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Rio Tinto Exploration Pty. Limited

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A member of the Rio Tinto Group

EL 4/94 Balfour
Third Annual and Final Report
for the Period 3 May 1996 to 11 November 1997
Tasmania, Australia

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Abstract

EL 4/94 Balfour was granted to Rio Tinto Exploration Pty Limited on 6 November 1994. The EL covers 25 km^2 centred on the Balfour Township in NW Tasmania. Rio Tinto's EL 18/92 (Mt Frankland) encircles this licence.

Exploratory drilling during 1996 failed to recognise the potential for a Rio Tinto sized ore body, and EL 4/94 Balfour was recommended for relinquishment on 28th August 1997. The licence was surrendered in full on 11th November 1997, and this report constitutes the third annual and final report. .

Work undertaken during the annual reporting period has included;

- regional structural mapping
- rock sampling (62 samples collected from ELs 4/94 and 18/92)
- re-interpretation of geological and geophysical data which has led to a new concept for copper ore bodies.
- diamond drilling (3 holes totalling 797m; DD97BC9, 10 and 11) at the Murray's Reward Prospect. DD97BC10 was abandoned at 82.1m and did not intersect mineralisation. Diamond drill problem - Hydraulic lock.

Best intersections from mineralised zones in DD97BC9 were;

- 17.3m @ 1.06% Cu from 55.3m (including 1.7m @ 2.58% Cu from 55.3m).
- 3m @ 2.07% Cu from 64m.
- 0.5m @ 5.44% Cu from 71.5m.

Best results from DD96BC11 were;

- 12m @ 0.64% Cu from 148m (including 0.3m @ 4.04% Cu from 151.7m).
- 2m @ 1.46% Cu from 170m.

It was concluded that;

- the area is structurally complex with variable fold geometry and fault history.
- structural mapping at the Murray's Reward Prospect suggests an ore shoot plunge steeply dipping to the SSE. ?
- drilling suggests there is only one main lode at Murray's Reward, comprising disseminated to blebby chalcopyrite in quartz dolomite, dipping 80° to the SW.
- the grade of the mineralised zone is sub-economic and appears to decrease with depth (to 120m). - Hole angled out of ore zone

Follow up diamond drilling at Murray's Reward failed to find evidence of stacked mineralised bodies and has decreased the likelihood of locating a larger body of high grade mineralisation at depth. It was therefore recommended that the Balfour licence and the encompassing Mt Frankland licence be relinquished.

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1. Conclusions and Recommendations

The conclusions from mapping and drilling at Balfour are:

- The area is structurally complex with variable fold geometry and fault history.
- Structural overprints affect lithology appearance eg high strain zones.
- Strong inferences of reverse faulting in the area; possible low angle reverse faults.
- Chlorite alteration maybe two phase - a footwall alteration to the major structural line of the Balfour Copper Trend and its subsidiaries and a regional metamorphic effect on lithologically different units i.e. the Chloritic Unit.
- Structural mapping at the Murray's Reward Prospect suggests an ore shoot plunge steeply dipping to the SSE.
- Drilling indicates that the Murray's Reward area is unlikely to host a significant body of mineralisation. As this is the best known mineralisation the trend is by inference down graded.

It was therefore recommended that EL 4/94, Balfour and the encompassing EL 18/92 Mt Frankland be relinquished.

2. Introduction

EL 4/94 Balfour was granted to Rio Tinto Exploration Pty Limited on 6 November 1994. The EL covers 25 km^2 centred on the Balfour Township in NW Tasmania. Rio Tinto's EL 18/92 (Mt Frankland) encircles this licence (plan Tv1036). An application to surrender EL 4/94 was made to Mineral Resources Tasmania on 28 August 1997. The licence was surrendered in full on 11th November 1997, and this report constitutes the third annual and final report.

Rio Tinto's principal commodity of interest at Balfour is copper. A NNW-SSE structural line called the Balfour Copper Trend bisects the licence and the surrounding EL 18/92 with prominent copper trial workings and showings.

A reappraisal of structural dynamics in conjunction with intrusive igneous episodes has identified the possibility of large scale bulk mineable copper deposits existing at Balfour. Potential Rio Tinto sized orebodies are thought to have limited areal extent but plunge sub-vertically for 100's of metres.

3. Review of Previous Work

3.1 Prior to Current Tenement

Significant exploration efforts within the Balfour area prior to current tenement are summarised below:

BHP **SPL 392 and 410 1964-1970?**

BHP drill tested the Specimen Hill Sn-W prospect (1 km south-west of Balfour) with seven vertical diamond holes. No results are available for the three angle holes planned to test Cu mineralisation at Murrays Reward Prospect (immediately west of Balfour).

Pickands Mather Co International **EL 12/65 1965-1971**

Pickands Mather & Co geochemically sampled an extensive area of the Rocky Cape Group and drilled a number of strong magnetic anomalies (mainly discordant magnetite lodes) in the sequence west of Balfour. The magnetite lodes were thin (10 to 15m) with no significant base metals, although minor low grade Pb, Ag, Zn and Cu mineralisation was encountered in places.

Australian Consolidated Industries Ltd (ACI) **EL 16/68 1968-1974**

ACI tested Cu prospects centred on old Cu workings along a 17 km strike length of the Balfour Cu Trend. In total 37 diamond holes were drilled at eight prospects. However a majority of the holes were drilled to test the Cu mineralised quartz lode at Murrays Reward. A resource of 0.5 Mt @ 0.8% Cu was defined.

Esso Australia Ltd **EL 2/73 1973-1974**

Esso flew a Catalina borne INPUT EM survey on 800m spaced lines over most of the Rocky Cape Group south of the Arthur River. A cursory helicopter based follow up of a wide selection of anomalies was carried out. Most anomalies were dismissed as being due to pyritic and/or graphitic shales and no drilling was undertaken.

Rio Tinto Exploration Pty Limited **ELs 1/77, 1/79 (1977-1983) 12/80, 36/80, 4/83 and 61/83**

Rio Tinto (later joined in joint venture by Geopeko Limited) carried out regional panned concentrate sampling for Sn over much of the Rocky Cape Group. Follow up work involved:

- Eight diamond holes at Specimen Hill and one at Mt Hazelton (10 km SSE of Balfour) to test magnetic targets with accompanying geochemical responses
- Two diamond holes to test strong magnetic anomalies in Proterozoic quartzite's and mudstones near the coast west of Balfour (the Little Eel and Possum Creek prospects). The best intersection was 3m @ 2% Pb and 13 g/t Ag

- Surface testing of other magnetic anomalies within the Rocky Cape Group, particularly those to the east of the Interview Granite. No positive results were returned.

In the early 1980's attention was focussed on the base metal potential of the region, particularly Pb-Zn within the Cowrie Siltstone unit east of Balfour. One diamond hole was drilled to test a coincident magnetic and EM response with associated weak base metal soil geochemistry (the Red Prospect near the Arthur River, 25 km NNW of Balfour). Results were not encouraging.

3.2 During Current Tenement

1994 - 1995 (S Menpes 1995, Rio Tinto Report No: 20878)

Work during the first period of tenure included:

- A review of previous exploration undertaken by ACI and Rio Tinto in the Balfour area.
- Recovery and duplication of the IP profiles from test surveys carried out by ACI.
- Appraisal of all pre-existing IP profiles for the Balfour area. The profiles show major conductors with a high percentage frequency effect (PFE) apparently corresponding to lithological boundaries. These lithological contacts are known to be copper anomalous at The Clump and Specimen Hill.
- Compilation of pre-existing Rio Tinto and competitor rock and soil geochemistry.
- Detailed 1:10 000 scale mapping of The Clump and Murrays Reward prospects by a contract geologist. The mapping supported the interpretation of previous workers that copper mineralisation near The Clump and at Murrays Reward is structurally controlled.
- Acquisition and analysis (Cu, Pb, Zn, Ag, Co, Ni, Fe, Mn by AAS-aqua regia/perchloric acid digest, As by hydride generation-AAS-aqua regia/perchloric acid digest, Sn and W by XRF and Au by Fire Assay) of 80 rock chip samples from locations along the Balfour Cu trend and Specimen Hill. Metals content, uniformity and regional extent discriminate the Balfour Copper Trend mineralisation from the complex, variable and regionally restricted Sn-W mineralisation around Specimen Hill. The two types of mineralisation were considered to have different evolutions with the Specimen Hill style being fairly directly granite-related.
- Orientation soil and wacker geochemical traverses over The Clump Prospect. Results indicated that the Balfour Copper Trend at this location is completely leached at surface, with copper values in soil and wacker samples all less than 50 ppm, with no coherent pattern.

- Rockchip sampling at Murrays Reward. The samples showed that mineralisation is confined to quartz-sulphide veins within otherwise barren siltstones.
- An area approximately 16 square km known as the Nelson Prospect was identified with potential to host Cu in sediments. Work within the Balfour licence included;
- The establishment of seven grid lines at 400 to 800m spacing totalling 10.2 line km.
- Acquisition of ground magnetic data along the grid lines.
- Detailed geological mapping and outcrop sampling (52 samples) along grid lines, the Heemskirk Road and Cassiterite Creek.
- Soil and wacker geochemical sampling at 25m sample spacing along five of the grid lines (120 hand auger samples and 142 wacker samples).
- Acquisition of three lines of IP data totalling 5.4 line km (50m dipole spacing).
- Weak geochemical anomalies at the Nelson prospect were followed up in 1996. The results are summarised in the Frankland River report (EL 18/92).

1995 - 1996 (Menpes 1996 Rio Tinto Report No: 22155)

Work during the second year of tenure included:

- A review of mineralisation styles by TM Porter.
- Cross section construction and correlation for ACI drillholes by TM Porter.
- A gravity data review by S Rajagopalan.
- A review of the Specimen Hill Tin-Tungsten Prospect by GW Patterson.
- Reinterpretation of Rio Tinto's aeromagnetic data by S Rajagopalan (review focussed on Murray's Reward - Specimen Hill area).
- Reinterpretation of various company's IP data by T Aravanis.
- Six rock chip samples collected by S Menpes including a quartz lode at Tatlows Costean grading 1.1% Cu.
- Geochemical digital data location discrepancies.

Details of the above mentioned exploration can be found in the relevant Rio Tinto reports.

4. Exploration Activities for the Period 3 May 1996 to 11 November 1997

4.1 Introduction - Geological Orebody Concept

Large scale orebodies by their nature are implicit of large amounts of fluid generation, concentration, transportation, precipitation and

preservation. Elements at Balfour which may justify the expectations for a large scale copper orebody include:

1. A large elongate high strain structural zone - the Balfour Copper Trend (30 km in length).
2. Multiphase episodes of deformation and igneous introduction - Penguin, Benambran and Tabberabbean Orogenies; Pre-Cambrian and Cambrian basalts and volcanics and Devonian granite intrusions.
3. Numerous copper mineral occurrences, some with extensive continuity - metal sources could include inferred buried granitic plutons and/or the Pre-Cambrian basalts.
4. The occurrence in the area of a 'triple point' of differing structural domains.

The target at Balfour is a large scale bulk mineable disseminated copper orebody. The combination of basalt-derived copper and granite driven mass fluid and rock flows within a structural focus could produce such an orebody. The geometry of a plastic flow behaving system would have rising 'spires' from a main 'reservoir(s)' which would give rise to steeply plunging ore shoots. At the pinnacles of these ore shoots would be narrow, high grade vein mineralisation. The erosion level at Balfour is high enough to suggest that the tops of the 'spires' have been exposed but not the main 'reservoir'. Rio Tinto's aim was to locate the spatial orientation of the ore shoots that will enable diamond drilling to intersect the 'reservoir'.

4.2 Regional Mapping

The Balfour area is regarded as being structurally complex, particularly in the vicinity of the Balfour Copper Trend.

Previous mapping by Nic Turner concentrated on known mineralised areas along the Balfour Copper Trend. Thus there was a need for a broader view of the structure and deformation geometry of the area linked in with the known mineral occurrences and styles. A regional structural mapping exercise was conducted. Observations are:-

- The sediments of the area, whilst assumed to have undergone several orogenic building episodes, have open folds of ~100m amplitudes and ~500m wavelengths.
- Locally there are zones of tighter folding and steeper bed dips often associated with shearing.
- Several episodes of shearing and quartz veining have occurred some of which show reverse movement. Some of these faults/shears are low angle.
- The segregation of the dark grey/black siltstone (sandstones and/or shales) into separate lithological units is questionable. Variations in

lithological appearance may be due to structural overprints rather than depositional environment variations.

- Nevertheless an attempt has been made to subdivide the informally terminal 'Balfour Subgroup'. This subgroup would appear to underlie the currently known stratigraphy of the Rocky Cape Group.
- Youngest - Togari Group: Forrest Conglomerate, Black River Dolomite and basalts etc, unconformity.

Oldest - Rocky Cape Group:
The Cowrie Siltstone
Balfour Subgroup
Chloritic Unit inc chloritic sands and silts
Siltstone Unit
The Combination Unit
The Scoured Channel Unit
The Wavy Laminar Unit
Quartz Arenite Unit

- Chlorite can be a major component of some lithologies; in some cases this a structural-related alteration overprint eg. Associated with The Balfour Copper Trend. A major chloritic unit in the north of the licence is believed to be related to a primary lithology with the chloritisation being a regional metamorphic overprint.
- Potentially significant pyrite mineralisation occurs in black siltstones of the above mentioned chlorite unit in the north of the licence. Pyrite occurs as:-
  a) cm-scale crystals with 1-2mm thick quartz rims
  b) very fine grained massive pyrite bands, parallel to bedding
  c) medium to fine grained stratabound zones of blebs and disseminations
- Clean, quartz arenites tend to occur in the west of the licence and are believed to be the oldest unit of the 'Balfour Subgroup'.

Recent work undertaken by MRT including an aeromagnetic survey of NW Tasmania has identified different structural domains. Some of these domains have curved boundaries with the implication being that they are thrust bounded (or at least reverse fault bounded). One of these structural domain boundaries is semi-coincident with the Balfour Copper Trend.

A highly interpretive geological map has been produced combining more than 250 visited exposures and Rio Tinto's 1993 aeromagnetic survey (Plan Tv1196, appendix 2 and 3). In addition three interpretative cross sections for the area have also been completed (Plan Tv1039, 1112, 1170). Large parts of the licence remain unmapped with geological interpretation based solely on the aeromagnetic data. Efforts should be made to map at low water the Lindsay and Frankland Rivers.

4.3 Rock Sample Analyses

In conjunction with the mapping a further 62 rock samples were collected from EL 18/92 and EL 4/94 (plan Tv1171, Appendix 4 and 5). The 127 samples collected by Nic Turner were analysed for additional major elements. In addition 7 samples were sent for thin section analysis. The aim of the rock sampling was twofold:-

a) establish element signatures for mineralisation and alteration associated with the Balfour Copper Trend
b) identify if any volcanic - related lithologies occur in the area.

The initial conclusions of the rock sampling are that there are no volcanic rocks in the area. However a full lithogeochemical study has not been made. Observations made so far include :-

- No distinct multielement signature has emerged for the copper mineralisation. Generally elevated arsenic, silver, cobalt and nickel coincide with copper.
- Weak carbonate replacement has been modified by surface leaching. Considerable leaching of metals has occurred.
- Intrusive rocks occur as :-
  1. Epidiorite (pyroxene-hornblende microdiorite) : south of Pierpont Morgan, on the Heemskirk Link Road.
  2. Basalt/fine grained dolerite at the Clump.
  3. Small scale orange/brown weathered veins, presumably of basalt/dolerite, at the Clump and on the Balfour access track
- Minor albitisation may have occurred south of the epidiorite on the Heemskirk Link Road.
- High levels of magnesium (>20% Mg) are found at the Development and Blocks prospects.
- A maximum value of 276ppm Sn is found associated with the high grade mineral at Murrays' Reward
- Trial workings SW of Balfour (o/c sites 172 and 173) contain rocks with anomalous copper, lead and tungsten. Ward reports zinc values of mullock up to 7% Zn.

4.4 Discussion

Mapping has identified a simple stratigraphy based on field observations and airborne magnetics. There is no evidence for volcanic rocks within the Balfour Subgroup. The chloritic unit at the top of the subgroup probably allowed the passage of regional metamorphic fluids. This affected the chloritisation of mafic-bearing sandstones. Chloritic units which occur lower in the stratigraphy may be sheared zones related to the Balfour Copper Trend in which chloritisation was part of the alteration package eg Blocks and Development.

The source of the copper can be from the copper-rich basalts of the Togari Group which have been overthrusted by the Rocky Cape Group. However if these basalts have massive sulphides with them and if the Balfour Copper Trend is a reverse fault then is there the possibility of a Neves Corvo type orebody scenario existing.

4.5 Diamond Drilling

As part of the exploration programme at Balfour, Tasmania (AFE 20070). Three holes were drilled in order to test for a potential Rio Tinto size copper orebody at Murrays' Reward Prospect. Another hole at South Balfour (proposed hole C) was originally planned, however, logistical factors (mainly weather) resulted in the hole being suspended, with drilling planned for a more suitable time of year. Drillhole logs and assay results are presented in Appendix VII.

A hole at Nelson Prospect to the northwest of Murrays' Reward was also considered to test for potential Pb-Zn mineralisation associated with a soil anomaly identified during the 1996 programme. However, exploration was confined to Murrays' Reward, and the soil anomaly remains untested.

The 1997 exploration programme conducted by Rio Tinto suggested that the level of erosion was sufficiently low, that a major copper orebody may exist at depth. Analogies with Mt Isa (particularly the quartz-dolomite style of alteration), and Cobar were drawn. A further aim was to test whether mineralisation at Murrays' Reward occurred as a single lode or as stacked ore shoots. The occurrence of major mineralisation along the Balfour copper Trend was thought to be related to cross-cutting structures, forming dilation zones, into which mineralised fluids migrated.

4.6 Drilling Results

DD97BC9 was oriented 55°→050 (AMG) and drilled between Murrays' Reward and Central Mt Balfour mines. The hole twinned ACI hole DDH16, but was drilled to a depth of 250.4m. Significant copper mineralisation was intersected from 55.3 to 72.2m, occurring as disseminated, blebby chalcopyrite + pyrite within quartz-dolomite. Two 30cm zones of semi-massive chalcopyrite associated with quartz occurred within this zone. Best intersections from the mineralised zone returned;

17.3m at 1.06% Cu from 55.3m, including 1.7m at 2.58% Cu from 55.3m
3m at 2.07% Cu from 64.0m
0.5m at 5.44% Cu from 71.5m

Below this zone a 2m interval within another quartz-dolomite unit returned;

2.0m at 1.03% Cu from 82.0m

Above and below this zone of mineralisation in BC9, green to grey, often laminated fine-grained chloritic schist is dominant. Occasional interbanded coarser units appear porphyroidal. Laminations are generally planar, with occasional wavy zones, often associated with late stage kinking. Younging evidence is rare, however there appears to be a reversal of younging direction below the main zone of mineralisation. The younging direction changes from younging up-core to younging down-core. Quartz ± dolomite veining persists to the end of the hole, and is often associated with pyrite, however there is little or no chalcopyrite. A 20.5m zone comprising quartz and silicified chloritic schist marks the eastern margin of the Balfour copper Trend.

DD97BC10 was oriented 65°→060. The planned depth of this hole was 500m, however, drilling was abandoned at 82.1m due to hydraulic lock caused by the intersection of a fault zone. This previously unrecognised fault may possibly be responsible for the division of the tin and copper zones at Balfour. The hole was subsequently moved 90m to the northeast, to the nearest suitable site (now BC11).

The geology of DD97BC10 comprised green-grey chloritic schist with occasional quartz + dolomite ± pyrite veining. Minor cassiterite occurred within a bleached, soapy chloritic zone at 71.2m. The fault zone at 79.7m consisted of puggy, clay-altered, brecciated schist.

Drilling of DD97BC11 was completed to a depth of 464.5m. The hole was designed to test mineralisation at depth (around 250m) and intercept the vertical projection of a surface gravity anomaly. Two cassiterite stringers within chloritic schist occur at 38.0m. A zone of disseminated, occasionally blebby chalcopyrite, associated with quartz-dolomite was intersected between 146.6 and 159.9m. This zone bears remarkable similarity to the 17.3m zone intersected in BC9, and is believed to be the main Murrays' Reward zone. Best result was;

12m @ 0.64% Cu from 148m including 0.3m @ 4.04%Cu from 151.7m

A smaller mineralised zone occurs between 171.0 and 172.0m. Best result was:

2m @ 1.46% Cu from 170m

Below this the hole was dominated by often laminated grey to green chloritic schist, with quartz ± dolomite veins and occasional pyrite. A zone of intense silicification occurred between 186.6 and 209.5m.

The vertical projection of the surface gravity anomaly, immediately to the east of the Balfour copper Trend, was intersected at approximately 400m. At this depth the dominant rock-type was green chloritic schist, with occasional breccia zones, and rare sulphides. The intensity of quartz ± dolomite veining was variable, but no greater in this zone than elsewhere in the drill core. It would appear this anomaly may be due to an elevation correction error.

4.7 Structure

Core orientation was attempted on core from DD97BC9 and BC11, with the aid of a sharpened spear dropped down the hole. Overall the number of successful attempts was somewhat disappointing, largely due to irregular or steeply angled breaks caused by the schistosity running at a low angle to the long core axis (LCA). Fabric orientations were measured with the core vertical, using graduated tapes which were wrapped around the circumference of the core. These orientations were then rotated to their correct positions using an equal angle stereonet.

The fact that relatively few of the orientation attempts were successful, makes determination of the macrostructure difficult. Only 5 measurements were obtained from BC9 and 6 from BC9. Mapping in the Murrays' Reward pit and No. 1 adit has shown there is considerable local variation in bedding and the orientation of the schistosity due to small scale deformation, and thus resolution of the macrostructure on the basis of only a handful of orientation measurements would not necessarily be reliable.

Mapping in the immediate vicinity of Murray's Reward revealed the intersection of at least two structures in the main ore. The major control appears to be a steep westerly dipping fault with a NNW strike. A secondary structure has an easterly dip at approximately 70° to the east, with a N-S strike. Any ore shoot resulting from the intersection of these two structures, would have a shallow plunge (approximately 25°) to the SSE, so it is unlikely that these secondary faults exert any control other than to offset the main lode.

Schistosity across the ore zone, as mapped in the No.1 adit dips steeply to the SW, with local variations due to fault drag and minor warping. The orientation of the schistosity reflects the strike of the Balfour copper Trend. Considerable variation occurs with depth however, as indicated by the orientation measurements obtained from BC9. At 97.0m in BC9 the schistosity (and sub-parallel bedding) is oriented 40°→050, and is accompanied by a change in younging direction, from younging up-core

to younging down-core. This may be an indication of a flat-lying structure such as a recumbent fold. Immediately to the west of the Murrays' Reward pit is a change in younging direction. Over the majority of the area bedding is right-way-up and younging to the west, however to the west of the pit bedding is overturned and younging to the east. This also suggests the presence of a flat-lying structure, however its exact orientation and relation to mineralisation, if any, is not known. The mineralised zone closely follows the surface I.P. trend at Murrays' Reward, and it is likely that this is the major ore zone, thereby downgrading the concept of stacked ore shoots. The projected mineralised zone intersected in BC9 occurs deeper than originally expected in BC11 (approximately 70m), and would appear to have been affected by later faulting. A sinistral kink in the surface I.P. trend to the northeast of BC9 could be an expression of this feature. Alternately it could be an expression of a major control on mineralisation however there is no associated magnetic feature.

4.8 Discussion

DD97BC9 and BC11 tested the concept of stacked ore shoots at Murrays' Reward. The mineralised zones intersected in BC9 (17.3m from 55.3m) and BC11 (13.3m from 146.6m) are remarkably similar in style and it would appear that there is only one main lode at Murray's Reward, comprising disseminated to blebby chalcopyrite in quartz-dolomite, and dipping at 80° towards the SW. A secondary shoot may exist approximately 10m further to the west, but is probably only a metre or so wide.

The grade of the main mineralised zone appears to be sub-economic, and appears to decrease with depth. However, no definitive test of the grade at depths of greater than 120m has been made. DD97BC10 was designed to do this, however, the presence of the fault causing unsuitable ground conditions further east, makes this difficult at Murrays' Reward. Two options would be to drill a hole from the east of the main Cu trend oriented at 70°→250, or drill a more steeply plunging hole from the site of BC11, given that the gravity anomaly has now been tested.

Conductivity measurements were collected taken from DD97BC9, however measurements below background noise were recorded, even in the most mineralised zones. Nevertheless, the mineralisation at Murrays' Reward closely follows the trend of the main I.P. anomaly, suggesting that this technique could be useful in locating further copper mineralisation elsewhere along the Balfour copper Trend.

The presence of tin stringers (although only minor), so close to the western margin of the Balfour copper Trend was previously unrecognised, and the contact between the two mineralised zones may be fault-related. Such a structure may have been the focus of mineralisation.

5. Rehabilitation

Rehabilitation has been completed on the diamond holes in the Murray's Reward area. Monitoring was ongoing, and a final assessment for clearance of the environmental/performance bonds will be carried out by a Mineral Resources Tasmania representative in December 1997.

6. Expenditure

Expenditure on the Balfour licence (EL 4/94) for the period from 3 May 1996 to 11 November 1997 was $302,194. Total expenditure during the licence history is $546,186.

7. References

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Menpes, S.A.	1996	Second Annual Report for the Period Ending 3rd May 1996 - EL 4/94 Balfour, Tasmania. *Rio Tinto Report No. 22155*

8. Location

Burnie	1:250,000	SK55-03
Sandy Cape	1:100,000	7815
Bluff Point	1:50,000	7815N
Balfour	1:50,000	7815S
Dempster	1:25,000	3243
Balfour	1:25,000	3242

9. Keywords

Tasmania * Rocky Cape Group * Togari Group * Proterozoic * Rockchip Sampling * Copper * Tin * IP Survey * Diamond Drilling

10. DPO Register

The following DPOs were submitted from the area;

82182, 82183, 82184, 82168, 82169, 82174 and 77317.

Results are included in the appendices.

Table 1

Rio Tinto Exploration Pty. Limited
DPO Register

EL 4/94 Balfour

DPO Number	LAB Batch Number	Lab Name	Lab Location	Office Date	Geologist	Tenement Number	Tenement Name	Sample Type	Number of Samples	250,000 Map Sheet
77317	-	University of New England	Armidale, NSW	27/10/96	S. Tear	4/94	Balfour	Petrology	7	Burnie SK55-03
82168	104165.60.11949	Analabs	Burnie, Tas	21/10/96	S. Tear	4/94 & 18/92	Balfour & Mt. Frankland	Rock	36	Burnie SK55-03
82169	CRA204.60.12408	Analabs	Burnie, Tas	25/10/96	S. Tear	4/94 & 18/92	Balfour & Mt. Frankland	Rock	17	Burnie SK55-03
82174	CRA204.60.12588	Analabs	Burnie, Tas	13/12/96	S. Tear	4/94 & 18/92	Balfour & Mt. Frankland	Rock	10	Burnie SK55-03
82182	7AD0798	Amdel	Adelaide, SA	3/3/97	T. Green	4/94	Balfour	Diamond drill core	77	Burnie SK55-03
82183	7AD1038	Amdel	Adelaide, SA	23/4/97	T. Green	4/94	Balfour	Diamond drill core	88	Burnie SK55-03
82184	7AD1435	Amdel	Adelaide, SA	25/5/97	T. Green	4/94	Balfour	Diamond drill core	126	Burnie SK55-03

Table 2

EL 4/94 Balfour
Expenditure Table

	1/5/96 - 11/11/97	TOTAL EXPENDITURE
Drilling	64,396	70,188
Contractors	11,208	62,044
Laboratory	6,278	20,069
Rent & Property	5,246	13,523
Payroll & Benefits	82,952	150,229
Field & Transport	26,893	57,276
Travel & Accommodation	9,446	15,492
Computer Services	7,868	9,187
Professional	9,262	10,012
Office & Miscellaneous	19,552	22,458
District Administration	19,528	51,122
Regional Costs	38,465	61,766
Tenements	1,100	2,820
TOTAL	**302,194**	**546,186**

319000 mE
320000 mE
330000 mE
145°
144.8°
144.9°
41.1°
41.2°
41.3°
5440000 mN
5430000 mN

Arthur River

Mt. Frankland EL18/92

THE CLUMP

EL4/94
Balfour

2M/76 Laan &
Langsford

1M/76 Laan &
Langsford

Frankland River

BALFOUR

MOUNT BALFOUR

MOUNT FRANKLAND

MOUNT HAZELTON

Ordnance Point

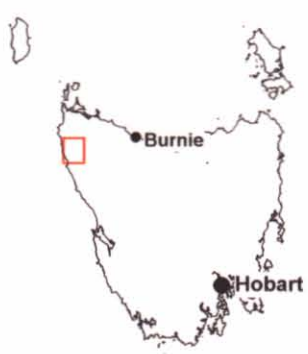
Southern Ocean

N

0 2 4
Kilometers

Projection: AMG Zone 55
Grid: AMG Zone 55 & Lat/Long AGD66

Location Diagram



Mapsheet Reference

Welcome 7816	Circular Head 7919	Table Cape 8016
SK55-20 NW-Tas		
Sandy Cape 7815	Arthur River 7915	Hellyer 8015

Legend

- Town
- Mountain
- EL Boundary
- Perennial Drainage
- Non-Perennial Drainage
- Highway
- Secondary Road
- Minor Road
- Track
- Railway
- Lake
- Swamp
- Urban

5 cm

RIO TINTO EXPLORATION PTY. LIMITED

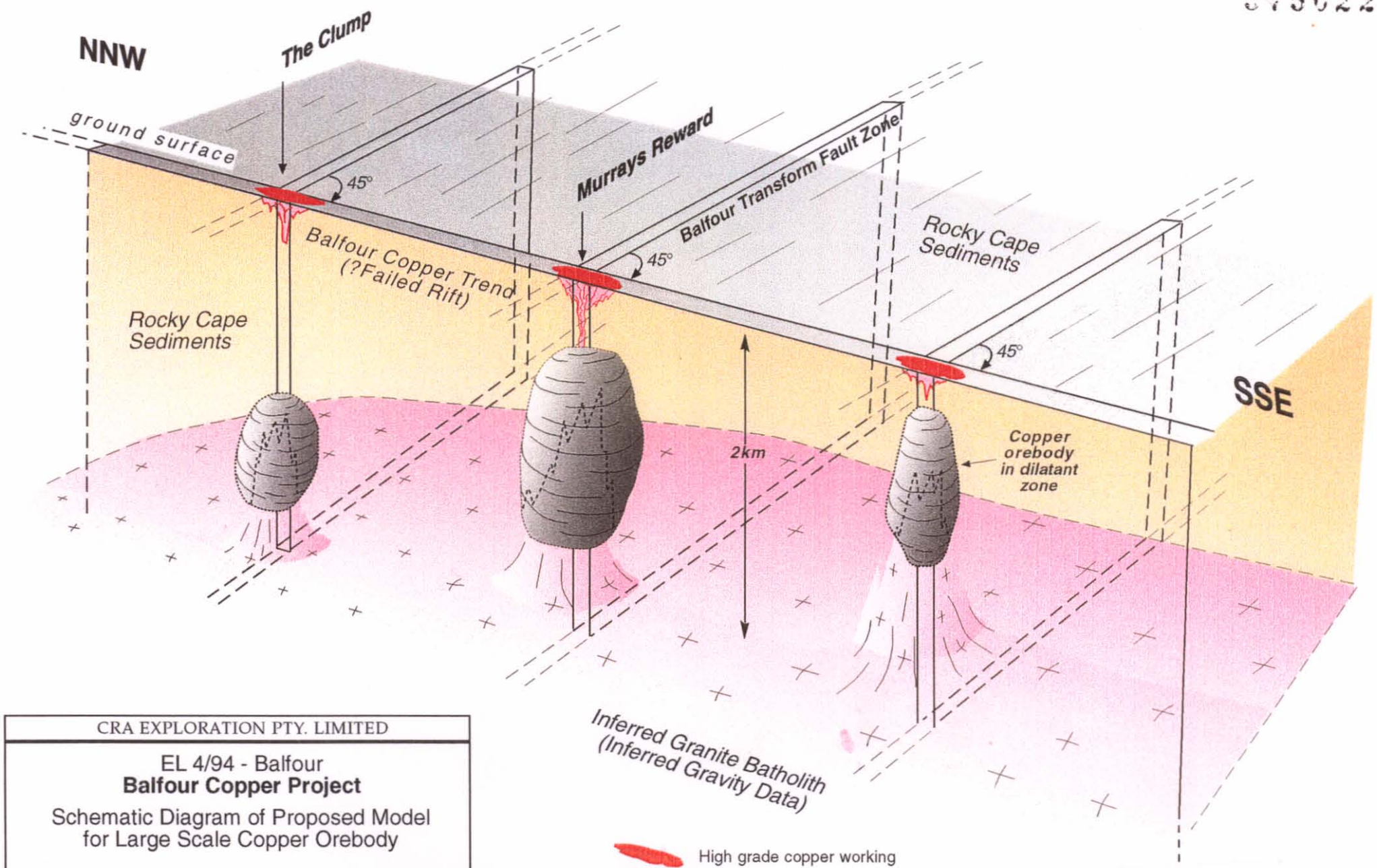
EL4/94 Balfour

Location Plan

Author: Simon Tear	Reference: NW SK55-20 or Burnie SK55-03
Drawn: Tony Sargeant	File Name: Tv1036.wor
Date: February 1996	Report No: 22685
Scale: 1:100,000	Plan No: Tv1036

E 69 / 1572

575022



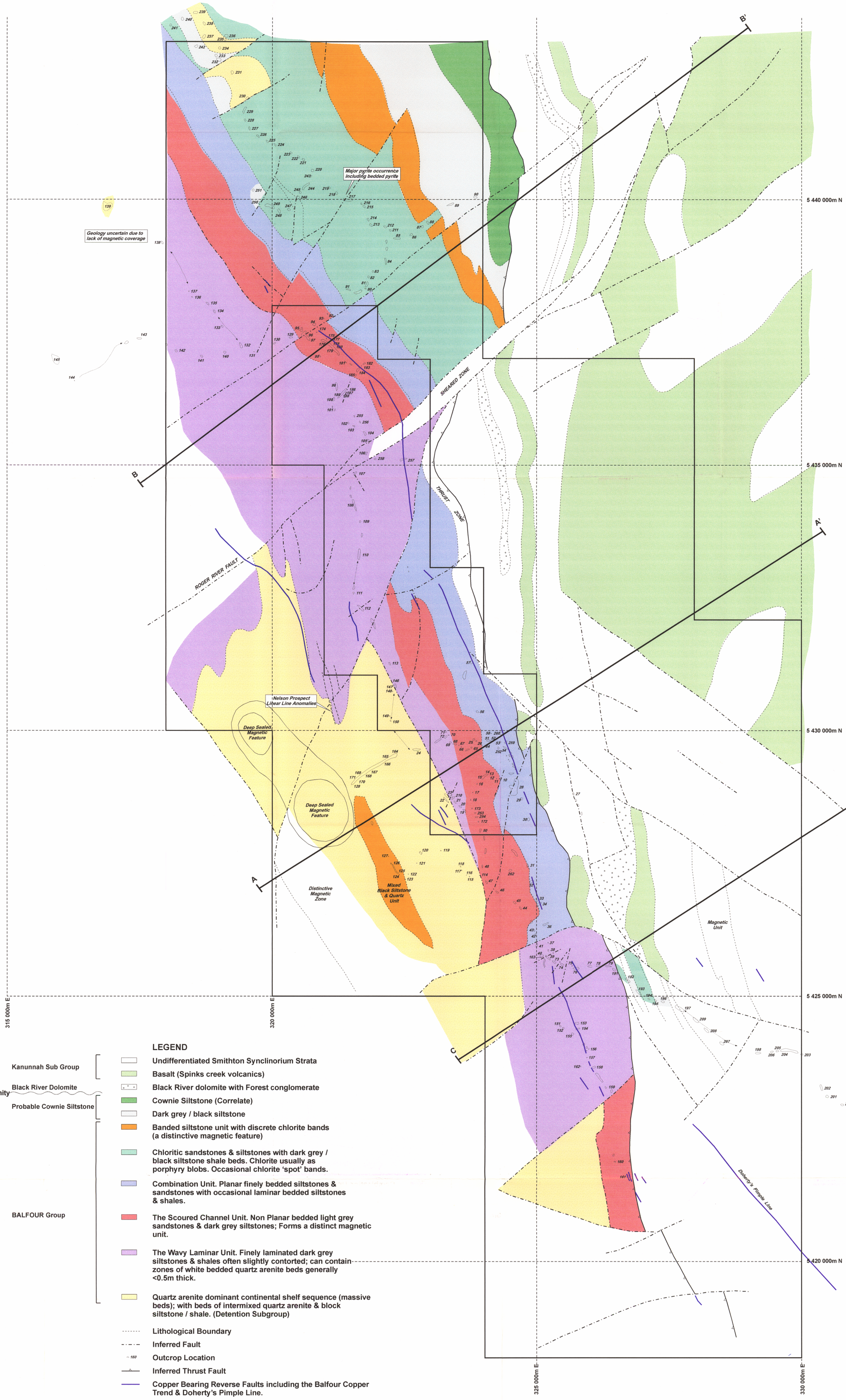
CRA EXPLORATION PTY. LIMITED

EL 4/94 - Balfour

Balfour Copper Project

Schematic Diagram of Proposed Model for Large Scale Copper Orebody

geol : S J Tear	scale: see note	report no: 22685
drawn: D Oliver	date: Oct 1996	plan no: Tv1206



LEGEND

NEOPROTEROZOIC

- Kanunnah Sub Group
  - Undifferentiated Smithton Synclinorium Strata
  - Basalt (Spinks creek volcanics)
- Black River Dolomite
  - Black River dolomite with Forest conglomerate

Unconformity

- Probable Cownie Siltstone
  - Cownie Siltstone (Correlate)
  - Dark grey / black siltstone
  - Banded siltstone unit with discrete chlorite bands (a distinctive magnetic feature)
  - Chloritic sandstones & siltstones with dark grey / black siltstone shale beds. Chlorite usually as porphyry blobs. Occasional chlorite 'spot' bands.

MESOPROTEROZOIC

BALFOUR Group

- Combination Unit. Planar finely bedded siltstones & sandstones with occasional laminar bedded siltstones & shales.
- The Scoured Channel Unit. Non Planar bedded light grey sandstones & dark grey siltstones; Forms a distinct magnetic unit.
- The Wavy Laminar Unit. Finely laminated dark grey siltstones & shales often slightly contorted; can contain zones of white bedded quartz arenite beds generally <0.5m thick.
- Quartz arenite dominant continental shelf sequence (massive beds); with beds of intermixed quartz arenite & block siltstone / shale. (Detention Subgroup)

- Lithological Boundary
- Inferred Fault
- 160 Outcrop Location
- Inferred Thrust Fault
- Copper Bearing Reverse Faults including the Balfour Copper Trend & Doherty's Pimple Line.
- Quartz Lode

Data Sources :
CRAE Mapping : Simon Tear (1996) & N.Turner (1994)
Mt Balfour Mining Field (Ward 1911)
CRAE Airborne Magnetic Survey

Notes :
1. Up to 100m error on Copper Lodes as transcribed from Ward 1911.
2. No Air photograph interpretation has been incorporated into the interpretive map.
3. Refer to Mapping sites map for distribution of observed outcrops - large areas in the east & west of 18/92 remain uncovered.
4. Considerable surface leaching has removed copper sulphides from exposed & outcropping quartz-dolomite veins. Therefore quartz lodes may be copper-bearing reverse faults - see Ward (1911).
5. Up to 3km of sediment loss is represented by the unconformity of the Cownie Siltstone & the Black River Dolomite.

5756623 5 cm

Rio Tinto Exploration Pty. Limited

EL 4/94 & 18/92 BALFOUR & Mt FRANKLAND
Balfour Copper Project
Interpretive Geology Map

Ref.	SK55-03 Burnie		
Scale	1 : 25000	Drawn	C.Pike
Author	S.Tear	Report	22685
Date	21-1-97	Plan No	Tv1196 (.cdr)

SW
A

NE
A'

EL 18/92

EL 18/92 EL 4/94

EL 4/94 EL 18/92

EL 18/92

Bearing 058° AMG

Deep Seated Magnetic Feature

Siltstone sub-unit

Mt Balfour track

Heemskirk link road

Regional Gravity High 800m to SE

Specimen Hill

ACI DDHs

DDH37

DDH34

CENTRAL MT BALFOUR MINE

Ⓐ ACI DDH37 2.53m @ 0.38% Cu from 204.9m

Ⓑ ACI DDH34 4.75m @ 0.22% Cu from 136.2m

Frankland River

Frankland River

Frankland River

Frankland River

200mRL

Sea Level 0m

−200mRL

−1000mRL

−2000mRL

Quartz Arenite Unit

Distinctive Magnetic Unit within Quartz Arenite Unit

Quartz Arenite Unit

Quartz Arenite Unit

Wavy Laminar Unit

Scoured Channel Unit

Breccia body

BALFOUR COPPER TREND

Combination Unit

Tertiary Basalt

Undifferentiated Upper Togari Group

Smithton Basalts

Basalt

Black River Dolomite

Forest Conglomerate

? unconformity ?

? Cowrie Siltstone ?

Balfour Subgroup

? Sole Thrust ?

Inferred buried granite (gravity data)

Schematic Stratigraphy for the Balfour Area

- Late Middle – early Late Cambrian
- *unconformity*

Neoproterozoic Togari Group

- Smithton Dolomite
- Kanunnah Subgroup (Siltstones with basalt & dolomites)
- Black River Dolomite
- Forest Conglomerate

- *unconformity*

Mesoproterozoic Rocky Cape Group

- Jacob Quartzite
- Irby Siltstone
- Detention Subgroup
- Cowrie Siltstone
- Balfour Subgroup

1. Chloritic Unit
2. Combination Unit
3. Scoured Channel Unit
4. Wavy Laminar Unit
5. Quartz Laminar Unit

- Lithological boundary
- Bedding trace
- Fault
- Quartz–Tourmaline–Cassiterite veins
- Copper ore shoot (Balfour Copper Trend)

0 500 1000m

Horizontal Scale = 1:25 000

5 cm

0m 100 200 300 400 500m

Vertical Scale 1:10 000

575024

CRA EXPLORATION PTY LIMITED

EL 18/92 – Mt Frankland
EL 4/94 – Balfour

BALFOUR COPPER PROJECT

Regional Cross Section A – A'

MURRAYS'REWARD

AUTHOR	DRAWN	DATE	SCALE	REPORT
S J Tear	D Oliver	Jan 97	1:25000	22684 22685

REF. Burnie SK55-03 SUB-DIR PLAN No. (Dia) Tv1039

SW
B

NE
B'

EL 18/92 | EL 18/92 | EL 4/94 | EL 4/94 | EL 18/92 | EL 18/92

Bearing 058° AMG

Nelson Bay River

Bouguer Gravity Low

Heemskirk link road

Scoured Channel Unit

Mt Balfour Shaft 70m to SSE

AG 13019

AG 13017

Frankland River

Distinctly magnetic unit

Blackwater Road

Blackwater Rivulet

Blackwater Road

200mRL

Sea Level 0m

−200mRL

−1000mRL

−2000mRL

Wavy Laminar Unit

Quartz Arenite Unit

27.5m @ 0.13% Cu from 178m

5.7m @ 0.27% Cu from 274.3m

Combination Unit

Chloritic Unit

Black Siltstone with bedded pyrite

Chloritic Unit

Dark grey siltstone

Cowrie Siltstone

Undifferentiated Togari Group

Basalt

Forest Conglomerate

Undifferentiated Togari Group

Undifferentiated Togari Group

Smithton Basalts

BALFOUR COPPER TREND

Scoured Channel Unit

Inferred Buried Granite

Schematic Stratigraphy for the Balfour Area

Late Middle – early Late Cambrian

unconformity

Neoproterozoic Togari Group

- Smithton Dolomite
- Kanunnah Subgroup (Siltstones with basalt & dolomites)
- Black River Dolomite
- Forest Conglomerate

unconformity

Mesoproterozoic Rocky Cape Group

- Jacob Quartzite
- Irby Siltstone
- Detention Subgroup
- Cowrie Siltstone
- Balfour Subgroup

1. Chloritic Unit
2. Combination Unit
3. Scoured Channel Unit
4. Wavy Laminar Unit
5. Quartz Laminar Unit

- Lithological boundary
- Bedding trace
- Fault
- Quartz–Tourmaline–Cassiterite veins
- Copper ore shoot (Balfour Copper Trend)

5 cm

3735025

0 500 1000m

Horizontal Scale = 1:25 000

0m 100 200 300 400 500m

Vertical Scale 1:10 000

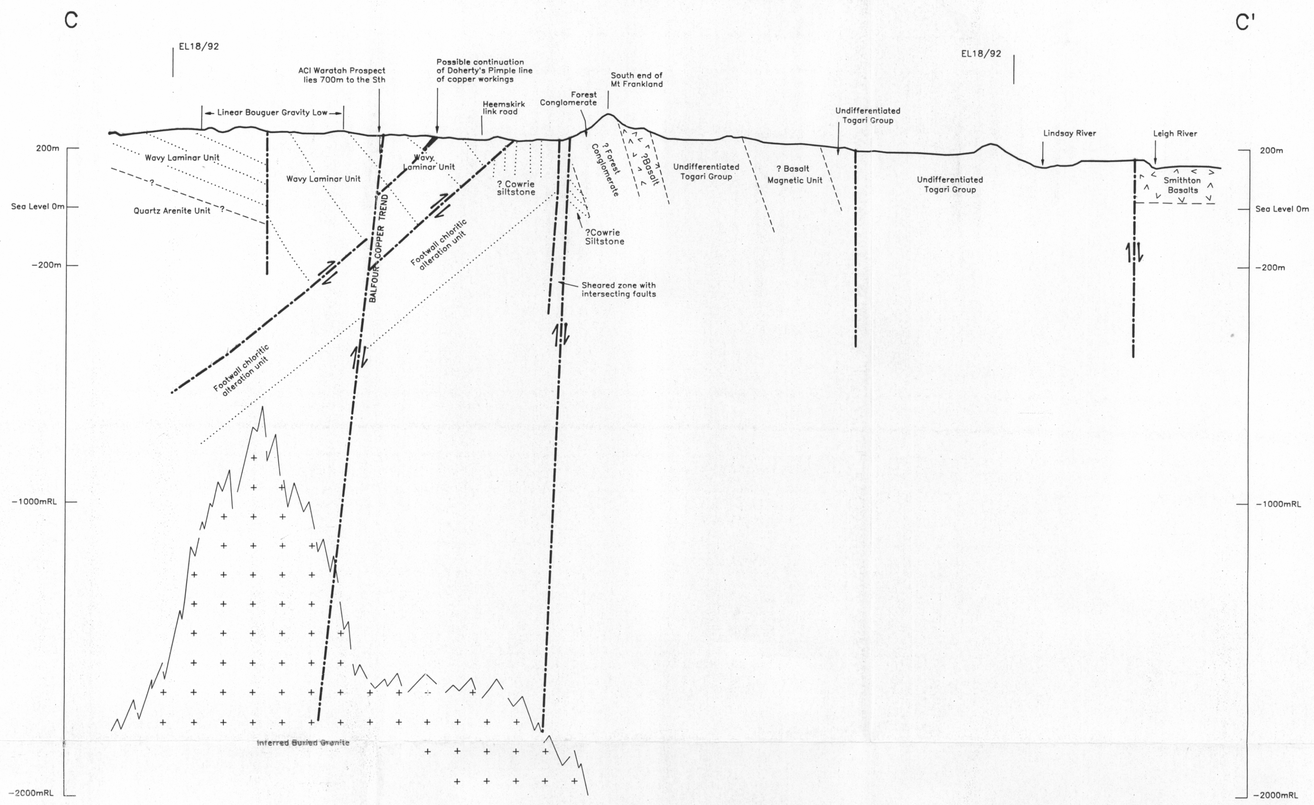
CRA EXPLORATION PTY LIMITED

EL 18/92 – Mt Frankland
EL 4/94 – Balfour

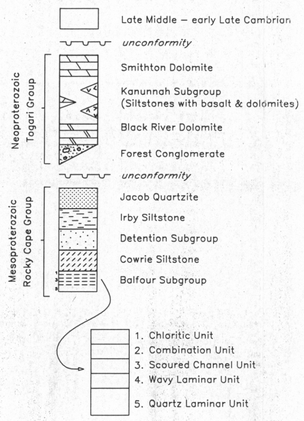
BALFOUR COPPER PROJECT

Regional Cross Section B – B'
'The Clump'

AUTHOR	DRAWN	DATE	SCALE	REPORT
S J Tear	D Oliver	Jan 97	1:25000	22884 32685
REF. Burnie SK55–03		SUB–DIR	PLAN No. (file)	Tv1112



Schematic Stratigraphy for the Balfour Area



- Lithological boundary
- Bedding trace
- Fault
- Quartz–Tourmaline–Cassiterite veins
- Copper ore shoot (Balfour Copper Trend)

0 500 1000m

Horizontal Scale = 1:25 000

0m 100 200 300 400 500m

Vertical Scale 1:10 000

575026

5 cm

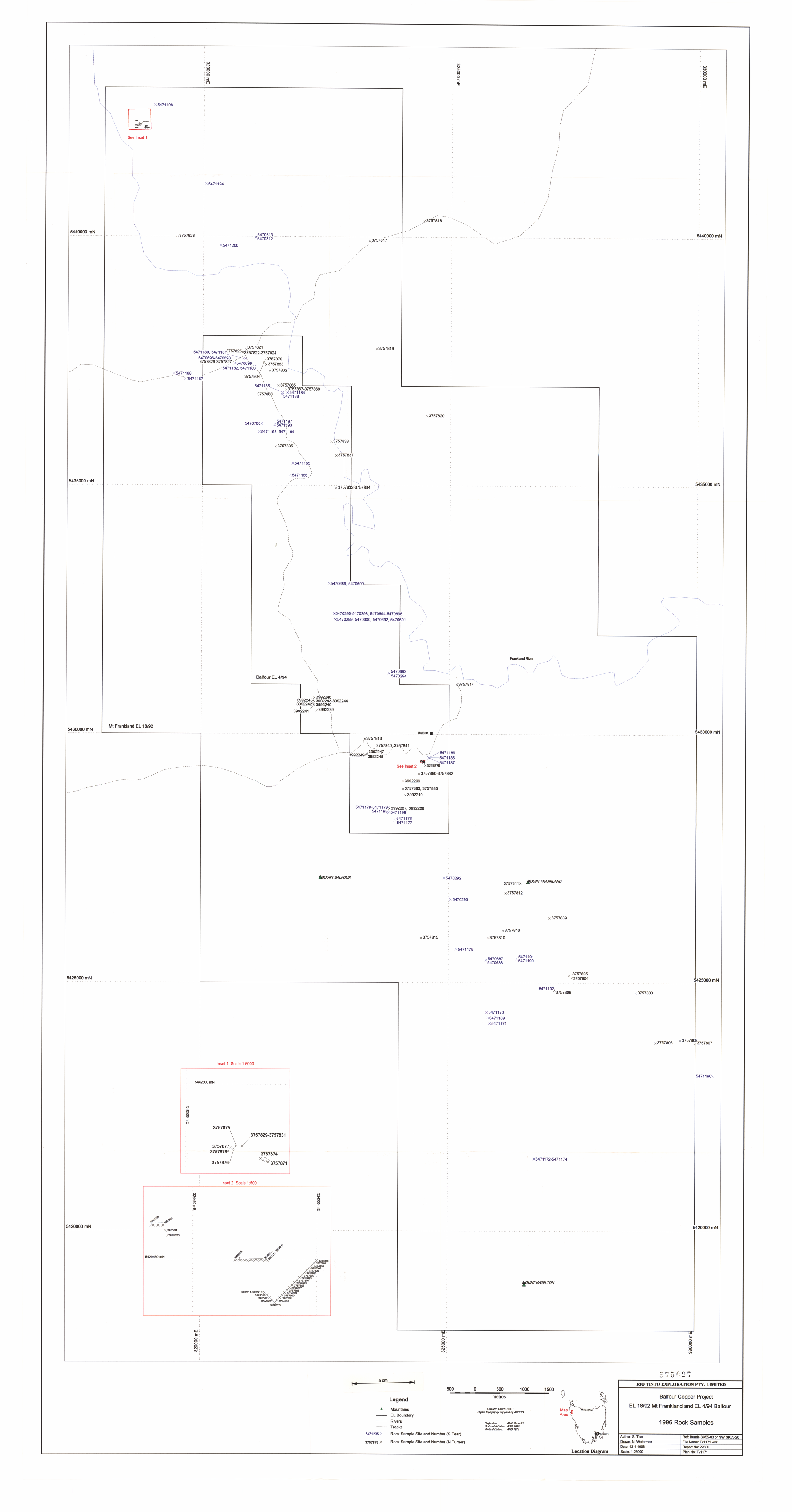
CRA EXPLORATION PTY LIMITED

EL 18/92 – Mt Frankland
EL 4/94 – Balfour

BALFOUR COPPER PROJECT

Regional Cross Section C – C'

AUTHOR	DRAWN	DATE	SCALE	REPORT
S J Tear	D Oliver	Jan 97	1:25000	22684 22685
REF. Burnie SK55–03		SUB–DIR	PLAN No. (Dia)	Tv1170



575057

RIO TINTO EXPLORATION PTY. LIMITED

Balfour Copper Project

EL 18/92 Mt Frankland and EL 4/94 Balfour

1996 Rock Samples

Author: S. Tear	Ref: Burnie SK55-03 or NW SK55-20
Drawn: N. Waterman	File Name: Tv1171.wor
Date: 12-1-1998	Report No: 22685
Scale: 1:25000	Plan No: Tv1171

323750mE 324000mE 324250mE 324500mE 324750mE 325000mE

5430500mN 5430250mN 5430000mN 5429750mN 5429500mN 5429250mN 5429000mN 5428750mN

Pnq Png Pyq Pl Py Tb

IP Anomaly

602m Q 590m P 574m O 644m N 650m M 572m L 540m K 600m J 500m I 557m H 590m G 304m F

22 20, 21 35 34 33 37 36 24 26 18 17 16 BC9 15 10 11 14 13 12 25 23 BC4 BC10 BC5

Proposed "d" Proposed "a" abandoned Proposed "b"

Central Mt Balfour Shaft

Adit portal lower level 53m below adit

PETERS RIDGE PETERS FLAT

Possible IP Anom. Possible IP Anomaly Probable IP Anomaly

65° 72° 70° 81° 56°

EOH 81m

No.1 Level Adit portal Murray's Reward Main Shaft Murray's Reward Pit No.2 level No.3 level Adit portal

Tatlows Shaft

Tim Creek

Reference Line

Tertiary basalt

Pl	Fracture zone containing quartz veins, carbonate & silicate rocks, pyrite, chalcopyrite & common covellite. This assemblage has been shattered, brecciated and sheared by late movement.
Png	Planar banded pale and medium green siltstone.
Pn	Thin banded green to olive siltstone with dark grey siltstone and minor mudstone.
Pnq	Pn with common interbeds of medium grained quartz arenite.
Py	Banded dark grey siltstone with common thin lenticular grey beds of fine grained sandstone.
Pyq	Py with common to abundant interbeds of medium grained quartz arenite.

Geological boundary
IP anomaly
Shaft
Surface projection of drillhole
"a" Proposed drillhole
Dip / strike of bedding
Road / track
Creek / watercourse

5 cm

0 50 100m

575028

RIO TINTO EXPLORATION PTY. LIMITED

EL4/94 – Balfour

BALFOUR COPPER PROJECT

Murrays Reward – Central Mt Balfour

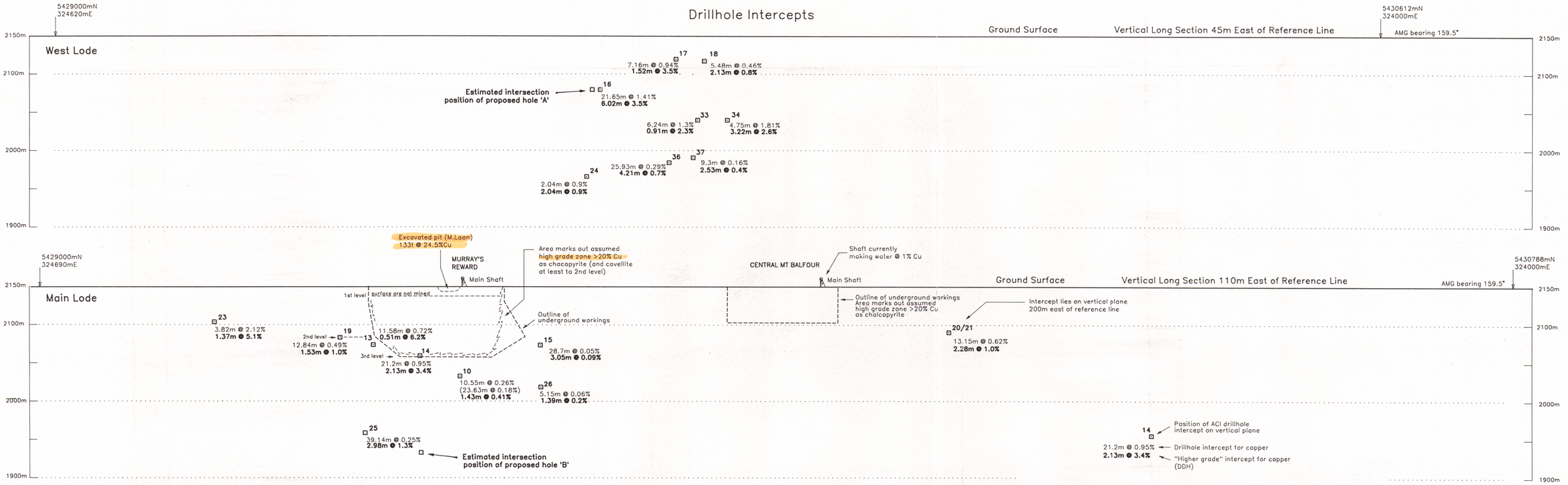
Drillhole Location Plan

AMC MN 12° N

AUTHOR	DRAWN	DATE	SCALE	REPORT
S J Teer	D Oliver	Aug 97	1:2500	22685

REF. Burnie SK5503 SUB-DIR PLAN No. (file) Tv1172

Drillhole Intercepts



NB : Reasons for termination of Murray's Reward underground operation not documented. Possibly attributed to :

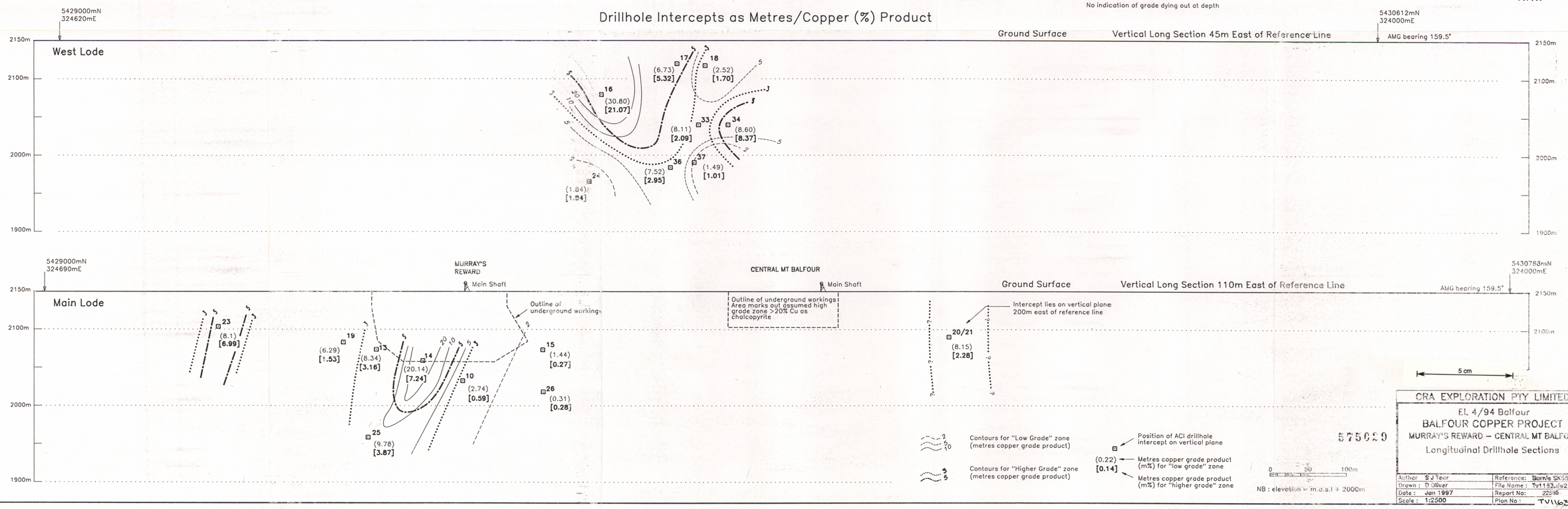
i) Embargo of overseas sales during WW1 plus very high shipping cost

ii) Flooding of the mine

iii) Fault offset at depth

No indication of grade dying out at depth

Drillhole Intercepts as Metres/Copper (%) Product



575029

CRA EXPLORATION PTY LIMITED

EL 4/94 Balfour

BALFOUR COPPER PROJECT

MURRAY'S REWARD – CENTRAL MT BALFOUR

Longitudinal Drillhole Sections

Author:	S J Tear	Reference:	Burnie SK55-03
Drawn:	D Oliver	File Name:	Tv1163.dw2
Date:	Jan 1997	Report No:	22695
Scale:	1:2500	Plan No:	TV1163

320500 mE
321000 mE
321500 mE
322000 mE
5437500 mN
5437000 mN
Tg
Png
Pn
Py
Pyq
Pl
67°
42°
52°
38°
68°
80°
E
D
C
B
A
27
9
4
3
6
28
2
1
Frankland
River
575030

Legend

- Tracks
- Faults
- Rivers
- Geology Boundaries
- Drillholes
- Cross Sections

50 0 50 100 150
metres

Projection: AMG Zone 55
Horizontal Datum: AGD 1966
Vertical Datum: AHD 1971

5 cm

Map Area
Burnie
Hobart

Location Diagram

RIO TINTO EXPLORATION PTY. LIMITED

Balfour Copper Project

EL 4/94 Balfour

The Clump Prospect Drillhole Location Plan

Author: M. Porter	Ref: Burnie SK55-03 or NW SK55-20
Drawn: N. Waterman	File Name: Tv1173.wor
Date: 1-21-1998	Report No: 22685
Scale: 1:2500	Plan No: Tv1173

NW

SE

321000mE
5437440mN

321762mE
5436750mN

Drillhole Intercepts

Bearing 303.5° (AMG)

Ground Surface

2150m

2100m

2000m

1900m

1
21.4m @ 0.25%
1.53m @ 1.0%

2
12.4m @ 0.19%
poor recovery

3
13.24m @ 0.45%
0.68m @ 2.3%

4
13.4m @ 0.07%
0.32m @ 0.8%

6
19.8m @ 0.15%
0.76m @ 0.3%

9
27.54m @ 0.18%
1.57m @ 1.52%

27
21.03m @ 0.11%
5.7m @ 0.27%

28
4.47m @ 0.05%
2.31m @ 0.06%

3
Position of ACI drillhole intercept on vertical plane
13.24m @ 0.45%
Drillhole intercept for copper
0.68m @ 2.3%
"Higher grade" intercept for copper (DDH)

NW

SE

5 cm

321000mE
5437440mN

321762mE
5436750mN

Drillhole Intercepts as Metres/Copper (%) Product

Bearing 303.5° (AMG)

Ground Surface

2150m

2100m

2000m

1900m

1
(5.35)
[1.53]

2
(2.36)
[N/A]

3
(5.96)
[1.56]

4
(0.94)
[0.26]

6
(2.97)
[0.23]

9
(4.96)
[2.39]

27
(2.31)
[1.54]

28
(0.22)
[0.14]

28
Position of ACI drillhole intercept on vertical plane
(0.22)
Metres copper grade product (m%) for low grade zone
[0.14]
Metres copper grade product (m%) for high grade zone

2, 5, 10
Contours for "Low Grade" Zone (metres copper grade product)

3, 5
Contours for "Higher Grade" Zone (metres copper grade product)

0 50 100m

NB : elevation = m.o.s.l + 2000m

575031

CRA EXPLORATION PTY LIMITED

EL 4/94 Balfour

BALFOUR COPPER PROSPECT

The Clump Prospect

Longitudinal Drillhole Section

Author : S J Tear	Reference: SK55-03 Burnie
Drawn : D Oliver	File Name : Tv1164.dw2
Date : Oct 1998	Report No: 22685
Scale : 1:2500	Plan No : Tv1164

Appendix 1

1996 Geological Mapping - Data Maps

TV1174	Balfour Copper Project EL4/94 Balfour and EL18/92 Mt Frankland Structural Data Map	1:250,000
TV1176	Balfour Copper Project EL4/94 Balfour and EL18/92 Mt Frankland 1996 Mapping: Bedding Measurements	1:250,000

315000E 320000E 325000E 330000E

5440000N 5435000N 5430000N 5425000N 5420000N

EL 18/92 MT FRANKLAND

EL 18/92 BALFOUR

Lode 156°/dip not known
qtz lim ridge
bifurcates & terminates
at south end

Lode 120/55 NE
chloritised slate

Gossan &
indurated slate

NS adit from NW. E-W lode
tunnelled from east at depth 540'
good ore intersected. Lode 135°/60NE
additional non ore structures dip 60° SW

Lode 100°/40°N - can be variable

contact

MT BALFOUR MINE
75' wide dipping NE. Lode 100°/40°N
Trials only (note in south drive
at times can dip NW eg the branch lode

Mean strike of lode 124°

Mean strike
of lode 145°

Western lode 142° dips to west
(can be sub horizontal) with a
silicic & hematitic footwall

10m thick lode dominantly siliceous
Tunnelled with good ore at depth

Siliceous lode with good ore cpy + cov
Tunnelled with good ore at depth

2m qtz vein with py + cpy +/-chlorite
significant for the massive nature of the vein

Small unconfirmed massive qtz lode with cpy

Lode 160° strike overlapping lenses of
variable strike; py + chlorite + silica

major

major

major

Surface trend of yellow decomposed ?ore material
with poss py + chlorite + cpy - Tunnelled (not seen
by Ward) chloritised pyritic slate

Lode outcrop in creek bed

Development Prospect (ACI drilling)
Good ore - bends suddenly to west
chalcocite abundant

Blocks (ACI drilling) Good ore
siliceous chloritic
cpy-py-cav +/- sericite

Qtz vein with
cavities after py

Blocks (ACI)
lode 140° strike
Good ore
waterlogged

Lode 161° strike
4m wide-water

5' of slate with
qtz - py - cpy

Qtz +py veining
10m wide

Black
graphitic
slate

Shaft & tunnel, slate 165°/80°W dip
dips east at start of tunnel (abnormal)
75m? wide mineral zone ore vein(s?) strike 030°
position approximate

21m mineral zone with chloritised & hematised country rock

Harpers Tunnel
(approx position)

Indefinite ore in tunnels
slate strikes 160°/70° E

CENTRAL MT BALFOUR MINE

Dark qtzite + black indurated slate
+py, qtz veinlets, chlor
Irregular structures

Good ore
Lode strikes 150° vert dip
30m mineral zone, ser alteration

Qtz+py lode strikes 145°
mineralised slate

MURRAYS REWARD MINE

Discovery outcrop in creek

Minor ga+py
in contorted slate

SPECIMEN HILL
tin tungsten lodes

Minor galena
in qtz lode

1.5m qtz vein with py
reports of minor gold

Adit driven ENE
terminated in soft black
pyritic slate

100' wide zone of
? barren qtz veins

4m wide lode striking 145° SW dip
ENE trending adit passed through
lode zone terminating in py black slate
Three shafts sunk, waterlogged.
Complex lode material & structure
ser_chlor slate, qtz gangue
7% Zn disseminated py +sid+cpy+sph+ga
(Drilled by CRAE 1982?)

Narrow qtz veins of
over large width (?20m)
no visible sulphides

Tunnel
banded slate & sst
130°/48° NE
lode +/-cpy

Qtz-ser-chlor-py
lode +/- galena
up to 50' wide

PIERPOINT MORGAN PROSPECT
(ACI Drilling)
Late strikes 151°, strikes W (?)
Tunnelled - 10m wide lode with
graphite slate in hangingwall

Lode strikes 125°

Indefinite lode
silicified sandstone
with semi-massive py

Lode 140 deg
honeycombed qtz
with limonite + py

Small vein
140°/SW dip
Qtz-ser-chlor-py

Lode 140 deg. Qtz lens
with limonite + hematite.
2m lode 128/70 SW
with copper ore

(30m long or 30m wide zone?)
Qtz lode vein strikes 160°/v steep
to west in mineralised & chloritised
slate +/- cpy. Cpy with Ga & sph
Beds strike a few deg west of north
dipping 25°-45°E

2m lode 151°/dips SW
complex structural &
irregular fractures

ACI WARATAH PROSPECT
Main Lode cpy+py+cov

Qtz Lode of py-cpy
5' wide, strike 146 °

Untested lode
142° strike

4' lode with cpy
+/- country rock
alteration. 123/75W

SOUTH BALFOUR MINE
Rich ore
Sheeted fracture zone
complex structure with
cpy-cov-py and altered
country rock 40' width
000/63W

Cpy+ trace Cov
in qtz vein

132°/48°W
pyrite in qtz
+ qtzite

168°/75°W
Qtz-py-cpy-
cov lode

140°/40°W
country rock
alteration abundant

Qtz lode 140°
Ferroan dolomite-qtz
-py-cpy-cov-mag
chlorite alteration of
country rock

Qtz lode152°

Limonite
patch

Sst and qtz
vein ridge

Qtz vein o/c

Qtz-chlor-Ser alteration
with py+cpy+cov abundant
Dipping 72° SW in hanging wall
61° SW in footwall.
Quartzite host dips east
Slate in hangingwall dips west

Vein well defined with
massive py+/- cpy

Altered country rock only
Sandstone with qtzite+py

Untested quartz vein
intersheared with
country rock

KEY

- *Shear*
- *Quartz vein*
- *Fabric Cleavage*
- *Fold hinge*
- *Quartz (Chalcopyrite) Lode (Ward, 1911) - margin of error +100m*
- *Shaft / mine*

Green - N. Turner mapping
Red - M. Donnelly mapping

5 cm

575033

Scale 1 : 25,000
0 500 1000 1500 2000 metres

RIO TINTO EXPLORATION PTY. LIMITED	
Balfour Copper Project	
EL4/94 Balfour and EL18/92 Mt Frankland	
Structural Data Map	
Author : S. J. Tear	Ref : 'Burnie' 1:250,000 (SK55-05)
Drawn : Exploration Graphics	Revised :
Date : October 1997	Report No : 22685
Scale : 1 : 25,000	Plan No : TV1174

315000E 320000E 325000E 330000E

5440000N 5435000N 5430000N 5425000N 5420000N

EL 18/92 MT FRANKLAND

EL 18/92 BALFOUR

Mapping by S. Tear

Mapping by M. Donnelly

Mapping by N. Turner

5 cm

Scale 1 : 25,000

0 500 1000 1500 2000 metres

RIO TINTO EXPLORATION PTY. LIMITED

Balfour Copper Project

EL4/94 Balfour and EL18/92 Mt Frankland

1996 Mapping: Bedding Measurements

Author : S. J. Tear	Ref : 'Burnie' 1:250,000 (SK55-05)
Drawn : Exploration Graphics	Revised :
Date : October 1997	Report No : 22685
Scale : 1 : 25,000	Plan No : TV1176

Appendix 2

Outcrop Location Data

575936

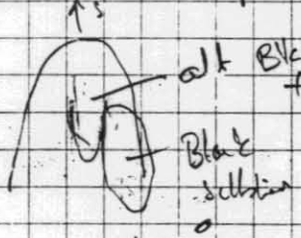
Balfour Mapping 11/10/96.

Murrays reward. 5 line km.

South end in Black Siltstone.

Fold hinge 20° to 148°

Shear ~~to~~ 007/40 E



Qtz Vein 167/80°E

fold hinge 8° to 348° in Black Siltstone

Shear fabric 146°/80°E

fold hinge 54° to 169°

other side of Vein

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(2) Black siltstone with fine sandstone beds.
near vertical bedding 165°/90.
younging centwards
cleavage/bedding parallel.
qtz cleavage 152°/90.

(3) lode ⊙/c
qtz Weathered black siltstone 158/65°E
qtz vein. 058/90
chloritic shale.

(4) 30m on from (3)
chloritic siltstones
with stymatic qtz veins
some similarities to Black siltstone
younging east vertical bedding 170°.

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Qtz Veins

155/90. straight

028/90 straight but boudined

Folded vertical bedding

Fabric 124°/90°-NE.

?Sourdough

⑤ Veining in ?chloritic rocks

?Chloritic black siltstone

170°/80W.

150°/90 10 cm intervals

0.5 m Qtz veins like track.

⑥ Chloritic phyllites in Trear Creek.

Site of Dirt and Bellows Fund.

575038

(7) 166/85E major plane
probably cleavage
chloritic silt stones
Cross shear 103/80° S.

(8) 172° approx strike of
Qtz lode 80m
up road E-South
shear parallel bedding
chloritic silt stones.

(9) Fabric in chloritised lodic
blade tektites + sandstones
133/80 NE. more chloritic
Bedding 171/85° NE bands.
Younging to East

575039

575040

(15) At 1st Major Junction
rare marine cross bedded 10-50cm
slightly chloritic ss?
Bedding 076°/80° S?
Near DDH 76/033° local max.
Pyjama rock: ?Young's east
rare fine sand + siltstone
beds <5cm.

(16) South End Specimen Hill.
poss Pyjama rock? 009°/70° S
Coarser 2-3cm sandstone beds

(17) 2nd site Pyjama Rock? 080°/50° S.

(18) 3rd site Pyjama rock?
039/40° SE.

(12) End of Trail
Sandstone + fine sandstone
like Ladybridge Cum, more
massive at Spreyton entrance.
Bed 172° strong 8: ripples

(13) Door Hill ?
dipping N dolerite.
fine sandstone - locally chloritic.
005°/70°E. Upright ripples and
Goodleigh type sedding 1/2m scale
N facing

(14) Heavy cast DL cryptolite
sandstone ?Chloritic
Bedding 045°/70°E
Has slump structures.

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(22) In Creek to West of road. 091° 42° S
Dark grey massive wet/Weathered
Pelagic sitstone
evidence of ductile shearing

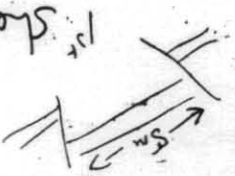
011/40 Cross veining.
qtz breccia veining.
< 20cm thick.

(23) Next big Road Cut.
2x channels down to
Creek to be mapped/logged
1' Qtz vein 059/80° NW.

(19) On Creek Road
Pelagic rock? Shearing
Fault
180°/45° E

(20) 1st Cut 170°/60°E
Pelagic rock?

(21) Main Cut
Seemingly all Pelagic rock?



1st Shear 123/80 SW
1m offset.
2nd or 2nd 130/83 SW.

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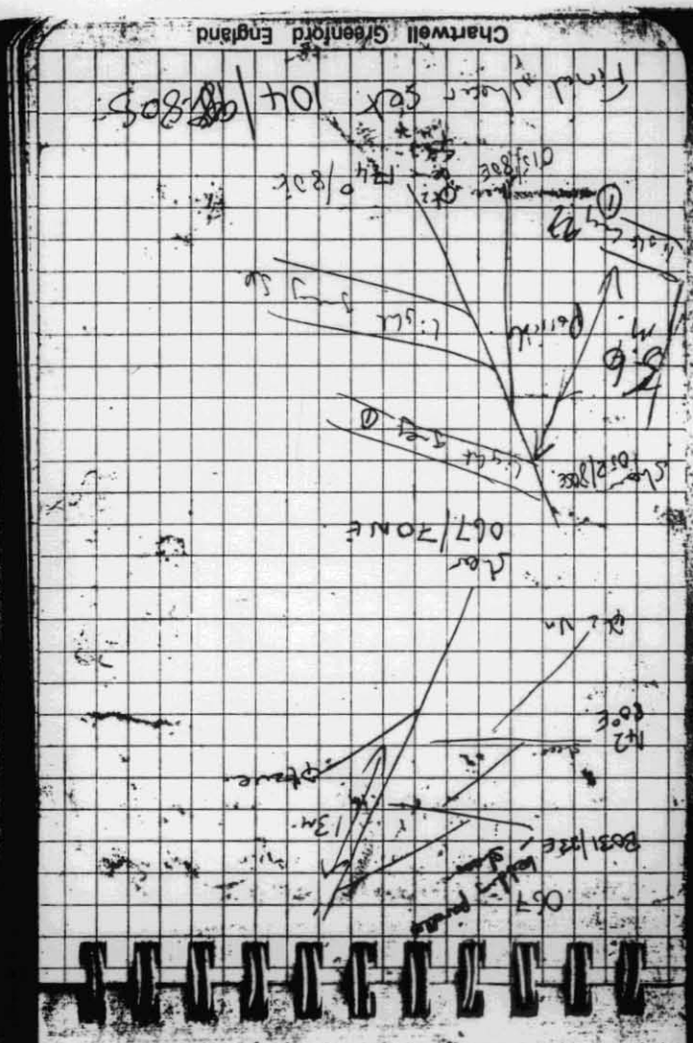


relatively massive.
Dark grey fine sandstone
Siltstone with lighter grey
coarser sandstone lens.
Cross bedding.
East Dextral shearing. bedding
side parallel shears
B170/46E.
S152/20°W.

West side Buff porphyritic ? dyke
178°/80W. Poss chilled margin

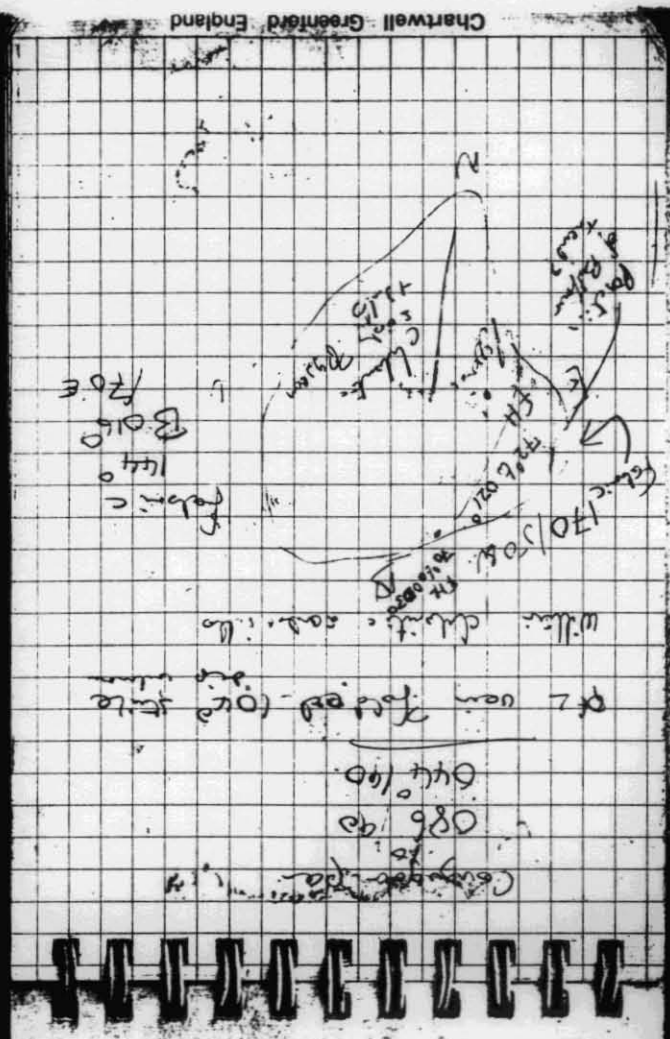
South East Qtz-sericite/Albite vein lens
067°/70° N

North East side Major zone of shearing
012°/70S

NE side 1' Qtz vein 070°/75N
Joints
Sinistral shearing

575042

575043



(25) Pyjama Rock?
B 171 | 7 E.
young to east.

(26) 12° to 154°? fold
huge in Otiria

12/10/96. 13 line km.

(27) White vein qtz
float blocks up to
½ m size

(28) S. Murray's Reward
on trail
Folded pyjama rock?
C.S. dipping S.

575044

575045

(29) RH 72° E 206°

in calcareous

chloritic siltstones

(strongly chloritic by creek.)

Bedding 016/85W.

slaty fabric 158°

scoured bedding à la pyjama rock?

Cross bedding in chloritic siltstones

(30) V regular chloritic silts + sands

1. 144° fabric

B174/80E like pyjama rocks?

Conjugate 132°

Shears 045°

fabric at 120° also part of the 132° shear direction

(31) Dark Grey/black pyritic micaceous Siltstone

?Trivial scratchings

Fabrics ① 174°

② 147°

Thin qtz stringers veins 169°/75W

(32) Cross Cut line.

West end

Thinly bedded/laminated silty planar Sea Silts + sands

↑ Old ↑ Young

146/70E

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575046

Thin veinlet systems 126°/40.
Bedding 158°/85 E

Thinly laminar
qtz lode near top of slope
at top of slope more
chloritic/altered laminar
calc+siliceous
hematitic staining
over hill + down other
side heavily altered
limonitic clay altered
laminar vein 162°/80U
(Mine)
? ↑ ?soil creep.?

(33) chloritised laminar
silty + sandy
small qtz stringers
D033/40 - ~~a~~ 180/90
~~155/86/70 W~~ Pervasive

Bedding 061/70E

(34) 156/80E B.
partially chloritic bedding
Thin sandstone + siltstone
qtz stringer 060°/90.
west side of road. Cross cut line.
more laminar either road.
+ qtz veins.
Bedding 161°/90 at road
chlorite spots on East side
of road.

(35) Peg 325200E
5426350N
abundant qtz on both
sides?

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575047

(36) Good outcrop.

Qtz Vn 154/52°W } conjugate pair
100/75°S

↑ Dextral movement of 10cm.

West side Chlorite supported Chloritic with + sands chl streaks spots in both sands + silts

B028/85E
At base ↑ of hill.

planar but not laminated with milder discolored Chlorite spots.

Dying out near top possibly more laminar near top spots more prevalent in thin siltstone beds

B178/80E near top.

B 018/80E near top.
1½m away.

v planar. possibly laminar

Qtz Vn 146/90
dextral 146°
179/33°W

B at top 013°/75°E.

Qtz Vn wide on road
2-3m +

Over Road on east side.

Qtz Vn or bedding 16/90.
Black/dk grey siltstone slate
Bedding ↑?
Py in thin Qtz veinlets.

20 Sandy blk siltstone + Qtz?

575048

(37) 385300E
5425900N
albitised qtz flsd
occ pos laminar
sands + silts.
177°/90.

(38) chloritic
sands + silts
at reasonably planar
Creek B176/90
Sinistral sense on. 010
plane
strongly chloritic bands.

50m up trail
mic laminar blk + lt grey
sands + silts distributed

bedding well imbricated.
pos fold hinge 50° to 030°

(39) Heemskeirk Link Road.
well laminated sands + silts
sheared appearance
B155/64E.
occ bigger 30cm sandstone
bands.
resembles flysch rocks
in places - scoured bedding.
Shear 062/70N
022/80W
occ lenses 2cm laminar pebbles

Note fold — tops to SW

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575049

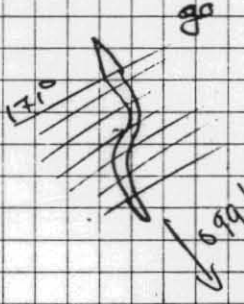
Shear 055/90.-
102/50° S.

Major shear 056/80 SE
1-2m wide
Qtz veins
2m wide
at N end of cutting
followed by chloritic
sheared sands & silts
not very chloritic in
places - some ice
at north end B171/90.

(40) Excavated trench NE road,
Qtz Vn 0.5m 023/90

18m qtz vein 008/80S
in chloritic sort of
sands & silts.
B171/90.

Tension gash.



at base of hill
V chloritic silt stn.
planar bands (silt)
2-3cm ss+ bands
006/80E

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575050

(41) Planar chloritic excavated creek silts and sands
B 077/72°E
small shear 093/7N
S 069/65SE
077/75SE
B 015/82E
Qtz Vn 130/90
15cm.
folded + sheared chloritic
Path at Portal under road
chloritic silts
continues along road to Bufton
for ~1,100m.

(42) chloritic silts + sands
fabric - foliation 153°
B 015/85E planar
locally almost laminar
localised cuspoid shears
077/80N
024/80W
} Conjugate set

(43) chloritic silts + sand
almost lamar-like

(44) Planar possibly non chloritic
Silts + sands
B 151/90 Dark grey silts
+ sands

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(45) Grey weathered - planar siltstone & sandstone
poss. pelitic.
? Transitional

(46) Pyritic Dk grey blocky siltstone
big Quarry
B162/90
some silt bands.
Chlorite porphyroblasts 1-2mm.
? Silicified

(47) Bk/Dk Grey silts and light grey sands
laminae & planes
scoured bedding

locally pyritic nodules
Syneresis cracks
— scoured bedded
B163/90
Dextral shear. 055/90
3m movement

(48) Some degree of scoured bedding,
some laminae & some planar
Dk grey silts + sandstones
Qtz vein 104/70 S. Dextral offset 30cm
bedding 008°/85°E

Many qtz veins & bands

575052

(49) Massive looking Dk grey / Blk
Siltstone,
pyritic silt (Dk grey) seams
almost a shale
B 121/78°S. —
massive looking.
Minor Qtz V. 022/75E
partly sheared
locally pyritic
some as big quarry

(50) Scoured bedded
Dk siltstone + Lt grey sandstone
Significant fold.
B 100/80 E S.
005/30 E
Pos Shear related drag fold.

Major Shear 146/90.
Boundary.
Obscure contents side of road
at north end of cut
more massive sst. — Prominent weathering features
B 144/56E
scoured bedded silts + sands

(51) Ridge of small flaser
beds < 1m. Minor fold hinges
1-2m + massive calcite qtz veins.
Slightly contorted via
folding 15° & 164° Fol.

(52) More chloritic & weathered
siltstone + sandstone.

(53) Well bedded chloritic - almost phyllitic
siltstone + sand. Very localised
[illegible]

575053

(54) Seemingly Scoured bedding
14 13/10/96. 7km.

(55) Chloritic sedimentary rock
as seen @ 53
< 1cm dark green chloritic
bands in a
wavy bedded sequence
of chloritic silts & sands.
fabric 136°/90
probable cleavage.

(56) Massive Quartzite.
Qtz veins
098/53S. 052/90
052/70SE. 107/46S.
046/75NW.
075/90.
035/45 NW.

going up till poses int
scoured bedding sandstone + siltstone
B 160/70E
becoming more planar in places
still scoured bedding
sometimes laminated
further uphill.
Qtz-cpy float
+ vein qtzite.

(57) Mine shaft - 20m deep
spoil of large qtz veins
>1m blocks.
with chlorite pipes
in a strongly chloritic
Protomylonitic rock.
hematite staining of rocks converted
to redorange brown

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575054

(58) Near Blocker Mine ?
(Chloritic units - possible tuffs reflora.
cross cut line.

Fabric 177/70°W.

Major fabric (? Bedding) 150°/90°

It grey ? sericitic silts + sandstones
chloritic layers.

(59) West end over track
DDH 056° Dip 58°.
From Drillsites NE.
17 paces start of chloritic o/c
(previous qtzite ?)
.5067/90.
↑ chloritic silts?
+ non chlor ss!

24 paces to the track.

(59) West end this NEW.
another drillhole.
10 paces + NE of track coming
out this 044° 60°
Colored in o/c. some form
of chloritic sst/siltstone

(60) Along track from 59.
30m. Qtzite.

(61) 3rd + perhaps final cut
line.
Site of poss. DDH
but 2nd shaft definitely
copy one in qtz
+ Wallpack.

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575055

Vein emplaced along dip which could be vertical with hanging wall chloritised sands/ silts - ?volcaniclastics

10m on from shaft
Chloritised sediments
fold hinge 56° & 352°

40m on. chloritic sediments

Qtz vns.
030/90 — ?? Conjugate pair
158/70W. }
012/90 ? more prevalent

(62) Dorehopment.
B 104/70E.
Fabric/cleavage 160

Orientation qtz veining
Strike 112/56S hinges of qtz
∴ fold hinge 86°&170°

(63) Plane 160°/75W.
044/85NW.
in Trench near dog-leg
V. sheared chloritic schists
Vn.
Black/dk Grey slate on uphill side.
qtz-dol with cpy + Cov-
Vein 136° Strike 1.2m width

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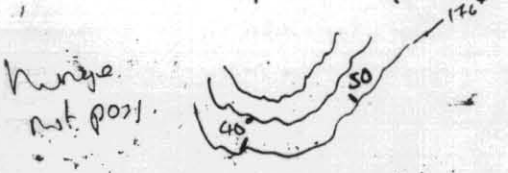
575056

(64) Peters Ridge.
scoured Bedding
with qtzite.

(65) Pos drag fold of
scoured bedded outer

fractures 102/90.
F F 090/70 EV

5m up not folded



10m up not more of
sandstone bands
+ v. thin laminae -
not planar

(66) Fine laminae - non planar
Siltstone + sandstone bands
partly convoluted bedding

(67) not as for 66.
3m Qtz vein with altered west
margin - east margin not visible
limonite - chlorite altered margin
followed by DK grey black siltstone
planar bedding
Grading into a scoured type lithology

(67) Scoured lithology
Bed 090/70SW
Qtz vein 078/MV
Strike of bed fracture 130/70SW

575057

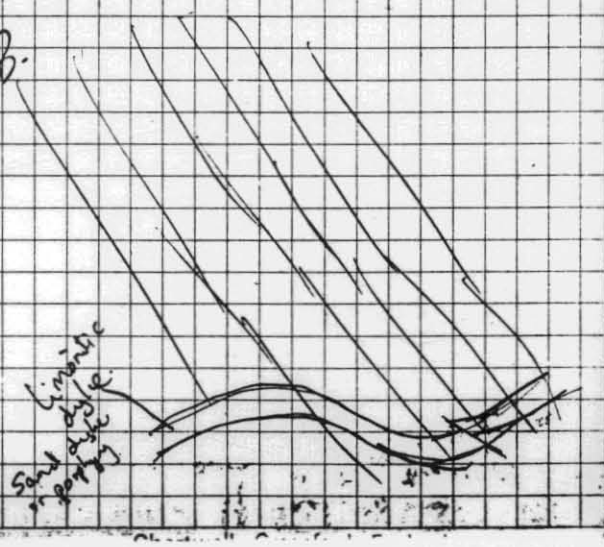
Introduction of non planar laminar zone at top towards creek.
QU 103/815 Dextral offset fracture 130/90.
" / 043/70 SE.
Not 30 scoured = looking 30cm sandstone bands continues over creek + round bend.

(69) no planar laminar unit hints of scoured bedding.

(70) Soft Black fissile siltstone band in laminar non planar silts + sands
B 170°/70E

(71) laminar non planar silts + sands
Silts 30cm silt bands
B. 175°/50°E.
right way up is not visible ?!
Fabric/cleavage 145°/75° NW. + clast ratio
Small scale veining 041/70 SE.

B.



575058

(72) QV 115/52 S.

in weathered black rotted substance.

Depressingly massive siltstone unit. It grey silt bands clean, platy/pitch on scale of slickensides 40° to 25°.

Heanskite Link Rd

(73) QV 145/70 SE

laminar subplanar

~~dark~~ silts + light sands

B 146/30 NW.

NO₂ sst > 3cm.

S 022/50°E

B after shear going South

177/20 E

Plastic type of rock

(74) ~~Sub~~ laminar subs planar - finely bedded dk silts + lt sands

Some convoluted bedding

Small slump 270/10

B 184/44 E

probably right way up

South end of cutting

occ 30cm sst layers.

immediately followed by major shear

004/Subs vertical 75cm wide.

followed ~~by~~ laminar with sst bands.

(75) not so obvious laminar sub parallel material

May be more weathered.

More massive dk grey silt stone with lighter grey fine sst bands + lenses

occ 3-5cm sst bands

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575059

(76) Mineralised d/c.
Shear zone with
gossan + - pyritic
qtz. in a very
Blackclay altered/sealed
Slide/siltstone sequence.
S/Q v 136/52NW mineral.
QV 116/90 — 5 tone.
Gossan.
continues a laminar
subs planar no set x 3cm thick
to Creek.

5-10m shear zone
Clays etc
Pyrite + Qtz veins

(77) laminar subplanar to planar
silts & sands
kinds of scoured bedding

OCC rusty bands,
perhaps worth a channel sample.
B 167/60°E

(78) laminar planar to
sub planar bedding
OCC sandstone 30-50cm
beds. Small dextral shear
030/90.
Varying colour dk grey silts
to lt grey silts.
½ way down creek no
more large cut beds.
For 20m then disappears.
2m thick bed
Some convoluted bedding.

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79

laminated cmst - well sheared possible shear
sericitic-silty. possible
S? major plan 136°/82°SW.
bedding cleaves 32° & 136°
width sampling for gold

0m

10m shear zone
minor shear + QV 144°/75°NE
drag fold on shear

10m minor shear + QV 154/85 SW

12m large QV 2.5m 160/75 W.
Minor Py.

12.5 laminar shale.

37.5m Altered sulphidic zone
silicified laminar sub planar
cmst

42.5 poss sheared bedding
with for 2m

44.5 ?chloritized
sheared + larger
sandstone bed
?silicified

not laminar / planar

very silicified looking
shale

60m shear zone 160°
chloritic ?shale
chlorite spots.

100m @ 326400E
5425450N

+20m bösm.

575061

17/10/96 . 12·5km

(80) Frankland River South side.

B 119/45 NE

Millimetric scale interbedded planar fine sst & siltstone

light grey, possibly chloritic siltstone interbedded (green hue)

locally massive sst bands.

Minr qtz veining.

(81) More NE side of river fine grained sandstone only 10cm scale occ silt interbeds

Planar with trace fossils.

Small cores taken.

moving back uphill - more strongly chloritic - locally recrystd. to hornfels

B144/80 NE

Foliation 173°/85W

Jointing

(82) Bedding planes

(81) planar 027/82W

with bedding lineation 32° to 027°

(83) B 176/25E

Planar Sands + silts

(24) 4m thick chloritic planar Sands + silts with abundant chlorite spots. Thin silts <1mm relatively massive no turn beds.

Thin section sample.

B 164/53E.

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575062

(85) Clubrock
< 2m
QV 048/50 015/79W.
At MT Frankland Road Junction
B 148/75 NE.

(86) chloritic spotted sediments but well rolled ie totally bimodal no fresh rock.

(87) Shear plane 150°/44 SW.
downthrow hanging chloritic - movement SW.
footwall - well bedded planar
Dk grey silts and sandstone
B 150/44 SW
Shear is bedding ≠ to silts + sands
Micron - Pt2 rainy with shear
10m thick unit
more indurated shearing + brk
blo spotted chloritic bird

B 120/80 SW. Pors conformable contact
Pors shear 148° between
Dk sandstone + silt + chlorite unit
now

(88) More distinctly bedded chloritic rock - chlorite beds rather than spots (rock present
Weakly developed foliation 018°.
B 149°/85 SW.

(89) Dk grey black silt stones + dk sandstone + more fine layers
B 166/80 E
2 phase from fault River ? relict ? indistinctly bedded but with ? chloritic spots
Cleavage/shear fabric 173°/10.
Competent bedding
Phyllonite

(90)

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(90) 3.25 km from Frankland River

Interbedded sands & silts

Very rolled. Moloid quite possible chloritic - spotted zones occurs assumed to be chlorite; small scale evidence of folding + faulting

B 170°/36 W.

cleavage 11° to 330°.

QV 172/28°W.

B 172°/66°E Poss fold hinge

QV 104/80 S.

QV 172/66°E

QV 030/52°W.

South of Frankland River - broadly units continue up from river but are often chloritic. Some beds <1cm scale seam chloritic.

(91) Bleached well bedded planar sands + silts + quite limonitic spotted layers assumed to be chlorite possibly even 1cm chloritic bands

B130/42°NE

fabric/cleavage 156°/70E.

Shear zone on actual cliff 174°.

B after 141°/68°NE

rock begins to look more chloritic no spots though.

Dark + light laminae in places.

(92) B129/65NE right way up

Dk grey siltstone + lighter sandstones not seemingly chloritic but very weathered well bedded locally laminar, v. planar

marked change in vegetation over the Bolton plain.

1.75km from River

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(93) sheared zone with massive looking dk grey siltstone with Qtz veining + Crinoids
QV 107/62°S. 145/70 SW

(94) Orientated Section 114/81 N
Black phyllitic siltstone with chiastolite porphyroblasts.
Perhaps siltstone some fine sst bands < 0.5cm
Thin QVs 109/90.
along road ~ 20m
more massive siltstone with
Zones of interbedded siltstone + silt.
planer + cross bedded dipping phyllitic
QV 130°/70° SW

(95) Quarry B 131/67° NE
Grey slate - planar well bedded
Grey siltstone + sandstone
flattish fold hinge 111° magnetic
2 sheer planes. Major 128/33° S Dextral
some Gossan material on the

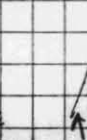
Minor parasitic fold
Competent bands showing dextral movement

QV 010°/77° E. = Qtz chloritic vein
QV 043/80 NW in pale siltstone breccia
QV 173/75° W = Qtz chloritic
QV 176/65 W = Qtz veining
wide shallow dipping E wall becoming steep
Termination gash

Sample Major shears 156/64 W 142/60 SW
130/62 SW

offsetting shear 033/90. Dextral.
Pyritic cross cutting gash in LH corner of quarry terminal 096/90.

(96) Major shear zone 127/80 SW in slate. Soft sediment shear 072/80 S



main shear
offset shear
1m beds.
B130/60 NE

(97) Spotted Brownish beds with chloritic sub-spotted rock
QV 041/90 chloritic

On west side of road major dilational sandstone vein limonite QV 066/80SE
Nos. subhorizontally scoured bedding.

(98) Sub-scoured bedding scm QV 048/90.
B 170°/37°E cuts set bed caps. Scoured surface @ southern end of outcrop.

(99) 073/90 QV. Silicia vein scm wide in sub flaser sequence lamé qtzite beds ½m. B 178/62E sandstones + phyllites. Zones calcareous/dolomitic becoming v laminar in places (minority) QV 042/90 most beds in area dip this heading south.

(100) B 106/65N Basalt dyke irregular shape but pois 022°/70°E
Unit 2 side scoured massive bedding sandstones + sandstones occ thinly bedded. In creek pole to unit/limit of Basalt dyke
Cut up but 068°/90°

(101) Black graphitic clay S^{2-} smelling.
2 samples - about cpy/handle
Coarse staining, Fe leakage

(102) 2km from Junction seemingly graphitic (shaley) clayey laminar silt stone. Cut not contorted laminae well rotted.

(103) 3 Qtz vein 172/40E Bedding parallel laminar + planar siltstone with <0.5cm silt bands. not too contorted.
Folding @ southern end huge dithering necks - flattish 010° trend in silt + harder unit QV 122°/46NE

(104) Bedded siltstone/graphitic + shale. some laminae. X-bedding; quite massive-looking - does dike massive look.
Bedding 118/25°N

(105) Shear zone in middle of cutting 050/90 quite major with quartz veining in a shaley looking laminar siltstone unit - more obvious contact to north of fault
Small vein system 132°/60°NE small pin sheet system 044/90 sinistral offset on earlier qtz veins Bedding parallel (105/25) another sheet vein 016/90 Dextral offset of Bedding parallel QV.
[illegible] laminar unit.
[illegible] vein 053/90

at Southern end of the more massive siltstone + some signs of flaser bedding - underlain laminated unit

(106) 2.95 km from Junction
Shear/clay gouge 142/20 NE
Jointing folded 074/[illegible]0 NW
Siltstone laminae unit occ harder dark fine sil bands
some veining in middle of ole + strong shear + clay gouge 169/90. QV 068/90
plane with Qtz sheet/side 122/55 W
Sheet/vein 90° to ~~north~~
Harder dark unit 082/64 N
Major shear 091/90 Samples
Another shear 088/90
" " 069/90
Qtz veining throughout southern part of olc. Esp on the breccia veining.

(107) 3.25 km from Junction
semi massive dark siltstone - probably part of the slightly contorted laminar unit.
Major shear in middle of olc 135/90 (N side)
With Qtz vein lenses
offshoot Qtz veining 103/85 S
& south of fault 096/41° N
small shear/kink band 130/80 NE

Fold hinge towards south end of olc 061/10 W
Bedding more flexured down stratigraphy to W
either fold hinge no clear direction

(108) small outcrop of fissile black shale with ~~quartzite~~ band - ~~contorted~~ (possible)
fissility 122/75 SW probably ~~not~~ bedding

(109) Dark siltstone + pale qtzite - folded + distorted laminae bedding
possibly scoured bedding
Qtz vein/shear 164/90

(110) laminae wavy bedded ~~or~~ siltstone + sandstone
B161/30° E
Becoming more massive siltstone going South
100m Upolary dip 1st mod. 174/90 QV
ds outcrop. B083/60SE or 015/60 E

(111) Dark siltstone possibly laminated B154/22E

(112) laminated siltstone passes into quartzite dominant + siltstone sequence
fracture poss joint 081°/75 N
reasonably well bedded but light in colour becoming more siltstone dominant going South. Small shear 042/90
not necessarily the one

(113) laminated siltstone with 0.5m qtzite bands.
Small quarry/dam on east side of road
laminated silts partly non planar
slightly antiinclined at east flows point.
overlain by qtzite with qtz veining
sheared.
B 154/42E

18/10/96. MT BALFOUR

(114) Laminated silt/slate + sst
with occ sandstone 30cm band
also silicic qtzite veins
2x 10cm wide. Bedding ≠ 005/80E

(115) White sugary qtzite olc
B plane 131/24NE around a bedding
10m up track sheared laminar
carbonaceous siltstone Qv 033/90.
2 x 1m long dyke B: variable - well
folded/sheared chloritic

(116) White qtzite, multi planed
Planes 094/75S, 003/75E
045/60NW ?B. 167/38E ?B
055/64SE

(117) White qtzite, B? 165/50E
1m Qv 165/90.
low another set plunging 30° to 067

(118) Top 1m steep dowle 037/90
White qtzite B 164/70E

(119) 166/70W small shear in
White qtzite
bedding ≠ 177/30E

(120) White qtz +/- silt/slate laminar bands
off track dominant 2nd dominant
S 053/90, 170/90. S+S 165/90.
B 083/30S ? 067/40SE ✓
S 143/75NE.
massive pits with occ x-bedded (laminated)
whiter qtzite. Cross + tension

(121) B 168/60E. Massive qtzites
Minor Qv 022/90
occ chloritic siltstone laminae
mica

(122) B 149/66NE Bedded qtzites

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123 B013/40E path, still clear
Massive Qtzite Road Junction

124 downhill before main drop
QV 154/90 ⇔ B149/90 - shearing?
QV 109/70 N B173/60E ✓
some siltstone bands

125 50m into steep descent
J070/90 035/70SE
Shearing visible in psedom x bedded Qtzites
+/- Siltstone bands.

126 at base of first Descent
B180/50E Siltstone bands

127 at base of 2nd Descent
B170/40E Table of siltstone
J020/90. 088/90. Soil creep

128 B130/40 SW. Qtzites bed with siltstone laminous bands,
J055/90. 147/50NE

Hamstkill Road.

129 094/32E B laminated x-bedded quartzites
QV 130/62° SW. probably it plate
⇒ 022/85 SE
o/c including undulating siltstone + ?sheared shaley sequence

dc is folded. B102/46E
Suggestion of scoured bedding a strong possibility.

130 Major cutting/Quarry face
Non planar laminar siltstones + sandstone
Some convolution of beds due to folding
/shearing B072/20°N. Limonitic zones.
Minor shear 048/90 + 151/90
008/90 Breccia/shear + Quartz - Minor could be a 3rd vein direction

131 @ S140/80 Contorted wavy bedded laminar siltstones and related joint 163/80W
relatively flat dipping beds 080 strike
Ferruginous shear 140 - Sandstone.
Small pipe strike 000/90 } sigmoidal shape

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(6) 50m [illegible] Balfour Junction
scoured type bedding in laminar
non planar siltstone B126/40NE
Small shear plane 042/90; J018/80W
B104/28N in between +134.65W
top of (5)+(6)
QV 060/90.

(132) QV 043/90 167/90 116/90. Joints in 13km.
slickens
in laminar non planar siltstone
flatbed bedding. B110/15°N
176/90 major Qv + shear zone
possible chloritic in part.

(133) B011/25E laminated non planar siltstone
limonitic soil + sandstones
Small QV 025/70W +116/70N
Side Cut — NE one measurement
— SW one sample.
by vehicle. Major Qtz Vein System
2 × 30cm veins 172/90
+ a much bigger 1m vein
over 3-4m wide zone.

(134) B170/11° Sst dominant laminar non planar
beds : different weathering pattern.

(135) QV 033/90 + 102/70S OK
in massive laminated siltstone + sandstone
possible tuffaceous bed light green sandstone
0.3m wide. Strike 102°
possibly scoured bedding — shallow dip
flat undulating folds.

(136) Mixed sequence
At South end of OK - appears folded.
1] A unit of laminar siltstone with possibly scoured
2] White quartzite - fault shattered vuggy rock
with blade shale interbeds. 010/52°E
3] A laminated non planar siltstone + sandstone
unit - quite shaley with Vn stringers
042/75NW.
4] 10cm silicic white qtzite
with only 1 seen OK shaley laminar unit
B134/50°NE QV 020/70W.
5] Probable non planar laminar unit
B114/30N

(137) Flat dipping laminar overlain by laminated
Silicic qtzite (white) 2825 km from junction
30cm on from vehicle more definite scoured
beds right way up.

(138) B112/6°S. Siltstones + sandstones more
quartzitic looking.

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(139) Manivo white qtzite quarry.
5.3km.

(140) B124/32NE Laminar non planar
siltstone - limonitic coil.

(141) seemingly more sandstone dominant
laminar non planar siltstone
Major Qtz vein/shear zone.
171/85E bonen of Qtz vein
+ continuous vein
overall shear is 5m wide.

Bedding Before 123/13°N
After 129°/13°N

(142) Sandstone abundant laminar non planar
Siltstone one 1.2cm set bonen appear
chloritic. B144/30NE.
small QV 023/85W
More sandstone at bone of Qtz
QV 159/90 with brown weathered halo
QV 018/80E brown weathered vein.
Vuggy qtz

(143) B128/22N laminar non planar dark
siltstone mod. silty brain passing
Nelson Bay River

(144) Set of poss planar laminar - may be
scoured bedding.
B 119/70N

(147) Filled in Quarry
laminar non planar material
Poss scoured bed material
+ dense chloritic rock - mafic sill.

4km.

Back towards Balfours

(146) Massive bedded dk grey siltstone
Set QV 105/65N B162/35°W Note!
1mm QV 167/85E
at 90° to 096/75SE
QV
Some degree of laminar bedding
20m localised skeletal QV 104/75°N not on
West of gulley!) becoming more chaotic
30m Shear 087/85S Black siltstone South
+ more laminae. of shear.
B046/8°NW

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50c Bedding/Cleavage 118/58 SW.
Bedding parallel shear + QV.
folded + sheared moving upstream

75 QV shear with drag fold 142°/85NE
Overlain by Qtzite
Underlain by planar laminar
siltstone.
Small QV 073/75 NW

Qtzite in creek 112/32° SW.
Qtzite all around.
Some sort of cross fault
between dry cutting at 752
+ creek @ 115m

147 Blue grey massive looking siltstone
B156/48°W

148 B112/34S. massive siltstone & moderately well bedded.
Some dark qtzites.
?Non planar laminar?
Progress uphill 50+m
into quartzite (white)

149 First obvious appearance of siltstone mixed material in gutter B131/55 SW

siltstone mixed in with quartzites
which do appear to constitute white —
may from 148 to 149 siltstone + qtzite

150 Folded zone. 20cm bedding parallel Qtz vein
B 120°/40
B 061/85°S

Coalescing

19/10/96. South Mine

151 o/c on side track.
laminated planar siltstone band
within white qtzite
poss bedding 164/~ 50E

152 50m along track non planar crenulated laminar
siltstone B146/50°NE occ 10-15cm
sandstone beds - can be with chloritic spots
locally disturbed by folding/faulting
not necessarily fully siltstone dominated

153 o/c on side of hill laminar non planar
siltstone B 045/60E small limb close 154/90.
major chloritic altered zone ~ 155/90.
3-4m wide, rock source on both sides

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(154) Road licken cleared qtz vein
near axis samples
mine dump loads angy + wall rock
exclusive vein qtz.

(155) Road cut over ore.
QV 142/80 SW intersects with 074/90.

142 QV

Tension gashes
166/80W.

laminated non planar siltstone.
some coal side of mineral zone.
140 is main mineralised direction
dips steep, 80° to SW.
some hints of scoured bedding.
B015/50°E
slaaps 104°/75S. - similar to vein.
148/75SW - deadly + similar
movement.
↑ drag folding NW. SE similar movement.

(155A) ⊙ 325850E 5424150N
Trial cut buggy workwork qtz
veining - Sampled
140° strike 80SW

(156) Weathered laminae non planar d/c
difficult to tell if sand or silt
dominant B.170/75E
Sandstone channels 30cm wide x 30cm.
Maybe planar not climatic.

(157) Following gentle ridge many
small coal cuts confirm vein
presence. Qtz vein material with
very faded intentions - Weathered
out dolomite.

(158) On track d/c B192/65E
Laminae non planar wavy beds
possible vein d/c but badly
weathered

(159) White qtzite + laminae non planar
beds. poor exposure B141/70NE

(160) B161/70E in laminae rocky siltstones
with occ 2-5cm qtzite beds.
poss alteration

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(161) South Belfour Mine.

(162) Laminar non planar ole. 164/70E.
Minor QV 098/75S + 133/70 SW.
weathered + transmits from ridge.

(163) laminar siltstone B 088/10 - ie folded in contact with chloritised laminar siltstone ie vein qtz lenses.

---

da Tennora Road

(164) J112/46N in flagging + 5cm.
B: 080/34S. weathered qtzite.

(165) B095/10S. Qtzite
fracture 074/80N } conjugate pair
024/90

J 031/90E
J 135/90.

(166) Fracture 110/75N 007/75E
J 045/90

(166A) B 163/17SW Qtzite.

(167) B160/30 SW Qtzite
J 160/70NE

(168) B 144/40 SW Qtzite

(170) QV 096/90 max shearing in Qtzite
multiple < 5cm veins

(171) B 140/32 SW

QV conjugate 042/90
QV 001/90 stringers
QV 097/80S parallel to jointing
QV 130/90 stringers all set by 087 jointing

(172) Cut line laminar non planar siltstone
Minimal QV

(173) Cut line laminar non planar siltstone
Minimal QV.

60 line km. to date

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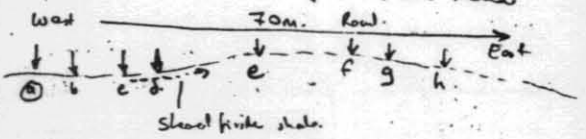
20/10/96

The Clump

(174) 1st Cross Cut from Main Road



a = planar laminated sandstone & siltstone B149/50NE

b = shear 075/90.

c = DK grey planar looking siltstone almost shale. 3m wide - friable on East side.

d = poss mineral/fibre zone limonitic staining shear zone. Circa 141°
shale/silt is laminar + planar.

e = Limonitic zone fracture zone - no wide qtz vein. S086/80N. Sheared zone.
Weathered clays.
still planar, silt stone B128/80NE.
Small QV 098/90.

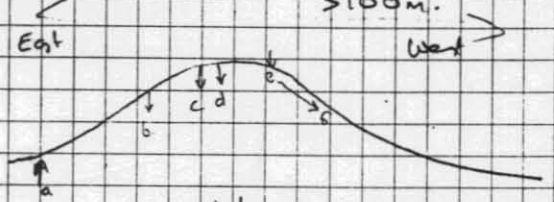
f = contact between DK grey planar siltstone and limonitic sheared material
Contact 147°/90 - 2 shear 2 Samples
shale - hanging wall

on east side of road massive black siltstone QV 031/90 sheared effect bearing laminar + phyllitic

(173) = B132/78 NE - laminar + planar siltstone

(172) = B124/85SW laminar planar siltstone +/- sandstone layer bands.

(175) 2nd Cut line



a = massive & laminated dark siltstone with limonite spots B130/84NE
located planar + laminated grey-dk silt.
occ black clay/shale. Lithic more massive look
bedding ## QV 126/175SW.

b = black siltstone with white porphyroblasts (X)
still not so well laminar or planar
massive looking.

c poss Wychbank Seamed Valley

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d) Unknown zone - weathered ? sericitised
probably laminar ± pervasive
v. little exposure from d onwards; still
limonitic clay pops thro' the lag

e) Black / dk grey sheared locally silt stone
as 3rd layer
QV stringers 102/80 S.
130/70 SW.
Foliation 161/90, difficult to tell

(F) not so sheared grey siltstone/sandstone
bedded ± planar B138/45 NE
↑ ? variable
shearing more finite at bottom of tuff
lowermost planar.

(176) - dominant foliation - around
shear parallel beddin 100/90.
West side of structure
3m QV 034/90
Subsidiary stringers
002/70E
m.QV
Small shear 135/90 + 118/70SW
3m laminated zone. Pritland silt stone

(177) Adit
Major shear minor QV
Mabeckite - dips 70° E
drive NNE shear zone adit 190°
1.5m QTz vein hangingwall.
- foliated key sheared rock (clay)
20-25m - foliated massive
black siltstone.
Plane 153/90
pitch 53°N bedding
pitch 55°S
Big quartz vein 079/90

(178) Cross cut end
hangingwall massive blocky silt stone
pervasive sericitised 115°/70°N
Qtz vein stringers 083/90
B133/60NE fractured
QV 100/90 S 089/90
Bedding 127/53NE
In folded fault planes settle to
Silver / cleavage 137/90.

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179 B 141/60 NE

180 Cent line as before.
South sheets 148/90 + 019/70E
30cm Qtz vein 140/80 NE
Qtz vein 073/90 } pair conjugate
" " 164/90 }
Shear 102/90
146/90 conjugate pair

181 Laminar planar siltstones + sandstones
B 130/62° NE photographs.
Fold hinge 35° to 330°.

182 B 126/70 NE to a weakly laminar siltstone generally a more marine type of siltstone

183 Seams of chlorite veining could mark a vein/shear zone for Mt Balfour mine.
Check Ward 1911. Sample.

184 B 120/47 NE
Qtz stringers 001/90
Well bedded siltstone.
Sample. Becoming more planar laminar

185 3cm Qtz chlorite veins/lenses
Fan echelon long axis 111/70 S.
Clastic. Fold wall rock in laminated planar siltstones + sandstones
B 082/74 N.
Can see kink bands 117° strike
F/H 40° to 302°
20m up 014/70E Qtz veining.

186 Rotted sheared black shale + siltstone/sandstone shearing 016/90
Main fabric direction also.
B 050/55 NW + shear planes
B 068/55 NW
D.N. shear 010/80 E

187 up to in sheared qtz veins Manjuel. interbedded shales.
B 140/38 NE

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(187) Qtz 077/90 2-3cm vein sigmoid
also .. 134/90 stringers
flat beddg 016/25SE

(189) B 014/47/015NE Black siltstone
with thin silt beds

(190) Murrays Reward.
chloritic unit in planar laminated
material. - due to shearing?
Blk siltstone wavy laminar
non planar - possibly scoured bedding.
Main shear 174°/72°E.

Hagerlink Gate road
after site 79.

(191) V. fissile chloritic slate
unit ? sheared fabric
151/90.

(192) B 163/90 : Planar + laminar
calc. siltstones + phyllites
pass chloritic altn at western
end of o/c. Quite fissile in planer
+ slaty - possibility of scoured
bedding increase in intensity towards
moving cont'd
note, limonitic fractures and + ve
creek chloritic sandstones in float.

(193) laminar & planar siltstone & sandstone
passes into chloritic siltstone
quite fissile in planer fabric
N-E bedding 158/90
chloritic siltstone much more fissile.
in pan loading
appears to be a fabric of 118°
looks like chloritised siltstone & sandstones
planer laminar

(194) B 169/90W chloritic slate/phyllite
++ fissility at creek
possible pervasive tuffs
with disseminated pyrite

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Balfour - Mapping Bk 2.

20/10/96.

Hoarmskirk Link road

(195) Dk grey possibly chloritic phyllite. Probable bedding 162/60W. Dominant plane - angular sharp silky after 10m passes into a more slaty fissile & weathered clayey slate - possibly chloritic lt grey with darker grey shale bands some of which are laminar even black shale after 20m more greyish slate/shale B:130/60W Black shale horizons possibly after 30m a more chloritic unit - judged only on weathering

(196) Possibly non-planar laminar unit with. Rusty zones bedding a little contorted but 167/80W +/- Quartzite bods.

(197) laminar, planar siltstones (slate) very blocky. B/02/43S. J. 179/78W & 145/80SW.

Planar in ca... possibly bedding.

at east end of drainage B 122/70SW. slight low marine - laminare planar siltstone

(198) Start of laminated & planar siltstone possibly scoured bedding in part B. 025/14°E. ~~near vertical bedding 117/80S~~ ??

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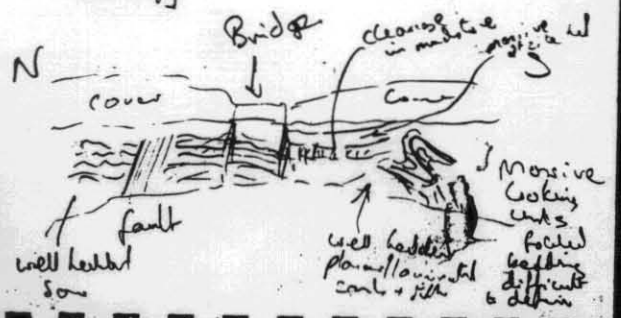
Balfour Mapping 6/12/96.

Lyndsay River.

(199) B161/20E
planar laminated sands + silts.
With some minor scale scouring
C053/62SE. in 40cm mudstone band.
bedding/cleavage lineation. 10° ↳ 068°
J 089/90.
130/75SW
fault 0.3m wide 089/68S
fold hinge 10° ↳ 067
stony joint on N side of ~~Bridge~~ fault. 137/78 NE
Bedding sub horiz. ? change in lithology



Mower Water Canal needed.

Fold hinge for tightly folded zone
65° ↳ 236°

(200) Star Pidcot + Pegs - ?RAE?
Rather slaty-looking siltstone/sandstone
B 170/10°W
Planar bedded (Poss laminations)
cleavage (or jointing) 090°/75S.
chloritic porphyroblasts + minor veining
2cm QV 099/68°S possibly may have been folded
strong O/C
Gives a limonitic stained soil on weathering.

(201) Thinly bedded sands + silts - weathered
B 128/17°NE
157/7°W joint or cleavage.

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(202) South of Creek. Weathered zone with qtz veining 095/62S. Vuggy Qtz. 5m wide? zone relatively weakly veined. Rotten rock.
2 blocks A4 size of vuggy qtz with pyrite - sampled.
Rock appears to have planar bedding but become quite slaty in places.
?B 072/29S

Major o/c north of Creek.
At North end bleached zone with Sericite veining 092/51S 5-10m wide pale limonitic in places - poss pervasive alteration locally.
B 066/12NW. cleavage 104/36S Qtz vein parallel.
Shear plane 056/43°SE also 101/55°S in middle of o/c.
Some rock seen quite silky planar bedded poss laminar in places.
bedding on cleavage breaks 12° to 104,
generally massive dark grey siltstone with very occ laminar bands.

Minor granite seen hilltop, eventually flat-lying with sheared zone closer spaced cleavage that's been folded at south end of o/c.
Thick Band 5° to 072°.
?

(203) B 054/30SE o/c in drainage ditch
Thinly planar bedded siltstones (fine-grained) possibly of minor alteration
Distinctive 'burrows' white weathered spots
slaty looking.

(204) B 054/40SE planar laminar bedded slaty unit. Correct way up. More slaty up stratigraphy in side creek - good o/c
Qtz vein 125/80NE
Small scale Fold hinge Difficult to measure 60° to 022

575081

(205) slaty cm/mm scale scoured unit right way up.
B030/44° SE
slickenides 30° & 064°.
Dextral movement
Scoured unit possibly only a silty unit of the slate.
but 20m thick at least.
localised chloritisation of bands.
FH 45° & 127° kink band. fold qtz vein & wall.
With planar bedding.

(206) a more planar laminar unit but with potential & become mm/cm scoured unit.
B087/24S

(207) B095/18°S planar laminar slate.
V planar + V laminar in places.
right way up.
(poss wavy laminar in places)

(208) B090/16S planar laminar slate.
as before.

(209) B124/74SW planar laminar slate. V slaty in places.
Pos shear zone 113/90
tree/grass roots growing in O/C.
10° & 140° kink bands
scoured

(210) near Bottow Tarn.
In Creek
Black/dk grey silt-stone wavy laminar.
Shear zone. 0.9m wide. 176/52E.
with qtz veins
following qtz vein
176/52E
153°/90°

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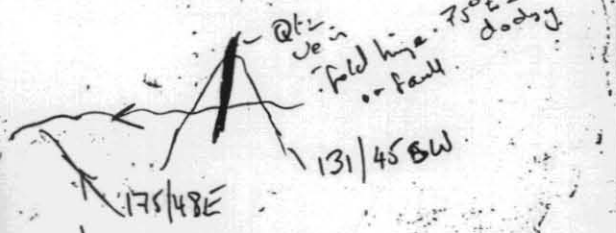
575082

On south side of creek variable bedding.

location of fault 80m downstream from road. B (from south over 20m) folded.
106/20 S.
056/20 SE
099/60 S.
127/70 SW.
064/30 SE

going up creek - evidence of torsion at base of Crow cut creek
1st Qtz strike approx. B158/45E
5m above fold hinge.



Up the Crow cut creek.

+20m In White Qtzite B155/76 W.
interbedded with Blade siltstone beds in White Qtzite

+25m B 028/46E White Qtzite with <15cm black siltstone beds

+30m 10-20cm Qtzite (white)
10-20 Dk grey silt/sandstone

+50m B060/40 SE

+70m. B173/50E lot of the major Qtzite bands <1m

+80m B100/75 Sandst+silt ? poss fossil but with occ qtzite beds
↑ fairly rare

+90m B109/35 S chiastolite and qtzite porphyroblasts

+105m Far from Road. B157/72°NE
Sandst? massively bedded black siltstone with massive qtzite beds

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575083

TRANKLAND ROAD

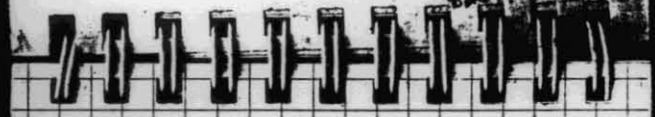
(211) +175m. just before left hand bend
Blocky chlorite porphyroblasts in light grey/green sericitic shale? or Sandstone.

(212) + 315m. just before R/H Bend
B140/27NE
Rotted blade siltstone probably clover with chlorite spots.

(211) Less weathered?
cleavage 158/80E. 168/80E
Minor Qtz vein stockwork at Northern end of o/c.
Also more chloritic bands at northern end, but passes into dk grey clay after siltstone, no chlorite spots. (well not so obviously!)

QV 126/80SW
066/80SE
2 Main Directions Diagrey

Limonitic Shear 136/34NE
with Quartz. hang wall dk grey clay



(213) +550m. just before Right hand bend.
B075/30NW
Blade/Dk grey Cm scale bedded siltstone (planar) locally more massive rotted siltstone with limonite. Appears folded with northern end more massive/unclear rotted siltstone - sheared.
B/137/38NE
→ 082/70S

(214) +715m Chloritic grey siltstone (massive looking) with small bands of fine grained grey qtzite.
B.143/67NE
C 003/90.
Before right hand that leads down to Creek.

(215) at Creek
+870m
Grey Siltstone with mm scale bands some chloritic B/136/40NE

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575084

In creek shaft west side finely l... coal / siltstone dark grey / grey

Fabric 154/75 SW. Joint or cleavage.

Creek East side.

Qv. 168/40 W

B 134/32 E ← Big hole in Creek Pass shaft.

B 139/60 NE.
down stream of hole.

C 149/80 W

(216) +1015m up hill after creek + left hand level.

B137/47 NE

Black shale / siltstone finely laminated overlain by dark grey finely laminated siltstone pass shearing in middle of o/c. C 140/80 NE.

(217) +1150m

B 133/60 NE

Black siltstone with abundant

Pyrite as :-

- % bedding parallel massive bands < 1.5cm.
- large cubes / porphyroblasts up to 3cm long
- Fine diseam bands
- Pyr + Qtz vein bedding parallel
- Diseam small scale porphyroblasts

Siltstone appears finely planar laminate - locally more massive.

Re-investigate + Sample

plowed off o/c .. minimal exposure but looks for 100m

(218) +1550m

B 136/40 NE

Pyritic black siltstone.

bedding parallel Pyr + Qtz veins.

Asbestos

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575085

(219) +1737m.
Finely bedded/planar laminated
Sands+ silts B122/44NE
Fabric (cleavage) 096/80N.
in QV Shear Zone

(220) +2235m. – Road Junction
Back 100m B127/37NE
Grey siltstone with fine
laminae - rather diffuse though
at the road Junction boulders
of a siltstone/sandstone laminae
but with diffuse bodys.

(221) 2515m. Weathered o/c
B138/48NE
Chlorite porphyroblasts.

(222) +2650m.
B154/40NE
J076/90
chlorite porphyroblasts in highly
altered calcitic siltstones.

(223) +2810m
B124/50N
Limonitic + weathered siltstones/sandstones
chlorite spot + bands at SE end
diminishing northwards (B117/44N)
Becoming a more bleached
fine sandstone @ 3040m.

End of Day
7 line kms.

7/12/96
Frankland Road.

(224) +3150m. cleaved sandstone with
chlorite spots + altered mafics locally
partly reticulite. may have been quite mafic

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Difficult to define bedding.
Fabric 142° steep angle
? sub horiz bedding?
In part ignimbritic looking.
Boulders (small) of breccia/agglomerate/
Conglomerate on NO side of cutting.

(225) +3300m.
B133/18°NE
Quartzite/sandstone +/- chloritic
Mdst/porphyry dykes + chloritic bands.
C or J 175/90.. Light grey silts/siltstones
Blocky nature.

+3495m.
(226) B129/16°NE. planar/laminar well
bedded sandstones (not necer. any
chloritic
J076/80SE or shear direction

(227) +3700m.
flatlying grey planar bedded silts.
Fabric 140° steep probable cleavage.

Note Beds are planar but not necessarily continuous
generally < 3mm thick
blocky nature in rock
Bearing a cream/buff coloured silt with
small bands + lenses of darker material
dip plane 095/70S.

(228) +3890m.
more ignimbritic wide flood
flat lying slightly pyritic silt
cleavage 004/?
J 056/80SE well rock alteration. ?veins
Rusty/limonitic clay beds. ?alteration.
locally chloritic

(229) +4100. B142/12SW
Qtz shear zone 166/80°? 50m back from vehicle
increase in amount of chloritic fissures within
the Qtz/chloritic vein zone
locally V. strongly chloritic
Qtz stringers in chloritic 121°/90.

(230) +4320m. Open area.
Grey massive looking gibbsite QV 2mm 040/90.

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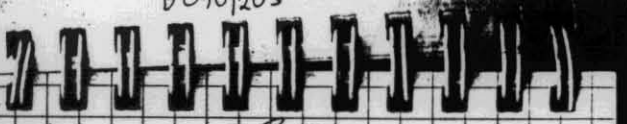
some degree of planar
siliceous looking no limonitic sil
B144/10 SW

(231) ~~$~~ 4940 by track & right.
Grey massive looking qtzite/sst.
Spec. cleavage 027/80NW. +t qtz vein.
2cm qtz vein 163/70W.

B051/11NW

(232) +5280m.
Dk grey phyllitic cmst siltstone/sst.
planar bedding. B011/40W
qtz. vein 059/90.
Jorc 020/70E
locally pyritic in lam bedded pyrite layers
Outcrop on other side of road by qtzite.
5350m
(233) Follow track in to west - Big mixed outcrop
25m Bedded Pyrite o/c
B090/20S



Bedded pyrite ~~Fm~~ B Fm
1) Fine disem massive up 4cm thick
2) Coarse pyrite crystals upto 0.7cm
The two coexist
3) Fine grained massive bands < 1cm
a planar extn siltstone

(234) +5575m
B052/18SE
Lt grey qtzstone. reasonably
well bedded
(possibly ± dolomitic spots)
becoming darker grey
poss cleavage 172/70W

(235) +5800.
25m upturned trees
massive grey sandstone siltstone
poss bedding 125/68SW. - Difficult to be sure.
Qtz vein <0.1cm 027/90.
Shear plane 060/76NW.
(6) 5800 limonitic sil. 2cm qtz
sst

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575088

(236) B 124/38 NE + 591m
laminar sands + silts;
horizontal planar - set division
laminar or ripple units.
with ?20·5m of sandstone bank
overlying

(237) White lt grey qtzite/sandstone
at Road Junction
flattish bedding assumed.

(238) White/lt grey sst/qtzite.
B133/23 NE

(239) B105/22N
Dark planar massive bedded
siltstone/sandstone +/- limonite.
Soil.

(240) Black/DK grey massive siltstone
+100m from logging hut junction
thin calcite veining/veinlets 114/28N.

(241) B 150/20 NE ?0/c
planar Bed Bands of sst/siltstone with
with 1cm-scm chlorite bands.
400m on from last Junction
Turn round back to Junction.
at 540m.

(242) + 250m
B 153/32 NE
Black / Dark Grey silt stone. massively bedded.
J 027/804.

Car park area @ 825m
Track probably comes @ 1110m
continues on East.
Pass 100m on from Carpark Foliated
Sandstone - Ut dipping

100m back from car & Road Junction
Black/DK grey siltstone. Pyritic
as before
163/30W. Coarse cubic pyrite.
J 071/90
pass c 027/804

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[illegible] Along side track.

243 +120m not sure if olc. Pile of boulders. B167/34E probably along chloritic planar bedded sandstone +/- chlorite - Green hue & rock not porphyroblasts.

244 +325m. Rotted sandstone ...possibly was chloritic. Flaked off olc. no obvious bedding apparent to be felt. chlorite porphyroblasts.

245 +540m at Creek seemingly less chlorite more of a white sst/qtzite. B129/46NE.

246 Possibly a chloritic sandstone with chlorite porphyroblasts

J041/80 ESE. B134/54NE
J160/62W.
J122/75SW +675m.

247 +950m
limonitic sst - chloritic sst
pyrite (+ chlorite)
* driven in hands — PS?

B130/31NE
planar bedded laminate chloritic sandstone/siltstone

248 +1275m
heavily limonitic sst
well bedded planar + laminar.
B139/52NE.

249 +1550m B142/50NE
well laminar planar siltstone
Sandstone - partially chloritised
limonitic spots.

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575090

(250) Dk grey/black massive looking siltstone. Lighter grey at bands. Local planar bedded looking at bit scoured B149/8[illegible]NE. [illegible] right way up.
+2000m

(251) massive looking - Dk grey black siltstone.

log across road @ 2500m.

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(252) Fissile dolomitic siltstones + sandstones may have been planar bedded now slightly (wavy laminar).
Murray, Pevard

---

(18) Scoured beds. Mm/cm scale. Right way up

(17) more of a wavy laminar then small mm scale scoured sink.

small scale scoured units parallel, B068/55° NW

Bm regional clearage 111/80N

(16) Sheared + locally slightly folded.
B012/70E

3m further bed B133/70NE.

C178/80E

Very sheared

20m further bed B042/70SE

C160/80N Wavy laminar.

site 173 @ NE end start
seemingly planar - partially scoured + partially wavy laminar

3cm Qtz-mm calcite vein 002/80E

Fold Qtz vein with agg.
B158/80E

801[illegible]/80E 10m on LHS of hill.

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575091

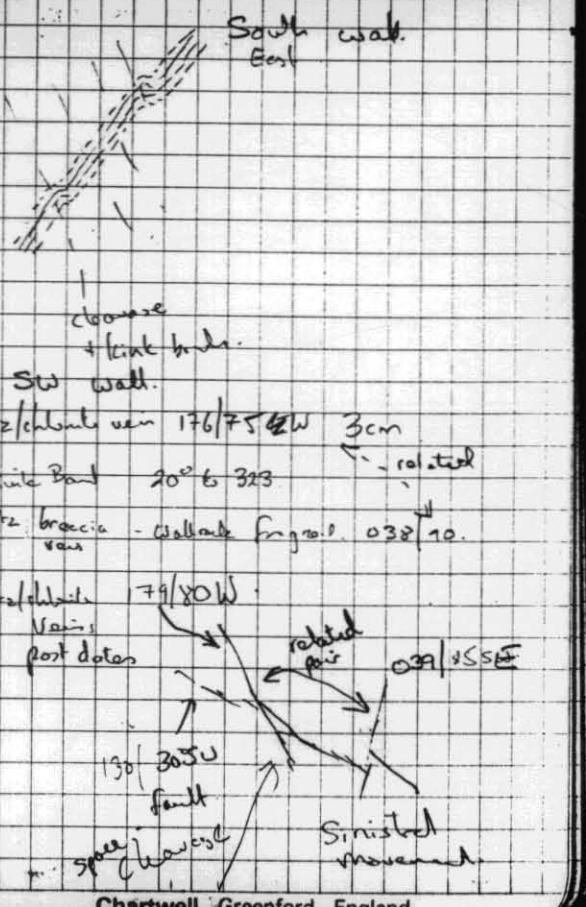
(253) - tight adit heading 017°
Cross cutting ? cleavage / bedding
+ veins 120°/70 SW.
in creek below adit run
B147/80 NE planar laminar
siltstone (Black)

(254) laminar siltstones & Sandstone
B 144 /42 NE.

8/12/96.

Big quarry Site.
33° to 105° - kink band SW wall
7° & 309° " " SE wall

cleavage 112/68S. SE wall.



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Planar partially laminar siltstone + fine sst.
Very flaty. right way up.
Qtz pyrite vein on NE wall 124/90.

The Clump

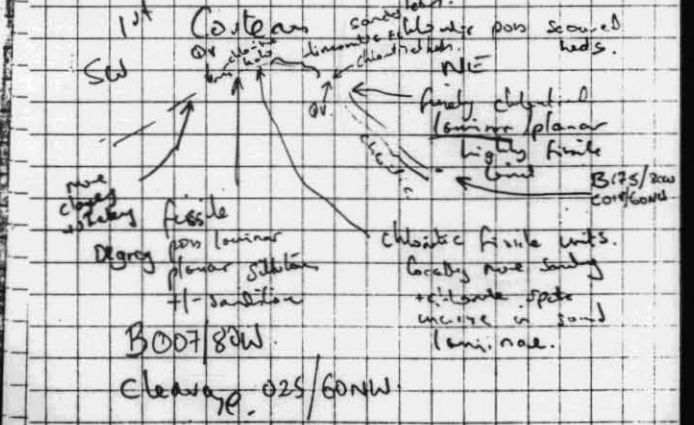
(255) Weathered dc of black/dk grey siltstone slightly wavy but definitely planar.
Qtz stringer veins 158/90.
Bedding 084/?80° to N.
dodgy
with a Qtzite/sst 30° & 80° NW band.

(256) 057/40NW Qtzite beds.

(257) Gully Prospect
old bulldozed track line bearing 082°. at end at easterly loop.
Qtz on track

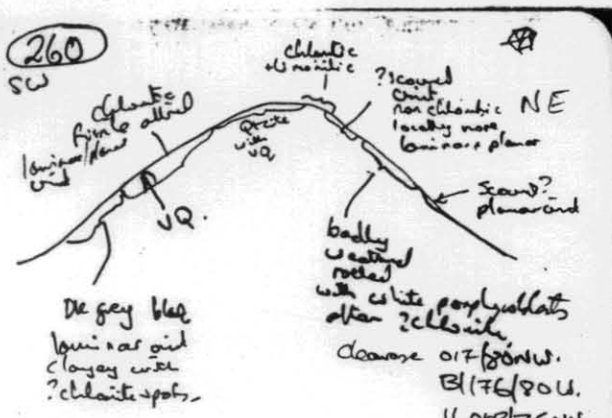
(258) Revegetated area
beds with wavy laminar d/c
Right way up.
B073/10 S bedding variable folded unit.
small network of Qtz veins
022/80NW ← 022/80NW
067/70N
139/80NE

(259) On top of Central Mt Bulfinch



575093

260



261 FH 30° & 138°
Specimen Hill.

262 324500E, 5427300N
CRA live in grey s.d/clay
∴ Wavy laminar. or Scour mud

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Appendix 3

Thin Section Report - P Ashley

575095

PETROGRAPHIC REPORT ON SEVEN ROCK SAMPLES FROM NORTH-WEST TASMANIA

for

CRA Exploration Pty Ltd

P.M. Ashley
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Armidale
NSW 2351

November, 1996

P. M. Ashley

SUMMARY

Seven rock samples from the Rocky Cape Group of north-west Tasmania were submitted for identification and petrographic description. For one sample (5473301) two oriented thin sections were prepared in order examine foliation relations and a polished thin section was prepared from sample 5473305. Ordinary thin sections were prepared from the remaining five samples.

Summary descriptions of the samples are listed below:

5473301 TS:
Summary: Moderately foliated dark grey graphitic slate, dominated by fine grained quartz and muscovite and containing pseudomorphs after former porphyroblasts of andalusite and corundum. Andalusite, and to a large extent corundum, have been pseudomorphed by retrograde muscovite and quartz. The rock contains two generations of thin, syn-tectonic quartz veins.

5473302 TS:
Summary: Fine grained phyllite, developed from a bedded siltstone-shale. The rock preserves bedding laminations, but has a moderate cross-cutting foliation and a weakly developed crenulation. It has been metamorphosed to low grade (chlorite grade, greenschist facies), with formation of a quartz-sericite-chlorite assemblage, with a few porphyroblasts of pyrite and a little leucoxene. There is no strong evidence for the rock to be a sheared volcaniclastic, but the precursor sedimentary material could have had a felsic volcanic provenance.

5473303 TS:
Summary: Fine grained phyllitic rock, originally a shale-siltstone of possible felsic to intermediate volcanic provenance. It is now dominated by a quartz-sericite-chlorite assemblage, with scattered pseudomorphic aggregates of quartz plus chlorite after former metamorphic porphyroblasts of ?andalusite.

5473304 TS:
Summary: Medium grained altered pyroxene-hornblende microdiorite. The original mineral assemblage has been largely replaced by a low grade metamorphic alteration assemblage of tremolite-actinolite, chlorite, clinozoisite, albite, sericite and a little titanite. The rock also contains a trace of disseminated pyrite. A few sub-planar crack-seal textured quartz veins cut the sample.

5473305 PTS:
Summary: Intensely altered schistose chlorite-quartz rock (possibly representing some form of precursor intermediate to mafic igneous composition), variably replaced by medium grained carbonate (probably ankerite/siderite), with syn-tectonic quartz veining and minor disseminations of chalcopyrite and pyrite. The rock has been slightly weathered, leading to the formation of goethite staining and possibly a little Mn oxide.

5473306 TS:
Summary: Fine grained low grade metamorphosed and moderately foliated shale-siltstone. The rock may have had a felsic igneous provenance and retains minor detrital quartz and feldspar. However, it has been mostly recrystallised into a foliated fine grained assemblage of quartz, sericite, subordinate carbonate (probably siderite) and a little chlorite. Carbonate forms prominent porphyroblasts stained brown by the development of supergene hematite/goethite.

5473307TS:
Summary: Brecciated quartz-rich siltstone, with strong replacement of clasts by fine grained chlorite. The breccia matrix is also dominated by fine grained chlorite, but contains some vein quartz material. A little pyrite was deposited with the vein quartz, but has subsequently been weathered out and replaced by goethite boxworks and staining. The rock is viewed as a type of tectonic breccia, with hydrothermal influx of Mg and Fe during and following brecciation.

Samples 5473301-3 and 5473306-7 represent low grade metamorphosed and variably altered and deformed sedimentary rocks of shale-siltstone type. 5473304 is an altered microdiorite, obviously representing an intrusive, and 5473305 is an intensely altered and mineralised rock of uncertain affinity, but possibly of intermediate to mafic igneous type.

The metasedimentary rocks are dominated by quartz plus fine grained muscovite (sericite), with local chlorite and carbonate. Sample 5473301 contains pseudomorphs after metamorphic porphyroblasts of andaulsite and corundum (with a trace of the latter being preserved) and 5473303 also contains pseudomorphs after former porphyroblasts of ?andalusite. These porphyroblastic developments may be a result of the bulk composition of the rocks being rich enough in Al to allow formation of the aluminous metamorphic minerals. Subsequently, there has been retrogression of these phases to form sericite, quartz and chlorite. The metasedimentary rocks are weakly to moderately foliated, with some also showing weak cross-cutting crenulations. Precursor materials for the metasedimentary rocks were evidently of felsic to intermediate igneous in composition (i.e. relicts of fine grained detrital quartz and feldspar and the fact that white mica is a characteristic alteration/metamorphic mineral). However, there is no unequivocal evidence that any of the metasedimentary rocks was directly volcaniclastic.

Sample 5473304 is interpreted to have originally been a pyroxene-hornblende microdiorite, also containing a little quartz and K-feldspar. It may be intrusive into the metasedimentary sequence. It has undergone the same type of low grade metamorphism as the metasedimentary rocks, but perhaps because of its more massive nature, has not developed a foliation. It has developed a low grade metamorphic alteration assemblage of tremolite-actinolite, chlorite, clinozoisite, albite, sericite and titanite. Sample 5473305 is difficult to classify in terms of primary composition due to intense alteration and mineralisation. However, the general chlorite-quartz-carbonate alteration assemblage, plus the presence of scattered aggregates of leucoxene (interpreted to be pseudomorphs after former igneous FeTi oxides) is taken to imply a relatively mafic igneous precursor. This rock has been replaced by chlorite + quartz + leucoxene, then flooded by masses of Fe-bearing carbonate (ankerite/siderite), quartz-veined and mineralised with disseminated chalcopyrite and pyrite. The style and origin of this Cu mineralisation is speculative, based on one handspecimen, but it is clearly of low-medium temperature hydrothermal type, possibly emplaced syn-tectonically.

Although the mineral assemblages found in many samples are entirely consistent with having formed under low grade (e.g. greenschist facies) metamorphic conditions, the presence of former pophyroblasts of ?andalusite and corundum imply slightly higher grade (plus appropriate aluminous rock composition). However, some samples (e.g. 5473305, 5473307) have intense chloritisation (plus some carbonate, quartz veining and sulphides) and there is development of carbonate porphyroblasts in 5473306. These attributes are clearly of hydrothermal alteration origin and are associated with fracturing and brecciation in 5473305 and 5473307. The cause of the hydrothermal alteration and mineralisation is not apparent from evidence in the sample suite.

5473301 TS: NW of the Clump on Blackwater Rd. Site 94

Summary: Moderately foliated dark grey graphitic slate, dominated by fine grained quartz and muscovite and containing pseudomorphs after former porphyroblasts of andalusite and corundum. Andalusite, and to a large extent corundum, have been pseudomorphed by retrograde muscovite and quartz. The rock contains two generations of thin, syn-tectonic quartz veins.

Handspecimen: The rock is composed of a moderately foliated, dark grey slate with abundant small (generally <1.5 mm) bladed porphyroblasts showing a weak preferred orientation, and less common porphyroblasts with a hexagonal morphology up to 2.5 mm across. It is likely that the rock is rich in quartz and muscovite and that the dark grey colour is due to finely divided graphite (the sample marks paper). The porphyroblasts may be aluminosilicate phases, but appear to be retrogressed (?sericitised). It is possible that there are two sets of thin quartz-rich veins in the sample, both of which are cross-cutting to the foliation, but which themselves are locally crenulated. The sample is essentially non-magnetic.

Thin Section:

a) Primary mineralogy and textures: Two thin sections were cut from the sample, one parallel to the foliation and the other at rightangles. The rock retains a relict detrital texture, manifest by angular to sub-rounded grains of quartz up to 0.05 mm across. These are set in a foliated, recrystallised matrix rich in fine grained flaky muscovite, with dark turbid pigmentation due to ultrafine graphitic material. There are a few prismatic to subrounded detrital grains of brown tourmaline up to 0.05 mm across. The relict detrital texture is more evident in the section cut normal to the foliation. The relatively fine grainsize of the detrital phases and the presence of graphitic material imply that the rock was originally a black (organic-bearing) shale-siltstone.

b) Alteration and structure: The rock has been metamorphosed and deformed, with development of a moderate foliation, metamorphic porphyroblasts, quartz veining and retrograde alteration effects. The majority of the rock has recrystallised to a moderately foliated, fine grained aggregate of quartz and muscovite (in which most of the quartz is probably relict detrital), with a little tourmaline and graphite. Bladed porphyroblasts up to 1.5 mm long have developed throughout, but have been subsequently pseudomorphed by fine grained muscovite and quartz. These pseudomorphs locally enclose grains of tourmaline and have diamond-shaped to squarish outlines; they are interpreted to represent former andalusite porphyroblasts. Scattered larger porphyroblasts with prominent hexagonal morphology are also present. These are up to 2.5 mm across and are also largely retrogressed to fine grained muscovite and quartz. A relict radiating pattern is present in these aggregates, along with traces of tourmaline and remnants of the original porphyroblastic mineral. The latter has high relief and low birefringence and is interpreted to be corundum. The rock also contains scattered ovoid aggregates up to 0.5 mm across which are dominated by fine grained leucoxene (?anatase).

Former andalusite porphyroblasts have a weak preferred orientation in the plane of the foliation, which is mainly defined by preferred orientation of muscovite flakes. At least two generations of veining have occurred; both types appear to cut porphyroblasts and both have been crenulated and recrystallised. Veins are up to 0.5 mm wide with early recrystallised quartz + muscovite types, being cut by recrystallised quartz-rich types. Muscovite in the pseudomorphic aggregates after andalusite and corundum appears to be randomly orientated.

c) Mineragraphy and paragenesis: No sulphide minerals have been noted in the sample.

Mineral Mode: Approximate modal proportions are: quartz 60%, muscovite 35%, graphite 2%, leucoxene, tourmaline and corundum each 1%.

Interpretation and Comments: The original rock is interpreted to have been an organic-bearing black shale-siltstone. It was evidently rather clay-rich and aluminous. Subsequently, it was metamorphosed, with development of porphyroblasts of andalusite and subordinate corundum, due to the aluminous rock composition. Since andalusite porphyroblasts developed a weak preferred orientation, it is assumed that it developed syn-tectonically, along with foliated muscovite. Syn-tectonic quartz-dominated veining also occurred, probably largely after porphyroblast development. Later, there was retrograde alteration (hydration, with possible introduction of K), with complete alteration of andalusite and almost complete alteration of corundum to fine grained muscovite and quartz. The retrograde muscovite is not foliated. It is considered most likely that development of porphyroblastic andalusite and corundum is due to low to medium grade regional metamorphism of an appropriately aluminous rock. The presence of graphite may have facilitated nucleation of andalusite and corundum porphyroblasts.

5473302 TS: From Blocks Mine. Site 61.

Summary: Fine grained phyllite, developed from a bedded siltstone-shale. The rock preserves bedding laminations, but has a moderate cross-cutting foliation and a weakly developed crenulation. It has been metamorphosed to low grade (chlorite grade, greenschist facies), with formation of a quartz-sericite-chlorite assemblage, with a few porphyroblasts of pyrite and a little leucoxene. There is no strong evidence for the rock to be a sheared volcaniclastic, but the precursor sedimentary material could have had a felsic volcanic provenance.

Handspecimen: The rock is a pale greenish, rather lustrous phyllite with a moderate foliation and a weak cross-cutting crenulation. It appears to be strongly sericitic, but with abundant quartz and minor chlorite. There are also a few isolated grains of quartz up to 1 mm across. Exterior surfaces and some foliation planes are stained by goethite, due to weathering oxidation of pyrite. The sample is essentially non-magnetic.

Thin Section:

a) Primary mineralogy and textures: In the section, relict bedding laminations are well-preserved, with individual laminae being on a scale of 0.5 mm to about 10 mm in thickness. Bedding is defined by differences in grainsize and mineralogy. Many beds are weakly graded, with more silty bases (showing local possible load casts into underlying shaly material) and shaly tops. The silty material contains abundant angular to subangular grains of detrital quartz up to 0.05-0.1 mm across, intergrown with sericite, chlorite and traces of tourmaline. The more shaly component of the rock is dominated by fine grained sericite, intergrown with quartz and accompanied by a little chlorite. Fine grained disseminated leucoxene (?anatase) occurs throughout and may be the result of alteration of former detrital FeTi oxide grains. Alternatively, leucoxene may simply be a diagenetic/low grade metamorphic phase.

b) Alteration and structure: The rock is dominated by a low grade metamorphic mineral assemblage of quartz and sericite, with minor chlorite. A moderate foliation is defined by preferred orientation of sericite and chlorite flakes and is at a moderate angle (40°) to the bedding plane. Incipient development of crenulation is defined by slight bending of the foliation plane. Rare porphyroblasts of pyrite up to 1 mm across occur sparsely and are accompanied by fibre quartz "pressure shadows". The sample also contains a few thin (<0.05 mm) anastomosing quartz veins which cut across foliation. Due to weathering effects, patchy goethite staining occurs in places.

c) Mineragraphy and paragenesis: The rock contains a few grains of porphyroblastic pyrite up to 1 mm across. These are interpreted to have grown during diagenesis or low grade metamorphism and prior to, or during, foliation development. There is no association between pyrite occurrence and quartz veining.

Mineral Mode: Approximate modal proportions are: quartz 50%, sericite 40%, chlorite 7%, leucoxene and goethite each 1% and traces of pyrite and tourmaline.

Interpretation and Comments: The rock is a psammopelitic phyllite, originally a bedded siltstone-shale. The low grade mineral assemblage of quartz-sericite-chlorite is consistent with chlorite grade of the greenschist facies and may have been partly developed from the breakdown of feldspar (although no relicts remain), but it is more likely that the original sediment contained a large detrital quartz + clay fraction. There is no strong evidence that the rock is a sheared volcaniclastic, although the mineral assemblage is not inconsistent with a felsic volcanic provenance for the sedimentary material. Because of the good preservation of sedimentary bedding laminations, this sample is distinctly more "sedimentary" than sample 5473303 which lacks well defined relict bedding laminae.

5473303 TS: Site 84 - Blackwater Rd. Chlorite spots in some rock.

Summary: Fine grained phyllitic rock, originally a shale-siltstone of possible felsic to intermediate volcanic provenance. It is now dominated by a quartz-sericite-chlorite assemblage, with scattered pseudomorphic aggregates of quartz plus chlorite after former metamorphic porphyroblasts of ?andalusite.

Handspecimen: The rock is composed of a pale greenish to creamy coloured, weakly foliated and weakly laminated sericitic phyllite, containing scattered prominent spots up to 1.5 mm across which are zoned from quartz-rich centres to chloritic rims. The weak laminations may represent original sedimentary bedding and the weak foliation is at a high angle (~70°) to this lamination. The sample is essentially non-magnetic.

Thin Section:

a) Primary mineralogy and textures: In the section, there is little evidence for the preservation of primary textures and minerals. It is possible that a small proportion of slightly larger quartz grains (up to 0.05 mm across0 could be original detrital grains. A weak, diffuse lamination is present and defined by slightly greater or less amounts of sericite. There are also one or two pseudomorphic aggregates up to 2 mm across now composed of fine grained quartz and sericite which have diffuse tabular outlines and which could represent former feldspar grains. The rock contains a tiny trace of ?detrital green tourmaline.

b) Alteration and structure: The rock is dominated by a low grade metamorphic mineral assemblage of quartz, sericite and chlorite, with minor disseminated aggregates of leucoxene throughout. Chlorite mainly occurs as small aggregates scattered throughout the sericite + quartz matrix. A weak foliation is defined by preferred orientation or sericite and this foliation is at a high angle (~60-70°) to the vague laminations. A dominating characteristic of this sample is the occurrence of disseminated aggregates of fine grained chlorite and quartz, locally with minor sericite. These aggregates are up to 1.5 mm across and commonly have granular quartz-rich cores and chlorite-rich margins. The aggregates have squarish to diamond-shaped or ovoid outlines and are interpreted to be pseudomorphs after a former aluminosilicate phase, probably andalusite. These porphyroblasts appear to have had random orientation.

c) Mineragraphy and paragenesis: No sulphides are evident in the section, although tiny spots of goethite in the handspecimen may represent the oxidised remnants of rare pyrite grains.

Mineral Mode: Approximate modal proportions are: quartz 45%, sericite 40%, chlorite 14%, leucoxene 1% and a trace of tourmaline.

Interpretation and Comments: The rock may represent a metamorphosed shale-siltstone of rather aluminous bulk composition. Vague laminations preserved in the sample may represent original sedimentary bedding. It is possible that there is a little detrital quartz, tourmaline and former feldspar, with the latter now replaced by quartz and sericite. Metamorphism may have been of relatively low grade, regional character, with development of a weak, sericite-defined foliation and the formation of scattered porphyroblasts of ?andalusite. Subsequently, there has been retrograde alteration, with replacement of ?andalusite by quartz and chlorite. The Fe and Mg necessary to make this reaction possible could have been present in the rock matrix and were not necessarily introduced during alteration. There is no strong evidence for the sample to be of volcanic origin, although its composition is not inconsistent with a felsic to intermediate igneous provenance for the sediment. The chloritic spots are not considered to be of volcanic origin, but represent retrogressed metamorphic porphyroblasts. Sericite has not been replaced by chlorite and both of these minerals appear to be in equilibrium.

5473304 TS: Site 79 Epidosite.

Summary: Medium grained altered pyroxene-hornblende microdiorite. The original mineral assemblage has been largely replaced by a low grade metamorphic alteration assemblage of tremolite-actinolite, chlorite, clinozoisite, albite, sericite and a little titanite. The rock also contains a trace of disseminated pyrite. A few sub-planar crack-seal textured quartz veins cut the sample.

Handspecimen: The sample is a medium grained, relatively equigranular altered intermediate igneous rock, possibly of dioritic composition. It appears to be moderately altered, with development of chlorite, actinolite and possible epidote. A trace of fine grained pyrite is disseminated in the sample and there is a little goethite staining on fracture surfaces due to incipient weathering effects. A few sub-planar quartz veins up to 1.5 mm wide cut the rock which is very weakly magnetic.

Thin Section:

a) Primary mineralogy and textures: In the section, relict igneous texture is moderately well preserved, despite rather strong alteration effects. It is likely that the rock was originally rich in tabular plagioclase grains up to 2 mm in length, intergrown with former tabular pyroxene grains (e.g. augite) up to 2.5 mm across. Both of these interpreted primary igneous minerals have been completely replaced by alteration minerals and only their pseudomorphic shapes remain. Green-brown hornblende is a subordinate primary igneous phase which is preserved and it may have partly rimmed former pyroxene grains. In interstitial positions are small aggregates of intergrown quartz and K-feldspar (microcline), with a typical grainsize of 0.1-0.3 mm. These aggregates locally include small grains of apatite and altered biotite. Disseminated throughout the rock are subhedral to anhedral grains of FeTi oxide up to 1 mm across. These may include primary igneous ilmenite and titanomagnetite, but they have been partly altered.

b) Alteration and structure: Alteration is pervasive and rather strong. All plagioclase has been replaced by fine grained masses of granular clinozoisite, commonly intergrown with albite, sericite, chlorite and a little tremolite-actinolite. Pyroxene has been completely replaced (along with some of the hornblende) to fine to medium grained pseudomorphic masses (locally semi-fibrous) of pale green tremolite-actinolite and chlorite, locally with traces of titanite. Biotite has been totally replaced by chlorite ± titanite and the igneous FeTi oxides partly replaced by titanite ± chlorite. Interstitial quartz and K-feldspar have remained unaltered. The rock retains a massive texture, but has been weakly fractured, with subsequent emplacement of a few sub-planar quartz-rich veins up to 1.5 mm wide. These veins may have developed during alteration and display crack-seal textures (indicating incremental opening and healing). Quartz is commonly intergrown with minor clinozoisite and tremolite-actinolite in these veins.

c) Mineragraphy and paragenesis: The rock contains a trace of fine grained disseminated pyrite, interpreted to have been formed during alteration. It has been locally replaced by goethite as a result of weathering oxidation.

Mineral Mode: Approximate modal proportions are: tremolite-actinolite 45%, chlorite 13%, albite and clinozoisite each 10%, quartz, K-feldspar, hornblende and sericite each 5%, FeTi oxide and titanite each 1% and traces of apatite and goethite.

Interpretation and Comments: The original rock is interpreted to have been a pyroxene-hornblende microdiorite, based on relict textures and mineralogy. It also contained minor interstitial quartz and K-feldspar. The rock underwent pervasive, rather strong alteration, probably as a result of low grade metamorphism (greenschist facies) to develop an assemblage of tremolite-actinolite, chlorite, clinozoisite, albite, sericite and minor titanite. A trace of pyrite also formed during alteration. Fracturing occurred during alteration, with emplacement of crack-seal textured quartz-rich veins.

5473305 PTS: Site 63 Development Prospect.

Summary: Intensely altered schistose chlorite-quartz rock (possibly representing some form of precursor intermediate to mafic igneous composition), variably replaced by medium grained carbonate (probably ankerite/siderite), with syn-tectonic quartz veining and minor disseminations of chalcopyrite and pyrite. The rock has been slightly weathered, leading to the formation of goethite staining and possibly a little Mn oxide.

Handspecimen: The sample is a heterogeneous, strongly altered and mineralised rock. It contains domains of grey, fine grained chloritic schistose material, enveloped in irregular domains of brown to orange-red medium grained carbonate (?ankerite/siderite). Disseminations and patches of chalcopyrite and a trace of pyrite occur sparsely throughout. The sample is essentially non-magnetic. Slight weathering has occurred, with alteration of carbonate to goethite and possibly Mn oxides.

Thin Section:

a) Primary mineralogy and textures: In the section, the sample is heterogeneous, with rather sheared domains up to several millimetres across being dominated by chlorite and quartz, with apparent replacement by extensive masses of medium grained brownish carbonate. These phases are the products of hydrothermal alteration and there is little strong evidence for the preservation of relict textures or minerals. In the chlorite + quartz domains, there are scattered aggregates of fine grained leucoxene (?anatase) up to 0.4 mm across which could be pseudomorphous after former igneous FeTi oxide grains. If this is accepted, then the relative abundance of these aggregates implies that the original rock could have been of intermediate to mafic composition.

b) Alteration and structure: Alteration effects are intense. Domains rich in fine to medium grained flaky pale green chlorite and fine granular quartz have a weak to moderate foliation, defined by preferred orientation of chlorite flakes. These domains contain scattered leucoxene aggregates as well as deformed, partly recrystallised small vein-like masses and irregular aggregates of quartz. There appears to have been extensive replacement of the chlorite + quartz assemblage by masses of medium grained pale brown carbonate (including a little quartz). Typical grainsize range of the carbonate is 0.2-1 mm. In turn, both the carbonate-rich masses and the chlorite + quartz assemblage have been cut by a few deformed and partly recrystallised quartz veins. The carbonate is partly altered to goethite (and ?Mn oxide), with the implication that it is a Fe (? and Mn)-bearing type (e.g. ankerite/siderite). The alteration of the carbonate is responsible for the brown and orange-red colouration of the handspecimen. Sulphide-rich aggregates and disseminations occur sparsely throughout the sample, in the carbonate masses, chlorite + quartz domains and in quartz veins.

c) Mineragraphy and paragenesis: The rock contains about 2-3 volume % of sulphides disseminated throughout. Chalcopyrite is the more abundant, forming irregular masses up to 2 mm across. Pyrite is a minor phase and locally forms composites with chalcopyrite. The latter appears to have been introduced after deformation, or at least mobilised and precipitated into late, interstitial positions. Typically it occurs interstitial to carbonate and deformed quartz, and locally occurs in fractures in pyrite. Both sulphides have been slightly replaced by goethite.

Mineral Mode: Approximate modal proportions are: carbonate 45%, quartz 30%, chlorite 20%, chalcopyrite 2%, pyrite, leucoxene and goethite (Mn oxide) each 1%.

Interpretation and Comments: It is difficult to assign a precursor lithology to this sample due to intense alteration effects. However, the chlorite + quartz + leucoxene assemblage could have formed from the replacement of a former intermediate to mafic igneous rock, by strong leaching of alkalis and alkaline earths. It appears as though phases of deformation were accompanied by strong introduction of carbonate (ankerite/siderite) (replacing chlorite), with quartz veining and development of minor sulphides. The latter, dominated by chalcopyrite and minor pyrite, are distributed throughout the altered and veined rock.

5473306 TS: Site 194 sericitic 'alt'

Summary: Fine grained low grade metamorphosed and moderately foliated shale-siltstone. The rock may have had a felsic igneous provenance and retains minor detrital quartz and feldspar. However, it has been mostly recrystallised into a foliated fine grained assemblage of quartz, sericite, subordinate carbonate (probably siderite) and a little chlorite. Carbonate forms prominent porphyroblasts stained brown by the development of supergene hematite/goethite.

Handspecimen: The sample is composed of a fine grained, moderately foliated quartz-sericite rock, with scattered brown spots up to 1 mm across. The latter appear to be composed of goethite, but some retain a rhombic shape, suggestive that they may be, or have been, a carbonate mineral. The sample is essentially non-magnetic.

Thin Section:

a) Primary mineralogy and textures: In the section, the rock is dominated by a fine grained, moderately schistose aggregate of quartz and sericite, with subordinate amounts of carbonate, commonly as porphyroblasts up to 0.8 mm across. There are vestiges of relict detrital texture preserved, manifest in scattered small subangular grains of quartz and minor plagioclase up to 0.1 mm across, together with traces of leucoxene and green tourmaline. However, the remainder of the rock has been thoroughly recrystallised and moderately foliated.

b) Alteration and structure: The rock has been strongly replaced by alteration minerals and has developed a moderate foliation. Much of the original mineral assemblage (assumed to have been rich in quartz and feldspar) has been replaced by fine grained granular quartz and fine flakes of sericite. The preferred orientation of the latter defines the foliation which can be seen to have been weakly crenulated. The rock also contains pale brownish carbonate (probably siderite) disseminated throughout, some intergrown with fine grained quartz and sericite, but most occurring as ovoid to rhombic porphyroblasts up to 0.8 mm across. These porphyroblasts are commonly elongate in the plane of the foliation and have replaced the quartz + sericite assemblage; their development is regarded as syn-tectonic. Carbonate porphyroblasts have been subsequently slightly stained by hematite and goethite due to incipient weathering effects - these are responsible for the brown colour of the spots in handspecimen.

c) Mineragraphy and paragenesis: No sulphides have been observed in the sample.

Mineral Mode: Approximate modal proportions are: quartz 50%, sericite 35%, carbonate 11%, plagioclase 2%, chlorite 1% and traces of leucoxene, tourmaline and hematite/goethite.

Interpretation and Comments: The rock is a low grade metamorphosed and moderately foliated shale-siltstone. It contains a little detrital quartz and plagioclase (and traces of leucoxene and tourmaline), but has been mostly recrystallised to a foliated aggregate of fine grained quartz and sericite. There are common carbonate (probably siderite) porphyroblasts and a little chlorite. Carbonate may have developed syn-tectonically and reflects CO_2 flux through the rock. The composition of the sample is consistent with it having a felsic igneous provenance, e.g. from felsic volcanic material, but there are no preserved volcaniclastic textures.

5473307TS: Site 57 Trial Shaft.

Summary: Brecciated quartz-rich siltstone, with strong replacement of clasts by fine grained chlorite. The breccia matrix is also dominated by fine grained chlorite, but contains some vein quartz material. A little pyrite was deposited with the vein quartz, but has subsequently been weathered out and replaced by goethite boxworks and staining. The rock is viewed as a type of tectonic breccia, with hydrothermal influx of Mg and Fe during and following brecciation.

Handspecimen: The sample is composed of a brecciated rock containing angular to sub-rounded clasts up to 4 cm across of pale to mid green chloritic altered fine grained ?sedimentary rock in a fine grained dark green chloritic matrix. The latter also contains a few masses of milky vein quartz up to 2 cm across. Goethite boxworks after pyrite are up to 2 mm across and are mainly associated with the patches of vein quartz. The sample is essentially non-magnetic.

Thin Section:

a) Primary mineralogy and textures: In the section, the rock has a heterogeneously brecciated appearance. It contains angular to sub-rounded clasts of massive to weakly laminated, partly recrystallised and quartz veined sedimentary rock, considered to represent a rather quartz-rich siltstone. The clasts are up to several centimetres across and a set in a hydrothermal matrix dominated by fine grained, locally foliated chlorite, with local masses of rather coarse grained vein quartz. The siltstone clasts are locally weakly foliated and contain dominant recrystallised quartz, with a typical grainsize of 0.05-0.1 mm; there are also traces of rutile and zircon. Textures imply that chlorite in the clasts is replacive and may have developed by alteration of former feldspar as well as from quartz. In places, chlorite has strongly replaced the clasts. A few thin quartz veins occur in the clasts and show evidence of having been strongly recrystallised.

b) Alteration and structure: Clasts in the breccia have been variably disaggregated and replaced by semi-massive fine grained chlorite, locally penetrating into the clasts along fractures. The breccia matrix is dominated by fine to medium grained chlorite which is foliated in places. Locally, chlorite is intergrown in bladed form with quartz. Tiny inclusions of rutile and zircon occur sparsely in chlorite. There are parts of the matrix which are composed of deformed vein quartz. The latter is coarse grained (up to 6 mm) and shows strain phenomena as well as some recrystallisation and replacement by chlorite. Matrix chlorite and vein quartz contain scattered goethite pseudomorphs after pyrite up to 1 mm across, mainly associated with the vein quartz. There is also a little goethite staining of chlorite due to weathering effects.

c) Mineragraphy and paragenesis: The rock contains irregularly distributed goethite pseudomorphs after former pyrite, mainly associated with the deformed vein quartz in the breccia matrix.

Mineral Mode: Approximate modal proportions are: quartz 60%%, chlorite 38%, goethite 1% and traces of rutile and zircon.

Interpretation and Comments: The original rock is interpreted to have been a rather even-grained, quartz-rich siltstone, but possibly containing considerable feldspar. The rock was heterogeneously deformed, with brittle failure and development of a tectonic breccia containing angular to sub-rounded clasts. Probably accompanying brecciation, there was introduction of Fe and Mg, resulting in strong chloritisation of the clasts and development of a chloritic matrix. Quartz veining also occurred after brecciation, with introduction of a little pyrite. Further deformation occurred, with formation of strain phenomena in vein quartz and development of foliation in the chloritic breccia matrix. Subsequently, supergene oxidation occurred, causing replacement of pyrite by goethite and the formation of minor goethite staining. There is no evidence that the rock was formerly of volcanic origin.

Appendix 4

Rock Chip Sample Ledger and Geochemical Assays

575108

Sampno	Prospect	EL	DPO	Samptype	Report	AMGE	AMGN	Colour	Altr/Min	Texture	FieldId	Comments	Na	Mg	Al	K	Ca	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	As	Mo	Ag	Cd	Sn	Sb	Ba	W	Au	Pb	Bi
5470689	Development	4/94	82168	Rock	22685	322584	5433031	RVDG	DiCo	Cs Vg Vc	Ovq	Pink red dol veining with x-cutting quartz	1200	20.59	0.245	0.015	0.185	45	6	-10	1840	4.34	62	17	6890	46	330	-10	-0.5	-1	3	72	-5	-10	0.06	150	66
5470690	Development	4/94	82168	Rock	22685	322565	5433032	RVDG	CoCl	Vs	Et		1150	12.65	2.18	0.02	0.075	206	20	11	3580	7.19	12	-10	9550	51	52	-10	-0.5	-1	-3	9	-5	-10	0.05	-10	14
5470691	Blocks	4/94	82168	Rock	22685	322702	5432302	DGV	Cl	Si	Et	Foot wall to Blocks mine	2400	4.36	8.28	3.31	0.05	2770	77	42	116	1.59	-5	-10	2160	103	340	-10	0.8	2	11	229	489	-10	-0.01	-10	-10
5470692	Blocks	4/94	82168	Rock	22685	322703	5432303	GV	Cl	Fi	Et	Hanging wall to Blocks mine	3250	0.836	9.32	4.76	0.085	2330	84	40	234	4.47	9	17	32	28	6	-10	-0.5	-1	3	6	763	-10	-0.01	-10	-10
5470693	Blocks	4/94	82168	Rock	22685	323786	5431232	DGV	Cl	Vq	Et	breccia in places	1350	4.5	5.17	0.045	0.01	813	33	22	514	9.48	-5	75	18	100	47	-10	-0.5	-1	-3	-5	17	-10	0.03	-10	-10
5470694	Blocks	4/94	82169	Rock	22685	322675	5432425	DGVW	CoCl	VqVs	Ovq		350	2.56	2.24	0.055	0.06	472	16	-10	169	7.59	-5	13	58900	40	78	-10	-0.5	-1	43	15	5	-10	0.02	-10	-10
5470695	Blocks	4/94	82169	Rock	22685	322676	5432426	DGVW	PyCoCl	Ds Si	Et	Foot wall mineralisation at Blocks mine	750	5.11	4.84	0.8	0.055	2150	42	27	222	6.04	-5	19	31000	46	27	-10	-0.5	-1	19	-5	129	-10	-0.01	-10	-10
5470696		4/94	82168	Rock	22685	320541	5437551	OBR	PyLi	Fe Sh Ds	Fz	Major shallow normal shear	2150	0.97	7.69	1.43	0.065	2430	59	50	3360	13.83	23	30	404	28	47	15	-0.5	-1	-3	-5	330	-10	0.02	13	-10
5470697		4/94	82168	Rock	22685	320542	5437552	OBR	LI	Fe Sh Vc	Fz		2350	0.212	8.27	2.3	0.065	2800	54	37	135	4.66	6	19	108	12	-5	-10	-0.5	-1	-3	-5	416	-10	0.01	10	-10
5470698		4/94	82168	Rock	22685	320543	5437553	OBR	PyLi	Fe Sh	Ssi	Cross cutting to 5470696 shear	2250	1.16	4.59	0.145	0.08	1740	36	27	3960	16.73	19	29	393	32	88	-10	-0.5	-1	-3	-5	241	-10	0.01	20	-10
5470699		4/94	82168	Rock	22685	320638	5437455	OBR	LI	Fe Sh	Fz	Hosted by slate	1400	0.767	5.09	0.08	0.015	1550	77	48	1080	7.88	-5	29	196	14	43	-10	-0.5	-1	-3	-5	25	-10	0.02	-10	-10
5470700		4/94	82168	Rock	22685	321180	5436240	BW		WePo	Ido		2250	0.069	8.56	0.06	0.055	19800	118	536	38	0.27	-5	53	66	13	6	-10	-0.5	-1	-3	24	220	-10	-0.01	49	-10
5470294		4/94	82169	Rock	22685	323785	5431231	GW	CiPy		Ovq	Octahedral pyrite	450	0.538	0.735	0.025	1.12	167	-2	12	124	3.62	44	32	13	28	57	-10	-0.5	-1	-3	-5	6	-10	-0.01	28	-10
5470295	Blocks	4/94	82168	Rock	22685	322671	5432421	DGVW	Cl	Si	Et	Hanging wall to Blocks mine [immediate]	2100	1.05	6.47	3.07	0.03	1570	61	34	196	4.57	-5	13	32	78	-5	-10	-0.5	-1	8	6	394	-10	-0.01	31	-10
5470296	Blocks	4/94	82168	Rock	22685	322672	5432422	DGVW	Cl		Et	Hanging wall to Blocks mine	2500	0.884	7.13	3.65	0.055	2470	68	39	159	3.41	-5	11	-5	24	6	-10	-0.5	-1	8	-5	526	-10	-0.01	-10	-10
5470297	Blocks	4/94	82168	Rock	22685	322673	5432423	DGVW	CiCo	Ds	Et	Poss sediments	1350	5.53	4.53	0.025	0.155	721	31	-10	397	8.65	102	307	38500	91	40	-10	4.4	-1	33	5	46	-10	-0.01	-10	-10
5470298	Blocks	4/94	82168	Rock	22685	322674	5432424	DGVW	Cl		Et	Foot wall to Blocks mine	1250	1.56	3.47	1.02	0.01	1170	24	16	269	3.9	-5	28	2050	29	-5	-10	-0.5	-1	4	5	77	-10	-0.01	-10	-10
5470299	Blocks	4/94	82168	Rock	22685	322704	5432304	DGV	Cl		Et	Poss sediments	2200	1.37	6.59	3.46	0.04	2090	61	29	139	3.2	-5	10	112	23	5	-10	-0.5	-1	9	-5	422	-10	-0.01	-10	-10
5470300	Blocks	4/94	82168	Rock	22685	322705	5432305	DGGV	Cl	Si	Et	Poss sediments	2950	9.34	6.84	0.39	0.095	2210	48	31	298	5.25	-5	-10	77	82	5	-10	-0.5	-1	3	-5	357	-10	-0.01	-10	-10
5471163		4/94	82169	Rock	22685	321142	5436080	N	Py	Fe	Ccy	Black sulphidic clay	4550	0.372	10.72	6.3	0.305	5520	101	91	57	1.57	-5	14	170	31	-5	-10	-0.5	-1	14	-5	1040	-10	-0.01	64	-10
5471164		4/94	82169	Rock	22685	321143	5436081	N	Py	Fe	Ccy	Black sulphidic clay	3700	0.314	9.25	5.21	0.115	5310	94	75	75	2.23	-5	12	147	39	6	-10	-0.5	-1	14	-5	858	-10	-0.01	51	-10
5471165		4/94	82168	Rock	22685	321823	5435450	OB	Li	Sh Fe	Fz		2050	0.264	5.53	1.81	0.02	3590	52	33	100	4.63	-5	-10	31	51	19	-10	-0.5	-1	3	-5	326	-10	-0.01	29	-10
5471166		4/94	82168	Rock	22685	321770	5435210	OB	Li	Sh Fe	Fz		2050	0.274	6.25	1.41	0.025	1650	38	41	58	3.43	-5	-10	15	12	5	-10	-0.5	-1	-3	-5	363	-10	-0.01	14	-10
5471176		4/94	82168	Rock	22685	323910	5428280	BOR	LiHe	Fe	Ccy		2100	0.703	7.24	0.6	0.055	1020	36	28	659	11.17	-5	-10	923	15	208	-10	-0.5	-1	-3	-5	213	66	-0.01	43	-10
5471177		4/94	82168	Rock	22685	323911	5428281	DGR	He	Fe	Mn	Thermally altered rock	1950	0.813	7.35	2.78	0.03	4130	64	37	1690	4.28	-5	-10	54	16	97	-10	-0.5	-1	15	-5	197	18	-0.01	26	-10
5471178		4/94	82168	Rock	22685	323785	5428530	BRO	LiHe	Fe	Ccy		3200	1.51	9	3.93	0.09	1920	71	27	689	5.91	-5	-10	308	73	731	-10	-0.5	-1	50	5	533	-10	-0.01	879	-10
5471179		4/94	82169	Rock	22685	323786	5428531	DGB	Li	Vn Lm	Ssi	Non planar	500	3.22	5.59	0.035	0.04	5760	74	70	5490	10.77	-5	-10	379	39	27	-10	-0.5	-1	11	-5	57	14	-0.01	52	-10
5471180	The Clump	4/94	82168	Rock	22685	320864	5437545	OB	Li	Fe Vq	Ccy	1.2 m channed sample	1650	1.33	6.96	1.56	0.025	1660	134	49	870	8.81	-5	-10	52	12	36	-10	-0.5	-1	-3	-5	846	-10	-0.01	-10	-10
5471181	The Clump	4/94	82168	Rock	22685	320865	5437546	DGN		Sh	Ssh		3050	0.404	8.56	4.66	0.085	5070	142	46	110	2.03	-5	-10	-5	-5	9	-10	-0.5	-1	18	-5	763	-10	0.01	12	-10
5471182	The Clump	4/94	82169	Rock	22685	321040	5437390	BORV	Cs	Vg Sh	Fz		350	0.015	0.835	0.06	-0.005	22	3	-10	37	0.64	-5	-10	23500	6	19	-10	10.7	-1	4	20	183	-10	0.01	37	789
5471183	The Clump	4/94	82169	Rock	22685	321041	5437391	BORV	LiCs	Vq Sh	Fz		550	0.033	3.6	0.045	0.025	203	20	30	70	4.19	-5	24	123000	29	81	-10	88.7	-1	-3	24	112	-10	0.22	54	1020
5471184	The Clump	4/94	82168	Rock	22685	321710	5436870	DGN	Cl	Mg Vn	Ssi	Mt Balfour mine hanging wall	2550	0.71	8.05	3.32	0.055	3200	79	50	1170	6.57	-5	12	54	15	-5	-10	-0.5	-1	-3	-5	536	-10	-0.01	-10	-10
5471185	The Clump	4/94	82168	Rock	22685	321610	5436870	G		Lm	Ssi	Mt Balfour mine footwall [planer]	2400	0.591	8.7	5.09	0.045	3220	81	54	152	2.67	-5	-10	27	8	12	-10	-0.5	-1	3	-5	896	-10	-0.01	13	-10
5471186	Murrays R	4/94	82168	Rock	22685	324590	5429530	NDG		Lm	Ssi	Non planar - Murrays Reward hanging wall	2600	0.849	8.22	4.17	0.045	2830	65	40	193	2.5	-5	10	227	24	107	-10	-0.5	-1	13	-5	564	-10	-0.01	11	-10
5471187	Murrays R	4/94	82168	Rock	22685	324591	5429531	GV	Cl	Lm Sh	Ssi	Planar? - Murrays Reward footwall	3600	0.689	9.29	4.7	0.095	2210	81	40	175	3.23	-5	-10	76	16	-5	-10	-0.5	-1	9	-5	837	-10	-0.01	-10	-10
5471188	The Clump	4/94	82169	Rock	22685	321600	5436840	WDG	PyCo	Vs	Ovq	Mt Balfour mine	300	0.004	0.02	-0.01	-0.005	-10	-2	-10	47	26.5	198	147	59600	-5	790	-10	11.4	-1	40	-5	18	-10	0.01	43	16
5471189	Murrays R	4/94	82169	Rock	22685	324592	5429532	EPY	CoCs	Ma	Oms		250	0.013	0.085	0.02	-0.005	15	-2	-10	15	17.16	-5	80	410000	86	145	-10	57.4	-1	276	30	26	-10	-0.01	10	-10
5471193	The Clump	4/94	82174	Rock	22685	321460	5436220	RBO	LI	FeWe	Eb	Rotted Ferruginous soil and rock frags	2700	0.55	15.27	0.145	0.155	14100	216	161	804	9.93	24	234	72	72	12	-10	-0.5	-1	5	-5	564	-10	0.04	22	-10
5471195		4/94	82174	Rock	22685	323785	5428465	LGG	GaPySe	Vq	Ssi	Mine spoil from 50 foot sharft	600	4	3.31	4.73	0.015	1600	32	11	2100	7.2	-5	-10	183	554	15	-10	42.8	2	816	8	67	40	0.02	19200	34
5471197	The Clump	4/94	82174	Rock	22685	321455	5436225	DGV			Eb	Crystaline non magnetic	20800	4.78	6.42	1.53	5.29	12400	184	166	1280	8.44	44	166	47	123	-5	-10	-0.5	1	13	-5	353	-10	0.03	27	-10
5471199		4/94	82174	Rock	22685	323790	5428435	DGN	Li	Vq	Ssi	Sheared ? shale with lensoid quartz veins	2900	2.91	9.6	3.16	0.12	2910	102	33	755	5.34	-5	12	129	89	292	-10	0.9	-1	39	-5	598	-10	0.04	54	-10
														0	0	0						0															

Nic Turner's 1994 Rock Samples : Additional Elements

Nic Turner's 1994 Rock Sampling																									
pno	peast	pnorth	ptype	pEL	pag	pal	pas	pau	pba	pca	pco	pcu	pfe	pk	pmg	pmn	pna	pni	ppb	psn	pTi	pv	pw	pzn	pcomments
3757862	321350	5437300	Rock		-1	6	21	-0.008		0.06	4	45	7.5	2.73	0.96	360	1850	3	5	7	3020	49	6	76	Laminated sandstone with pyrite
3757863	321275	5437425	Rock		-1	9.04	12	-0.008		0.16	5	16	3.28	4.92	0.93	239	4700	6	-3	8	4480	88	-5	68	Dark grey siltstone with limonite
3757864	321225	5437475	Rock		-1	3.09	35	-0.008		0.09	4	576	23.6	0.07	0.18	233	500	-3	13	3	1940	98	-5	66	Granular chlorite with pyrite
3757865	321525	5437000	Rock		-1	2.86	26	0.015		0.01	4	601	19.9	0.27	0.57	237	400	-3	-3	7	1150	33	-5	48	Chloritic siltstone with sulphide
3757866	321400	5436850	Rock		-1	0.41	639	0.068		0.01	169	1338	16.2	0.04	0.32	101	500	10	5	7	62	5	13	44	Pyrite in quartz gangue
3757867	321675	5436925	Rock		2	7.26	54	0.018		0.38	60	24800	20.4	0.28	6.11	4348	9450	56	-3	5	400	61	-5	149	Chalcopyrite in chloritic siltstone
3757868	321675	5436925	Rock		4	0.2	996	0.194		0.01	325	88400	22.6	0.02	0.17	102	400	55	34	38	29	3	15	71	Pyrite/chalcopyrite in quartz
3757869	321675	5436925	Rock		3	0.56	700	0.088		0.04	29	25200	14.4	0.02	3.18	5981	700	10	-3	5	24	3	14	56	Pyrite/chalcopyrite in quartz
3757870	321250	5437525	Rock		-1	6.25	129	0.014		0.28	13	280	18.7	0.56	2.93	3105	1450	10	16	-3	3200	129	-5	165	Chloritic siltstone with pyrite
3757871	318830	5442185	Rock		-1	4.76	696	0.012		0.4	81	122	3.39	1.53	3.59	373	650	85	28	9	2320	86	9	66	Dark grey siltstone with 3mm pyrite band
3757872	318820	5442190	Rock		-1	5.79	25	0.013		0.54	15	66	2.51	1.67	4.53	971	850	16	4	6	2710	79	9	78	Grey siltstone with 1-3mm pyrite bands
3757873	318810	5442195	Rock		-1	7.47	11	0.018		0.09	6	86	0.6	4.38	0.35	69	2350	5	13	7	3460	114	7	70	Grey siltstone
3757874	318800	5442200	Rock		-1	5.29	48	0.022		0.16	28	49	2.6	3.21	0.32	122	1600	42	17	9	2550	112	12	66	Grey to black siltstone with disseminated pyrite
3757875	318700	5442250	Rock		-1	5.92	39	0.022		0.25	55	84	3.23	3.33	0.51	229	2400	53	11	11	2810	110	-5	66	Black siltstone with ? fine pyrite
3757876	318690	5442240	Rock		-1	5.57	102	0.028		0.04	34	73	4.98	3.7	0.28	35	9000	51	29	12	2970	161	-5	58	Black siltstone rich in disseminated pyrite
3757877	318680	5442245	Rock		-1	6.22	4	0.018		0.01	3	24	0.22	3.66	0.29	21	1150	-3	17	8	4330	153	6	50	Black siltstone no visible pyrite
3757878	318670	5442230	Rock		-1	6.05	3	0.013		0.01	-3	11	0.16	3.58	0.28	20	1200	-3	14	8	4100	153	8	76	Black siltstone no visible pyrite
3757879	324524	5429375	Rock		4	6.32	144	-0.008		0.03	8	281	20.1	0.65	1.4	2043	600	4	74	16	2180	75	9	82	Green pyritic sandstone
3757880	324400	5429200	Rock		37	0.09	13800	0.03		0.01	-3	5896	19.4	0.02	0.01	599	350	-3	576	2433	-10	-2	164	3374	Pyrite grey ? sulphide quartz
3757881	324400	5429200	Rock		17	0.2	17700	-0.008		0.2	-3	6653	44.2	0.01	1.31	24000	400	-3	156	798	13	-2	3000	2222	Siderite with chalcopyrite ? sphalerite
3757882	324400	5429200	Rock		135	0.26	33100	0.024		0.07	10	16200	19.9	0.03	0.3	7328	350	-3	1532	9106	15	-2	1000	99400	Grey ? sulphide minor calcopyrite quartz
3757883	324075	5428900	Rock		10	1.87	6500	0.023		0.03	4	1306	5.9	0.94	0.46	576	800	-3	69	1757	305	14	121	582	Quartz vein with pyrite ? sphalerite
3757884	324075	5428900	Rock		1	4.74	140	0.012		0.04	-3	566	24.9	2.28	3.17	2460	1450	3	-3	32	5600	29	-5	1049	Black vitreous mineral / rock no sulphide apparent
3757885	324075	5428900	Rock		37	1.39	43100	0.048		0.01	15	2497	23.3	0.79	0.12	1062	700	-3	350	86000	225	10	82000	68	Quartz vein with pyrite ? sphalerite
3757886	324500	5429450	Rock		-1	10.06	181	-0.008		0.1	-3	138	3.39	5.22	0.58	129	3300	5	-3	16	3640	87	14	165	Pale siltstone with quartz veins
3757887	324499	5429449	Rock		-1	9.98	174	-0.008		0.07	-3	101	2.71	5.02	0.72	189	2800	9	-3	24	3000	87	16	122	Pale siltstone with quartz veins
3757888	324498	5429448	Rock		-1	8.46	260	0.01		0.04	-3	537	7.1	4.16	0.42	90	1650	-3	-3	15	2350	73	-5	27	Quartz vein with gossan
3757889	324497	5429447	Rock		-1	10.13	33	-0.008		0.07	-3	107	2.57	5.09	0.73	165	2500	9	-3	21	2610	83	15	28	Pale siltstone with quartz veins
3757890	324496	5429446	Rock		-1	9.96	167	0.013		0.1	-3	338	3	4.96	0.72	116	3450	13	3	14	3150	77	7	31	Pale siltstone with quartz veins
3757891	324495	5429445	Rock		-1	9.37	183	-0.008		0.09	-3	444	2.95	4.73	1.04	180	3000	16	4	23	3390	79	14	37	Sheared quartz / pale siltstone
3757892	324494	5429444	Rock		29	4	281	0.02		0.01	3	3101	2.83	1.79	0.72	257	850	7	12	44	1010	35	-5	48	Sheared quartz / pale siltstone
3757893	324493	5429443	Rock		15	4.67	99	0.01		0.01	4	274	2.16	2.12	0.88	281	800	8	4	45	1450	43	13	31	Sheared quartz / pale siltstone
3757894	324492	5429442	Rock		102	1.76	354	0.106		-0.01	41	354000	9.6	0.58	0.12	37	450	62	233	274	354	13	14	121	Very rich in covellite
3757895	324491	5429441	Rock		22	6.97	668	0.026		0.06	-3	25200	2.58	4	0.4	35	2350	24	75	62	2960	68	8	27	Sheared dark grey siltstone with malachite
3757896	324490	5429440	Rock		6	8.31	212	0.023		0.05	-3	526	1.13	4.46	0.6	121	2300	14	23	49	3860	70	29	24	Sheared quartz /grey siltstone breccia
3757897	324489	5429439	Rock		-1	9.92	29	0.041		0.05	-3	105	0.66	5.49	0.42	64	1950	19	17	29	3730	89	5	24	Dark grey siltstone with quartz veins
3757898	324488	5429438	Rock		-1	8.6	39	0.028		0.04	-3	96	1.77	4.42	0.52	160	1550	13	28	16	3270	75	10	24	Dark grey siltstone with quartz veins
3757899	324487	5429437	Rock		-1	9.09	48	0.016		0.07	-3	263	3.74	4.19	0.73	246	2350	15	48	13	2330	82	-5	34	Dark grey siltstone with quartz veins
3757900	324486	5429436	Rock		-1	10.67	32	0.023		0.2	-3	329	6.5	4.96	0.99	319	5400	18	230	17	3970	123	16	49	Dark grey siltstone with quartz veins
3992201	324485	5429435	Rock		-1	10.89	21	0.011		0.15	-3	130	2.77	5.49	0.68	180	4350	11	30	12	3660	97	8	28	Dark grey siltstone with quartz veins
3992202	324484	5429434	Rock		-1	9.18	29	0.011		0.09	-3	94	2.71	4.54	0.72	183	2750	9	25	11	2430	81	-5	30	Dark grey siltstone with quartz veins
3992203	324483	5429433	Rock		-1	8.75	10	0.013		0.07	-3	255	3.06	4.34	0.8	188	2350	11	23	14	3600	81	6	36	Dark grey siltstone with quartz veins
3992204	324482	5429434	Rock		-1	8.26	10	0.013		0.05	-3	209	3.42	4.13	0.65	138	1900	4	17	14	2580	74	-5	31	Dark grey siltstone with quartz veins
3992205	324481	5429435	Rock		-1	8.65	31	0.014		0.04	-3	293	3.33	4.25	0.72	156	1700	8	34	14	3540	77	5	34	Dark grey siltstone with quartz veins
3992206	324480	5429436	Rock		-1	8.82	36	0.017		0.16	-3	324	3.99	4.44	0.79	145	4500	5	20	13	2840	80	9	32	Dark grey siltstone with quartz veins
3992207	323800	5428500	Rock		14	1.02	23	-0.008		0.02	-3	83	4.05	1.93	1.69	416	650	-3	14500	701	347	6	5	327	Quartz vein with pyrite ? sphalerite
3992208	323800	5428500	Rock		79	5.99	118000	0.012		0.06	-3	420	10.6	3.75	0.54	106	2000	-3	481	16000	324	15	3000	82	Medium grained quartz muscovite granitic texture
3992209	324075	5429050	Rock		-1	0.27	467	-0.008		0.03	-3	147	2.25	0.06	0.05	28	500	-3	29	125	56	5	-5	16	Quartz vein with gossan
3992210	324125	5428775	Rock		-1	5.93	212	-0.008		0.04	-3	413	10.7	2.01	1.85	1508	1400	-3	-3	60	3520	65	34	73	Green siltstone with limonite
3992211	324479	5429437	Rock		-1	8.42	41	0.034		0.18	-3	812	5.7	4.3	0.8	129	4950	3	45	12	2540	71	-5	33	Dark grey siltstone with quartz veins
3992212	324479	5429437	Rock		-1	8.59	38	0.021		0.14	-3	465	3.05	4.34	0.82	138	4050	3	21	13	2850	76	6	33	Dark grey siltstone with quartz veins
3992213	324479	5429437	Rock		4	0.89	155	0.021		0.01	6	309	2.97	0.35	0.06	29	550	6	8	7	231	13	-5	14	Pyritic limonitic quartz vein
3992214	324479	5429437	Rock		-1	8.33	100	0.008		0.12	-3	260	3.15	4.25	0.73	163	3750	5	7	22	3130	74	6	32	Dark grey siltstone with quartz veins
3992215	324479	5429437	Rock		-1	8.52	39	0.011		0.15	-3	324	2.53	4.45	0.85	212	4450	3	26	17	3450	82	-5	34	Dark grey siltstone with quartz veins
3992216	324479	5429437	Rock		-1	8.88	65	0.01		0.1	-3	634	2.1	4.66	0.55	98	3450	-3	14	15	2910	90	13	22	Dark grey siltstone with quartz veins
3992217	324480	5429450	Rock		2	7.78	273	0.012		0.1	-3	349	3.66	3.87	1.18	304	2900	12	5	12	2270	64	6	42	Grey siltstone with disseminated pyrite
3992218	324480	5429450	Rock		10	8.1	715	0.02		0.05	9	652	5.2	3.72	1.31	340	1800	17	9	13	2150	68	9	48	Pale sandstone pyrite - rich
3992219	324480	5429450	Rock		-1	9.34	139	0.016		0.11	-3	136	2.06	5.48	0.84	186	3850	3	10	13	3300	72	-5	30	Dark grey siltstone with quartz veins
3992220	324479	5429450	Rock		-1	10.39	283	0.01		0.16	-3	96	1.42	5.95	0.84	119	5050	-3	22	123	3390	75	5	25	Dark grey siltstone with quartz veins
3992221	324478	5429450	Rock		1	8.4	110	0.016		0.07	-3	100	1.07	4.36	0.68	89	2400	-3	13	19	2740	59	5	19	Dark grey siltstone with quartz veins
3992222	324477	5429450	Rock		2	7.21	105	0.016		0.04	3	588	2.03	3.76	0.7	106	1700	3	16	16	2360	54	5	23	Dark grey siltstone with quartz veins
3992223	324476	5429450	Rock		1	8.78	130	0.016		0.08	-3	170	2.11	4.48	0.97	179	2950	3	16	15	2930	75	-5	25	Dark grey siltstone with quartz veins
3992224	324475	5429450	Rock		4	6.86	137	0.013		0.09	-3	278	1.73	3.71	0.77	104	2950	3	20	36	2570	57	-5	23	Dark grey siltstone with quartz veins
3992225	324474	5429450	Rock		-1	9.53	196	0.019		0.13	-3	221	2.49	5.04	1.01	161	4200	5	36	40	3190	81	-5	29	Dark grey siltstone with quartz veins
3992226	324473	5429450	Rock		-1	9.26	54	0.011		0.12	-3	282	2.33	4.89	0.82	156	3300	4	64	71	2430	77	8	182	Dark grey siltstone with quartz veins
3992227	324472	5429450	Rock		-1	8.76	104	0.008		0.1	-3	190	1.81	4.75	0.65	113	3300	-3	27	16	2620	75	10	29	Dark grey siltstone with quartz veins
3992228	324471	5429450	Rock		-1	8.55	59	0.01		0.1	-3	322	2.38	4.37	0.73	157	3200	4	15	13	2930	77	7	30	Dark grey siltstone with quartz veins
3992229	324470	5429450	Rock		-1	8.44	103	0.013		0.1	-3	406	4.01	4.21	0.9	215	2350	4	37	14	2530	78	-5	30	Dark grey siltstone with quartz veins
3992230	324469	5429450	Rock		-1	9.48	48	0.013		0.2	-3	311	2.96	4.55	1.86	275	5450	3	40	16	3580	69	-5	33	Dark grey siltstone with quartz veins
3992231	324468	5429450	Rock		-1	8.52	78	0.01		0.07	-3	354	0.72	4.77	0.53	31	2000	-3	9	6	2860	73	6	224	Dark grey siltstone with quartz veins
3992232	324467	5429450	Rock		-1	6.53	5	0.008		0.03	-3	88	0.26	3.85	0.3	11	1350	-3	-3	10	3300	52	7	19	Dark grey siltstone with quartz veins
3992233	324440	5429460	Rock		-1	7.64	29	-0.008		0.06	-3	54	3.08	3.76	0.57	353	2100	6	3	13	3020	61	7	27	Grey siltstone
3992234	324439	5429462	Rock		-1	9.88	34	0.009		0.15	-3	57	2.41	5.8	0.53	220	4750	-3	-3	12	2290	45	-5	21	Grey siltstone
3992235	324438	5429464	Rock		-1	9	29	-0.008		0.09	-3	57	2.28	4.83	0.52	193	2650	5	8	9	2810	64	-5	23	Grey siltstone
3992236	324436	5429464	Rock		-1	11.47	27	-0.008		0.2	-3	44	2.48	6.04	0.8	219	5650	8	14	11	3680	93	11	81	Grey siltstone
3992237	324434	5429464	Rock		-1	4.91	104	0.008		0.04	-3	200	11.7	0.6	1.57	1136	600	5	7	4	1480	39	7	61	Pale sandstone pyrite - rich
3992238	324433	5429464	Rock		-1	8.78	18	-0.008		0.07	-3	35	2.18	4.99	0.46	186	2700	6	9	10	3740	81	7	27	Grey siltstone
3992239	322325	5430475	Rock		-1	0.81	12	0.009		0.01	-3	12	0.55	0.64	0.06	62	500	-3	3	6	218	6	-5	17	Quartz arenite
3992240	322275	5430575	Rock		-1	0.04	3	-0.008		0.01	-3	6	0.31	0.03	0.01	22	400	-3	-3	3	93	-2	-5	19	Quartz arenite with scattered cavities
3992241	322275	5430600	Rock		-1	0.88	7	-0.008		0.04	-3	9	0.9	0.61	0.18	220	500	-3	-3	5	185	7	-5	51	Quartz arenite with disseminated pyrite
3992242	322250	5430625	Rock		-1	1.11	43	-0.008		0.01	-3	25	1.6	0.35	0.53	599	400	4	60	6	247	9	6	44	Quartz arenite with disseminated pyrite

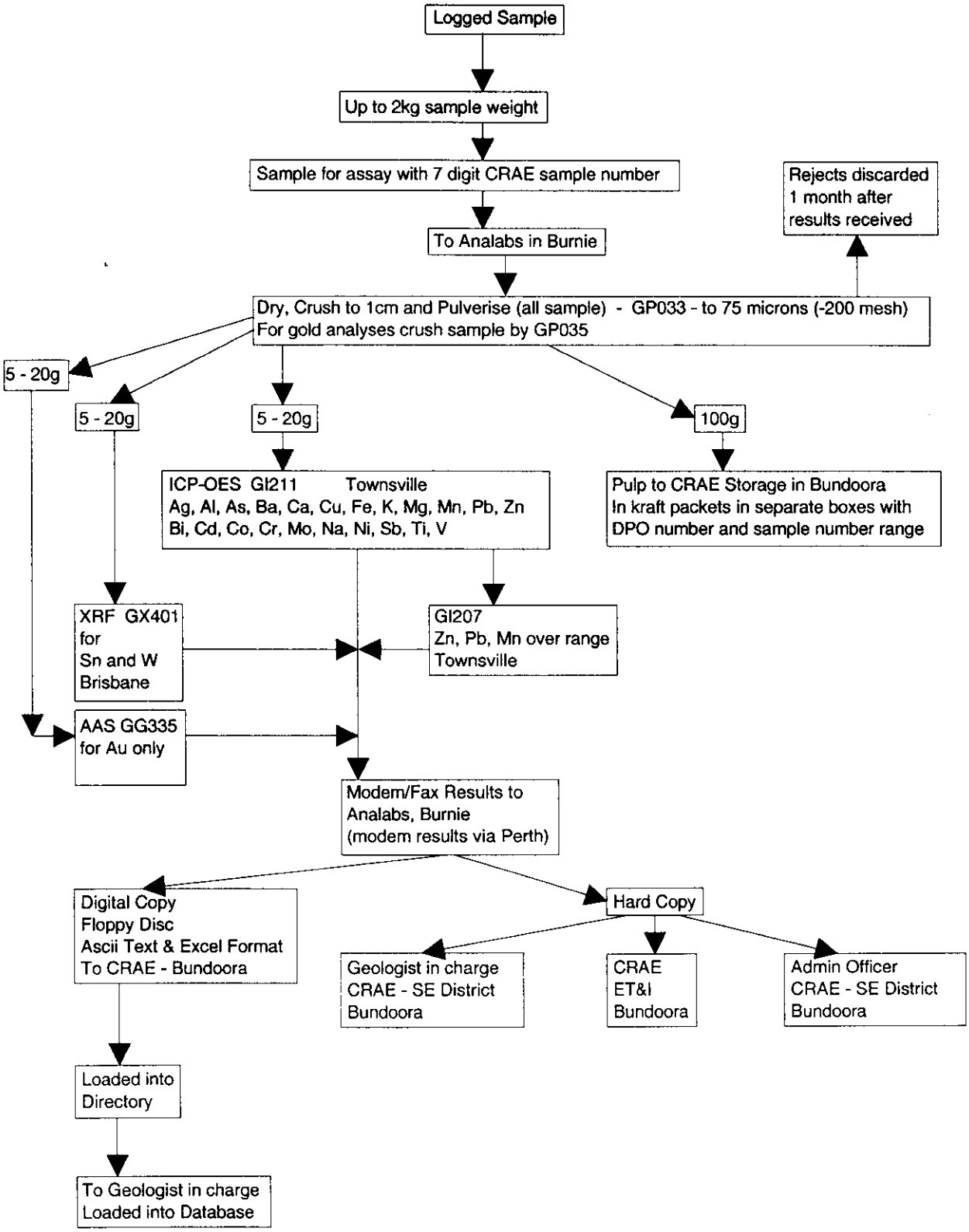
3992243	322275	5430650	Rock		-1	1.19	6	-0.008		0.01	-3	7	0.44	0.77	0.11	40	450	-3	-3	4	284	9	-5	22	Quartz arenite with disseminated pyrite
3992244	322275	5430650	Rock		-1	1.1	15	-0.008		0.01	-3	10	0.43	0.8	0.09	32	450	-3	9	6	382	9	-5	17	Quartz arenite with disseminated pyrite
3992245	322250	5430675	Rock		-1	1.32	117	-0.008		0.01	-3	28	0.96	0.99	0.18	161	500	3	-3	10	384	9	-5	20	Quartz arenite with disseminated pyrite
3992246	322275	5430725	Rock		-1	6.88	5	-0.008		0.04	-3	5	0.49	5.43	0.48	48	1150	-3	-3	13	1880	40	7	25	Dark grey siltstone
3992247	323350	5429625	Rock		-1	2.39	25	-0.008		0.01	-3	16	3.23	0.96	0.77	536	450	-3	-3	5	790	12	-5	31	Quartz arenite with pyrite
3992248	323350	5429600	Rock		-1	1.12	7	-0.008		0.01	-3	6	0.66	1.24	0.05	27	500	-3	-3	7	538	8	-5	20	Quartz arenite
3992249	323300	5429575	Rock		-1	5.06	8	-0.008		0.03	-3	5	2.73	3.96	0.92	515	900	3	-3	14	1530	26	-5	40	Quartz arenite
3757803	328800	5424800	ROCK	EL18/92	-1	6.98		-0.008		0.21	-3	5	1.31	4.52	0.39	100	2750	4	7	11	4330	61	-5	32	Black siltstone with disseminated chlorite
3757804	327500	5425100	ROCK	EL18/92	1	1.74	1800	0.019		0.09	66	7000	9.9	0.12	0.82	516	4000	20	8	7	622	16	-5	43	Quartz vein with associated chlorite and Cu
3757805	327450	5425150	ROCK	EL18/92	-1	6.28		-0.008		3.05	25	133	10.7	1.6	2.12	987	22300	15	6	5	8660	344	-5	101	Medium grained dolerite
3757806	329200	5423800	ROCK	EL18/92	-1	5.76		0.008		0.1	11	24	3.43	2.79	0.35	80	3500	12	93	7	3460	51	-5	41	Dark grey siltstone with disseminated pyrite
3757807	330000	5423800	ROCK	EL18/92	-1	7.37		-0.008		0.12	4	8	4.21	4.58	0.56	322	4500	7	8	11	4030	85	10	51	Planar banded greenish grey siltstone
3757808	329700	5423850	ROCK	EL18/92	-1	6.41	16	-0.008		0.06	3	12	1.81	4.28	0.37	87	2450	7	14	8	3940	70	6	23	Dark grey siltstone with pale sandstone bands
3757809	327150	5424850	ROCK	EL18/92	1	7.9		-0.008		0.07	9	4	2.48	3.86	0.63	63	9350	13	5	10	3320	59	6	67	Planar banded pale green spotted slate
3757810	325800	5425900	ROCK	EL18/92	-1	4.03		-0.008		0.02	-3	2	1.64	2.33	0.69	66	850	-3	-3	7	1720	21	-5	22	Cream to palest green slaty to phyllitic siltstone
3757811	326450	5427000	ROCK	EL18/92	-1	1.04	2	-0.008		0.01	-3	7	0.46	0.48	0.03	30	600	-3	4	5	380	7	-5	16	Darker and lighter banded pink quartz arenite
3757812	326150	5426800	ROCK	EL18/92	-1	5.66		-0.008		0.06	3	2	1.81	3.7	0.38	23	1000	3	3	9	2190	48	-5	11	Pink and green mica phyllite
3757813	323300	5429900	ROCK	EL4/94	-1	5.48	3	-0.008		0.04	-3	20	6.12	2.6	1.27	621	1100	-3	5	10	3030	57	10	31	Dark grey banded siltstone with limonitic seams
3757814	325150	5431000	ROCK	EL18/92	4	6.57		-0.008		0.04	5	14	1.95	3.7	0.81	167	1650	4	5	7	3410	61	6	26	Dark grey lustrous slate
3757815	324450	5425900	ROCK	EL18/92	-1	0.2	180	-0.008		0.03	-3	17	4.44	0.03	0.02	27	300	-3	5	8	206	4	-5	16	Quartz arenite with limonite on joints
3757816	326100	5426050	ROCK	EL18/92	-1	4.65		-0.008		0.03	-3	3	0.71	1.86	3.01	44	600	-3	3	4	1440	10	-5	17	Pale green mica phyllite with pyrite
3757817	323350	5439925	ROCK	EL18/92	-1	10.09		-0.008		0.1	8	70	2.91	4.64	1.01	101	3650	24	9	9	4380	116	9	42	Black pyritic siltstone
3757818	324450	5440325	ROCK	EL19/92	-1	8.36		-0.008		0.06	19	54	1.08	4.47	0.4	29	2000	17	56	8	3560	48	5	44	Black pyritic siltstone
3757819	323500	5437750	ROCK	EL18/92	-1	7.78	24	-0.008		0.05	-3	8	4.32	3.63	0.4	111	7950	7	39	10	4590	77	-5	56	Grey green siltstone
3757820	324525	5436400	ROCK	EL18/92	-1	7.02		-0.008		6.5	28	45	10.4	0.1	3.72	1064	23500	36	5	10	9520	365	6	115	Fresh basalt
3757821	320875	5437725	ROCK	EL4/94	1	3.56	39	0.034		0.04	8	1108	18.6	0.05	0.81	603	500	5	24	8	891	34	-5	71	Richly pyritic chloritic siltstone
3757822	320800	5437675	ROCK	EL4/94	-1	3.81	21	0.008		0.08	5	159	9.86	0.65	1.04	765	500	3	4	8	890	35	6	62	Granitoid veinlet - altered to greisen
3757823	320800	5437675	ROCK	EL4/94	-1	4.9	240	0.028		0.04	3	98	15.2	1	0.75	534	500	-3	10	11	1280	39	17	42	Oxidized (limonitic) sulphide veinlet
3757824	320800	5437675	ROCK	EL4/94	-1	7.5	4	-0.008		0.08	-3	21	1.28	4.84	0.43	250	2000	-3	5	8	3990	64	5	15	Porphyroblastic slate - thermal sericitised
3757825	320775	5437675	ROCK	EL4/94	-1	-0.01	2	-0.008		0.06	3	12	3.99	3.72	0.99	796	1500	-3	-3	10	2510	59	-5	30	Altered (? greisenised) siltstone
3757826	320550	5437500	ROCK	EL4/94	69	1.09		0.249		0.01	4	52100	22.9	0.1	0.26	147	300	9	12	9	248	5	7	22	Chalcopyrite covellite sulfates limonite
3757827	320550	5437500	ROCK	EL4/94	10	2.71		0.059		0.01	16	3571	26.3	0.02	0.79	601	450	23	44	7	888	18	5	26	Quartz chlorite pyrite assemblage
3757828	319475	5440000	ROCK	EL18/92	-1	7.6		-0.008		0.07	-3	44	4.03	4.66	0.49	301	2300	6	7	9	3760	66	-5	57	Dark grey spotted siltstone
3757829	318725	5442250	ROCK	EL18/92	-1	4.99	180	0.024		0.04	32	30	12.4	2.98	0.23	18	1300	42	38	8	2290	114	-5	33	Richly pyritic dark grey to black siltstone
3757830	318725	5442250	ROCK	EL18/92	2	2.81	1230	0.028		0.11	73	782	30.5	1.26	0.27	57	600	270	87	6	860	40	-5	67	Rounded pyrite in dark grey to black siltstone
3757831	318725	5442250	ROCK	EL18/92	-1	5.92		-0.008		0.1	-3	32	0.34	3.35	0.27	23	1600	-3	24	10	3620	118	6	15	Spotted richly carbonaceous siltstone (black)
3757832	322700	5434950	ROCK	EL4/94	3	0.29	10	0.048		1.15	17	65300	14.8	0.04	0.61	462	1750	14	20	65	20	-2	13	20	Quartz/carbonate vein with chalcopyrite etc
3757833	322700	5434950	ROCK	EL4/94	-1	4.16	9	-0.008		1.9	3	123	9.14	0.1	10.21	6700	2950	8	-3	5	1560	15	7	44	Schist - ? talcose
3757834	322700	5434950	ROCK	EL4/94	-1	2.98	3	-0.008		0.09	25	96	4.54	0.03	3.17	1023	350	10	-3	5	1030	17	-5	60	Strongly altered chloritic siltstone
3757835	321475	5435775	ROCK	EL4/94	1	0.94	11	-0.008		0.04	9	70	1.56	0.23	0.18	142	400	8	799	5	471	9	-5	755	Quartz sandstone with pyrite and sphalerite
3757836	315050	5428850	ROCK		-1	0.14		-0.008		0.01	-3	13	0.29	0.07	0.03	21	400	4	4	4	256	-2	-5	12	Open space quartz vein
3757837	322700	5435600	ROCK	EL4/94	-1	7.22		-0.008		0.07	15	31	9.9	2.43	1.11	498	4900	20	19	8	2240	50	5	99	Medium green sandstone with pyrite nodules
3757838	322600	5435875	ROCK	EL4/94	2	0.64	23	0.019		0.06	5	758	27.8	0.1	0.09	116	850	-3	102	13	698	15	8	22	Limonitic gossan and pyrite
3757839	327050	5426300	ROCK	EL18/92	-1	0.29	1	-0.008		0.01	-3	11	0.34	0.15	0.01	38	350	-3	4	6	153	2	-5	10	Reddish coarse grained quartz sandstone
3757840	323500	5429700	ROCK	EL4/94	-1	5.16		-0.008		0.01	4	16	6.44	1.18	2.05	1160	450	16	8	321	2360	49	7	65	Altered (? greisenised) fine grained sandstone
3757841	323500	5429700	ROCK	EL4/94	-1	2.89	7	-0.008		0.01	-3	11	5.52	0.13	1.79	1409	300	4	3	50	747	13	10	76	Granitoid veinlet - altered to greisen
3190573	355800	5357180	ROCK		-1		24	-0.005				8							225	-3					345	
3190574	355600	5357060	ROCK		-1		16	-0.005				15							83	14					230	
3190575	355600	5357060	ROCK		2		28	-0.005				9							210	-3					530	
3190576	356000	5357200	ROCK		-1		86	-0.005				10							205	-3					110	
3987404	355500	5357400	ROCK		-1			2028				34	39.2			630			173						549	
3987405	355500	5357400	ROCK		-1			130				6	2.8			266			12						83	
3987406	355500	5357400	ROCK		-1			14				2	8.2			3790			41						329	
3987407	355600	5357625	ROCK		-1			8				3	9.2			436			91						73	

Appendix 5

Laboratory Analysis Flow Sheet

575112

Rock Sampling Flowsheet



GI211 - Aqua Regia/Perchloric/hydrofluoric acid : acid digest
GI207 - Aqua Regia/Perchloric/hydrofluoric acid : acid digest

S.J.Tear August 1996

Appendix 6

Logs and Geochemical Results from Drilling

575114

CRA Exploration Pty. Limited - Diamond drill core log				Hole No: DD97BC9
Tenement: EL 4/94, Tasmania			**Map Ref.:** SK 5503, Burnie	
Collar R.L.: 200m		Co-ordinates: 324340E, 5429635N	Hole Orientation: 55° towards 050	Logged by: TJG
From	**To**	**Geological Desciption**	**Special Features**	**Core Orientation**
0	3.5	No core.		
3.5	4	Broken chloritic metasiltstone.		
4	6.8	Chloritic metasiltstone. Breccia zone @ 5.9m containing minor clay and silica.	Cleavage sub-parallel to bedding (40-50° to LCA).	
6.8	8.3	Clay, puggy zone possibly associated with a fault. Occasional chloritic siltstone with minor Si veining.		
8.3	12.8	Very chloritic siltstone. Minor pyrite, often associated with quartz veins.	Bedding/cleavage @ 45° to LCA. Occasional folds evident in quartz veins.	
12.8	14	Light brown-green weathered fine-grained siltstone. Contains up to 1% pyrite. Contact with chloritic siltstone marked by a clay puggy zone, containing fragmented brecciated quartz. Breccia zone pyrite-rich.		
14	17.5	Chloritic metasiltstone. Irregular silica veining with crystalline pyrite. Washed out zones in core may have been after sulphides. @ 17.4 m green and greyish bands have sharp contacts. Below 15m patchy pyrite evident.	Possible younging evidence @ 15.7m suggests fining downwards ie. younging down-core.	
17.5	17.9	Clay altered, puggy, fragmented zone. Occasional pyrite crystals.		
17.9	25.7	Greenish siltstone with strong cleavage in places. Pyrite contained with silica veins around 18.5m as well as in patches within the siltstone. Si veining common around 24.0m, and there is an associated increase in pyrite.	Si veins generally sub-parallel to cleavage, however some appear to be ptygmatically folded.	
25.7	28.4	Fairly monotonous greyish siltstone. Gradational contact with unit above. Scattered patchy pyrite.		
28.4	33.9	Fine planar laminated siltstone with cleavage sub-parallel to bedding. Occasional 1 to 2cm pyrite clasts, with finer grained disseminated pyrite throughout. Small diamond-shaped porphyroblasts in darker units (?choritoid).	Fining upwards, bedding right way up.	
33.9	35.2	Laminated siltstone though not as well defined as unit above. Unit characterised by fine pyrite + ?Si bands, cross-cutting lamination.	Bedding @ 40° to LCA. Veins @ 80 to 90°.	

575115

CRA Exploration Pty. Limited - Diamond drill core log				Hole No: DD97BC9
Tenement: EL 4/94, Tasmania			**Map Ref.:** SK 5503, Burnie	
Collar R.L.: 200m		Co-ordinates: 324340E, 5429635N	Hole Orientation: 55° towards 050	Logged by: TJG
35.2	35.8	Planar laminated unit. Si + pyrite veing common, as well as fine-grained disseminated pyrite. Pyrite clasts also common. Contact with unit below appears to be an absence of lamination. ?Chloritoid porphyroblasts evident.		
35.8	39.3	Monotonous siltstone with disseminated fine-grained pyrite. Pyrite appears as porphyroblasts in places. Occasional Si veins steep, and folded about cleavage.	Boudinaged pink Si veins @ 37.1m.	
39.3	44	Planar laminated unit. Pyrite shows a strong association with Si. 50cm zone of unlaminated siltstone from 42.1m.	Occasional pyrite veins at 90° to LCA. Bedding @ 40° to LCA. @ 40.6m smallscale brittle fault @ 15° to LCA, which has apparent normal movement.	
44	46	Zone of significant core loss. Dark brown sandy sericitic material. Possibly a fault. Some minor laminated siltstone.		
46	51.4	Highly deformed laminated siltstone. Numerous silica + pyrite veins generally at a high angle to the LCA though some shallower. Bedding often disrupted by Si veins, as well as later pervasive deformation. Fine-grained disseminated pyrite throughout.	Bedding @ 45° to LCA, and appears to be the major control on cleavage angle. Possible cross bedding @ 48.3m suggests right way up.. Scour channel structure @ 49.2 consistent.	
51.4	52.2	Zone of some core loss. Quartz blow / fault zone in dark chloritic laminated siltstone. Contains around 1% pyrite and up to 0.5% chalcopyrite.		
52.2	55.4	Fairly planar laminated and strongly cleaved (sub-parallel to bedding) siltstone. Pyrite associated with cross-cutting Si veins and Si bands in core.	Bedding/cleavage at 45° to LCA.	
55.4	59.6	Quartz zone possibly associated with a fault. Contains semi-massive zones (2-3cm) of chalcopyrite and pyrite. Initially some minor puggy clay zones and green chloritic schist, often brecciated. Dolomite patchy within quartz, becoming more common @ 57.1m.		
59.6	60.3	Significant core loss between 59.5 and 60.2m. Intensely chlorite altered, green metasiltstone. Pyrite crystals common. Clayey and puggy in parts and brecciated.		

575116

CRA Exploration Pty. Limited - Diamond drill core log				Hole No: DD97BC9
Tenement: EL 4/94, Tasmania			**Map Ref.:** SK 5503, Burnie	
Collar R.L.: 200m		Co-ordinates: 324340E, 5429635N	Hole Orientation: 55° towards 050	Logged by: TJG
60.3	61.1	Quartz-dolomite zone with patchy chalcopyrite, and stringers (up to 2%). Pyrite relatively minor. Some brecciation evident.		
61.1	62	Relatively siliceous (veined) chloritic metasiltstone. Up to 2% disseminated pyrite. Brecciated.		
62	62.7	Quartz-dolomite with minor chalcopyrite and pyrite (<1%). Essentially replaced chloritic metasiltstone. Upper and lower contacts grade into siltstone as quartz drops off. Dolomite dominant (70%).		
62.7	63.35	Green chloritic metasiltstone. Contains numerous Si veins + pyrite and possibly some chalcopyrite. Veins deformed by bedding parallel cleavage. Siltstone monotonous but occasional planar laminations evident.	Cleavage/bedding @ 40° to LCA.	
63.35	66.9	Quartz-dolomite containing patchy sparsely disseminated chalcopyrite (patches up to 2cm). Pyrite becoming dominant around 64.0m. Initially dolomite patchy, dominated by quartz till 65.4m then mostly dolomite. 20cm of chloritic siltstone from 65.1m.		
66.9	70.3	Grey-green chloritic metasiltstone, finely laminated. Contact with quartz marked by a clay puggy zone. Up to 1% chalcopyrite till 67.5m, but pyrite dominant associated with Si veins. Minor dolomite with pyrite around 69.2m.	Lamination variable but generally 0-10° to LCA. Cleavage @ 35 to 40° to LCA, clearly visible below 69.6m.	
70.3	71.1	Quart-dolomite, minor chalcopyrite to 70.7m then dominated by crystalline pyrite. Fragments of chloritic metasiltstone throughout. Dolomite initially patchy, then dominant from 70.6m (60%).		
71.1	72.2	Unit dominated by quartz but up to 50% green chloritc siltstone to 71.7m. Siltstone Si veined with only minor pyrite. Massive quartz from 71.7m, with semi-massive chalcopyrite (up to 7%). Pyrite common associated with chalcopyrite.		

CRA Exploration Pty. Limited - Diamond drill core log				Hole No: DD97BC9
Tenement: EL 4/94, Tasmania			**Map Ref.:** SK 5503, Burnie	
Collar R.L.: 200m		Co-ordinates: 324340E, 5429635N	Hole Orientation: 55° towards 050	Logged by: TJG
72.2	73.7	Green chloritic metasiltstone. Si veins common often deformed, cross-cutting lamination.Pyrite throughout locally up to 1%. Dolomitic between 72.2 and 72.6m, then fairly patchy.	Lamination and sub-parallel cleavage runs sub-parallel to LCA, though contorted.	
73.7	76.3	Quartz-dolomite. Quartz till 74.35m then 80 to 90% dolomite. Thin band of chloritic schist up to 2cm throughout. Crystalline pyrite throughout (<1%). Washed-out zones around 76.1m may have contained sulphides.		
76.3	80	Chloritic metasiltstone. Si veining common. Cubic pyrite throughout and some blebby pyrite associated with Si veins.	Cleavage @ 45° to LCA.	
80	81.1	Quartz-dolomite unit. Occasional thin bands of chloritic schist. Pyrite generally around 1%, but locally up to 6% in 10cm zones. Rarer blebby chalcopyrite evident.		
81.1	82.2	Chloritic metasiltstone, Si-dolomite veining prominent towards 82.1m. 1% pyrite throughout, up to 2% associated with Si veins.	Lamination at low angle to LCA but variable. Cleavage @ 40 to 50° to LCA.	
82.2	83.5	Quartz-dolomite unit, 80 to 90% dolomite till 82.9m. Blebby chalcopyrite till 83.4m. Pyrite dominant from 82.9m occurring in bands and as clusters throughout. Contact with unit below marked by a brecciated chloritic unit, containing quartz and pyrite.		
83.5	89.5	Unit dominated by quartz. Disseminated chalcopyrite up to 85.0m. Numerous schist fragments below 86.0m.		
89.5	90	Pyritic dolomite, containing 10cm of chloritic schist.		
90	108	Largely chloritic schist, sometimes pyritic (up to 1%) but variable.		
108	129.6	Laminated chloritic schist, with minor silica and dolomite veins. Disseminated pyrite throughout. 30cm zone of quartz-dolomite from 112.4m containing disseminated pyrite and minor chalcopyrite. Minor chalcopyrite in quartz around 117.7m.	Numerous small soft-sediment filled cracks.	

575118

CRA Exploration Pty. Limited - Diamond drill core log				Hole No: DD97BC9
Tenement: EL 4/94, Tasmania			**Map Ref.:** SK 5503, Burnie	
Collar R.L.: 200m		Co-ordinates: 324340E, 5429635N	Hole Orientation: 55° towards 050	Logged by: TJG
129.6	158.55	Grey banded siltstone. Poorly defined blebby pyrite layers scattered throughout. Occasional vuggy quartz veining from 140.6m to 145m. Only minor sulphide. Slightly coarser bands appear porphyroblastic (?chloritoid).	Soft-sediment-filled cracks indicate younging down-core (133.7m). Banding at 30° to LCA. Cross bedding @ 139.3m indicates younging down-core. Cross-bedding @ 158.8 indicates younging down-core.	
158.55	159.25	Very green chlorite-altered unit. Minor blebby pyrite appear as porphyroblasts, with Si pressure fringes. Lighter bands contain porphyroblasts.	Bedding/cleavage @ 40 to 50° to LCA.	
159.25	162.3	Slightly less chlorite-altered unit. More greenish bands have a porphyroidal texture. Contact with unit above marked by a 2cm quartz vein, containing minor pyrite. Blebby pyrite throughout unit. Unit becomes grey around 162m with some minor Si-dol veins.		
162.3	162.5	Clay breccia zone containing fragmented quartz and only minor pyrite.		
162.5	165.75	Greyish laminated siltstone, with interbanded pale green porphyroidal units. Minor cross-cutting quartz dolomite bands. Pyrite throughout.	Younging evidence not conclusive but appears to be younging down-core, as indicated by graded bedding and sediment-filled cracks.	
165.75	166.5	laminated green chloritic unit. Pyrite locally in poorly defined bands. Grey to black porphyroblasts around 166.4m.		
166.5	169.8	Largely grey laminated siltstone with occasional spotted pyritic zones up to 40cm in width. These zones contain some thin pyritic bands. Coarser units generally porphyroidal, becoming more chloritic down-hole.	Small sediment-filled cracks in fine-grained grey units suggest younging down-core.	
169.8	179.9	Greenish laminated chloritic unit. Fine-grained with a porphyroidal texture. Occasional black porphyroblasts around 177m. Blebby and crystalline pyrite becoming more common with depth.		

575119

CRA Exploration Pty. Limited - Diamond drill core log				Hole No: DD97BC9
Tenement: EL 4/94, Tasmania			**Map Ref.:** SK 5503, Burnie	
Collar R.L.: 200m		Co-ordinates: 324340E, 5429635N	Hole Orientation: 55° towards 050	Logged by: TJG
179.9	183.25	Grey-green chlorite-altered laminated unit. Lighter coarser units have porphyroidal appearance. Occasional Si-dolomite veins. Pyrite generally minor, crystalline and as fine irregular stringers.	Inconsistent younging directions. Lamination @ 40-45° to LCA.	
183.25	185.1	Similar to unit above but slightly coarser in appearance, and more green in colour. Tends to grey around 183.9m. Minor pyrite and occasional fine quartz-dolomite veins.	Lamination @ 35° to LCA.	
185.1	187.7	Grey-green laminated unit. Coarser units are spotted with dark grey porphyroblasts. Minor pyrite.	Lamination @ 45° to LCA. Younging down-core @ 187.9 as indicated by sediment-filled cracks and channels.	
187.7	189.1	Silicified siltstone. Occasional pyrite clasts and some fine Si veinlets. Minor dolomite.		
189.1	196.1	Laminated chloritic unit. Some spotted coarser units with ?chloritoid porphyroblasts. Very minor pyrite.	Lamination and cleavage @ 45° to LCA.	
196.1	196.9	Grey coloured unit intensely Si-veined. Minor pyrite and rare fine-grained pyrite.		
196.9	206.7	Finely laminated siltstone. Pyrite in clusters and crystalline pyrite throughout. Minor quartz veining. Two very chloritic zones from 201.2 and 201.9m, 10 and 20cm respectively.	Sediment-filled cracks indicate younging down-core.	
206.7	212.5	Interbanded fine-grained laminated siltstone with coarser chloritic, porphyroidal units. Disseminated fine-grained pyrite throughout. @ 210.6m, 20cm zone of silicification. Dolomite veining from 210.3m for 1.9m.		
212.5	213.3	Zone of fairly intense silicification, associated with minor dolomite veining. Generally only minor pyrite around 213.4m.		
213.3	218.5	Interbanded green-grey, laminated siltstone and psammite. Initially 1.3m of the coarser porphyroidal unit. Silicified for 60cm from 214m, below this laminated siltstone with occasional porphyroidal coarser units. Pyrite generally rare.	Banding and cleavage @ 35 to 45° to LCA.	

575120

CRA Exploration Pty. Limited - Diamond drill core log				Hole No: DD97BC9
Tenement: EL 4/94, Tasmania			**Map Ref.:** SK 5503, Burnie	
Collar R.L.: 200m		Co-ordinates: 324340E, 5429635N	Hole Orientation: 55° towards 050	Logged by: TJG
218.5	224.3	Highly silicified zone comprising quartz and silicified schist. Patchy dolomite evident though generally minor. Pyrite as irregular stringers and blebs throughout, <1%.		
224.3	227.5	Coarser grained partially silicified chloritic schist. Disseminated pyrite throughout. @ 226m a 1cm wide chloritic shear zone, containing brecciated quartz. Surrounding wall rock pyritic. Contact with lower unit gradational as Si veining intensifies.	Chloritic shear @ 15cm to LCA.	
227.5	233	Highly silicified zone. Quartz to 229.8m, initially quite pyritic. 1.1m zone of silicified schist from 229.8, up to 1% pyrite. Quartz veins common. Quartz to 233m with a 40cm zone of clay-altered chloritic psammite from 232m.	Quartz vein @ 227.7m @ 0° to LCA.	
233	250.4	Wavy laminated siltstone. Pyrite minor, though occasional bands contain blebby pyrite. Occasional quartz veins evident some folded about fabric. A few contain minor dolomite. Laminations have wavy appearance due to late-stage kinking and folding.	Cleavage @ 40 to 45° to LCA. Bedding occasionally folded about cleavage.	
EOH				

575121

DD97BCS - Assays

Sample No	DPO	From	To	Ag (ppm)	Al (ppm)	As (ppm)	Ba (ppm)	Bi (ppm)	Ca (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Fe (ppm)	K (ppm)	Mg (ppm)	Mn (ppm)	Mo (ppm)	Na (ppm)	Nb (ppm)	Ni (ppm)	P (ppm)	Pb (ppm)	Sb (ppm)	Sr (ppm)	Ti (ppm)	V (ppm)	Y (ppm)	Zn (ppm)	S (ppm)	Au (ppb)	Pt (ppb)	Pd (ppb)
4140540	82182	3.5	6	-1	82000	4	330	-5	500	-5	100	10	25	10	35900	35100	6950	300	-3	900	20	12	150	35	15	14	2300	37	19	56	1100	-1	-5	2
4140541	82182	6	8	-1	81900	4	330	-5	950	-5	90	10	41	22	41800	34800	7550	500	-3	850	15	17	250	10	15	16	2300	59	12	40	1300	-1	-5	1
4140542	82182	8	10	-1	84900	18	360	-5	320	-5	85	18	47	18	47400	36500	9050	370	-3	800	15	18	200	-5	10	13	2100	73	10	36	1850	-1	-5	-1
4140543	82182	10	12	-1	98400	18	430	-5	320	-5	80	20	52	11	52200	43600	9850	500	-3	1050	15	21	160	5	20	16	2350	85	10	80	2650	-1	-5	1
4140544	82182	12	12.8	-1	102000	16	460	-5	370	-5	95	19	52	12	47200	46400	8600	750	-3	1300	15	19	155	5	20	31	2200	89	11	68	1450	-1	-5	-1
4140545	82182	12.8	14	-1	101000	4	480	-5	1250	-5	85	13	78	49	77500	46300	8500	2450	-3	1200	15	27	260	65	20	38	2350	86	14	700	9400	-1	-5	1
4140546	82182	14	16	-1	87500	-3	400	-5	450	-5	80	13	43	7	46700	34400	8450	750	-3	950	10	20	190	-5	10	13	1950	71	11	31	3700	-1	-5	3
4140547	82182	16	18	-1	99300	4	430	-5	800	-5	100	10	48	34	51600	37800	9350	650	-3	1050	15	20	280	-5	15	18	2550	76	13	38	1400	-1	-5	1
4140548	82182	18	20	-1	80100	-3	340	-5	550	-5	80	14	51	48	51600	24200	9650	700	-3	750	10	18	240	-5	10	12	1950	62	10	36	3950	2	-5	-1
4140549	82182	20	22	-1	88900	-3	380	-5	500	-5	75	10	44	24	49000	27700	10000	370	-3	800	15	18	230	-5	10	13	2700	70	11	34	1150	-1	-5	3
4140550	82182	22	24	-1	92700	-3	400	-5	470	-5	90	9	44	17	47300	30000	9650	260	-3	850	20	17	260	-5	15	13	2650	65	14	36	1800	-1	-5	-1
4140551	82182	24	26	-1	76700	8	320	-5	310	-5	85	14	49	27	52900	34400	7900	330	-3	700	20	17	165	-5	10	10	2350	48	13	36	8700	-1	-5	-1
4140552	82182	26	28	-1	83600	8	350	-5	600	-5	85	13	42	36	55000	34900	9150	220	-3	750	15	17	250	-5	15	12	2400	58	13	31	2800	-1	-5	-1
4140553	82182	28	30	-1	100000	18	450	-5	500	-5	110	16	47	25	52800	43700	8950	260	-3	850	20	17	240	-5	25	15	2550	76	15	31	800	3	-5	-1
4140554	82182	30	32	-1	105000	12	480	-5	430	-5	105	15	47	11	56500	45900	9350	260	-3	950	20	20	220	-5	26	16	2850	85	14	39	1450	-1	-5	-1
4140555	82182	32	34	-1	77700	10	340	-5	360	-5	80	12	46	13	47600	32200	7550	185	-3	700	15	15	195	-5	10	13	2400	61	13	25	2050	-1	-5	-1
4140556	82182	34	36	-1	80900	12	370	-5	460	-5	85	9	41	39	50000	35800	7300	470	-3	700	15	18	155	-5	10	12	2150	52	14	23	6500	3	-5	-1
4140557	82182	36	38	-1	79900	4	360	-5	290	-5	80	9	42	17	41400	25700	7550	220	-3	700	15	17	150	-5	10	12	1850	63	10	23	1450	-1	-5	-1
4140558	82182	STANDARD 0.233% Cu		1	85500	14	440	-5	30400	-5	35	12	195	2350	27100	22600	9000	310	240	54300	5	13	550	750	15	600	2900	98	9	170	7650	140	-5	4
4140559	82182	38	40	-1	86700	14	380	-5	340	-5	80	11	55	45	48300	36200	9250	250	-3	850	15	19	185	-5	15	13	2800	66	11	26	4600	-1	-5	-1
4140560	82182	40	42	-1	78300	26	320	-5	360	-5	80	11	64	56	48100	34800	9050	310	-3	650	15	20	210	5	10	12	2550	61	10	24	7150	2	-5	-1
4140561	82182	42	44	-1	94100	16	420	-5	1050	-5	80	9	56	69	54100	41400	11500	310	-3	750	15	22	500	-5	10	14	2500	72	12	42	8500	2	-5	-1
4140562	82182	44	46	-1	76000	16	95	-5	550	-5	85	9	72	135	51000	33700	9450	600	10	600	15	23	180	10	15	10	2550	56	12	65	9400	-1	-5	-1
4140563	82182	46	47.5	-1	83100	14	350	-5	280	-5	70	8	63	230	57100	34900	11700	300	-3	600	15	18	170	-5	10	11	2050	61	10	27	9300	2	-5	-1
4140564	82182	47.5	48	-1	75900	38	90	-5	440	-5	80	12	92	200	60100	30900	12500	440	-3	500	15	20	185	10	10	9	2350	80	12	30	18400	-1	-5	-1
4140565	82182	48	50	-1	73300	6	320	-5	240	-5	70	6	54	15	37300	28000	10700	550	-3	550	15	13	145	-5	10	9	2150	60	8	21	4300	-1	-5	-1
4140566	82182	50	51.7	-1	81900	4	250	-5	350	-5	90	7	63	26	30000	36200	12400	185	-3	650	15	11	175	-5	15	12	3100	67	10	21	5250	-1	5	-1
4140567	82182	51.7	52	-1	34300	24	155	-5	27600	-5	35	5	250	1650	39700	17800	17900	2300	-3	330	5	17	185	-5	15	42	850	27	19	19	15900	-1	-5	-1
4140568	82182	52	54	-1	92600	18	185	-5	450	-5	90	9	54	160	20400	46900	11200	90	-3	900	15	15	210	-5	25	13	2650	70	9	14	9300	3	-5	-1
4140569	82182	54	55.3	-1	98800	10	450	-5	1750	-5	95	10	63	430	22500	44800	16800	160	-3	1400	20	17	700	-5	20	15	3500	72	12	19	7200	-1	-5	-1
4140570	82182	55.3	56	14	23100	98	5	-5	23300	-5	130	50	135	36400	121000	410	50000	8150	-3	75	5	50	1100	5	10	30	290	16	41	210	67400	48	-5	1
4140571	82182	56	57	9	18000	42	-5	-5	18000	-5	30	32	115	18400	100000	180	42000	5650	-3	45	-5	30	185	-5	-5	19	350	17	19	91	67100	33	-5	-1
4140572	82182	57	58	3	25800	20	10	-5	4580	-5	35	12	130	4960	55800	220	71400	4350	-3	55	-5	17	90	-5	-5	49	420	21	22	58	26200	13	-5	-1
4140573	82182	58	59.7	2	13700	28	10	-5	7950	-5	20	23	180	3150	33100	470	22200	1000	-3	90	-5	12	150	-5	-5	19	230	9	4	42	22200	8	-5	-1
4140574	82182	59.7	60	1	110000	61	85	-5	1900	-5	70	29	99	1200	140000	9000	190000	1150	-3	230	20	25	290	-5	30	5	2800	99	12	180	32800	15	5	9
4140575	82182	60	60.4	-1	70700	18	20	-5	750	-5	45	15	106	700	105000	1700	121000	700	6	65	10	16	230	-5	10	3	1850	58	7	140	32300	4	-5	-1
4140576	82182	60.4	61	-1	9200	6	15	-5	21700	-5	-10	14	185	6100	28800	800	18700	950	-3	400	-5	11	550	5	-5	41	80	6	6	25	19500	3	-5	-1
4140577	82182	61	62	-1	54000	48	10	-5	20300	-5	65	37	110	7650	104000	180	125000	3000	-3	55	5	24	150	-5	5	36	600	44	14	68	81300	33	-5	-1
4140578	82182	STANDARD 0.233% Cu		1	86900	12	370	-5	25100	-5	25	10	180	2500	28400	18600	7600	270	195	43800	-5	10	470	600	5	490	2350	80	7	140	6450	140	-5	5
4140579	82182	62	62.7	-1	15900	14	15	-5	161000	-5	50	13	51	15100	70500	145	164000	14000	-3	130	-5	45	270	5	10	180	120	16	38	58	41700	11	-5	-1
4140580	82182	62.7	63.5	-1	78100	26	-5	5	16400	-5	85	24	61	6100	115000	70	220000	3600	-3	75	10	22	220	-5	15	19	750	76	24	85	26000	8	-5	-1
4140581	82182	63.5	64	-1	6500	56	-5	-5	37400	-5	20	18	220	5550	38100	260	31000	2600	4	120	-5	17	45	-5	5	48	60	8	11	21	21600	19	-5	-1
4140582	82182	64	64.4	2	22500	28	-5	-5	72700	-5	30	17	120	14600	72600	50	91000	5550	4	45	-5	24	440	-5	-5	58	290	24	16	50	34300	17	-5	-1
4140583	82182	64.4	65.3	4	14400	62	-5	-5	18200	-5	35	27	170	24900	78400	100	39700	1850	-3	40	-5	20	450	-5	-5	17	115	19	6	75	61700	31	-5	-1
4140584	82182	65.3	66	3	6400	165	-5	10	178000	-5	40	61	30	15900	77500	140	131000	9500	-3	65	-5	56	80	5	10	130	45	14	24	51	60800	78	-5	-1
4140585	82182	66	67	3	23800	185	5	10	116000	-5	60	52	48	22700	108000	430	123000	10900	-3	60	5	52	125	5	10	79	230	26	28	98	57500	80	-5	-1
4140586	82182	67	68	-1	83100	14	160	-5	2250	-5	90	26	97	3050	57200	17800	97400	900	-3	220	15	16	180	-5	15	4	1550	69	11	62	8950	7	-5	-1
4140587	82182	68	70	-1	79000	22	230	-5	800	-5	80	28	89	210	48900	25700	61800	600	-3	310	10	18	185	-5	15	4	1400	67	8	48	10900	2	-5	-1
4140588	82182	70	70.4	-1	61500	18	230	-5	4100	-5	60	16	195	950	30700	26000	27200	470	-3	360	10	17	175	-5	10	10	1750	55	8	27	7150	4	-5	-1
4140589	82182	70.4	71	-1	9000	105	-5	5	54100	-5	55	33	125	4050	73600	105	125000	6600	-3	40	-5	28	145	15	10	45	80	13	20	26	39700	25	-5	-1
4140590	82182	71	71.5	-1	50800	84	25	-5	650	-5	70	47	190	195	63200	2500	92900	1850	-3	70	10	20	200	-5	-5	-2	900	46	9	37	10000	9	-5	1
4140591	82182	71.5	72	-1	6000	125	-5	-5	1650	-5	-10	19	330	53400	76000	260	9250	220	4	60	-5	25	155	5	10	3	100	7	-2	120	62300	50	-5	-1
4140592	82182	72	72.6	-1	24900	130	10	-5	700	-5	25	38	180	6500	91400	450	98400	3650	-3	75	5	25	100	5	-5	-2	370	25	17	39	51600	16	-5	-1
4140593	82182	72.6	74	-1	51100	110	-5	5	2200	-5	85	40	86	700	62300	85	109000	1100	-3	35	10	16	500	-5	5	3	1100	45	15	42	17300	10	-5	-1
4140594	82182	74	76	-1	7700	32	-5	5	59800	-5	35	20	75	185	45900	45	144000	5050	-3	65	-5	21	380	-5	10	56	65	12	24	6	10000	4	-5	-1
4140595	82182	STANDARD 0.233% Cu		1	85900	10	350	-5	23500	-5	20	9	165	2450	28600	17900	7450	260	195	41200	-5	12	440	600	10	480	2300	77	7	135	6200	130	-5	2
4140596	82182	76	78	-1	58500	72	65	-5	3450	-5	65	25	63	28	70800	6650	111000	1400	-3	130	15	17	250	-5	10	6	1850	54	15	62	14100	8	-5	-1
4140597	82182	78	79	-1	21800	36	5	-5	8850	-5	20	30	130	1000	60500	300	82100	2900	-3	100	-5	18	175	-5	-5	11	330	18	31	24	27300	6	-5	-1
4140598	82182	79	80	-1	85600	20	5	-5	2350	-5	70	23	78	800	12200	170	15900	2350	-3	55	15	24	210	-5	15	4	1900	62	15	125	13200	2	-5	-1
4140599	82182	STANDARD 0.233% Cu		1	87100	10	350	-5	23300	-5	20	9	140	2400	28400	17600	8000	290	190	41100	-5	9	440	550	5	470	2350	77	7	130	6200	120	-5	3
4140600	82182	80	81.1	-1	10200	16	6	5	118000	-5	35	21	47	6300	82500	65	186000	7300	-3	95	-5	25	65	5	10	120	135	15	26	26	30900	5	-5	-1
5855101	82182	81.1	82	-1	84400	53	50	-5	4100	-5	125	24	58	2250	109000	6050	152000	2000	-3	195	10	20	290	-5	20	12	1250	71	22	84	30400	16	-5	-1
5855102	82182	82	84	-1	13700	28	5	-5	54000	-5	20	33	100	9650	84400	380	78300	4900	-3	55	-5	26	550	10	10	70	105	16	59	41	62400	25	-5	-1
5855103	82182	84	85	-1	3100	34	-5	-5	10400	-5	-10	33	78	1000	47200	240	8600	750	-3	80	-5	12	20	5	-5	15	10	6	-2	8	49800	7	-5	-1
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5855105	82182	86	88	-1	9200	52	-5	-5	21800	-5	150	40	195	105	20800	220	19500	800	-3	110	-5	30	3150	-5	-5	36	115	6	13	14	10200	14	-5	-1
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5855122	82183	114	116	-1	77600	14	340	-5	750	-5	65	10	59	41	33300	15300	11600	190	-3	330	10	13	420	10	5	6	1650	31	7	23	9650	2	-5	-1
5855123	82183	116	117.65	-1	83200	24	360	-5	460	-5	80	19	51	65	38100	21000	15600	240	-3	370	10	21	270	10	10	6	1750	36	9	27	8550	4	-5	-1
5855124	82183	117.65	118	-1	41900	40	170	-5	7450	-5	95	41	210	110	39600	13400	19700	600	-3	185	5	27	1200	30	-5	19	900	20	9	24	15000	3	5	-1
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5855126	82183	118	120	-1	67700	12	380	-5	160	-5	75	7	87	76	32300	31100	9150	240	-3	410	10	13	165	15	-5	6	1400	35	7	21	5150	7	-5	-1

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5855128	82183	122	124	-1	80400	38	370	-5	350	-5	60	8	52	28	41400	15200	8250	220	-3	2650	10	14	185	20	-5	9	1650	38	8	29	4450	1	-5	-1
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5855130	82183	126	128	-1	79400	65	470	-5	650	-5	80	8	49	24	37100	27900	7450	270	-3	3250	10	18	195	20	-5	10	1850	40	9	25	4300	2	-5	-1
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5855132	82183	130	132	-1	68000	14	390	-5	3700	-5	80	6	54	21	36800	27200	8800	480	-3	4800	10	12	250	20	-5	16	1650	38	8	25	4600	-1	5	-1
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5855136	82183	138	140	-1	104000	20	650	-5	12800	-5	110	6	44	14	31500	21800	7850	1050	-3	4300	10	18	340	10	15	38	2150	36	13	22	2000	3	-5	-1
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5855139	82183	144	146	-1	100000	10	650	-5	4100	-5	95	6	37	16	30300	36100	6750	310	-3	7450	10	15	350	20	15	23	2050	41	11	31	2700	7	-5	-1
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5855142	82183	150	152	-1	87000	22	500	-5	12200	-5	85	5	57	12	31100	20800	6100	600	-3	8400	10	12	260	15	10	44	1850	41	10	30	2600	-1	-5	-1
5855143	82183	152	154	-1	74600	10	480	-5	15000	-5	75	5	36	12	27000	30200	5500	550	-3	9350	10	9	950	5	-5	51	1650	39	11	20	1600	4	-5	-1
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5855154	82183	172	174	-1	95600	-3	650	-5	10300	-5	85	5	39	6	19600	34300	9900	500	-3	1800	10	8	460	-5	5	35	1850	28	14	20	5500	4	-5	-1
5855155	82183	174	176	-1	69400	-3	490	-5	18000	-5	65	3	32	10	22200	28800	9700	1050	-3	5050	10	9	360	5	-5	40	1350	19	13	21	2000	2	-5	-1
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5855158	82183	178	180	-1	73500	16	400	-5	14600	-5	60	5	72	39	32800	24500	5500	750	-3	16800	10	14	800	10	5	65	1550	41	12	31	2300	-1	-5	-1
5855159	82183	180	181.4	-1	76500	40	460	-5	4850	-5	85	13	68	5	23700	28500	4250	380	-3	12700	5	17	200	5	5	32	1000	40	8	13	900	-1	-5	-1
5855160	82183	181.4	182	-1	86300	14	400	-5	12000	-5	85	4	35	10	24800	24900	4850	950	-3	22900	10	11	320	5	5	54	1550	28	12	13	1300	-1	-5	-1
5855161	82183	182	184	-1	75100	22	460	-5	9150	-5	75	7	41	7	23500	21000	4550	650	-3	14500	10	11	320	10	-5	43	1550	28	13	11	950	-1	-5	-1
5855162	82183	STANDARD 0.233% Cu		-1	70100	12	390	-5	23200	-5	20	9	190	2350	25400	13100	6800	280	185	39500	5	13	460	600	-5	500	2350	69	6	130	5900	160	-5	5
5855163	82183	184	186	-1	77100	8	500	-5	8600	-5	95	6	33	6	24900	29800	4450	850	-3	15100	15	9	490	15	5	47	2950	30	16	12	700	2	-5	-1
5855164	82183	186	188	-1	65000	10	260	-5	16600	-5	70	5	62	11	35900	15800	6250	1550	-3	22700	15	12	350	10	-5	68	2000	27	12	21	1550	-1	-5	-1
5855165	82183	188	189	-1	60600	-3	145	-5	17700	-5	90	3	61	3	19000	9300	4050	1250	-3	32200	10	8	185	-5	-5	70	1200	8	15	16	700	7	-5	-1
5855166	82183	189	190	-1	88000	-3	550	-5	8000	-5	115	3	24	5	18600	37500	5250	700	-3	12100	20	7	390	5	5	31	2450	16	19	31	700	11	-5	-1
5855167	82183	190	192	-1	69300	4	320	-5	12400	-5	95	5	37	11	19000	21700	5650	1150	-3	22200	15	7	280	10	-5	42	1500	12	17	21	850	-1	-5	-1
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5855187	82183	221	222	-1	7250	12	35	-5	12800	-5	20	12	210	15	20200	1800	8300	1300	-3	175	-5	11	70	10	-5	65	210	8	3	13	5000	2	-5	-1
5855188	82183	222	224	-1	3900	4	30	-5	1000	-5	15	4	200	6	10000	1450	1950	460	4	60	-5	8	80	5	-5	7	135	4	-2	6	1300	-1	5	-1
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5855192	82183	230	232	-1	35500	12	330	-5	2150	-5	45	7	195	16	28100	14600	5750	410	-3	270	5	13	170	20	-5	17	1100	24	5	24	10800	1	-5	-1
5855193	82183	232	233	-1	28500	12	260	-5	2600	-5	65	5	240	8	26300	10900	6250	450	-3	210	5	12	170	45	-5	20	950	13	6	24	9850	1	-5	-1
5855194	82183	233	234	-1	65300	12	650	-5	650	-5	75	8	76	8	45600	25700	17400	290	-3	390	15	13	240	10	-5	11	2060	36	8	55	10800	1	-5	-1
5855195	82183	234	236	3	77100	14	750	-5	440	-5	75	14	74	24	30500	35700	10500	180	-3	550	15	20	135	10	5	14	2250	51	8	34	6000	1	-5	-1
5855196	82183	236	238	-1	83800	44	650	-5	600	-5	90	18	80	14	32900	38700	9200	270	-3	600	15	20	140	15	10	14	2700	62	7	37	2400	-1	-5	-1
5855197	82183	238	240	-1	91000	18	600	-5	460	-5	95	16	78	17	33400	42500	7250	250	-3	650	15	23	150	5	15	15	2400	68	8	36	1900	-1	-5	-1
5855198	82183	240	242	-1	86100	6	500	-5	700	-5	90	9	60	18	36400	37800	7400	290	-3	600	15	19	190	5	10	15	2350	66	7	36	1400	-1	-5	-1
5855199	82183	242	244	-1	102000	14	600	-5	850	-5	100	13	55	13	41000	43600	8150	360	-3	700	20	23	230	10	20	18	2300	66	10	46	-500	-1	-5	-1
5855200	82183	244	246	-1	88800	8	550	-5	1600	-5	95	12	64	14	42500	37600	9450	360	-3	800	15	21	210	-5	10	20	2550	68	8	44	1900	-1	-5	-1
3755955	82183	STANDARD 0.233% Cu		1	69900	12	390	-5	22600	-5	30	12	155	2300	26100	17800	6700	260	185	39300	5	13	460	600	-5	500	2400	70	6	140	5800	140	5	4
3755956	82183	246	248	-1	90700	36	480	-5	850	-5	100	44	84	18	45400	38000	7550	400	-3	2400	20	29	180	-5	10	22	3000	71	8	48	2200	-1	-5	-1
3755957	82183	248	250	-1	85300	12	450	-5	1950	-5	90	13	74	21	35100	36300	5700	500	-3	3200	20	24	140	10	5	29	3750	67	7	43	-500	-1	-5	-1
3755958	82183	250	250.5	-1	88000	4	470	-5	900	-5	95	11	82	7	35900	37000	5800	360	-3	3250	20	21	130	-5	10	26	3750	69	7	54	-500	-1	-5	-1

575123

DD97BC11 - Core Orientation Measurements

Depth	Dip	Azimuth (AMG)	Feature
65.5	24	093	Contact between quartz-dolomite and chloritic schist
74.1	53	301	Schistosity
97	40	050	Schistosity
200.8	83	276	Schistosity
241.3	71	195	Lamination and sub-parallel schistosity

575124

DD97BC9 - Conductivity Measurements (S/m)

Depth	Conductivity	Depth	Conductivity	Depth	Conductivity	Depth	Conductivity
0		35		70	431	105	98
0.5		35.5		70.5		105.5	
1		36	167	71	471	106	122
1.5		36.5		71.5		106.5	107
2		37		72	472	107	
2.5		37.5	360	72.5	341	107.5	125
3		38		73		108	
3.5		38.5		73.5		108.5	10
4		39		74		109	
4.5		39.5		74.5	346	109.5	
5		40		75	350	110	70
5.5		40.5		75.5		110.5	
6		41		76	440	111	165
6.5		41.5		76.5		111.5	190
7		42	870	77		112	60
7.5		42.5		77.5		112.5	120
8		43	111	78	408	113	155
8.5		43.5	151	78.5		113.5	
9		44		79		114	215
9.5		44.5		79.5		114.5	460
10		45		80		115	
10.5		45.5		80.5	400	115.5	474
11		46		81		116	
11.5	366	46.5		81.5		116.5	
12		47	169	82		117	565
12.5		47.5		82.5		117.5	684
13		48	158	83	382	118	844
13.5		48.5		83.5	446	118.5	730
14	420	49	160	84	411	119	600
14.5		49.5		84.5		119.5	
15		50	168	85	295	120	629
15.5		50.5		85.5		120.5	
16		51		86		121	578
16.5		51.5		86.5		121.5	632
17		52		87	164	122	353
17.5		52.5		87.5		122.5	
18		53		88	150	123	
18.5	422	53.5		88.5		123.5	
19		54		89	149	124	360
19.5		54.5		89.5		124.5	338
20		55		90	34	125	
20.5		55.5	172	90.5	72	125.5	
21	481	56	125	91		126	
21.5		56.5		91.5		126.5	
22		57		92		127	
22.5		57.5	167	92.5		127.5	
23		58		93	102	128	
23.5		58.5	126	93.5		128.5	
24		59		94	83	129	
24.5		59.5		94.5		129.5	
25		60	200	95	154	130	
25.5		60.5		95.5	163	130.5	
26		61	128	96	128	131	
26.5		61.5	200	96.5	176	131.5	
27		62	265	97	203	132	
27.5	479	62.5	295	97.5	183	132.5	
28		63		98	155	133	
28.5	457	63.5	287	98.5		133.5	
29		64		99		134	
29.5		64.5	253	99.5		134.5	
30		65		100	120	135	
30.5		65.5	289	100.5	73	135.5	
31		66	385	101	26	136	
31.5		66.5	460	101.5	12	136.5	
32		67		102		137	
32.5		67.5	468	102.5	53	137.5	
33		68	452	103	20	138	
33.5		68.5		103.5		138.5	
34	612	69		104	30	139	
34.5	612	69.5	454	104.5	46	139.5	

575125

CRA Exploration Pty. Limited - Diamond drill core log				Hole No: DD97BC10
Tenement: EL 4/94, Tasmania			**Map Ref.:** SK 5503, Burnie	
Collar R.L.: 200m		Co-ordinates: 354416E, 5357460N	Hole Orientation: 65° towards 060	Logged by: TJG
From	**To**	**Geological Desciption**	**Special Features**	**Core Orientation**
2.5	4.1	Laminated chloritic schist. Cleavage sub-parallel to laminations. Quite broken in parts.	Lamination/cleavage @ 0 to 5° to LCA.	
4.1	4.8	Bleached, greasy, intensely clay-altered zone. Cleavage slightly irregular.	Cleavage @ 20° to LCA.	
4.8	15.6	Laminated chlorite-altered schist. Initially cleavage sub-parallel to bedding until around 11.7m, where bedding steepens and there is some folding about cleavage. Unit becoming more bleached with depth with fine-grained elongate porphyroblasts evident.	Lamination/cleavage @ 25 to 30° to LCA. Cross-bedding @ 11.9m indicates young up-core. Consistent @ 12.4.	
15.6	23.5	Chloritic laminated schist. Crystalline pyrite evident initially also in veins associated with Si-dolomite. Disruption to orientation of lamination associated with soft-sediment deformation. Around 18.3m fine-grained porphyrobasts common.	Cleavage @ 20° to LCA.	
23.5	44.5	Grey slighty wavy, laminated schist. Initially green, strongly chlorite-altered laminated schist. Crystalline pyrite around 36m associated with Si veining. Occasional dolomite veins evident. @ 38.9m non-laminated ?coarser porphyroidal unit for 70cm.	Cleavage @ 20° to LCA, and lamination @ 15°.	
44.5	47.5	More coherent slightly bleached and less cleaved unit.	Cleavage @ 45° to LCA, lamination @ 30° to LCA. Some microfolding about cleavage evident. No convincing younging evidence.	
47.5	56	Laminated, cleaved, grey chloritic siltstone. Lamination sub-parallel to cleavage above 49.5m. Below this banding disrupted with some minor shearing evident along cleavage planes. Minor Si + dolomite veining	Above 49.5m cleavage/lamination @ 30° to LCA. Below this cleavage @ 25° to LCA, with the aiation @ 20°.	
56	59.3	Chloritic, "soapy" unit. Planar laminations sub-parallel to cleavage. Occasional pyrite clasts as well as minor Si veining. One 3cm dolomite + sulphide vein sub-parallel to cleavage.	Cleavage/lamination @ 15° to LCA.	
59.3	60.5	Much less laminated, monotonous unit. Rare pyrite.	Cleavage @ 30° to LCA.	

60.5	75.8	Chloritic metasiltstone. Laminated with sub-parallel cleavage. Initially lamination wavy. Becoming increasingly pyritic around 67.5m with several large clasts and 5m veinlets. Bleached chloritic soapy zone @ 71.2m with minor cassiterite.	Cleavage @ 30° to LCA.	
75.8	77.5	Clay-altered puggy breccia zone. Fragmented grey schist. Minor pyrite and some small rounded quartz pebbles.		
77.5	79.7	Greenish-grey schist. Brecciated between 78 and 79m. Some core loss.	Cleavage @ 50° above breccia zone and @ 40° to LCA below.	
79.7	82.1	Clay breccia zone (fault) washed-out. @ 81m greenish fragmented schist with minor pyrite.		
EOH				

575127

CRA Exploration Pty. Limited - Diamond drill core log				Hole No: DD97BC11
Tenement: EL 4/94, Tasmania			**Map Ref.:** SK 5503, Burnie	
Collar R.L.: 205m		Co-ordinates: 324402E, 5429412N	Hole Orientation: 55° towards 072	Logged by: TJG
From	**To**	**Geological Desciption**	**Special Features**	**Core Orientation**
3	7.3	Greenish weathered clay altered rock with a weak cleavage. Occasional pyrite veins.	Cleavage @ 35° to LCA.	
7.3	14.5	Slightly greyer clay-altered/weathered siltstone. Fine laminations becoming more obvious around 12.3m. Occasional pyrite clasts around 9.5m.		
14.5	16.5	Slightly laminated grey schist. Rare pyrite clasts. No younging apparent.	Lamination and cleavage @ 30° to LCA.	
16.5	21	Green laminated schist. Thin pyrite veinlets containing crystalline pyrite. No younging evidence apparent.		
21	25.4	Green, fairly monotonous unit. Soft and clay altered. Contact with unit above marked by a small breccia zone. Some fairly thin veinlets containing crystalline pyrite.		
25.4	31.4	Highly altered zone of green, often fragmented siltstone/mudstone (clay-altered). Laminated units interbanded with more monotonous units. Initially crystalline pyrite sparse, though increasing around 27.6m. 5mm quartz-pyrite vein @ 28.6m.		
31.4	64.5	Green interbedded laminated siltstone and mudstone. Fine porphyroblasts in monotonous units have stretch parallel to cleavage. Pyritic zones @ 51.5, 52 & 53.9m. Two cross-cutting cassiterite stringers contain translucent green mineral with round habit.	Lamination and sub-parallel cleavage initially @ 20° to LCA. Cleavage steepens to 0° to LCA around 56.1m.	
64.5	100.3	Grey laminated siltstone. Occasional Si veins deformed about cleavage. Elongate pyrite porphyroblasts common. Some minor chalcopyrite associated with an Si vein @ 68m.		
100.3	103	Initially unit green and chloritic grading to greyaround 102m. Pyrite (up to 2%) as veins and clasts throughout. Thin chlorite veins have soapy texture. Some 1cm Si veins contain dolomite. Conatct with unit above marked by pyritic clay-altered zone.	Cleavage variable, 0 to 25° to LCA.	

575128

CRA Exploration Pty. Limited - Diamond drill core log				Hole No: DD97BC11
Tenement: EL 4/94, Tasmania			**Map Ref.:** SK 5503, Burnie	
Collar R.L.: 205m		Co-ordinates: 324402E, 5429412N	Hole Orientation: 55° towards 072	Logged by: TJG
103	111.4	Grey schistose unit (initialy green). Pyrite associated with sometimes rootless Si vens, as well as clasts within schist. Some 1cm Si-pyrite veins below 109m. Becoming very pyritic around 110.4m with numerous deformed Si-pyrite veins.	Cleavage variable due to original sedimentary structure. Generally between 0 to 20° to LCA.	
111.4	117.5	Chlorite-altered schist, bleached and fairly intensely dolomite veined. Initially pyritic (veins) before Si and dolomite veins dominate. Doloite dies off around 115m.	Cleavage @ 20° to LCA with dolomite veins sub-parallel.	
117.5	124.9	Very grey, graphitic schist. Most Si-dolomite-pyrite veins <5mm. Larger quartz veins (3cm) @ 118.1 and 118.3m. @ 118.3 vein contains vuggy dolomite and pyrite. 5cm dolomite vein @ 118.4m. 20cm zone of quartz and vuggy dolomite from 121.4m.	Cleavage @ 20° to LCA.	
124.9	130.15	Composite unit comprising altered green psammite, minor schist and intense quartz-dolomite veining. No pyrite evident. Dolomite often forms the selvage on Si veins. Si veins occasionally cross-cut earlier dolomite veins. Quartz zones up to 30cm.		
130.15	145.5	Grey fine-grained schist. 10cm quartz+dol zones. @ 133.5, 133.7, 137.5m (brecciated) & 140.5. Becoming pyritic @ 135cm. Pyrite in Si veins below 138m, with minor chalco @ 139m. Chalco @ 142.4 & 143.7m. Chalco in an intensely veined zone @ 145.1m.		
145.5	146.6	Fairly bleached grey schist. Fine Si + dolomite veining, containing pyrite and some chalcopyrite. @ 146.6m 20cm dolomite zone with minor quartz. Minor blebby pyrite and chalcopyrite in this zone.	Cleavage @ 20° to LCA with fine Si-dol veins sub-parallel.	
146.6	159.9	Zone of quartz-dolomite. Initially dominated by quartz with subordinate schist till 154.5m. Sparsely disseminated chalcopyrite above 148.5. More massive below this with 20cm zone from 150.6, 30cm from 151.9m, 20cm from 158.2. ?Chalcocite @ 150.3m.	Brecciated at base of this unit.	

575129

CRA Exploration Pty. Limited - Diamond drill core log				Hole No: DD97BC01
Tenement: EL 4/94, Tasmania			**Map Ref.:** SK 5503, Burnie	
Collar R.L.: 205m		Co-ordinates: 324402E, 5429412N	Hole Orientation: 55° towards 072	Logged by: TJG
159.9	171	Greenish grey chloritic schist (minor Si-dolomite veining), becoming grey around 163m, then more chloritic around 166.9m associated with increased quartz veining. Some brecciation around 168.7m.	Lamination and sub-parallel cleavage variable 5 to 20° to LCA. Some boudinaged quartz veins below 167m, and fracturing due to slip on a steeper cleavage.	
171	172	Brecciated chloritic schist with pyrite & chalcopyrite. Chalcopyrite massive in steep poorly defined stringers (up to 5%).		
172	179	Greenish grey chloritic schist becoming increasingly quartz veined around 177m with a very pyritic (minor chalcopyrite) silicified zone @ 175.4m. Fine-grained pyrite on cleavage planes throughout unit.	Cleavage around 25° to LCA with cross-cutting veins @ 45°.	
179	185.5	Highly silicified and quartz-veined schist. @ 178.8m 20cm pyritic zone with red Fe stained silica (jasper). Minor disseminated chalcopyrite and possibly some greyish chalcocite. Similar zone @ 180.6m. Quartz veins contain minor patchy dolomite.	Cleavage variable @ 20 to 60° to LCA, before becoming unrecognisable. Quartz veining @ low angle to LCA.	
185.5	186.2	Soapy chloritic zone. Minor pyrite.	Cleavage @ 20° to LCA. 5mm quartz vein sub-parallel.	
186.2	187.2	Silicified schist now totally replaced by quartz. Dolomite veining evident and patchy in quartz. Occasional pyrite veining.		
187.2	187.8	Brecciated, soapy chloritic zone. Minor quartz veining and very rare pyrite.	Cleavage @ 20° to LCA.	
187.8	195.5	Silicified chloritic schist. Initially grey with quartz veins and fragments throughout. Minor orange/brown dolomite in quartz. Becoming chloritic and soapy around 188.8m. Some brecciation.		
195.5	204.8	Highly silicified schist (minor pyrite) grading into quartz. Blebby "caramel-coloured" dolomite @ 198.3m, with only thin veinlets above and below.		
204.8	206.4	Silicified soapy chloritic unit. Minor clay alteration.	Cleavage @ 15° to LCA.	

575130

CRA Exploration Pty. Limited - Diamond drill core log				Hole No: DD97BC11
Tenement: EL 4/94, Tasmania			**Map Ref.:** SK 5503, Burnie	
Collar R.L.: 205m		Co-ordinates: 324402E, 5429412N	Hole Orientation: 55° towards 072	Logged by: TJG
206.4	209.5	Similar to unit above, but more silicified. Originally dark green silicified siltstone with no apparent cleavage. Contact with unit below marked by a 30cm quartz zone. Pyrite throughout.		
209.5	215.6	Grey laminated metasiltstone. Si veining throughout becoming silicified around 214.5m. Generally quite pyrite-rich and porphyroblastic. Slight wavy lamination and some strong sub-parallel shearing.	Cleavage/lamination @ 15° to LCA, but slightly variable.	
215.6	216.6	Intensely silicified schist, grading to quartz. Minor brownish dolomite veins.		
216.6	219.4	Greenish silicified schist. Porphyroidal and disseminated fine-grained pyrite throughout. Quartz veining common. Sharp contacts with grey laminated siltstone.		
219.4	220.3	Fragmented zone caused by abutting of greenish porphyroidal unit with grey laminated schist. Quartz veining evident with numerous cleavage parallel offsets. Contact parallel to LCA and marked by clay alteration.		
220.3	227.7	Greyish siltstone. Laminated in parts but overall dominated by thick monotonous units. Cleavage irregularities related to bedding. Numerous deformed Si veins.	Cleavage @ 15° to LCA.	
227.7	261.8	Grey laminated siltstone. Quartz and chlorite veining sub-parallel to lamination but varies slightly. Lighter layers often porphyroidal. Marked changes in bedding/cleavage angle often associated with small faults. Pyrite in Si-rich layers.	Cleavage variable orientation but generally 30° to LCA. Small faults @ 239 & 246m apparently normal. Some kink-banding evident. Cleavage steepens to 5° to LCA @ 250 and 255.5m. Highly defomed zone @ 254m with minor quartz-dolomite.	
261.8	268.7	Similar unit to above but greenish and slightly chloritic. @ 267m very pyritic in a more massive band. Large pyrite clasts in mudstone.		

575131

CRA Exploration Pty. Limited - Diamond drill core log				Hole No: DD97BC#1
Tenement: EL 4/94, Tasmania			**Map Ref.:** SK 5503, Burnie	
Collar R.L.: 205m		Co-ordinates: 324402E, 5429412N	Hole Orientation: 55° towards 072	Logged by: TJG
268.7	277.7	Brecciated zone, bleached, broken and marked by increased quartz veining + minor dolomite. Pyrite minor. Some chloritisation and clay alteration, especially in more brecciated parts.	Cleavage around 20° to LCA.	
277.7	317.3	Green-grey chloritic schist. Rare sulphides. Minor quartz-dolomite veining (some up to 10cm) but generaly contain no sulphides.	Foliation varies but generally @ 20° to LCA. Locally steepens to 0° to LCA. No younging evidence.	
317.3	322.4	As above but greener and slightly washed-out. Increased quartz veining. Brecciated @ 322m. Minor pyrite associated with quartz.		
322.4	325.8	Clay-altered puggy brecciated schist. Rare crystalline pyrite.		
325.8	356.3	Greenish schist, locally fragmented @ 331.9 - 332.1, 336.5 & 336.9m Possibly associated with a decrease in cleavage angle to 0° to LCA. Clay puggy zone 347.4 to 348.3m. Rare quartz-dolomite veins up to 10cm.	Generally cleavage @ 15 to 20° to LCA.	
356.3	375.7	As above but grey in colour. Increase in quartz-dolomite veining. Rare sulphides.	Cleavage @ 20° to LCA but locally steepens.	
375.7	463.1	Green chloritic schist. Infrequent quartz-dolomite veining, though sometimes complex. Sheared quartz veins the result of cleavage-parallel slip. Local clay-altered breccia zones between 398.2 & 400.2m; 418-419m; 438 -438.5m. Very rare sulphides.		
463.1	464.5	Washed-out clay altered light green schist.		
EOH				

DD97BC11 - Assays

Sample No	DPO	From	To		Au	Au Dp1	Pt	Pt Dp1	Pd	Pd Dp1	Ag	Al	As	Ba	Bi	Ca	Cd	Ce	Co	Cr	Cu	Fe	K	Mg	Mn	Mo	Na	Nb	Ni	P	Pb	Sb	Sr	Ti	V	Y	Zn
3755956	82184	3.8	5.8		<1	<9000	<5	<9000	<1	<9000	<1	85500	4	460	<5	600	<5	50	10	31	14	34300	52700	7050	230	<3	850	5	19	195	20	5	13	4060	54	12	87
3755958	82184	5.8	7.8		<1	<9000	<5	<9000	<1	<9000	<1	83100	4	440	<5	600	<5	55	10	39	23	39400	50800	7650	210	<3	750	<5	20	135	10	5	13	3800	61	10	83
3755960	82184	7.8	9.8		2	<9000	<5	<9000	<1	<9000	<1	88400	6	480	<5	480	<5	55	12	46	36	38600	50300	7100	190	<3	850	<5	20	170	15	5	12	3400	62	10	76
3755961	82184	9.8	11.8		<1	<9000	<5	<9000	<1	<9000	<1	98000	6	500	<5	1200	<5	55	8	45	18	37800	55700	7000	170	<3	900	<5	17	550	10	10	16	4250	70	11	55
3755962	82184	11.8	13.8		<1	<9000	<5	<9000	<1	<9000	<1	77700	6	400	<5	200	<5	55	9	44	25	34100	43300	5900	175	<3	800	<5	18	110	10	<5	11	3800	56	10	51
3755963	82184	13.8	15.8		1	<9000	<5	<9000	<1	<9000	<1	78600	6	380	<5	300	<5	55	9	37	23	38700	38100	5900	185	<3	900	5	19	120	10	5	12	4560	60	8	56
3755964	82184	15.8	17.8		1	<9000	<5	<9000	<1	<9000	<1	68100	6	350	<5	210	<5	50	7	28	7	29500	35400	4950	200	<3	650	<5	15	110	20	<5	10	3200	38	9	51
3755965	82184	17.8	20		<1	<9000	<5	<9000	<1	<9000	<1	77200	4	370	<5	240	<5	65	9	33	10	39000	38700	6850	190	<3	700	5	18	150	25	5	10	3400	46	10	66
3755966	82184	20	22		1	<9000	<5	<9000	<1	<9000	<1	71400	<3	350	<5	550	<5	50	7	44	40	41700	37300	8200	230	<3	800	<5	18	270	10	<5	10	3850	53	9	76
3755967	82184	22	24		1	<9000	<5	<9000	<1	<9000	<1	83300	<3	460	<5	370	<5	55	12	50	7	37100	52000	7650	190	<3	750	5	22	220	10	5	11	4550	64	11	62
3755968	82184	24	26		<1	<9000	<5	<9000	<1	<9000	<1	94200	<3	550	<5	270	<5	65	12	59	6	36300	42800	7400	155	<3	950	5	23	145	10	10	14	4100	75	8	63
3755969	82184	26	28		3	<9000	<5	<9000	<1	<9000	<1	92400	<3	600	<5	800	<5	65	11	39	3	34600	60800	7250	185	<3	900	5	19	400	10	10	16	4200	70	10	57
3755970	82184	28	30		2	<9000	<5	<9000	<1	<9000	<1	85900	<3	500	<5	230	<5	60	13	47	21	36000	61300	6950	145	<3	850	5	20	120	15	5	14	4700	71	8	55
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575133

5856252	82184	176	178	3	<9000	<5	<9000	<1	<9000	<1	55100	32	600	<5	450	<5	70	11	120	550	36700	39900	21600	240	<3	420	<5	16	170	30	<5	8	2000	56	6	32
5856253	82184	178	180	5	<9000	<5	<9000	<1	<9000	<1	48800	20	600	<5	450	<5	65	12	165	1150	40100	34700	21000	330	<3	330	<5	15	110	20	<5	8	1850	52	6	27
5856254	82184	180	182	6	<9000	<5	<9000	1	<9000	<1	28800	32	300	5	800	<5	60	12	260	600	34200	18700	13100	260	4	250	<5	11	160	15	<5	8	950	23	4	24
5856255	82184	182	184	3	<9000	<5	<9000	<1	<9000	<1	40300	14	500	<5	420	<5	75	7	220	49	36200	33200	11900	330	<3	470	<5	12	180	10	<5	9	1250	29	5	27
5856256	82184	184	186	2	<9000	<5	<9000	<1	<9000	<1	10800	4	125	<5	550	<5	20	<2	115	30	10100	8550	2050	105	<3	115	<5	3	220	<5	<5	4	280	6	2	9
5856257	82184	186	188	2	<9000	<5	<9000	<1	<9000	<1	52800	8	750	<5	900	<5	55	5	210	20	25300	47600	5550	350	4	650	<5	12	370	10	<5	11	1500	25	6	23
5856258	82184	STANDARD - 0.233%		130	150	<5	<5	4	3	<1	86300	14	450	<5	20800	<5	30	10	290	2350	29100	33800	8650	230	180	34800	<5	14	430	550	<5	450	2350	73	5	140
5856259	82184	188	190	4	<9000	<5	<9000	<1	<9000	<1	90000	6	1100	<5	3000	<5	85	6	140	300	31800	38500	8950	300	24	5060	<5	11	380	80	5	80	2200	53	9	40
5856260	82184	190	192	2	<9000	<5	<9000	<1	<9000	<1	74400	10	850	<5	1050	<5	65	7	210	36	34500	66300	9050	650	<3	750	<5	14	420	10	<5	13	1300	36	7	27
5856261	82184	192	194	3	3	<5	<5	<1	<1	<1	5850	14	40	<5	550	<5	25	5	470	43	14200	3400	1950	380	6	800	<5	10	85	15	<5	11	250	6	<2	14
5856262	82184	194	196	<1	<9000	<5	<9000	<1	<9000	<1	5950	12	30	<5	370	<5	30	5	270	26	17100	2900	2600	380	4	140	<5	9	110	10	<5	10	270	7	<2	17
5856263	82184	196	198	1	<9000	<5	<9000	<1	<9000	<1	5950	5	25	<5	500	<5	25	5	300	10	16500	2750	2950	360	4	120	<5	10	175	5	<5	8	250	6	2	19
5856264	82184	198	200	2	<9000	<5	<9000	<1	<9000	<1	7800	8	55	<5	550	<5	20	4	320	9	16800	5350	2450	430	4	165	<5	9	185	<5	<5	10	310	8	<2	17
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5856266	82184	202	204	<1	<9000	<5	<9000	<1	<9000	<1	7350	12	55	<5	410	<5	25	6	330	12	19000	4900	2900	200	4	140	<5	10	150	<5	<5	6	380	8	3	14
5856267	82184	204	206	<1	<9000	<5	<9000	<1	<9000	<1	77300	6	1100	<5	410	<5	75	4	155	9	25000	64500	6150	300	<3	1100	<5	9	210	10	<5	16	2000	28	9	16
5856268	82184	206	208	1	<9000	<5	<9000	<1	<9000	<1	53800	8	700	<5	380	<5	65	6	190	10	50500	47500	9800	550	4	700	<5	10	175	15	<5	11	1200	25	7	42
5856269	82184	208	210	2	<9000	<5	<9000	<1	<9000	<1	46100	18	90	<5	420	<5	55	12	290	43	50900	39800	10000	490	4	600	<5	13	175	20	<5	11	1550	34	8	40
5856270	82184	210	212	2	<9000	<5	<9000	<1	<9000	<1	87900	22	950	<5	550	<5	90	8	83	18	40500	71100	7800	320	<3	1200	<5	17	290	15	5	21	3050	74	11	25
5856271	82184	212	214	1	<9000	<5	<9000	<1	<9000	<1	90800	72	550	<5	750	<5	85	7	175	28	44800	58000	6650	430	<3	900	<5	15	320	20	<5	17	2650	48	8	27
5856272	82184	214	216	<1	<9000	<5	<9000	<1	<9000	<1	51200	18	410	<5	500	<5	55	7	220	19	32300	31800	5500	220	4	600	<5	14	195	20	<5	10	2200	38	8	25
5856273	82184	216	218	<1	<9000	<5	<9000	<1	<9000	<1	30100	10	210	<5	1800	<5	45	5	220	19	27700	23100	6250	210	<3	270	<5	11	700	15	<5	13	1450	21	8	23
5856274	82184	218	220	3	<9000	<5	<9000	<1	<9000	<1	75600	14	500	<5	650	<5	85	9	120	13	44000	56700	12200	480	4	800	<5	16	230	30	<5	15	3060	42	12	41
5856275	82184	268	270	<1	<9000	<5	<9000	<1	<9000	<1	86600	18	550	<5	3800	<5	75	19	115	14	37500	75800	8950	600	4	1000	<5	22	145	10	5	35	3850	79	7	38
5856276	82184	318	320	<1	<9000	<5	<9000	<1	<9000	<1	91500	6	550	<5	470	<5	90	14	105	6	39800	58300	6250	270	<3	2400	<5	22	135	10	5	36	3150	83	7	45
5856277	82184	322	324	1	<9000	<5	<9000	<1	<9000	<1	101000	10	600	<5	1300	<5	70	20	110	40	53000	51100	8050	600	<3	2200	<5	27	210	10	5	37	3600	92	7	59
5856278	82184	STANDARD - 0.233%		160	<9000	<5	<9000	4	<9000	1	72600	20	470	<5	22300	<5	30	12	175	2600	30900	29300	8700	270	210	31600	<5	14	440	650	<5	500	2650	82	6	180
5856279	82184	324	325.8	2	<9000	<5	<9000	<1	<9000	<1	80000	14	390	<5	1500	<5	80	21	195	160	45600	52000	6700	500	<3	1800	<5	29	185	10	<5	31	3100	71	6	88
5856280	82184	361.5	364	1	<9000	<5	<9000	<1	<9000	<1	90300	12	600	<5	850	<5	85	19	155	35	45600	48100	8650	430	<3	2650	<5	23	200	15	5	33	2800	81	7	81
5856281	82184	370	372	<1	<9000	<5	<9000	<1	<9000	<1	74100	6	500	<5	1300	<5	70	16	135	9	40400	54500	5500	500	<3	2300	<5	22	200	10	<5	32	2650	67	6	49
5856282	82184	398	400	<1	<9000	<5	<9000	<1	<9000	<1	78100	14	550	<5	1200	<5	85	15	140	14	41400	53400	7400	390	4	1450	<5	22	150	15	<5	18	3200	72	8	62
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					FA9	FA9	FA9	FA9	FA9	FA9	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE	ICSE
					1	1	5	5	1	1	1	10	3	5	5	10	5	10	2	2	2	100	10	10	5	3	10	5	2	5	5	5	2	10	2	2	2		
					PPB	PPB	PPB	PPB	PPB	PPB	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM

575134

DD97BC11 - Core Orientation Measurements

Depth	Dip	Azimuth (AMG)	Feature
36	85	63	schistosity
51	61	55	schistosity
91.5	Unreliable		schistosity
220.5	88	236	schistosity
259.9	Unreliable		schistosity
283.5	82	54	schistosity
298.1	67	51	schistosity
391.5	Unreliable		schistosity
394.5	16	71	schistosity
427.5	Unreliable		schistosity