 | 80-1423 |
| **G07** | 78.94 | 82.91 | 3.97 | 0.29 | - | |
| **G08** | 116.43 | 122.83 | 6.4 | 0.24 | - | |
| **G10** | 171.3 | 184.1 | 12.8 | 0.39 | - | |
| **G11** | 140.82 | 162 | 21.18 | 0.46 | - | |
| **Hole No** | **Depth from m** | **Depth to m** | **Intercept length m** | **Grade %Sn** | **Petrological Description** | |
| | | | | | **Depth m** | **Reference** |
| **G11W** | 143.87 | 171.6 | 27.73 | 0.60 | - | |
| **G12** | 168.86 | 228.3 | 59.44 | 1.12 | - | |
| **G13** | 196.9 | 203.61 | 6.71 | 0.80 | 197.5 | 80-1412 |
| **G14** | 192.02 | 203.91 | 11.89 | 0.27 | - | |
| **G15** | 234.09 | 263 | 28.91 | 0.56 | - | |
| **G15W2** | 237.78 | 249.15 | 11.37 | 0.23 | - | |
| **G16** | 114.6 | 118.87 | 4.27 | 0.30 | - | |
| **G18** | 291.08 | 303.28 | 12.2 | 1.11 | 300.0 | 80-1412 |

| Hole No | Depth from m | Depth to m | Intercept length m | Grade %Sn | Petrological Description | |
|---|---|---|---|---|---|---|
| | | | | | Depth m | Reference |
| **G22** | 184.4 | 206.04 | 21.64 | 0.25 | - | |
| **G22** | 206.65 | 236.83 | 30.18 | 0.52 | - | |
| **G23** | 106.22 | 113.69 | 7.47 | 0.38 | - | |
| **G24** | 145.71 | 156.27 | 10.56 | 0.50 | - | |
| **G25** | 147 | 149 | 2.0 | 0.12 | - | |
| **G26** | 233 | 264 | 31.0 | 1.56 | - | |
| **G28** | 245.5 | 247.9 | 2.4 | 0.37 | - | |
| **G33** | 349.67 | 352.18 | 2.51 | 0.83 | - | |
| **G34B** | 336.57 | 338.75 | 2.18 | 2.17 | - | |
| **G45** | 173.75 | 195.75 | 22.0 | 0.19 | 194.3 | 80-1412 |
| | | | | | 195.75 | 80-1412 |
| **G49** | 115.35 | 160.8 | 45.45 | 0.56 | 130.1 | 80-1412 |
| | | | | | 134.5 | 80-1412 |
| | | | | | 1384 | 80-1412 |
| | | | | | 150.3 | 80-1412 |
| **G49** | 173.4 | 201.4 | 28.0 | 0.43 | - | |

| Hole No | Depth from m | Depth to m | Intercept length m | Grade %Sn | Petrological Description | |
|---|---|---|---|---|---|---|
| | | | | | Depth m | Reference |
| **G51B** | 217.5 | 255.5 | 38.0 | 0.73 | 230.3 | 80-1412 |
| | | | | | 240.2 | 80-1412 |
| | | | | | 242.1 | 80-1412 |
| **G52** | 133.2 | 140.5 | 7.3 | 0.89 | 133.6 | 80-1412 |
| **G61** | 222.7 | 239.85 | 17.15 | 0.95 | - | |
| **G61** | 241.2 | 242.2 | 1.0 | 0.01 | - | |
| **G62** | 200 | 255 | 55 | 0.63 | - | |
| **G63** | 286.25 | 289.4 | 3.15 | 2.40 | - | |
| **ZQ1093** | 74 | 80 | 6 | 0.69 | - | |
| **ZQ1094** | 64 | 71 | 7 | 1.23 | - | |
| **ZQ1095** | 61.55 | 62.7 | 1.15 | 0.43 | - | |
| **ZQ1096** | 85.8 | 108 | 22.2 | 0.79 | - | |
| **ZQ1097** | 53.2 | 59 | 5.8 | 0.24 | - | |
| **ZQ1098** | 95 | 106 | 11 | 0.83 | - | |

138 965 G4/75.2 m (T.S. 30544)

The available evidence suggests that this heavily sideritised rock may have been an argillite or cherty argillite; it is substantially mineralised, but the cassiterite is very fine-grained.

The bulk of the rock consists of small interlocking patches of brown, partly oxidised siderite in which subtle relict bedding is preserved. There are irregular patches of illite-sericite as aggregates of matted fine flakes with embedded quartz, passing into more quartzose patches; these are thought to represent part of the original rock, and form recognisable fragments of less severely sideritised rock in the hand specimen.

Cassiterite occurs throughout, as 5 µ to 40 µ grains, sometimes as zones of loosely-aggregated grains, traversing the bedding. As before, cassiterite is included in all other minerals without preference.

Quartz veins cut the rock and appear to pre-date the sideritisation; they contain isolated fluorite patches. The veins are fractured, displaced and partly penetrated by siderite; it is believed that they post-date the deposition of the cassiterite.

138 966 G6/84.4 m (T.S. 30545)

A strange rock, apparently of mixed sedimentary and volcanic origin, possibly a subaqueous lava with included pockets of a clastic rock (siltstone); the rock is weakly mineralised but, significantly, the cassiterite occurs in illite-sericite patches and in late-stage siderite.

The rock consists of irregular, but generally subparallel-elongate patches of cryptocrystalline silica with bubbly/scoriaceous textures in places and with rare illite-sericite pseudomorphs after ?feldspar microphenocrysts (the illite contains cassiterite grains); these patches have diffuse boundaries. Thereare pockets of clastic material, occurring both interstitially (i.e. between silica patches) and as inclusions within silica patches; the clastic material consists of silt-sized quartz grains and relatively conspicuous detrital heavy-minerals (zircon, tourmaline, leucoxene), as well as mica flakes.

The silica patches could be of chemical rather than volcanic origin, but the bubble textures and faint flow-banding are not easily explained.

Siderite has formed, replacing illite-sericite patches and incorporating the contained cassiterite. Pyrite crystals are haphazardly scattered through the rock.

230 515 (G 13 / 197.5 m) (T.S., P.S. 29949)

The generally banded fabric of this rock, and the absence of relict minerals/textures, suggest that it is in fact a vein. Cassiterite is relatively abundant, but is fine-grained, cloudy and generally poorly-defined.

The major components are siderite, fluorite, and illite-sericite, with pyrite, quartz veinlets and cassiterite. The major minerals occur as crude, more or less subparallel bands; interlocking, fairly coarse siderite forms the bulk of the rock, with irregular small patches of colourless fluorite and aggregates of fine illite also forming more or less continuous, thinner bands. Quartz forms veins and occasional strongly banded cavity-fillings with chalcedony and fine carbonate.

The cassiterite occurs fairly haphazardly, as individual small crystals (< 50 µ) and aggregates/clusters, in siderite, fluorite and illite-sericite, though dominantly in siderite. Some of the clusters are quite extensive, forming zones of crystal-swarms, which appear to pre-date the other minerals.

Euhedral, anisotropic pyrite is the dominant sulphide; traces of pyrrhotite and chalcopyrite also occur, andpatches of stannite up to 300 µ across are associated with pyrite, embedded in siderite.

110020

**CENTRAL MINERALOGICAL SERVICES PTY. LTD.**

Date 1st November, 1979

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

| IDENTIFICATION |
|---|
| 138472 |
| Mineralised Siderite Rock |

Job No. CMS 79/10/37 Date Received: 19.10.1979

Reference Verbal request - C. Young

Sample No. 138472

Nature of Sample: D.D. Core G18 300 m

**DESCRIPTION** **SECTION No.** 29738

a. Hand Specimen:

Dark, coarsely-crystalline carbonate rock with sulphides.

b. Microscopic:

This is a very coarsely-crystalline siderite rock, containing ultrafine carbonaceous matter, as well as fluorite and coarser sulphides.

The dominant component is siderite, as coarse, but irregularly-shaped, interlocking crystals up to several millimetres in size; however, these large crystals contain relict textures indicating originally much finer material, very probably sedimentary, diagenetically recrystallized. Fluorite was introduced subsequently, partly replacing the siderite, as patches up to 5 mm across enclosing remnants of siderite (in optical continuity with unreplaced grains); the relict textures are partly preserved by the ultrafine carbon.

Very fine topaz (< 10 μ grains) has developed in siderite near the fluorite-sulphide patches, as perfectly-formed crystals, accompanied by small, doubly-terminated quartz crystals and an ultrafine, unidentified fibrous mineral (?tremolite); these minerals were detected by acid-treating the carbonate and examining the residue.

Sulphides introduced with fluorite, topaz and quartz include pyrrhotite, pyrite, and chalcopyrite; the pyrrhotite is severely altered to pyrite/marcasite. Minor magnetite accompanies the sulphides.

138 890 (T.S., P.S. 30337) G45 194.3 m

This rock resembles 138 886, and also appears to contain no cassiterite; evidence of the chert origin is clearer than in the other rock.

The major component is microcrystalline quartz, typical of crystallized chert, with patchesof slightly coarser quartz associated with carbonaceous matter; there are also irregular patches of zonally developed fibrous chalcedony, which merge into the remainder of the rock; it is believed that the chert was disturbed before lithification (ie. probably whilst in gel form), and then crystallized, in patches, to fibrous chalcedony. This mechanism of partial fluidisation and cr-ystallization best explains the various textures present.

Pyrite, in massive form and as euhedral crystals, occurs with vein quartz, fibrous-matted, ultrafine apatite and traces of fine carbonate, representing a younger phase, perhaps closely following the fluidisation-crystallization of the host rock. Other sulphides are associated with these pyrite-quartz veins and include stannite, chalcopyrite, galena, and tetrahedrite, generally as small inclusions in pyrite.

230 508 (T.S. 29877) G49 130.1 m

This is a very well-mineralised carbonate rock with fluorite and sulphides; relationships between the various minerals are somewhat confused and are far from clear.

The main mineral present is coarsely-crystalline sideritic carbonate, as interlocking plates which may have formed from smaller grains, though the evidence is much more nebulous than in previous samples. Some plates are densely crowded with fine, pale cassiterite crystals (5-40 μ), and vein-like zones of such composites occur; these appear pinkish-brown in hand specimen. More complex patches are also present in which colourless fluorite forms the host, with fine carbonate and cassiterite inclusions. The cassiterite-rich "zones" do not appear to be related to any other feature, but are cut by various veins of quartz, sericite,

and sulphides; some of these contain a dark, microgranular, (?manganiferous) carbonate. Small sphalerite grains are seen.

The evidence from this rock suggests that the original rock may have been a pyritic, carbonaceous dolomite (i.e. similar to 230505, 230507), which was sideritised and mineralised; the alternative interpretation is that the cassiterite was syngenetic in the original carbonate rock, which was recrystallized and veined to its present form.

230 509 (T.S. 29878) G49 134.5 m

This is a well-mineralised, extensively metasomatised (replaced) rock, whose present mineral assemblage is broadly similar to that of 230508.

Little of the original rock has survived, but relict patches suggest that it was a cherty mudstone or argillaceous chert; there are vague intergrowths of fine quartz and illite-sericite. Throughout the rock, shapeless patches of ultrafine quartz/fluorite intergrowths have replaced the original rock, and parts of the rock consist of large interlocking, poikiloblastic crystals of siderite, which appears to be younger than the fluorite/quartz (but may be more or less contemporaneous).

Cassiterite occurs throughout the rock as small subhedral to euhedral pale crystals (5-50 μ), and also inzones of densely clustered crystals; the textural relationships suggest that cassiterite was introduced early, probably as the first metasomatic mineral, followed by fluorite, quartz and siderite; it is embedded in all these. The distribution of the cassiterite is not specifically related to that of any of the other introduced minerals. Pyrite veins cut the rock.

The petrological evidence in this rock and the previous one, taken as a whole, suggests a Renison- or Cleveland-style metasomatic-hydrothermal mineralisation of favourable beds (chemical sediments, mainly carbonates, and ?volcanics).

230 510 (T.S. 29879) G49 138.4 m

This is a quartz-siderite rock with scattered minor sulphides and cassiterite.

Much of the quartz is microcrystalline, and it is believed that the original rock was an impure chert with minor clay (now sericite), which was partly replaced by siderite; the sulphides (sphalerite, galena, pyrite/pyrrhotite, ?chalcopyrite) in turn seem to replace the carbonate.

The cassiterite occurs as small rounded to euhedral crystals (5-50 μ), scattered fairly randomly through the rock, singly and in small clusters, embedded in all other minerals, but not preferentially in any one mineral; the inference is that it was introduced at an early stage, followed by carbonate and sulphides. It is believed that, if the original rock was a chert, it would have been fairly unreactive and impenetrable, hence less well-mineralised by cassiterite than a carbonate rock or argillite. The sulphides are closely associated with the siderite, indicating a later phase of (probably) low-temperature/ lower energy mineralisation. Perhaps the whole style of mineralisation is marginal to a more intense phase.

138 886 (T.S., P.S. 30333) G 49 150.3 m

This is a siliceous, pyritic rock composed of various forms of $SiO_2$ and pyrite cr-ystals; it shows virtually no relict features and there are no indications of volcanic material.

Much of the rock consists of microcrystalline quartz typical of cherts, and the whole rock may in fact be a chert breccia, even though breccia fabric is vague, because the other forms of $SiO_2$ have obliterated any relict features. Evidently, there were open cavities at some stage and were filled with fibrous-radiating chalcedony; patches of clear mosaic quartz also occur. Matted masses of exceedingly fine, fibrous ?apatite are present in the microcrystalline quartz.

Pyrite has formed as individual euhedral crystals and as larger masses; no other sulphides were seen. Minor fracturing has occurred, with introduction of quartz veinlets carrying carbonaceous material. No cassiterite was detected.

230 516 (G 51B / 230.3 m) (T.S., P.S. 29950)

This is a quartzose, pyritic rock with few relict features, but in places there are vague textures suggestive of a volcanic, probably tuffaceous derivation, with a bedded fabric.

The rock now consists of microcrystalline quartz, abundant granular to euhedral pyrite, and patches of ultrafine, matted-fibrous, pale tourmaline; small, colourless fluorite patches are interspersed, and there are aggregates of a ?phosphate mineral. Isolated small (< 20 μ) cassiterite crystals were detected. The vague vesicular textures preserved in quartz are accentuated by ultrafine leucoxene pigmentation.

Pyrite forms featureless patches of subhedral crystals, occasionally containing < 20 μ chalcopyrite inclusions. Rutile is relatively conspicuous and is an opaque variety (hence not identified in thin-section).

230 517 (G 51B / 240.2 m) (T.S., P.S. 29951)

This is a mineralised quartz-sericite rock, with minor pyrite and fluorite; there is little real indication of its origin, but vague bedding and clastic textures suggest a possible pyroclastic derivation, taking into account the present composition.

The main components are pseudomorphous and irregular aggregates of fine sericite and microcrystalline quartz, both separate and intergrown; these aggregates are bedded, and could represent altered volcanic material. Fluorite and apatite patches are randomly scattered through the rock, and small euhedral pyrite crystals occur sporadically.

Cassiterite is well-defined, as good euhedral crystals, 5 µ to 80 µ in size, as individuals and clusters, forming vague zones more or less along the general bedding-orientation; the cassiterite is unrelated to the younger siderite-quartz veinlets, though these also tend to run more or less in the same orientation. It would seem that cassiterite, pyrite, fluorite and apatite were introduced when the rock was sericitised.

In polished section it is seen that some of the cassiterite is associated and intergrown with rutile. Pyrite occurs as scattered small crystals showing zonal growth-textures; no other sulphides were seen.

138 967 G52/133.6 m (T.S. 30546)

A very extensively metasomatised rock, but containing relict patches of fine quartz which are thought to represent chert.

The dominant mineral is siderite, occurring as interlocking, poikiloblastic patches with many inclusions of quartz, crystallized ?chert, pyrite, streaks of fine carbonaceous matter (this occurs in the ?chert as well) and ultrafine cassiterite (< 20 µ). One unusual feature of this rock is the presence of large, irregular patches of apatite up to 1.5 mm in size, evidently introduced and showing the same replacive relationship towards the ?chert as the siderite. Patches of coarse vein-quartz have also been introduced; cassiterite occurs within these as well as in all the other minerals.

# Appendix C

## Index to Petrological Descriptions of Mineralised Intersections of Severn Mineralisation

| Hole No | Depth from m | Depth to m | Intercept length m | Grade %Sn | Petrological Description | |
|---|---|---|---|---|---|---|
| | | | | | Depth m | Reference |
| **G39** | 196.5 | 231.05 | 34.55 | 0.51 | - | |
| **G39** | 231.1 | 246.2 | 15.1 | 0.16 | - | |
| **G41** | 230.0 | 236.0 | 6.0 | 0.69 | - | |
| **G43** | 242.0 | 292.0 | 50.0 | 0.28 | - | |
| **G65** | 217.8 | 267.75 | 49.95 | 0.72 | 234.9 | 81-1521 |
| | | | | | 249.2 | 81-1521 |
| | | | | | 252.4 | 81-1521 |
| | | | | | 257.8 | 81-1521 |
| | | | | | 261.3 | 81-1521 |
| | | | | | 261.8 | 81-1521 |
| **G69** | 138.0 | 141.0 | 3.0 | 0.75 | - | - |
| **G72** | 282.5 | 310.5 | 28.0 | 0.65 | 285.6 | 81-1571 |
| | | | | | 298.9 | 81-1571 |
| | | | | | 309.5 | 81-1571 |
| **Hole No** | **Depth from m** | **Depth to m** | **Intercept length m** | **Grade %Sn** | **Petrological Description** | |
| | | | | | **Depth m** | **Reference** |
| **G74** | 351.0 | 371.0 | 20.0 | 0.84 | 368.8 | 81-1623 |
| | | | | | 369.5 | 81-1623 |
| | | | | | 370.3 | 81-1623 |
| **G77** | 333.9 | 340.0 | 1.0 | 0.11 | - | - |
| **G81** | 437.0 | 464.0 | 27.0 | 0.65 | - | - |
| **G87** | 326.0 | 354.0 | 28.0 | 0.53 | - | - |

233819 G65 234.9m

233 819 (T.S. 34146)

This is a thoroughly chloritised tuffaceous greywacke in discordant (tectonic) contact with a sericitic cherty argillite.

The psammite is poorly sorted in the silt to medium sand range and bedded only inrespect of a dimensional preferred orientation of clastic particles. The bulk of these are chloritised beyond specific recognition, although clearly microcrystalline intermediate lava clasts and splintery to cuspate, angular, mildly abraded shard fragments were major framework components. The medium-sand-sized particles, comprising 5-10 % of the total and more or less evenly disseminated throughout, comprise quartz grains, felsitic intermediate-acid lava clasts, chert fragments and sparse sericitic alkali feldspar grains. The rock thus has a definite polymict character enhanced by slight relative rounding of the coarser particles.

Accessories include thinly disseminated degraded (chloritised) biotite flakes and conspicuous clastic leucoxenic semi-opaques. The matrix is chloritic and poorly resolved against the chloritised framework. Cloudy ankeritic carbonate is an accessory alteration phase. This sediment has a very incipient tectonic fabric, essentially parallel to bedding, and reflecting no more than load- or burial metamorphic conditions (i.e. sub-greenschist).

The argillite comprises mainly sericite with subordinate, closely intergrown ultrafine quartz and minor pale phlogopite. This rock is massive to faintly laminated and is pervasively microfractured and penetrated by discontinuous films of quartz, ankeritic carbonate and

phlogopite. Pervasive leucoxenic staining suggests a certain pelitic ash component is present, but there is no microtextural evidence to support this. Contact with the psammite is defined by a thin zone of relatively marked microfracturing and localised brecciation.

**233808 G65 249.2m**

233 808 (T.S. 34140)

This specimen is representative of a fine- to medium-grained phlogopite-quartz rock with disseminated to semi-massive, fine-grained pyrrhotite. The rock exhibits a lenticular, somewhat contorted, sub- to millimetric scale banding and is of altered sedimentary character. Nature of the original sediment is obscure, but, in the absence of relict clastic features, it may have been an impure carbonate facies or calc-pelite. Minor traces of relict carbonaceous matter tend to confirm the altered sediment interpretation.

The bulk of the rock comprises extensively chloritised, fine-grained, random to semi-orientated pale brown phlogopite with subordinate, closely intergrown, phlogopite-stained, granular to subhedral quartz. Relatively massive quartz lenses occur sporadically and represent conformable, discontinuous veins, at least in part. These features are parallelled by spongy, discontinuous lenses of ankeritic carbonate. Accessories include irregular patches and euhedral disseminations of cloudy apatite, traces of extremely fine, acicular, pale brown tourmaline and conspicuous, very fine, virtually opaque rutile.

Sulphides occur as fine-grained disseminations and films throughout the phlogopite-quartz aggregates. These "grade" into semi-massive, fine-grained spongy lenses with intergranular phlogopite and minor quartz. These zones comprise mainly granular, mosaic-textured pyrrhotite aggregates including sparse single to clustered pyrite (to 1.5 mm, generally <100 μ) and arsenopyrite euhedra. Irregular blebs and crude lenses of chalcopyrite and stannite (to 200 μ) are disseminated throughout. Cassiterite was observed only as extremely rare microscopic grains (max. 25 μ, typically < 15 μ) embedded in stannite.

Pyrrhotite, in this rock, is incipiently altered along sparse late microfractures, to marcasite.

## 233809 G65 252.4m

233 809 (T.S. 34141)
This rock appears related to 233808, but reflects a late phase of siderite-pyrite alteration. It can be classified mineralogically as a siderite-pyrite rock.

Gross textural features are similar to the previous specimen and comprise essentially a crude lenticular sulphide/carbonate banding disrupted by crosscutting, discontinuous films of sulphide. Carbonate zones consist of coarse poikilitic anhedral, semi-lustre-mottled siderite, weakly but pervasively stained with microscopic talc

inclusions (?retrograde after phlogopite). Interspersed sulphide lenses and filmsconsist of fine to ultrafine pyrite (secondary after pyrrhotite), enclosing sporadic patches of paler (ankeritic) carbonate at the cores with minor, closely intergrown fluorite. Accessories include traces of quartz and rare films of sellaite, typically associated with the ankerite-fluorite clots. Cassiterite is sparsely present as cloudy, microscopic particles (mean 5-15 µ) and spongy, microcrystalline clots (to 125 µ, typically < 75 µ), generally included in carbonate, occasionally enclosed in pyrite and concentrated locally into the sellaite lenses. Cassiterite exhibits a semi-banded distribution and predates the latesiderite-pyrite alteration phase.

Polished section examination reveals rare pyrite euhedra of primary character, embedded in the finely granular to ultrafinely spongy secondary pyrite, and thinly disseminated microscopic blebs of chalcopyrite.

## 233810 G65 257.8m

233 810 (T.S. 34142)
This is a quartz-pyrite-siderite rock and, in common with 233809, reflects a siderite-pyrite alteration phase.

The areas sectioned consist essentially of granular, semi-to near-massive pyrite aggregates with subordinate, closely associated, porcellanous to lustre-mottled siderite and granular to subhedral quartz. Quartz grains (mean 1 mm), included in the sulphide(-carbonate) aggregates are typically relatively euhedral, with characteristic sector (growth-) twinning. In areas of relatively massive quartz, sulphides adopt an intergranular habit. These features are typical of quartz-pyrrhotite rocks and, by analogy, this rock was primarily a medium-grained pyrrhotite-quartz rock (?vein), with the pyrrhotite now replaced by pyrite and siderite.

Accessories include sporadic films of ankeritic carbonate with minor associated fluorite in part outlining former pyrrhotite grain boundaries. Minor traces of ultrafine acicular tourmaline occur included in quartz. Cassiterite is sparsely present as single to clustered, equant, twinned grains (30-125 µ, mean 60-70 µ, clusters to 500 µ) included in quartz or, elsewhere, embedded in the secondary pyrite aggregates. Minor stannite occurs as irregular blebs (max. 200 µ, typically < 75 µ) throughout the pyrite aggregates, generally associated with fine-grained spongy aggregates, discontinuous films and microscopic blebs of chalcopyrite.

## 233811 G65 261.3m

233 811 (T.S., P.S. 34143)
This is a quartz-pyrrhotite rock, texturally similar to the pyritised/sideritised specimen 233810, but finer-grained (quartz, total approx. 60 %, mean 150 μ) and with a distinct fine, millimetric-scale, lenticular banding suggestive of an altered (silicified, sulphidised) sediment mode of origin.

Banding is enhanced by the distribution of conspicuous cassiterite and accessory gangue components comprising discontinuous films of ankeritic carbonate, disseminated blebs and crude lenses of sellaite and of pale green hydromuscovite (after ?phlogopite). These are disrupted, locally, by sparse crosscutting veinlets of pyrrhotite and quartz.

Cassiterite is concentrated in the relatively massive sulphide zones which range up to 5 mm in width. Cassiterite comprises less than 5 % to around 25 % of these zones, typically as evenly sized (mean 50-60 μ, range 20-200 μ), discrete to clustered equant grains of pyrrhotite-intergranular habit. Subordinate to minor amounts of finer-grained cassiterite (mean 5-10 μ) occur included in quartz or locally embedded in mica aggregates. Rarely cassiterite is included in carbonate and sellaite.

Pyrrhotite, in this rock, is incipiently microfractured, but unaltered. Accessory opaques comprise thinly disseminated, single to clustered arsenopyrite euhedra (mean 75 μ), sparse primary pyrite euhedra, and rare blebs of chalcopyrite.

## 233812 G65 261.8m

233 812 (T.S., P.S. 34144)
This is a partly pyritised and sideritised quartz-pyrrhotite rock with close affinities to 233810 and 233811. The main contrast is textural, with quartz occurring as mildly stressed and carbonate-healed, microfractured, sub- to euhedral (prismatic with "pyramidal" terminations) grains with a mean diameter about 350 μ and clouded with ultrafine inclusions (carbonate, sericite, vacuoles). Sulphides comprise around 15-50 % of the areas sectioned and are of crudely banded distribution and distinctly quartz-intergranular habit (typical of relatively siliceous ores of this type). Accessory gangue components comprise sellaite blebs with included ultrafine acicular tourmaline, films and crude lenses of ankeritic carbonate with minor associated fluorite and rare carbonated mica (?phlogopite) flakes.

Cassiterite is conspicuous and of crudely banded distribution. Sizing is in the 20-175 μ range with a mode about 50-70 μ. The bulk occurs as granular clusters of crudely lenticular shape, embedded in semi-lustre-mottled ankerite. Minor intergranular sulphide is associated. Subordinate, similarly sized cassiterite occurs embedded in siderite or loosely locked in secondary pyrite. Accessory amounts with a slightly finer sizing are included in quartz.

Polished section examination reveals the secondary pyrite, which is typcally accompanied by cloudy sideritic carbonate, to be partly recrystallized to granular aggregates and, locally, fine sub- to euhedral crystals (evidently in response to the late stress phase). Sparse poikilitic primary pyrite euhedra are present. In addition to relict pyrrhotite, accessory opaques comprise marcasite (also after pyrrhotite) and minor traces of chalcopyrite.

# Appendix D

## Estimates of core recoveries of intercepts of Queen Hill and Severn mineralisation

**Note:**

Many of the recoveries had to be estimated by measuring between core blocks. This was necessary because the core had been halved in most places and quartered in many others. This has resulted in over-estimates of recoveries in many instances.

| Hole ID | Box No. | From (ft) | From (m) | To (ft) | To (m) | Interval (m) | Recovered (m) | Recovery % | Comments |
|---|---|---|---|---|---|---|---|---|---|
| **G01** | | | | | | | | | |
| G01 | 6 | 115.00 | 35.05 | 125.00 | 38.10 | 3.05 | 2.92 | 95.80 | |
| G01 | | 125.00 | 38.10 | 129.00 | 39.32 | 1.22 | 1.20 | 98.43 | |
| G01 | | 129.00 | 39.32 | 137.00 | 41.76 | 2.44 | 2.46 | 100.89 | |
| G01 | | 137.00 | 41.76 | 145.00 | 44.20 | 2.44 | 2.15 | 88.17 | |
| G01 | | 145.00 | 44.20 | 153.00 | 46.63 | 2.44 | 2.27 | 93.09 | |
| G01 | | 153.00 | 46.63 | 161.00 | 49.07 | 2.44 | 2.23 | 91.45 | |
| G01 | | 161.00 | 49.07 | 169.00 | 51.51 | 2.44 | 2.43 | 99.66 | |
| G01 | 10 | 169.00 | 51.51 | 177.00 | 53.95 | 2.44 | 2.37 | 97.19 | |
| G01 | 10 | 177.00 | 53.95 | 185.00 | 56.39 | 2.44 | 2.30 | 94.32 | |
| G01 | 11 | 185.00 | 56.39 | 193.00 | 58.83 | 2.44 | 2.38 | 97.60 | |
| G01 | | 193.00 | 58.83 | 201.00 | 61.26 | 2.44 | 2.31 | 94.73 | |
| G01 | | 201.00 | 61.26 | 209.00 | 63.70 | 2.44 | 2.49 | 102.12 | |
| G01 | | 209.00 | 63.70 | 217.00 | 66.14 | 2.44 | 2.28 | 93.50 | |
| G01 | | 217.00 | 66.14 | 222.00 | 67.67 | 1.52 | 1.29 | 84.65 | |
| G01 | | 222.00 | 67.67 | 225.00 | 68.58 | 0.91 | 0.93 | 101.71 | |
| G01 | | 225.00 | 68.58 | 233.00 | 71.02 | 2.44 | 2.40 | 98.43 | |
| G01 | 14 | 233.00 | 71.02 | 245.00 | 74.68 | 3.66 | 2.01 | 54.95 | Block in wrong place? |
| G01 | 15 | 245.00 | 74.68 | 255.00 | 77.72 | 3.05 | 4.50 | 147.64 | Block in wrong place? |
| G01 | | 255.00 | 77.72 | 265.00 | 80.77 | 3.05 | 3.02 | 99.08 | |
| G01 | | 265.00 | 80.77 | 275.00 | 83.82 | 3.05 | 3.24 | 106.30 | |
| G01 | | 275.00 | 83.82 | 295.00 | 89.92 | 6.10 | 6.40 | 104.99 | |
| G01 | | 295.00 | 89.92 | 305.00 | 92.96 | 3.05 | 2.36 | 77.43 | |
| G01 | | 305.00 | 92.96 | 313.50 | 95.55 | 2.59 | 3.05 | 117.72 | |
| G01 | | 313.50 | 95.55 | 315.00 | 96.01 | 0.46 | 1.30 | 284.34 | Block in wrong place? |
| G01 | | 315.00 | 96.01 | 324.00 | 98.76 | 2.74 | 1.70 | 61.97 | Block in wrong place? |
| G01 | | 324.00 | 98.76 | 329.00 | 100.28 | 1.52 | 1.18 | 77.43 | |
| G01 | | 329.00 | 100.28 | 335.00 | 102.11 | 1.83 | 1.93 | 105.53 | |
| G01 | | 335.00 | 102.11 | 340.00 | 103.63 | 1.52 | 1.44 | 94.49 | |
| **Hole ID** | **Box No.** | **From (ft)** | **From (m)** | **To (ft)** | **To (m)** | **Interval (m)** | **Recovered (m)** | **Recovery %** | **Comments** |
| G01 | | 340.00 | 103.63 | 349.00 | 106.38 | 2.74 | 2.97 | 108.27 | |
| G01 | | 349.00 | 106.38 | 350.00 | 106.68 | 0.30 | 0.30 | 98.43 | |
| G01 | 22 | 350.00 | 106.68 | 355.00 | 108.20 | 1.52 | 1.70 | 111.55 | |
| G01 | 22 | 355.00 | 108.20 | 357.50 | 108.97 | 0.76 | 0.81 | 106.30 | |
| | | | | | | | | | |
| **G02** | | | | | | | | | |
| G02 | 20 | 316.00 | 96.32 | 322.00 | 98.15 | 1.83 | 1.30 | 71.08 | |
| G02 | 20 | 322.00 | 98.15 | 333.00 | 101.50 | 3.35 | 3.24 | 96.64 | |
| G02 | 21 | 333.00 | 101.50 | 346.00 | 105.46 | 3.96 | 2.97 | 74.95 | |
| G02 | 22 | 346.00 | 105.46 | 359.00 | 109.42 | 3.96 | 4.32 | 109.02 | |
| | | | | | | | | | |
| **G03** | | | | | | | | | |
| G03 | 20 | 270.85 | 82.56 | 284.00 | 86.56 | 4.01 | 4.32 | 107.78 | |
| | | | | | | | | | |
| **G04** | | | | | | | | | |
| G04 | 16 | 222.00 | 67.67 | 231.50 | 70.56 | 2.90 | 2.95 | 101.88 | |
| G04 | 17 | 231.50 | 70.56 | 232.00 | 70.71 | 0.15 | 0.19 | 124.67 | |
| G04 | 17 | 232.00 | 70.71 | 242.00 | 73.76 | 3.05 | 3.25 | 106.63 | |
| G04 | 18 | 242.00 | 73.76 | 252.00 | 76.81 | 3.05 | 3.60 | 118.11 | |
| G04 | 19 | 252.00 | 76.81 | 262.00 | 79.86 | 3.05 | 3.08 | 101.05 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| G04 | 20 | 262.00 | 79.86 | 272.00 | 82.91 | 3.05 | 3.21 | 105.31 | |
| | | | | | | | | | |
| **G06** | | | | | | | | | |
| G06 | 19 | 259.00 | 78.94 | 266.50 | 81.23 | 2.29 | 2.44 | 106.74 | |
| G06 | 19 | 266.50 | 81.23 | 269.00 | 81.99 | 0.76 | 0.81 | 106.30 | |
| G06 | 20 | 269.00 | 81.99 | 279.00 | 85.04 | 3.05 | 2.80 | 91.86 | |
| G06 | 20 | 279.00 | 85.04 | 282.60 | 86.14 | 1.10 | 1.30 | 118.47 | end of tray |
| | | | | | | | | | |
| **G07** | | | | | | | | | |
| G07 | 13 | 249.00 | 75.90 | 255.50 | 77.88 | 1.98 | 1.53 | 77.23 | |
| G07 | 13 | 255.50 | 77.88 | 268.00 | 81.69 | 3.81 | 3.38 | 88.71 | |
| G07 | 14 | 268.00 | 81.69 | 278.00 | 84.73 | 3.05 | 3.15 | 103.35 | |
| G07 | 14 | 278.00 | 84.73 | 283.00 | 86.26 | 1.52 | 0.38 | 24.93 | |
| | | | | | | | | | |
| **G08** | | | | | | | | | |
| G08 | 19 | 396.30 | 120.79 | 414.00 | 126.19 | 5.39 | 5.34 | 98.98 | |
| | | | | | | | | | |
| **G10** | | | | | | | | | |
| G10 | 24 | 555.50 | 169.32 | 560.00 | 170.69 | 1.37 | 0.94 | 68.53 | |
| G10 | 25 | 560.00 | 170.69 | 568.00 | 173.13 | 2.44 | 2.30 | 94.32 | |
| G10 | 25 | 568.00 | 173.13 | 582.00 | 177.39 | 4.27 | 3.98 | 93.27 | |
| | | | | | | | | | |
| **G11** | | | | | | | | | |
| G11 | 24 | 453.60 | 138.26 | 457.00 | 139.29 | 1.04 | 1.08 | 104.21 | |
| G11 | 24 | 457.00 | 139.29 | 463.00 | 141.12 | 1.83 | 1.99 | 108.81 | |
| G11 | 25 | 463.00 | 141.12 | 469.00 | 142.95 | 1.83 | 2.06 | 112.64 | |
| G11 | 25 | 469.00 | 142.95 | 472.50 | 144.02 | 1.07 | 1.05 | 98.43 | |
| G11 | 25 | 472.50 | 144.02 | 474.00 | 144.48 | 0.46 | 0.27 | 59.06 | |
| G11 | 25 | 474.00 | 144.48 | 478.00 | 145.69 | 1.22 | 0.44 | 36.09 | |
| G11 | 25 | 478.00 | 145.69 | 480.00 | 146.30 | 0.61 | 0.46 | 75.46 | |
| G11 | 26 | 480.00 | 146.30 | 483.50 | 147.37 | 1.07 | 0.64 | 59.99 | |
| G11 | 26 | 483.50 | 147.37 | 485.00 | 147.83 | 0.46 | 0.71 | 155.29 | |
| G11 | 26 | 485.00 | 147.83 | 488.50 | 148.89 | 1.07 | 1.22 | 114.36 | |
| G11 | 26 | 488.50 | 148.89 | 497.00 | 151.49 | 2.59 | 2.74 | 105.76 | |
| G11 | 27 | 497.00 | 151.49 | 505.50 | 154.08 | 2.59 | 2.65 | 102.29 | |
| G11 | 27 | 505.50 | 154.08 | 507.00 | 154.53 | 0.46 | 0.53 | 115.92 | |
| G11 | 27 | 507.00 | 154.53 | 517.00 | 157.58 | 3.05 | 2.98 | 97.77 | |
| G11 | 28 | 517.00 | 157.58 | 527.00 | 160.63 | 3.05 | 3.06 | 100.39 | |
| G11 | 29 | 527.00 | 160.63 | 537.00 | 163.68 | 3.05 | 3.02 | 99.08 | |
| | | | | | | | | | |
| **Hole ID** | **Box No.** | **From (ft)** | **From (m)** | **To (ft)** | **To (m)** | **Interval (m)** | **Recovered (m)** | **Recovery %** | **Comments** |
| **G11W** | | | | | | | | | |
| G11W | 2 | 462.60 | 141.00 | 472.60 | 144.05 | 3.05 | 2.93 | 96.13 | |
| G11W | 2 | 472.60 | 144.05 | 480.00 | 146.30 | 2.26 | 2.17 | 96.21 | |
| G11W | 3 | 480.00 | 146.30 | 483.00 | 147.22 | 0.91 | 1.14 | 124.67 | |
| G11W | 3 | 483.00 | 147.22 | 486.60 | 148.32 | 1.10 | 1.10 | 100.25 | |
| G11W | 3 | 486.60 | 148.32 | 487.60 | 148.62 | 0.30 | 0.25 | 82.02 | |
| G11W | 3 | 487.60 | 148.62 | 491.50 | 149.81 | 1.19 | 0.89 | 74.87 | |
| G11W | 3 | 491.50 | 149.81 | 495.00 | 150.88 | 1.07 | 1.08 | 101.24 | |
| G11W | 4 | 495.00 | 150.88 | 504.50 | 153.77 | 2.90 | 3.12 | 107.75 | |
| G11W | 4 | 504.50 | 153.77 | 514.50 | 156.82 | 3.05 | 3.10 | 101.71 | |
| G11W | 4 | 514.50 | 156.82 | 517.00 | 157.58 | 0.76 | 0.75 | 98.43 | |
| G11W | 5 | 517.00 | 157.58 | 527.00 | 160.63 | 3.05 | 3.30 | 108.27 | |
| G11W | 5 | 527.00 | 160.63 | 537.00 | 163.68 | 3.05 | 2.95 | 96.78 | |
| G11W | 6 | 537.00 | 163.68 | 547.00 | 166.73 | 3.05 | 3.10 | 101.71 | |
| G11W | 6 | 547.00 | 166.73 | 557.00 | 169.77 | 3.05 | 3.04 | 99.74 | |
| G11W | 7 | 557.00 | 169.77 | 567.00 | 172.82 | 3.05 | 3.15 | 103.35 | |
| | | | | | | | | | |
| **G12** | | | | | | | | | |
| G12 | 32 | 548.00 | 167.03 | 553.60 | 168.74 | 1.71 | 1.78 | 104.28 | |
| G12 | 33 | 553.60 | 168.74 | 558.00 | 170.08 | 1.34 | 1.36 | 101.41 | |
| G12 | 33 | 558.00 | 170.08 | 564.00 | 171.91 | 1.83 | 1.82 | 99.52 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| G12 | 33 | 564.00 | 171.91 | 570.60 | 173.92 | 2.01 | 2.23 | 110.85 | |
| G12 | 34 | 570.60 | 173.92 | 578.00 | 176.17 | 2.26 | 2.46 | 109.07 | |
| G12 | 34 | 578.00 | 176.17 | 581.60 | 177.27 | 1.10 | 1.61 | 146.73 | |
| G12 | 34 | 581.60 | 177.27 | 583.50 | 177.85 | 0.58 | 0.67 | 115.69 | |
| G12 | 34 | 583.50 | 177.85 | 588.00 | 179.22 | 1.37 | 1.38 | 100.61 | |
| G12 | 35 | 588.00 | 179.22 | 591.00 | 180.14 | 0.91 | 1.15 | 125.77 | |
| G12 | 35 | 591.00 | 180.14 | 598.00 | 182.27 | 2.13 | 2.30 | 107.80 | |
| G12 | 35 | 598.00 | 182.27 | 608.00 | 185.32 | 3.05 | 3.28 | 107.61 | |
| G12 | 36 | 608.00 | 185.32 | 618.00 | 188.37 | 3.05 | 2.70 | 88.58 | |
| G12 | 36 | 618.00 | 188.37 | 628.00 | 191.41 | 3.05 | 3.55 | 116.47 | |
| G12 | 37 | 628.00 | 191.41 | 638.00 | 194.46 | 3.05 | 4.16 | 136.48 | Blocks missing? |
| G12 | 38 | 638.00 | 194.46 | 658.00 | 200.56 | 6.10 | 5.38 | 88.25 | Blocks missing? |
| G12 | 38 | 658.00 | 200.56 | 668.00 | 203.61 | 3.05 | 2.96 | 97.11 | |
| G12 | 39 | 668.00 | 203.61 | 678.00 | 206.65 | 3.05 | 3.25 | 106.63 | |
| G12 | 39 | 678.00 | 206.65 | 685.50 | 208.94 | 2.29 | 2.30 | 100.61 | |
| G12 | 40 | 685.50 | 208.94 | 695.50 | 211.99 | 3.05 | 3.33 | 109.25 | |
| G12 | 40 | 695.50 | 211.99 | 698.00 | 212.75 | 0.76 | 0.65 | 85.30 | |
| G12 | 40 | 698.00 | 212.75 | 700.50 | 213.51 | 0.76 | 0.76 | 99.74 | |
| G12 | 41 | 700.50 | 213.51 | 707.25 | 215.57 | 2.06 | 1.93 | 93.81 | |
| G12 | 41 | 707.25 | 215.57 | 711.50 | 216.87 | 1.30 | 1.40 | 108.07 | |
| G12 | 41 | 711.50 | 216.87 | 714.00 | 217.63 | 0.76 | 0.20 | 26.25 | |
| G12 | 41 | 714.00 | 217.63 | 718.00 | 218.85 | 1.22 | 2.04 | 167.32 | |
| G12 | 42 | 718.00 | 218.85 | 728.00 | 221.89 | 3.05 | 3.03 | 99.41 | |
| G12 | 42 | 728.00 | 221.89 | 738.00 | 224.94 | 3.05 | 3.08 | 101.05 | |
| G12 | 43 | 738.00 | 224.94 | 748.00 | 227.99 | 3.05 | 3.92 | 128.61 | |
| G12 | 43 | 748.00 | 227.99 | 758.00 | 231.04 | 3.05 | 2.33 | 76.44 | |
| | | | | | | | | | |
| **G13** | | | | | | | | | |
| G13 | 36 | 636.50 | 194.01 | 646.50 | 197.05 | 3.05 | 2.99 | 98.10 | Full core |
| G13 | 37 | 646.50 | 197.05 | 656.90 | 200.22 | 3.17 | 2.92 | 92.12 | |
| G13 | 37 | 656.90 | 200.22 | 666.00 | 203.00 | 2.77 | 2.62 | 94.46 | |
| G13 | 38 | 666.00 | 203.00 | 669.50 | 204.06 | 1.07 | 0.89 | 83.43 | |
| G13 | 38 | 669.50 | 204.06 | 673.00 | 205.13 | 1.07 | 0.76 | 71.24 | |
| | | | | | | | | | |
| **G14** | | No core blocks & depths not marked on trays | | | | | | | |
| | | | | | | | | | |
| **G15** | | Could not be found | | | | | | | |
| | | | | | | | | | |
| **G15 W** | | | | | | | | | |
| **Hole ID** | **Box No.** | **From (ft)** | **From (m)** | **To (ft)** | **To (m)** | **Interval (m)** | **Recovered (m)** | **Recovery %** | **Comments** |
| G15 W | 12 | 776.00 | 236.52 | 781.50 | 238.20 | 1.68 | 3.10 | 184.92 | Block in wrong place? |
| G15 W | 13 | 781.50 | 238.20 | 795.00 | 242.32 | 4.11 | 3.10 | 75.34 | Block in wrong place? |
| G15 W | 14 | 795.00 | 242.32 | 803.00 | 244.75 | 2.44 | 2.05 | 84.07 | |
| G15 W | 14 | 803.00 | 244.75 | 805.00 | 245.36 | 0.61 | 0.50 | 82.02 | |
| G15 W | 14 | 805.00 | 245.36 | 808.00 | 246.28 | 0.91 | 0.84 | 91.86 | |
| G15 W | 14 | 808.00 | 246.28 | 817.00 | 249.02 | 2.74 | 2.74 | 99.88 | |
| G15 W | 15 | 817.00 | 249.02 | 823.00 | 250.85 | 1.83 | 1.50 | 82.02 | |
| G15 W | 15 | 823.00 | 250.85 | 828.00 | 252.37 | 1.52 | 1.75 | 114.83 | |
| G15 W | 15 | 828.00 | 252.37 | 831.00 | 253.29 | 0.91 | 0.75 | 82.02 | |
| G15 W | 15 | 831.00 | 253.29 | 837.00 | 255.12 | 1.83 | 0.94 | 51.40 | |
| | | | | | | | | | |
| **G16** | | Core burnt. No core blocks & no depths on trays | | | | | | | |
| | | | | | | | | | |
| **G18** | | | | | | | | | |
| G18 | 59 | 950.00 | 289.56 | 959.60 | 292.49 | 2.93 | 1.49 | 50.92 | Block in wrong place? |
| G18 | 60 | 959.60 | 292.49 | 967.00 | 294.74 | 2.26 | 3.55 | 157.39 | Block in wrong place? |
| G18 | 60 | 967.00 | 294.74 | 977.00 | 297.79 | 3.05 | 2.99 | 98.10 | |
| G18 | 61 | 977.00 | 297.79 | 987.50 | 300.99 | 3.20 | 2.60 | 81.24 | |
| G18 | 61 | 987.50 | 300.99 | 997.50 | 304.04 | 3.05 | 3.20 | 104.99 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| G18 | 62 | 997.50 | 304.04 | 1008.00 | 307.24 | 3.20 | 3.20 | 99.99 | |
| | | | | | | | | | |
| **G22** | | | | | | | | | |
| G22 | 42 | 707.00 | 215.49 | 717.00 | 218.54 | 3.05 | 2.96 | 97.11 | |
| G22 | 43 | 717.00 | 218.54 | 727.00 | 221.59 | 3.05 | 3.46 | 113.52 | |
| G22 | 43 | 727.00 | 221.59 | 737.00 | 224.64 | 3.05 | 2.93 | 96.13 | |
| | | | | | | | | | |
| **G23** | | | | | | | | | |
| G23 | 24 | 343.55 | 104.71 | 347.55 | 105.93 | 1.22 | 1.16 | 95.14 | |
| G23 | 24 | 347.55 | 105.93 | 351.55 | 107.15 | 1.22 | 1.46 | 119.75 | |
| G23 | 25 | 351.55 | 107.15 | 360.00 | 109.73 | 2.58 | 2.68 | 104.06 | |
| G23 | 25 | 360.00 | 109.73 | 363.60 | 110.83 | 1.10 | 1.20 | 109.36 | |
| G23 | 26 | 363.60 | 110.83 | 372.50 | 113.54 | 2.71 | 3.03 | 111.70 | |
| G23 | 26 | 372.50 | 113.54 | 378.10 | 115.24 | 1.71 | 1.80 | 105.46 | |
| | | | | | | | | | |
| **G24** | | Blocks in metric. Core reblocked ? | | | | | | | |
| G24 | 27 | | 142.65 | | 144.08 | 1.43 | 1.98 | 138.46 | Block in wrong place? |
| G24 | 27 | | 144.08 | | 145.50 | 1.42 | 1.05 | 73.94 | Block in wrong place? |
| G24 | 28 | | 145.50 | | 148.10 | 2.60 | 2.30 | 88.46 | |
| G24 | 28 | | 148.10 | | 149.60 | 1.50 | 1.04 | 69.33 | |
| G24 | 28 | | 149.60 | | 151.20 | 1.60 | 1.02 | 63.75 | Block in wrong place? |
| G24 | 29 | | 151.20 | | 153.40 | 2.20 | 2.90 | 131.82 | Block in wrong place? |
| G24 | 29 | | 153.40 | | 156.70 | 3.30 | 2.94 | 89.09 | |
| G24 | 30 | | 156.70 | | 158.50 | 1.80 | 1.54 | 85.56 | |
| | | | | | | | | | |
| **G25** | | Blocks in metric. Core reblocked ? | | | | | | | |
| G25 | 28 | | 145.10 | | 146.60 | 1.50 | 1.35 | 90.00 | |
| G25 | 28 | | 146.60 | | 147.50 | 0.90 | 1.07 | 118.89 | |
| G25 | 29 | | 147.50 | | 148.10 | 0.60 | 0.57 | 95.00 | |
| G25 | 29 | | 148.10 | | 149.20 | 1.10 | 1.10 | 100.00 | |
| G25 | 29 | | 149.20 | | 150.30 | 1.10 | 0.88 | 80.00 | |
| G25 | 29 | | 150.30 | | 150.90 | 0.60 | 0.34 | 56.67 | Block in wrong place? |
| G25 | 29 | | 150.90 | | 151.30 | 0.40 | 0.50 | 125.00 | Block in wrong place? |
| **Hole ID** | **Box No.** | **From (ft)** | **From (m)** | **To (ft)** | **To (m)** | **Interval (m)** | **Recovered (m)** | **Recovery %** | **Comments** |
| G25 | 29 | | 151.30 | | 153.10 | 1.80 | 2.10 | 116.67 | |
| G25 | 30 | | 153.10 | | 154.10 | 1.00 | 1.00 | 100.00 | |
| G25 | 30 | | 154.10 | | 156.20 | 2.10 | 2.20 | 104.76 | |
| G25 | 31 | | 156.20 | | 159.25 | 3.05 | 3.10 | 101.64 | |
| G25 | 31 | | 159.25 | | 160.90 | 1.65 | 1.67 | 101.21 | |
| | | | | | | | | | |
| **G26** | | Blocks in metric. Core reblocked ? | | | | | | | |
| G26 | 44 | | 226.00 | | 229.20 | 3.20 | 3.00 | 93.75 | |
| G26 | 45 | | 229.20 | | 231.40 | 2.20 | 2.15 | 97.73 | |
| G26 | 45 | | 231.40 | | 233.10 | 1.70 | 1.48 | 87.06 | |
| G26 | 46 | | 233.10 | | 234.60 | 1.50 | 0.50 | 33.33 | |
| G26 | 46 | | 234.60 | | 237.05 | 2.45 | 1.20 | 48.98 | |
| G26 | 46 | | 237.05 | | 237.45 | 0.40 | 0.40 | 100.00 | |
| G26 | 46 | | 237.45 | | 237.80 | 0.35 | 0.09 | 25.71 | |
| G26 | 46 | | 237.80 | | 238.80 | 1.00 | 1.00 | 100.00 | |
| G26 | 47 | | 238.80 | | 242.00 | 3.20 | 3.00 | 93.75 | |
| G26 | 47 | | 242.00 | | 243.20 | 1.20 | 0.72 | 60.00 | |
| G26 | 47 | | 243.20 | | 244.45 | 1.25 | 0.97 | 77.60 | |
| G26 | 47 | | 244.45 | | 245.80 | 1.35 | 1.05 | 77.78 | |
| G26 | 48 | | 245.80 | | 248.40 | 2.60 | 1.58 | 60.77 | |
| G26 | 48 | | 248.40 | | 250.50 | 2.10 | 1.80 | 85.71 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| G26 | 48 | | 250.50 | | 252.20 | 1.70 | 1.28 | 75.29 | |
| G26 | 49 | | 252.20 | | 255.30 | 3.10 | 2.82 | 90.97 | |
| G26 | 49 | | 255.30 | | 256.60 | 1.30 | 1.40 | 107.69 | |
| G26 | 50 | | 256.60 | | 259.80 | 3.20 | 3.15 | 98.44 | |
| G26 | 50 | | 259.80 | | 263.00 | 3.20 | 3.20 | 100.00 | |
| G26 | 51 | | 263.00 | | 266.20 | 3.20 | 3.13 | 97.81 | |
| | | | | | | | | | |
| **G28** | | | | | | | | | |
| G28 | 49 | 802.00 | 244.45 | 805.00 | 245.36 | 0.91 | 1.20 | 131.23 | |
| G28 | 50 | 805.00 | 245.36 | 812.00 | 247.50 | 2.13 | 2.18 | 102.17 | |
| G28 | 50 | 812.00 | 247.50 | 822.00 | 250.55 | 3.05 | 3.00 | 98.43 | |
| | | | | | | | | | |
| **G39** | | No core blocks & no depths on trays | | | | | | | |
| | | | | | | | | | |
| **G41** | | Blocks in metric. Core reblocked ? | | | | | | | |
| G41 | 41 | | 226.70 | | 229.70 | 3.00 | 3.00 | 100.00 | |
| G41 | 41 | | 229.70 | | 232.70 | 3.00 | 2.95 | 98.33 | |
| G41 | 42 | | 232.70 | | 235.70 | 3.00 | 2.00 | 66.67 | |
| G41 | 42 | | 235.70 | | 238.50 | 2.80 | 2.65 | 94.64 | |
| G41 | 42 | | 238.50 | | 240.60 | 2.10 | 2.31 | 110.00 | |
| | | | | | | | | | |
| **G43** | | No coe blocks (core retrayed). Measurements from tray labels | | | | | | | |
| G43 | 45 | | 235.80 | | 240.00 | 4.20 | 5.47 | 130.24 | |
| G43 | 46 | | 240.00 | | 245.00 | 5.00 | 4.11 | 82.20 | |
| G43 | 47 | | 245.00 | | 250.00 | 5.00 | 3.40 | 68.00 | |
| G43 | 48 | | 250.00 | | 253.50 | 3.50 | 2.83 | 80.86 | |
| G43 | 49 | | 253.50 | | 256.80 | 3.30 | 2.57 | 77.88 | |
| G43 | 50 | | 256.80 | | 261.80 | 5.00 | 3.75 | 75.00 | |
| G43 | 4 | | 261.80 | | 266.80 | 5.00 | 3.90 | 78.00 | |
| G43 | 5 | | 266.80 | | 272.80 | 6.00 | 3.50 | 58.33 | |
| G43 | 6 | | 272.80 | | 278.80 | 6.00 | 4.95 | 82.50 | |
| G43 | 7 | | 278.80 | | 284.80 | 6.00 | 5.45 | 90.83 | |
| G43 | 8 | | 284.80 | | 290.60 | 5.80 | 5.26 | 90.69 | |
| G43 | 9 | | 290.60 | | 296.60 | 6.00 | 5.10 | 85.00 | |
| | | | | | | | | | |
| **G45** | | | | | | | | | |
| G45 | 37 | | 172.40 | | 175.40 | 3.00 | 3.09 | 103.00 | |
| G45 | 38 | | 175.40 | | 177.00 | 1.60 | 1.65 | 103.13 | |
| **Hole ID** | **Box No.** | **From (ft)** | **From (m)** | **To (ft)** | **To (m)** | **Interval (m)** | **Recovered (m)** | **Recovery %** | **Comments** |
| G45 | 38 | | 177.00 | | 178.40 | 1.40 | 1.57 | 112.14 | |
| G45 | 39 | | 178.40 | | 181.40 | 3.00 | 3.15 | 105.00 | |
| G45 | 40 | | 181.40 | | 184.40 | 3.00 | 3.23 | 107.67 | |
| G45 | 40 | | 184.40 | | 187.40 | 3.00 | 3.15 | 105.00 | |
| G45 | 41 | | 187.40 | | 189.30 | 1.90 | 2.05 | 107.89 | |
| G45 | 41 | | 189.30 | | 191.90 | 2.60 | 2.34 | 90.00 | |
| G45 | 42 | | 191.90 | | 193.40 | 1.50 | 1.45 | 96.67 | |
| G45 | 42 | | 193.40 | | 196.40 | 3.00 | 3.16 | 105.33 | |
| G45 | 43 | | 196.40 | | 199.30 | 2.90 | 3.27 | 112.76 | |
| G45 | 43 | | 199.30 | | 202.20 | 2.90 | 3.09 | 106.55 | |
| G45 | 44 | | 202.20 | | 205.30 | 3.10 | 3.28 | 105.81 | |
| G45 | 45 | | 205.30 | | 208.40 | 3.10 | 3.35 | 108.06 | |
| G45 | 46 | | 208.40 | | 211.40 | 3.00 | 3.09 | 103.00 | |
| G45 | 46 | | 211.40 | | 214.40 | 3.00 | 3.09 | 103.00 | |
| G45 | 47 | | 214.40 | | 217.40 | 3.00 | 3.08 | 102.67 | |
| G45 | 47 | | 217.40 | | 220.40 | 3.00 | 3.13 | 104.33 | |
| G45 | 48 | | 220.40 | | 221.40 | 1.00 | 1.00 | 100.00 | |
| G45 | 48 | | 221.40 | | 223.40 | 2.00 | 2.20 | 110.00 | |
| G45 | 49 | | 223.40 | | 224.90 | 1.50 | 1.00 | 66.67 | |
| G45 | 49 | | 224.90 | | 228.10 | 3.20 | 3.30 | 103.13 | 0.5m cavity at 225m |
| G45 | 50 | | 228.10 | | 229.40 | 1.30 | 1.50 | 115.38 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| G45 | 50 | | 229.40 | | 232.40 | 3.00 | 3.36 | 112.00 | |
| G45 | 50 | | 232.40 | | 235.30 | 2.90 | 3.20 | 110.34 | |
| G45 | 51 | | 235.30 | | 238.10 | 2.80 | 2.58 | 92.14 | |
| G45 | 52 | | 238.10 | | 241.40 | 3.30 | 3.64 | 110.30 | |
| G45 | 53 | | 241.40 | | 244.40 | 3.00 | 3.08 | 102.67 | |
| | | | | | | | | | |
| **G49** | | | | | | | | | |
| G49 | 22 | | 149.10 | | 152.20 | 3.10 | 3.10 | 100.00 | |
| G49 | 23 | | 152.20 | | 155.20 | 3.00 | 3.02 | 100.67 | |
| G49 | 23 | | 155.20 | | 158.20 | 3.00 | 2.50 | 83.33 | |
| G49 | 23 | | 158.20 | | 161.20 | 3.00 | 2.45 | 81.67 | |
| G49 | 24 | | 161.20 | | 164.20 | 3.00 | 3.10 | 103.33 | |
| G49 | 24 | | 164.20 | | 167.20 | 3.00 | 3.12 | 104.00 | |
| G49 | 24 | | 167.20 | | 170.20 | 3.00 | 2.98 | 99.33 | |
| G49 | 25 | | 170.20 | | 173.20 | 3.00 | 3.08 | 102.67 | |
| G49 | 25 | | 173.20 | | 175.40 | 2.20 | 2.33 | 105.91 | |
| G49 | 25 | | 175.40 | | 176.20 | 0.80 | 0.37 | 46.25 | |
| G49 | 25 | | 176.20 | | 176.80 | 0.60 | 0.30 | 50.00 | |
| G49 | 25 | | 176.80 | | 178.00 | 1.20 | 0.60 | 50.00 | |
| G49 | 26 | | 178.00 | | 178.60 | 0.60 | 0.65 | 108.33 | |
| G49 | 26 | | 178.60 | | 179.20 | 0.60 | 0.68 | 113.33 | |
| G49 | 26 | | 179.20 | | 182.20 | 3.00 | 3.08 | 102.67 | |
| G49 | 26 | | 182.20 | | 185.10 | 2.90 | 3.00 | 103.45 | |
| G49 | 26 | | 185.10 | | 185.20 | 0.10 | 0.13 | 130.00 | |
| G49 | 27 | | 185.20 | | 188.20 | 3.00 | 3.25 | 108.33 | |
| G49 | 27 | | 188.20 | | 191.20 | 3.00 | 3.10 | 103.33 | |
| G49 | 27 | | 191.20 | | 194.20 | 3.00 | 3.03 | 101.00 | |
| G49 | 28 | | 194.20 | | 197.20 | 3.00 | 2.96 | 98.67 | |
| G49 | 28 | | 197.20 | | 200.20 | 3.00 | 3.24 | 108.00 | |
| G49 | 29 | | 200.20 | | 203.20 | 3.00 | 3.06 | 102.00 | |
| G49 | 29 | | 203.20 | | 206.20 | 3.00 | 3.17 | 105.67 | EOH |
| | | | | | | | | | |
| **G51B** | | Could not be found | | | | | | | |
| | | | | | | | | | |
| **Hole ID** | **Box No.** | **From (ft)** | **From (m)** | **To (ft)** | **To (m)** | **Interval (m)** | **Recovered (m)** | **Recovery %** | **Comments** |
| **G52** | | | | | | | | | |
| G52 | 14 | | 132.00 | | 133.90 | 1.90 | 1.95 | 102.63 | |
| G52 | 14 | | 133.90 | | 135.00 | 1.10 | 1.18 | 107.27 | |
| G52 | 14 | | 135.00 | | 138.00 | 3.00 | 2.75 | 91.67 | |
| G52 | 15 | | 138.00 | | 141.00 | 3.00 | 3.20 | 106.67 | |
| G52 | 15 | | 141.00 | | 144.00 | 3.00 | 3.08 | 102.67 | Mainly full core |
| | | | | | | | | | |
| **G61** | | | | | | | | | |
| G61 | 39 | | 214.70 | | 218.00 | 3.30 | 3.20 | 96.97 | |
| G61 | 40 | | 218.00 | | 220.70 | 2.70 | 2.80 | 103.70 | |
| G61 | 40 | | 220.70 | | 223.70 | 3.00 | 3.16 | 105.33 | |
| G61 | 40 | | 223.70 | | 225.90 | 2.20 | 1.80 | 81.82 | |
| G61 | 41 | | 225.90 | | 226.70 | 0.80 | 0.78 | 97.50 | |
| G61 | 41 | | 226.70 | | 229.70 | 3.00 | 3.27 | 109.00 | |
| G61 | 42 | | 229.70 | | 232.70 | 3.00 | 2.82 | 94.00 | |
| G61 | 42 | | 232.70 | | 233.40 | 0.70 | 0.76 | 108.57 | |
| G61 | 42 | | 233.40 | | 235.70 | 2.30 | 2.35 | 102.17 | |
| G61 | 43 | | 235.70 | | 238.70 | 3.00 | 2.90 | 96.67 | |
| G61 | 43 | | 238.70 | | 241.70 | 3.00 | 3.05 | 101.67 | |
| | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **G62** | | | | | | | | | |
| G62 | 36 | | 199.20 | | 202.20 | 3.00 | 3.13 | 104.33 | |
| G62 | 37 | | 202.20 | | 205.20 | 3.00 | 3.00 | 100.00 | |
| G62 | 38 | | 205.20 | | 208.20 | 3.00 | 3.15 | 105.00 | |
| G62 | 38 | | 208.20 | | 211.20 | 3.00 | 2.75 | 91.67 | |
| G62 | 39 | | 211.20 | | 214.20 | 3.00 | 2.47 | 82.33 | |
| G62 | 39 | | 214.20 | | 217.20 | 3.00 | 3.00 | 100.00 | |
| G62 | 40 | | 217.20 | | 220.20 | 3.00 | 3.15 | 105.00 | |
| G62 | 41 | | 220.20 | | 223.20 | 3.00 | 3.00 | 100.00 | |
| G62 | 41 | | 223.20 | | 226.20 | 3.00 | 3.00 | 100.00 | |
| G62 | 41 | | 226.20 | | 228.30 | 2.10 | 2.14 | 101.90 | |
| G62 | 42 | | 228.30 | | 229.20 | 0.90 | 0.90 | 100.00 | |
| G62 | 42 | | 229.20 | | 232.20 | 3.00 | 3.00 | 100.00 | |
| G62 | 42 | | 232.20 | | 235.20 | 3.00 | 2.93 | 97.67 | |
| G62 | 43 | | 235.20 | | 238.20 | 3.00 | 3.14 | 104.67 | |
| G62 | 43 | | 238.20 | | 241.20 | 3.00 | 2.85 | 95.00 | |
| G62 | 44 | | 241.20 | | 244.20 | 3.00 | 3.17 | 105.67 | |
| G62 | 44 | | 244.20 | | 247.20 | 3.00 | 3.02 | 100.67 | |
| G62 | 45 | | 247.20 | | 250.20 | 3.00 | 3.02 | 100.67 | |
| G62 | 46 | | 250.20 | | 253.20 | 3.00 | 2.71 | 90.33 | |
| G62 | 46 | | 253.20 | | 256.20 | 3.00 | 3.11 | 103.67 | EOH |
| | | | | | | | | | |
| **G63** | | | | | | | | | |
| G63 | 57 | | 283.50 | | 286.50 | 3.00 | 2.98 | 99.33 | |
| G63 | 58 | | 286.50 | | 289.50 | 3.00 | 3.05 | 101.67 | |
| G63 | 59 | | 289.50 | | 292.50 | 3.00 | 3.34 | 111.33 | Mainly full core |
| | | | | | | | | | |
| **G65** | | | | | | | | | |
| G65 | 48 | | 214.50 | | 217.50 | 3.00 | 3.05 | 101.67 | |
| G65 | 49 | | 217.50 | | 220.50 | 3.00 | 3.03 | 101.00 | |
| G65 | 49 | | 220.50 | | 223.50 | 3.00 | 3.00 | 100.00 | |
| G65 | 50 | | 223.50 | | 226.50 | 3.00 | 2.98 | 99.33 | "Dropped Tray" |
| G65 | 50 | | 226.50 | | 229.50 | 3.00 | 3.10 | 103.33 | "Dropped Tray" |
| G65 | 51 | | 229.50 | | 232.50 | 3.00 | 3.07 | 102.33 | |
| **Hole ID** | **Box No.** | **From (ft)** | **From (m)** | **To (ft)** | **To (m)** | **Interval (m)** | **Recovered (m)** | **Recovery %** | **Comments** |
| G65 | 51 | | 232.50 | | 235.50 | 3.00 | 2.89 | 96.33 | |
| G65 | 52 | | 235.50 | | 238.50 | 3.00 | 3.00 | 100.00 | |
| G65 | 52 | | 238.50 | | 241.50 | 3.00 | 3.06 | 102.00 | |
| G65 | 53 | | 241.50 | | 244.50 | 3.00 | 3.10 | 103.33 | |
| G65 | 53 | | 244.50 | | 247.50 | 3.00 | 3.04 | 101.33 | |
| G65 | 54 | | 247.50 | | 250.50 | 3.00 | 3.04 | 101.33 | |
| G65 | 54 | | 250.50 | | 253.50 | 3.00 | 3.00 | 100.00 | |
| G65 | 55 | | 253.50 | | 256.50 | 3.00 | 2.98 | 99.33 | |
| G65 | 55 | | 256.50 | | 259.50 | 3.00 | 3.10 | 103.33 | |
| G65 | 56 | | 259.50 | | 262.50 | 3.00 | 3.05 | 101.67 | |
| G65 | 56 | | 262.50 | | 265.50 | 3.00 | 2.99 | 99.67 | |
| G65 | 57 | | 265.50 | | 268.50 | 3.00 | 2.93 | 97.67 | |
| G65 | 57 | | 268.50 | | 269.10 | 0.60 | 0.50 | 83.33 | |
| G65 | 58 | | 269.10 | | 270.50 | 1.40 | 1.74 | 124.29 | |
| G65 | 58 | | 270.50 | | 271.50 | 1.00 | 1.10 | 110.00 | |
| G65 | 58 | | 271.50 | | 274.50 | 3.00 | 3.03 | 101.00 | |
| | | | | | | | | | |
| **G69** | | | | | | | | | |
| G69 | 31 | | 136.50 | | 138.20 | 1.70 | 1.80 | 105.88 | |
| G69 | 32 | | 138.20 | | 139.50 | 1.30 | 1.40 | 107.69 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| G69 | 32 | | 139.50 | | 142.00 | 2.50 | 2.24 | 89.60 | |
| | | | | | | | | | |
| **G70** | | | | | | | | | |
| G70 | 16 | | 80.20 | | 82.20 | 2.00 | 2.15 | 107.50 | |
| G70 | 16 | | 82.20 | | 84.00 | 1.80 | 1.73 | 96.11 | |
| G70 | 16 | | 84.00 | | 85.20 | 1.20 | 0.80 | 66.67 | |
| G70 | 17 | | 85.20 | | 86.00 | 0.80 | 1.13 | 141.25 | |
| G70 | 17 | | 86.00 | | 86.80 | 0.80 | 1.08 | 135.00 | |
| | | | | | | | | | |
| **G72** | | | | | | | | | |
| G72 | 55 | | 280.50 | | 283.50 | 3.00 | 3.04 | 101.33 | |
| G72 | 56 | | 283.50 | | 286.50 | 3.00 | 2.90 | 96.67 | |
| G72 | 56 | | 286.50 | | 289.50 | 3.00 | 3.05 | 101.67 | |
| G72 | 57 | | 289.50 | | 292.50 | 3.00 | 3.00 | 100.00 | |
| G72 | 58 | | 292.50 | | 295.50 | 3.00 | 2.95 | 98.33 | |
| G72 | 58 | | 295.50 | | 298.50 | 3.00 | 3.03 | 101.00 | |
| | | | | | | | | | |
| **G74** | | | | | | | | | |
| G74 | 70 | | 348.20 | | 351.20 | 3.00 | 3.15 | 105.00 | |
| G74 | 71 | | 351.20 | | 354.30 | 3.10 | 3.17 | 102.26 | |
| G74 | 71 | | 354.30 | | 357.50 | 3.20 | 3.10 | 96.88 | |
| G74 | 71 | | 357.50 | | 360.60 | 3.10 | 3.16 | 101.94 | |
| G74 | 72 | | 360.60 | | 363.80 | 3.20 | 2.98 | 93.13 | |
| G74 | 72 | | 363.80 | | 364.50 | 0.70 | 1.05 | 150.00 | |
| G74 | 72 | | 364.50 | | 367.50 | 3.00 | 3.20 | 106.67 | |
| G74 | 73 | | 367.50 | | 370.30 | 2.80 | 3.30 | 117.86 | |
| G74 | 73 | | 370.30 | | 372.80 | 2.50 | 2.27 | 90.80 | |
| G74 | 73 | | 372.80 | | 375.50 | 2.70 | 2.93 | 108.52 | |
| | | | | | | | | | |
| **G81** | | | | | | | | | |
| G81 | 89 | | 433.50 | | 436.50 | 3.00 | 3.10 | 103.33 | |
| G81 | 90 | | 436.50 | | 439.50 | 3.00 | 3.20 | 106.67 | |
| G81 | 90 | | 439.50 | | 440.00 | 0.50 | 0.56 | 112.00 | |
| G81 | 91 | | 440.00 | | 442.50 | 2.50 | 2.53 | 101.20 | |
| **Hole ID** | **Box No.** | **From (ft)** | **From (m)** | **To (ft)** | **To (m)** | **Interval (m)** | **Recovered (m)** | **Recovery %** | **Comments** |
| G81 | 91 | | 442.50 | | 445.50 | 3.00 | 3.00 | 100.00 | |
| G81 | 92 | | 445.50 | | 448.40 | 2.90 | 2.80 | 96.55 | |
| G81 | 92 | | 448.40 | | 451.40 | 3.00 | 3.00 | 100.00 | |
| G81 | 93 | | 451.40 | | 454.50 | 3.10 | 3.15 | 101.61 | |
| G81 | 93 | | 454.50 | | 457.50 | 3.00 | 3.20 | 106.67 | |
| G81 | 94 | | 457.50 | | 460.50 | 3.00 | 3.15 | 105.00 | |
| G81 | 94 | | 460.50 | | 463.50 | 3.00 | 3.00 | 100.00 | |
| G81 | 95 | | 463.50 | | 466.50 | 3.00 | 3.00 | 100.00 | |
| | | | | | | | | | |
| **G84** | | | | | | | | | |
| G84 | 67 | | 397.50 | | 400.50 | 3.00 | 2.93 | 97.67 | |
| G84 | 68 | | 400.50 | | 403.50 | 3.00 | 2.99 | 99.67 | |
| G84 | 68 | | 403.50 | | 406.50 | 3.00 | 3.01 | 100.33 | |
| G84 | 69 | | 406.50 | | 409.50 | 3.00 | 3.00 | 100.00 | |
| G84 | 69 | | 409.50 | | 412.50 | 3.00 | 3.05 | 101.67 | |
| G84 | 69 | | 412.50 | | 415.50 | 3.00 | 3.03 | 101.00 | |
| G84 | 70 | | 415.50 | | 416.20 | 0.70 | 0.75 | 107.14 | |
| G84 | 70 | | 416.20 | | 417.00 | 0.80 | 0.90 | 112.50 | |
| G84 | 70 | | 417.00 | | 418.50 | 1.50 | 1.65 | 110.00 | |
| G84 | 70 | | 418.50 | | 420.00 | 1.50 | 1.36 | 90.67 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| G84 | 70 | | 420.00 | | 421.50 | 1.50 | 1.60 | 106.67 | |
| G84 | 71 | | 421.50 | | 424.50 | 3.00 | 3.00 | 100.00 | |
| | | | | | | | | | |
| **G87** | | | | | | | | | |
| G87 | 56 | | 325.00 | | 328.10 | 3.10 | 3.10 | 100.00 | |
| G87 | 57 | | 328.10 | | 331.20 | 3.10 | 3.24 | 104.52 | |
| G87 | 57 | | 331.20 | | 331.70 | 0.50 | 0.73 | 146.00 | |
| G87 | 57 | | 331.70 | | 334.50 | 2.80 | 3.00 | 107.14 | |
| G87 | 58 | | 334.50 | | 337.50 | 3.00 | 3.00 | 100.00 | |
| G87 | 58 | | 337.50 | | 338.30 | 0.80 | 0.52 | 65.00 | |
| G87 | 59 | | 338.30 | | 340.50 | 2.20 | 2.56 | 116.36 | |
| G87 | 59 | | 340.50 | | 343.50 | 3.00 | 2.96 | 98.67 | |
| G87 | 59 | | 343.50 | | 346.00 | 2.50 | 2.70 | 108.00 | |
| G87 | 60 | | 346.00 | | 349.00 | 3.00 | 2.65 | 88.33 | |
| G87 | 60 | | 349.00 | | 352.10 | 3.10 | 3.20 | 103.23 | |
| G87 | 61 | | 352.10 | | 355.30 | 3.20 | 3.20 | 100.00 | |
| | | | | | | | | | |

DOCUMENT INFORMATION

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## DOCUMENT CHANGE CONTROL

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| 5 | Formatting changes | Mick McKeown | 9/05/2011 |
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## DOCUMENT REVIEW AND SIGN OFF

| Version | Reviewer | Position | Signature | Date |
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| 6 | Mick McKeown | Senior Engineering Geologist | MV McKeown | 10/5/2011 |