000

617001

of M	A.O.	C.G.	E.O.	D.S.M.E
				Registrar
Received Answered	11 FEB 1983			E & R.
DEPT. OF MINES REF. No. 1062/83				

GEOLOGY AND MINERALISATION, SPECIMEN HILL AREA.

BALFOUR NW TASMANIA.

The contents of this report remain the property of CRA Exploration Pty. Limited and may not be published in whole or in part nor used in a company prospectus without the written consent of the Company.

N.RLLangsford

Geologist.

27/9/82.

OPEN FILE

Report prepared for CRA Exploration Pty.Ltd.

11050

CONTENTS

LIST OF FIGURES

ABSTRACT

An alteration-breccia zone of about 50,000m^2 occurs on Specimen Hill. The zone hosts sheeted quartz-arsenopyrite-cassiterite-wolframite vein systems. Tourmaline alteration is marked in the northern part of the zone. The alteration/breccia zone appears to lie along a fault within Carey's "Balfour-Redpa deep fault corridor". The veins are probably related to granite at depth.

Similar veins occur in Peter's Flat east of Specimen Hill. Exposures are poor and no subsurface information is available. Further east thin quartz-cassiterite veins occur with a yellow clay alteration zone along the contact of the Specimen Hill Siltstone and Balfour Shale.

Small but very rich quartz-cassiterite-pyrite "pods" occur in Tatlow's leases as approx E-W trending S dipping lenses.

GEOLOGICAL SETTING

The tin-tungsten-copper deposits of Balfour occurs within Upper Precambrian sediments, dominantly siltstones and shales with lesser quartzites. Eo-cambrian rocks including basic volcanics occur a few kilometres north of Balfour, just north of the Frankland River.

Exposures are limited around Balfour and no regional mapping has been done south of the Frankland River. Descriptions of the "Balfour Slates and Quartzites" are given in Ward(1912)

Carey's photo-geological map (Heithersay,1981) shows a swarm of north-west trending faults passing through Balfour area (Carey's "Balfour-Redpa deep fault corridor").

Approximately normal to this fault direction are lesser north-east trending faults; these can be recognised at Balfour as they clearly off-set stratigraphy. The north-west trending faults are sub-parallel to strike, and in areas of poor outcrop are difficult to recognise. One of these faults can be recognised on Specimen Hill.

Closely associated with the fault swarm are a series of small "dome and basin" structures. If granite underlies the area these structures may reflect cusps and ridges in the granite surface. No granite rocks are known to outcrop in the area under investigation.

STRATIGRAPHY

The oldest unit (Lithofacies 1 of Heithersay) is a massive to faintly laminated siltstone-sandstone-carbonaceous shale sequence. it dips andfaces west to south-west on the western flank of Specimen Hill. The siltstone units are dominantly grey, massive and medium to thick bedded. They rarely exhibit any soft sediment deformation structures.

Beds of black shale occur in the bed of Matrix Creek and can be seen in the sluiced areas on the western portion of the Hill and in DDB 10 (Porter 1980)

Further west, along the airstrip road, the sediments dip shallowly E in accordance with the regional dip and facing direction. White fine-grained silty medium-bedded sandstones and quartzites are common.

The problem of the attitude variation between the above unit and the Specimen Hill Siltstones (informal name; Yaxley, 1981) or "pyjama" rocks is explained by a fault structure (exposed as a sheared silicified ferruginous siltstone with yellow clays), trending approximately grid N and dipping steeply E(?). The Specimen Hill Siltstone is about 400m thick. It consists of two sub-units of banded "pyjama" siltstones separated by a more massive siltstone unit with quartzites.

The "pyjama" siltstones occur on the northern flank of Specimen Hill and in Peter's Flat between Specimen Hill and Peter's Ridge. Exposures in the latter area have been improved by recent alluvial mining.

All members of the Specimen Hill Siltstone dip and face east. Within the "pyjama" siltstones excellent facings can be obtained from sand dyklets, graded bedding and cross bedding.

The "pyjama" siltstones consist of alternate white and dark grey bans of varying thickness. The white bands consist of a grain-supported framework of well-rounded equigranular quartz. The matrix is sericite, clays and lesser chlorite. Tourmaline is common, replacing matrix and less commonly, quartz grains.

The base of the white layers commonly shows slumps, soft sediment deformation and penetration structures. Siltly "dyklets" penetrate several cm. into the underlying dark bands. The dykes generally occur in large numbers on individual bands but are rare or absent on others. The upper sections of the white bands are generally cross-beddedwith current scours and truncations.

The dark bands are generally finely, regularly laminated with no cross-bedding etc. Minor slumping can be seen. The contact between the white and dark bands is very sharp. The dark bands consist of matrix-supported quartz grains with a carbonaceous clay matrix.

Within the lower "pyjama" member thin beds of grey, friable, clay-rich, silty sandstone occur. The sandstones are medium grained and well laminated with rare cross bedding. The laminae are more resistant to weathering than the massive sections and form friable "plates".

The central member of the Specimen Hill Siltstone consists of interbedded white,silty, fine-grained quartzites and massive to regularly laminated siltstones. Very minor "pyjama" siltstones occur.

The quartzite units are 1-2m thick, thickly bedded and massive or faintly laminated. The quartzites weather to a friable sandstone.

The interbedded siltstones are grey to brown, generally finely and regularly laminated, occasionally blocky and massive. Thin sandstone interbeds, similar to those in the lower member occur within the siltstones.

The upper member is similar to the lower member, consisting of "pyjama" siltstones with laminated siltstones. This unit is now exposed in the flat between Specimen Hill and peter's Ridge. The lower section of the member contains several cross-bedded sandstone units about 30 cms thick which contain several percent sphalerite, with pyrite and minor cassiterite and introduced? carbonate (W.Fander C.M.S. Report).

"Pyjama" siltstone units become less common up sequence and a marked change occurs along the crest of Peter's Ridge; the Specimen Hill Siltstone passes conformably into the Balfour Shale (informal name; Yaxley 1981). The contact is marked by several cherty? quartzite units 0.5-2m thick which form the backbone of Peter's Ridge.

The overlying Balfour Shale is a thinly, regularly laminated green chloritic siltstone/shale unit. it is a fine-grained quartz siltstone with a sericite-chlorite matrix. It is distinctly fissile and contains up to several percent pyrite as idiomorphic grains.

The Balfour Shale unit hosts the Murrays' Reward-Central Mount Balfour copper mineralisation within a black shale facies.

STRUCTURE

Detailed mapping has established the dominant elements

of Specimen Hill to be 1) a fold with axis trending approx. 330°Mag. and plunging 60-65°S
2) a fault striking approx. 310° and dipping steeply E
3) a large breccia zone on the crest of the Hill.

Folding

The shape of the anticline can be seen in Fig. 1 and 2. The eastern limb dips steeply east and is quite regular; the southern limb is more complex. Lack of exposure on the southern flank of Specimen Hill precludes a detailed picture. The more strongly developed of two cleavages (S1)- 335°80E is probably an axial plane cleavage.

The setting of fold is not clear but it may be related to the Specimen Hill fault (see below).

Faulting

A persistent, crosscutting linear feature on the western and crestal portions of Specimen Hill has been interpreted as a fault. The zone can be traced from 50m north of Matrix Creek; at this point it is a series of small sulphide-quartz veins, silicified siltstones and yellow clay. In Matrix Creek the fault is a 1-2m wide "buck" quartz blow. A silicified, sheared limonite stained "siltstone" can be traced south up to DDB2. Pits and trenches have been cut into this formation which is associated with yellow clays.

South of DDB2 exposure is poor but pale green, strongly cleaved siltstones with white barren quartz veins and shattered and tourmalinised quartzites and siltstones occupy the projected position of the fault. An easterly dipping fault zone has been interpreted in DDB1 and DDB12 (Heithersay,1981).

Further south the projected position of the fault zone is covered by gravels and peat.

It may be significant that the axis of the magnetic anomaly over Specimen Hill coincides with the fault zone.

Sampling within the Specimen Hill adit (Fig2) showed high tin values occuring in silicified siltstones in the projected position of the fault zone. (See Table 2)

The zone of mineralisation and alteration intersected in DDB6 (BHP) is probably part of the fault zone. The fault extends North down Cassiterite Creek valley and was probably intersected in DDB17.

It can be seen that alteration and anomalous amounts of tin are associated with the fault over a distance of at least 1.4kms. The fault corresponds to one within Carey's "Balfour-Redpa deep fault corridor".(See plan TS 1/77Bal-17)

The two major vein directions on Specimen Hill are subparallel to the major fault directions; the fault described above and NE-Sw trending faults. One of the latter cuts off Peter's Ridge and Specimen Hill to the south (See Fig1) It may be the cause of the mineralised breccia zone in DDB14 and the sulphide mineralisation at S2 (See Table 2).

Breccia Zone

In the Northern section, where quartz veining is most intensely developed, the zone is one of tourmalinisation ranging in intensity from minor to total replacement of the rock fabric. In places the siltstones are converted to a porous mass of acicular tourmaline and quartz crystals, often with appreciable amounts of cassiterite (S. Whitehead AMDEL 1979, GS 625/78). Elsewhere sedimentary textures are preserved although complete replacement has taken place to form a hard tough khaki rock. Quartzites are strongly fractured with tourmaline films along joints and fractures.

Tourmalinised rocks contain up to 2500 ppm tin, 1000 ppm W and other elements, apart from the mineralisation occuring in quartz veins.

Further north the tourmalinised zone grades into a breccia zone, with a chaotic textured matrix of brown sandy iron-rich? material, and disoriented clasts of quartzite, sandstone and siltstone. The matrix contains fine fragments of quartzite and sandstone and is penetrated by fractured quartz veins.

The matrix penetrates fractures, cleavages and "pull aparts" in the clasts. Large disconnected fractured and closely jointed quartzite masses, 5-10m in length, occur in the breccia but most clasts are in the range 0.1-2m. Irregular masses of finely laminated green chloritic siltstone, similar to the Balfour Shale, occur. The breccia zone shows irregular patches of tourmalinisation associated with quartz-cassiterite veins and pods.

The zone shows a strong but irregular cleavage or joint direction. The western margin of the breccia zone may be the Specimen Hill Fault. The breccia has no magnetic expression but coincides with IP anomalies on Lines 94,95 and 96.

The outline of the body, as far as is known, is shown on Fig 2. Trenching to determine the limits of the breccia/ alteration zone were only partly successful due to a layer of very hard cemented wash. The nature of the brown sandy breccia matrix remains unknown. No subsurface information is available to determine its constitution below the weathered zone.

Mineralisation within breccia zone

The quartz-wolframite-cassiterite veins occuring in the northern part of the breccia/alteration zone have been discussed above. Samples were collected from crushed tourmaline-quartz bands in the southern part of the zone. No cassiterite was visible in either sample. The zones sampled were 30-50cm wide. Results are shown in Table 2.

High grade pods of quartz-cassiterite-tourmaline mineralisation occur within intensely tourmalinisedd zones in the breccia zone e.g. at approximately 9520N 10090E and 9560N 10090E. The mineralisation in each case consisted of a quartz-cassiterite pod 3-5m long, up to 30cms thick, with a halo of disseminated cassiterite crystals in intensely tourmalinised shales. The extent of the pods is not known, as mining was confined to the partly weathered upper sections. The mineralisation may be similar to that at Panasqueira, Portugal. (TM Porter, pers com; 1979 Hosking 1973)

Mineralised Quartz veins, Specimen Hill

Fig.3 is a stereoplot of veins in the vicinity of DDB11 and DDB12 on Specimen Hill. Only veins thicker than 2cms and persistent over greater than 1m length were measured.

Away from the summit of Specimen Hill, mainly on the west side, quartz veins are generally less than 2cm wide, irregular and impersistent. Many of the veins strike about 75°Mag, with shallow dips to North and South.

It is unlikely that the small irregular veins exposed on the western side of Specimen Hill are of economic significance.

The more important veins on Specimen Hill are of several different types.

a) with black cassiterite as approximately 1mm grains as a selvage of varying density, and none within the vein.

b) with coarse to medium grained brown zoned cassiterite crystals within a vein and commonly a mica selvage. The veins are commonly vuggy and "comby". The vugs are due to the weathering of sulphides or carbonate.

c) coarse grained wolframite-quartz-arsenopyrite-pyrite veins intersected in DDB12. Lack of cassiterite is noticable.

d) Quartz-wolframite veins, with a strike of approx. 230°Mag. The veins are vuggy and appear to be leached. Similar veins with considerable pyrite were exposed in the "pyrite pit" at 9570N 9985E. Concentrates from this area contained considerable wolframite and sulphides.

e) a thick, flat-lying quartz-wolframite-cassiterite-arsenopyrite-pyrite vein exposed over a strike length of 200m on the west flank of Specimen Hill and intersected in several BHP drill holes. In outcrop the vein contains abundant coarse-grained wolframite, cassiterite and commonly,sulphides. In many places however it is leached free of sulphides. The vein dips about 10° to the SE.

In isolation this vein is not of economic significance but it shows that thick and persistent veins with high tin/tungsten values do occur.

The cavities within the quartz-cassiterite veins trending approx 300-320Mag have been interpreted as due to the leaching of wolframite. It is considered unlikely for the following reasons. 1) wolframite occurs at surface in other vein types 2) wolframite can be panned from below wolframite bearing veins, but no wolframite was detected in concentrates derived from treating partly weathered material from the veins in question.
3) no wolframite was seen in a very careful search of the veins at surface (i.e. those with cross-grained cassiterite).

For these reasons it is considered that the vuggy veins with coarse-grained cassiterite have never contained significant wolframite. Several bulk samples (5kg) showed that the veins contained up to 4% tin. However to gain an accurate estimate of grade, considering the coarse grainsize of the cassiterite, would require samples of at least 20kg of vein material(AIMM "Geologist's Field Manual" Pg96)

Orientation of veins

The veins intersected in DDB12 have been interpreted as striking 300°M, dipping 0-35°E (Heithersay,1982). This is incompatible with the attitudes of any of the veins cropping out. Another complicating factor is that neither DDB11 or DDB12 were surveyed.

The present writer considers that the wolframite-bearing veins cored in DDB12 are the persistent swarm striking about 230Mag dipping steeply North-West. The cluster of poles of this swarm can be clearly seen in the stereogram (Fig 3). The evidence for this conclusion is

a) the veins carry wolframite at surface, whereas the other vein system does not.

b) the projected position of the swarm is close to the intersection

c) angles of veins to core axis are in the right range (30-40°)

d) the angle of intersection explains the considerable apparent thickness of the intersection.

e) bedding and cleavage relationships are of doubtful value considering the hole cuts the nose of a fold and faulting is suspected as well.

MBD11 intersected only thin veins of quartz-pyrite-arsenopyrite-chalcopyrite with very minor cassiterite but no quartz veins similar to those exposed at surface.

Few quartz veins are known from the southern part of the breccia zone. However specimens of vein quartz with coarse-grained cassiterite within wash suggest that tin-bearing veins do occur in that section of the breccia zone.

Peter's Flat- Sandstone/quartzite units

Recent alluvial mining has poorly exposed a sequence of "pyjama" siltstones, the upper member of Specimen Hill Siltstone. The member consists of thinly laminated green, grey and yellow-brown siltstones, with minor massive yellow-brown siltstones. Dyklets, slump structures etc. are common. Pyrite occurs as disseminations and veinlets, generally less than 2%.

Interbedded with the siltstones are several sulphide rich bands or lenses of quartzite and sandstone. The sandy units are grey to cream fg-mg quartzite sandstones, commonly crossbedded, and fg grey faintly laminated silicified quartzites. They contain up to 15-20% sulphides, mainly as fine-grained to medium-grained disseminations, and thin veinlets. Pyrite and sphalerite are dominant, but chalcopyrite is common. Pyrite occurs as fine disseminations, cubes up to 2mm and veinlets. Sphalerite occurs as brown fine-grained disseminations and aggregates up to 5mm. Chalcopyrite occurs as irregular blebs of less than 2mm.

Secondary siderite and f.g. cassiterite have been noted in the cross-bedded sandstone units.

Owing to poor exposures the thickness, number and lateral persistence of the sandstone/quartzite units cannot be determined; but they would appear to be 0.5-2m thick.

The contrast in sulphide content between the siltstone and sandstone/quartzite units is noteworthy. For assays see Table 2.

Peter's Flat - veins

Quartz-arsenopyrite-pyrite-chalcopyrite(cassiterite-wolframite) veins occur within the siltstones on Peter's Flat. The veins are dominantly quartz with thick selvages of arsenopyrite and lesser pyrite. Significant chalcopyrite occurs mainly within the veins. (Cassiterite and wolframite are rarely seen within the veins but can be seen by panning "dollied" vein material)

Thickness of veins ranges from 5-30cms, mainly in the range 5-10cms. Sulphides form about 20% of the veins. Textures of the veins are massive to "comby", rarely vuggy. Sulphides are coarse grained.

The veins show very little sign of oxidation; sulphides are fresh below cover of peat and alluvium. "Nuggets" of sulphides and sulphide-rich vein fragments are common in the wash" on Peter's Flat. Tin concentrates from the Flat (50-65%Sn) contained 2-4% As, 1-3%Wo_3, 5-10% pyrite and 50-200ppm Bi.(This suggests that arsenic has a low chemical mobility in peaty environments but will be dispersed mechanically.)

Owing to the poor exposure it is impossible to estimate the persistence and frequency of the veins. The exposures available and the amount of vein fragments in the wash suggest a fair abundance.

The veins show a wide variation in attitude; mainly they are parallel to strike of the host strata, dipping steeply West; some veins are East-WEst, dipping shallowly South. The veins appear very similar to those West of Tatlow Camp (around 9200N, 10325E).

A chip sample from a typical vein showed (ppm) Cu,3350; Pb,45; Zn,1200; Ag,8.5; W,39; Sn,1.12%; Bi,40; As, 2.4%.

Peter's Ridge

peter's Ridge is a prominent feature east of Specimen Hill. Recent stripping has produced good exposures between 96N and 99N.

The "backbone" of the ridge is a series of 4-6 massive to faintly laminated white to pale grey quartzites, 1-3m thick. A detailed section is shown on Fig.4. The quartzites are strongly, irregularlyjointed and dip and face east. Interbedded with the quartzite are thinly laminated green chloritis siltstones with irregular quartzite bands 5-10cms thick. the quartzites are partly silicified and limonite stained; in part they have a grey "cherty" appearance,

The quartzites mark the contact between the Specimen Hill Siltstones (below) and Balfour Shale (above). Above the quartzites the Balfour Shale is a regularly laminated green siltstone, with "brown alteration" extending a few metres into the Balfour Shale. Below the quartzites the Specimen Hill Siltstone consists of massive to laminated brown, yellow and green siltstones,interbedded, fine-grained, cross-bedded sandstones and green "pyjama" siltstones. Limonite staining is common. The sediments are variably altered or weathered to yellow clays.

Yellow clays extend to the base of the uppermost quartzite but are not found above it; they extend west to the base of the ridge. Within the stripped area most of the sediments are altered or weathered to some degree. Sedimentary structures are preserved. Limonite staining and silicification of quartzite bands is common within the yellow clay zones. The limiting of the clays to below quartzites suggests that they may be the weathered expression of hydrothermal alteration. The impervious quartzites may have "dammed back" the fluids. Weathering may have accentuated an otherwise inconspicuous primary alteration.

Significant mineralisation occurs as cassiterite-bearing quartz veins mainly confined to the quartzites and below. The veins are 1-5cms wide, irregular and impersistent. Spacing of veins are difficult to estimate but are generally 1-5m apart. Veins thinner than 1cm are not shown on the map; thses are fairly numerous. The distribution of rubble prevents detailed examination of most of the veins. The cassiterite in the veins is fine-grained, black, shiny and well crystallised.

Where veins cut the upper quartzite, irregular impregnations and "pods" of coarse-grained cassiterite occur, up to 3m long and 20-30cms wide. Below these "pods" strong yellow clay alteration occurs. This suggests a connection between tin mineralisation and the yellow clays.

Five chip samples of the yellow clays were taken. See Fig 4. They suggest a significant tin-arsenic-anomaly within the altered zone. No visible cassiterite or sulphides were included in the samples.

	Cu	Pb	Zn	As	Bi	W	Sn
S10	25	15	20	1200	20	31	821
S11	25	5	15	1200	20	31	332
S12	10	-	10	100	-	14	29
S13	25	5	10	300	-	4	139
S14	35	-	20	300	10	21	368

Similar yellow clays containing 190-2780 ppm Sn occur, poorly exposed along the Southern extension of Peter's Ridge. DDB7 (Jacro AQ) drilled beneath Peter's Ridge on line 9500N intersected several quartzite bands in the zone between the Balfour Shale and Specimen Hill Siltstone. Two 1m thick beds of massive grey pyritic silicified?quartzite contained the following (ppm)

Cu	Pb	Zn	Sn	W
380	120	2600	1100	30
400	30	600	1600	20

The association of tin with quartzites is notable. Details of the hole are reported in Porter (1980).

Further south at 9400N 10350E Peter's Ridge is cut by a fault. Bending of the quartzite members indicates a dextral fault (south block north-east). Yellow clay is prominent here; there are several flat-lying minor quartz-sulphide-cassiterite veins and some crystalline cassiterite in silicified quartzite fault breccia.

DDB14 and 16 were drilled to intersect the interpreted Balfour Shale-Specimen Hill Siltstone contact on lines 9400N and 9100N. The suite of quartzites marking the contact to the north were not intersected. No "pyjama" rocks characteristic of the Speciemn Hill Siltstone were intersected in DDB14. it is a possibility that the brecciated zone in DDB14 (152-157m) and the alteration zones may be due to the North-east striking fault. (See Fig1)

DDB16 intersected the contact between Balfour Shales and Specimen Hill Siltstone, marked by silicified siltstone. Alteration and mineralisation were less than in DDB14, strengthening the suggestion that the alteration and mineralisation in DDB14 may be related to faulting.

The massive arsenopyrite-carbonate-wolframite veins cropping out around 9200N 10350E were probably not intersected as they dip much more steeply than indicated on plan TS1/77Bal15.

The occurence of fluorite and scheelite at depth in DDB14 and 16 is of considerable interest.

Tatlow's Leases

A new tin occurence has been opened up on Tatlow's leases at approx 8950N 10250E; the workings have been informally named "Robbie's Workings".

The tin-bearing vein is exposed in a cut 10m×2m×3.5m deep (as at 12/8/82). The mineralisation was exposed in an old prospecting trench, about 0.5m deep, as a weakly mineralised narrow quartz vein. This has developed into a vein 8-10m long, (open to the West), 10-30cms wide and continuing underfoot. At last inspection (1/9/82) the vein consisted of a 4m long pod, 30cms wide of quartz-cassiterite containing an estimated 40% tin.

The host rocks are thinly, regularly laminated, thin bedded green chloritic siltstones; they have a distinctive silky sheen and are highly fissile. Bedding is consistent at 10°Mag, dipping 55-65°E.

Two main joint sets occur; 90-95°Mag dipping 75-85°E and 35-50°Mag dipping 40°N. A minor set strikes 345° and is vertical. Joint planes vary from planar to irregular and are spaced 0.1-0.3m. A strong crenulation plunges shallowly South in the plane of the bedding.

The east limit of the mineralised zone is a graphitic and clay-filled shear 2-5cms thick, striking 330°Mag, dipping 45° West.

When first inspected by the writer on 4/7/82 the vein, at 2m depth, sonsisted of coarse grained quartz-cassiterite,porous pyrite containing 5-10% fine grained cassiterite, and quartz-pyrite-cassiterite veinlets in talcose chloritic siltstone, identical to the ore from Tatlow's Shaft. Minor "griesen" ore also occured. A bulk sample (300kg) of the ore contained 29%Sn. (S.Tatlow pers. comm.) At that stage the vein was about 5m long and 30cms wide. Minor barren quartz and pyrite veins occured in the N wall of the cut. As at 12/8/82 the vein is about 8.5m long, open to the West but definitely cut off by the graphitic shear to the East.

The ore zone is 20-50cm wide consisting of irregular thin anastomosing quartz-pyrite-cassiterite veinlets in talcose chloritic siltstone with a characteristic "roddy" structure. Patches and stringers of brassy stanniferous pyrite are common. Lenses of quartz-cassiterite containing 30-70% cassiterite occur.

The lode strikes 65°M and is vertical to steeply South dipping; slickensides are strongly developed on the South margin.

The mineralisation is very similar to that found in Tatlow's Shaft. The "roddy" anastomosing veinlet mineralisation is identical in the two prospects; the massive quartz-cassiterite and porous tin-rich pyrite types are present in both prospects. The only significant variation is the weak development of "griesen" ore in Robbie"s Workings. ("Griesen ore" is a massive breccia-like, quartz-muscovite-chlorite-cassiterite-pyrite rock. Tin content is 20-30%, pyrite as 2-3m cubes 5-10%. The chlorite occurs as irregular masses in a quartz-muscovite "griesen" matrix.)

At Tatlow's Shaft the writer in 1981 mapped an E-W striking lens of "griesen" ore; the mineralisation, at least in the upper levels, had an East-west elongation and steep southerly dip, much the same as the vein in Robbie's Workings. Local control of mineralisation by small shears can be seen in both veins.

It is of interest that both tin "lodes" were exposed as narrow weakly mineralised quartz-pyrite-cassiterite veins. Many such veins are exposed in the area of Tatlow's leases. The strike of the "lodes" is almost parallel to the gridlines; the geochemical sampling and IP surveys have had minimum chances of detecting more of this type of mineralisation.

Tin mineralisation continues underfoot in Tatlow's Shaft at 20m. DDB14 was drilled below the workings (sited West of Tatlw's Shaft and drilled east) but intersected no mineralisation. The writer considers that a hole should have been sited south of the shaft and drilled to the north to test the mineralisation.

If a concentration of these lodes occurs they could constitute an attractive exploration target. A chip sample of the host rock (S20) and an identical lithotype away from any known mineralisation (S21) are shown below.

	Cu	Pb	Zn	As	Ag	W	Sn	Bi
S20	420	55	585	-	0.5	74	972	x
S21	180	5	95	100	0.5	16	-	x

Results from DDB15 suggest that the lithogeochemical haloes around "Tatlow type" lodes are small, but probably high contrast.

Murrays' Reward Copper

A composite chip sample of chalcopyrite-pyrite-quartz lode material from Murrays' Reward dumps was analysed. A previous sample collected by T.M.Porter and the writer showed 350ppm tin (4.5%Cu). S19 showed 4.78%Cu, 300ppmAs and 101ppm Sn.

Samples from carbonate hosted copper mineralisation in ACI drill core from Murrays' Reward showed < 5ppm tin. Th~~is~~ere is some evidence that the silica hosted and carbonate hosted copper mineralisation may be significantly different.

<u>Geochemistry of breccia-alteration zone</u>

Chip, channel, Jacro and diamond drilling (see Table1) have shown that the zone is highly anomalous in tin and to a lesser extent, tungsten.

Surface samples invariably show very low Cu, Pb, Zn, BI and As values, compared with those found in the drill holes, indicating leaching of these metals. Lead is fairly low in any case but the zone shows an association Sn-W-Cu-As-Bi-(Zn).

The presence of tourmaline and minor phlogopite indicates B and F metasomatism.

<u>Zoning</u>

Th~~is~~ere is controversial aspect of tin-tungsten mineralisation in general. At Balfour the situation is complicated by surface leaching, faulting, different styles of mineralisation and limited subsurface information.

However a central zone of W-Sn-As-Cu-Bi, centred on Specimen Hill appears to be surrounded by a broader Sn-Zn zone and anouter Zn(Pb?) zone. Approximate outlines are shown on Fig.1.

Siderite appears to be more common in the outer eastern zone i.e. in Peter's Flat and DDB14 and 16; the siderite is described as "replacive". Fluorite also appears to more abundant to the east of Specimen Hill in Tatlow's Shaft and DDB14 and 16.

SUMMARY AND DISCUSSION

A swarm of quartz-arsenopyrite-cassiterite-wolframite-pyrite-chalcopyrite veins occur on Specimen Hill, on Peter's Flat and Ridge and in Tatlow's Lease area. The veins range from 1cm up to 50cms in thickness and contain up to 10% tin or tungsten and up to 20% sulphides.

The veins, minor lenticular quartz-cassiterite-tourmaline bodies on Specimen Hill occur within an altered breccia zone, showing tourmaline and sericite alteration to varying degrees. As a whole the body is distinctly anomalous in tin (more than 300ppm) and AS, Zn, W and Cu.

Lenses of fine-grained quartzite and sandstone in Specimen Hill siltstone on Peter's Flat contain up to 10% fine-grained pyrite, sphalerite and chalcopyrite, and minor cassiterite. Poor exposure prevents examination of the extent of the stratabound sulphides and veining in Peter's Flat.

High grade (+20%Sn) but small lenses of quartz-sulphide-cassiterite occur in Tatlow's Leases, with some "griesen" ore. Considerable numbers of thses lenses may exist and if close enough, could be a significant target.

The vein mineralisation is presumed to be granite derived. This is a reasonable assumption as similar tin/tungsten occurences are clearly related to acid intrusives. See for example Taylor 1979; Hosking 1976; Blisset 1959; Smirnov 1977)

The following points are of interest with regard to this deposit type: a) significant mineralisation occurs over a vertical distance of approx 300m.

b) vein systems are related to granite cusps and ridges, commonly on the margins rather than the apices (where griesens occur)

c) faults are commonly important in controlling distributions of vein systems ans economic concentrations within the systems

d) the Balfour veins contain considerably more sulphides than other tin/tungsten veins described.

Evidence for Granite at depth

Apart from the presence of the veins and alteration zones themselves, there is little evidence for the presence of granite. a) reports of quartz-mica-hornfels-"marginal contact metamorphism" from surface samples on Specimen Hill CMS Report 80/11/25.

b) presence of "greisen ore" in Tatlow's Shaft and Robbie's Workings

c) presence of possible altered "acid dyke" north of Specimen Hill on ML59M/68. This has been described as a quartz-kaolin rock; it consists of stiff white clay, coarse quartz fine tourmaline and cassiterite. The quartz grains are not at all rounded.

Economic possibilities of

a) Specimen Hill. The alteration/breccia zone on Specimen Hill, as far as it has been outlined, covers about 50,000m²; assuming an SG of 2½ and vertical extent of 200m, this would contain about 25,000,000 tons of material. The writer is not maintaining that such a quantity of "ore" is available but that a large mineralised body can be fitted into the zone of alteration.

b) Peter's Flat and Ridge - veins. Poor exposures prevent any estimation of the extent of veining. The one sample analysed indicates that the veins contain significant tin. The area of potential veining is about 400 100m.

c) Tatlow's Leases. The veins discovered to date are short (10m) and probably of limited depth. However they are exceedingly rich. it is of interest that both veins were exposed as narrow quartz veins; numerous veins of this type occur in Tatlow's Leases. An area where such veins were 10-15m apart would be an attractive target.

d) The extent of the sulphide bearing quartzites is not known due to poor outcrop. The presence of strata-bound sulphides is of interest.

e) It is possible that the tourmaline breccia zone may be a footwall alteration zone to stratigraphically higher stratiform mineralisation. There is a suggestion from petrographic description that some tourmaline is diagenetic/ sedimentary. The lenses of sulphide-bearing quartzite on Peter's Flat would be the "exhalative" mineralisation related to the alteration zone. The zinc-rich sulphide mineralisation, on this model, would grade into stratiform tin mineralisation (see Plimer,1980). The presence of andesites in the lower part of the sequence may be of significance in this regard. The amphibolites described by Ward(1911) in the Balfour area may also be of significance, as there is a regional association of tin deposits and basic rocks in N.W. Tasmania.

RECOMMENDATIONS

1. The alteration-brecc ia zone should be tested as potential host for a 'stockwork' or sheeted vein system containing tin or tungsten. The holes suggested by Heithersay (1980) would be suitable i.e. 9500N, 9900E -500m and 9800N, 10000E - 200m. The first hole would give an good intersection of the Specimen Hill alteration zone at a vertical depth of 150-200 metres. If encouraging results are obtained the other hole could be drilled.

Alternatives are a) a hole drilled West from the eastern foot of Specimen Hill at about 9500N, 10250E. A hole of about 400m would adequately test the zone.

b) a series of rotary-percussion holes drilled into the breccia zone from the top of the hill. These would give a relatively cheap means of determining the potential of the top section of the target zone. The method would not be applicable below the water table.

2. Peter's Ridge. A 200m drill hole collared at 9700N, 10600E, drilled 45° grid W, would test the yellow clay alteration zone/quartzite horizon.

3. Peter's Flat. Initially several trenches should be cut across the partly stripped area to enable more detailed examination of the veins and sampling of the sulphide-bearing quartzite units. This could only be done successfully in summertime owing to high winter level of Cassiterite Creek.

4. Tatlow's Leases. Detailed mapping around the Tatlow lease to determine if any controls of the tin mineralisation can be established, and to determine if any concentration of veins might exist in the exposed areas.

REFERENCES

BERKMAN DA 1982 "Field Geologist's Manual" A.I.M.M. Monograph 9.

BLISSETT AH 1959 "The geology of the Rossarden - Storeys Creek District" Geol. Surv. Tas. Bull 46.

HEITHERSAY PG 1981 Progress Report EL 1/77 Balfour. Geopeko Ltd.

HOSKING KFG 1973 "The Search for Tungsten" Geol. Soc. Malaysia Bull 5.

KINGSBURY CJR 1965 "Cassiterite and Wolframite veins of Aberfoyle and Storeys Creek" Economic Geology of Australian Ore Deposits A.I.M.M. Eighth Comm. Min. Met. Cong.

PLIMER IR 1980 "Exhalative Sn and W deposits associated with mafic volcanics as precursors to Sn and W deposits associated with granites, Mineralium Deposita Vol 15 No. 3.

PORTER TM 1979 "The Balfour - Specimen Hill Program - Six monthly report to June 26th 1979.

PORTER TM 1980 Balfour Program - 1980 Report.

SMIRNOX VI 1977 (Ed) "Ore Deposits of the USSR" Pitman Publishing Vol 3. Deposits of Tungsten 180 - 228; Deposits of Tin 229 - 294.

TAYLOR RG 1979 "Geology of Tin Deposits" Elsevier.

WARD L Keith 1911 "The Moont Balfour Mining Field" Geol. Surv. Tas Bull 10.

YAXLEY G 1981 "Geology and mineralisation of the Balfour district" BSc Hons. Thesis. Univ. of Tas.

TABLE 1

GEOCHEMICAL SAMPLING SPECIMEN HILL BRECCIA

Channel Samples (Porter 1980) across tourmaline alteration zone near DDB 11 and 12.

Length of Sample	Sn ppm	W ppm	
27m	1600	80	
70m	520	75	Cu Pb Zn <10 ppm
70m	450	50	
10m	1150	40	

Chip Samples across brown alteration bx zone.
For location see Plan TASh 994, All 10m long samples.

Sample No.	Sn ppm	W ppm	As ppm
52	561	13	-
58	93	27	-
59	84	21	-
516	510	65	-
517	419	64	-
527	49	65	-
529	428	15	200
530	40	66	100
531	172	47	200
532	264	46	-
533	72	33	-
534	535	42	-
535	100	33	-
536	93	30	-

Bi Cu Pb Zn <10 ppm Ag <1 ppm

Chip Samples from friable tourmaline breccias.
For location See Plan TASh 994

Sample No.	Sn ppm	W ppm	As ppm
56	222	104	-
57	3390	54	-
528	4320	94	200

Bi Cu Pb Zn <10 ppm Ag <1

TABLE 2

ADIT SAMPLING - SPECIMEN HILL

Distance from portal m	Sn ppm		W ppm		Cu ppm		Bi ppm	
0 - 10	250	120	30	70	200	150	10	20
10 - 20	340	270	410	160	100	90	26	20
20 - 28	2200	1500	360	160	48	85	180	40

Chip samples collected from E and W walls (Porter 1979).

Quartz tourmaline crush? zones - Specimen Hill breccia zone Plan TASh 994

Sample No.	Cu	Pb	Zn	Bi	W	Sn
57	10	-	5	-	54	3390
518	10	165	5	20	207	4850

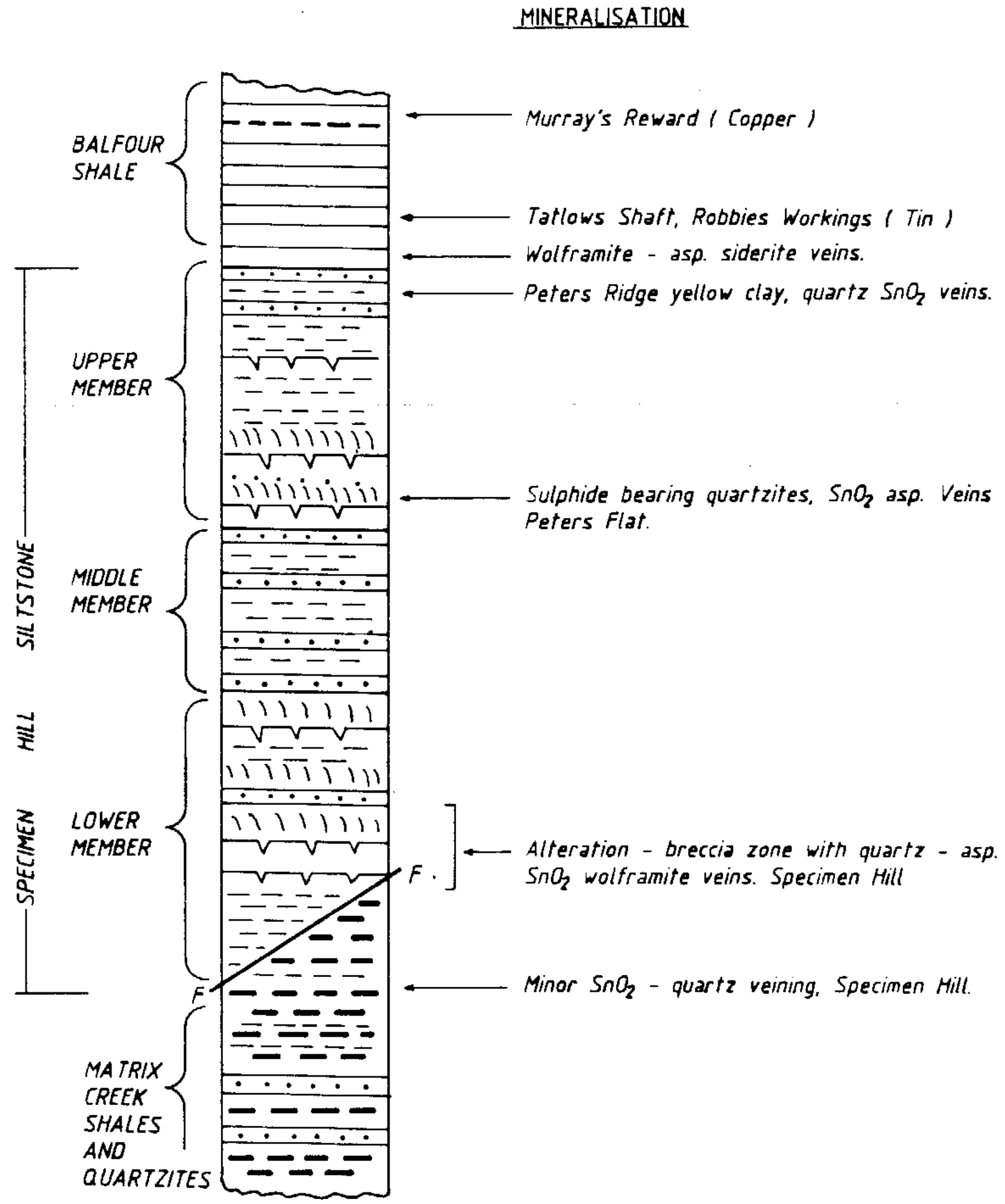
Sulphide rich quartzites - Peter's Flat Location - Plan TASh 656

Sample No.	Cu	Pb	Zn	Bi	As	W	Sn
537	740	55	160	50	2900	43	4810
538	100	-	2600	-	-	43	431
539	380	70	1.37%	-	-	117	1150

024

TABLE 3

617025



═ Regularly lam. green siltstone.

–– Massive to laminated siltstone

\\\\\\\\ " Pyjama " siltstone

. . . . Quartzites sandstones

▬ ▬ ▬ Black shales, siltstones.

CRA EXPLORATION PTY. LIMITED

DIAGRAMATIC
STRATIGRAPHIC COLUMN
SPECIMEN HILL AREA

Ref: SK55 - 3

Scale:

Drawn: R. T.

Author: N. R. L.

Report N°:

Date: JAN 1983

Plan N°: TASh 1139

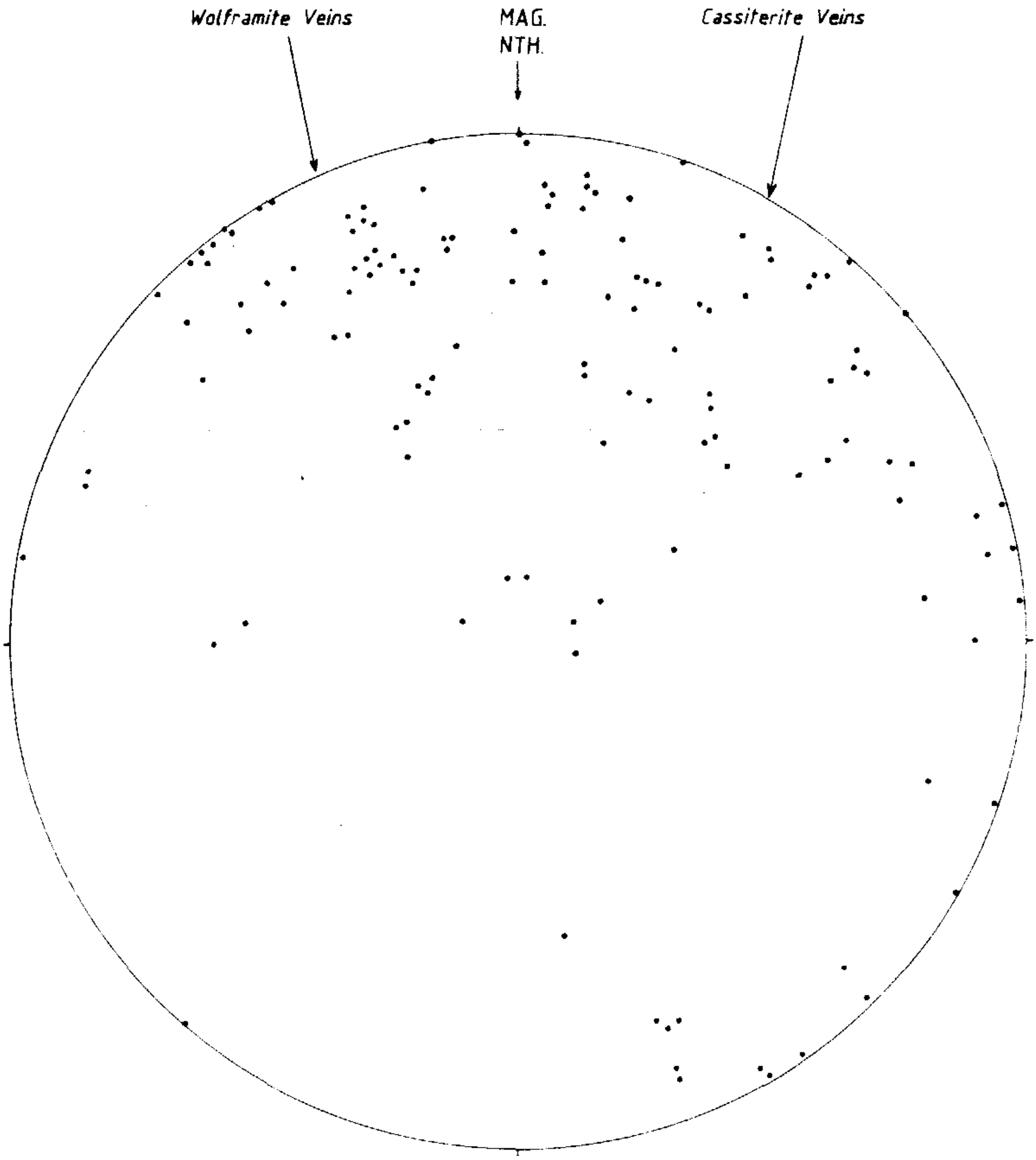
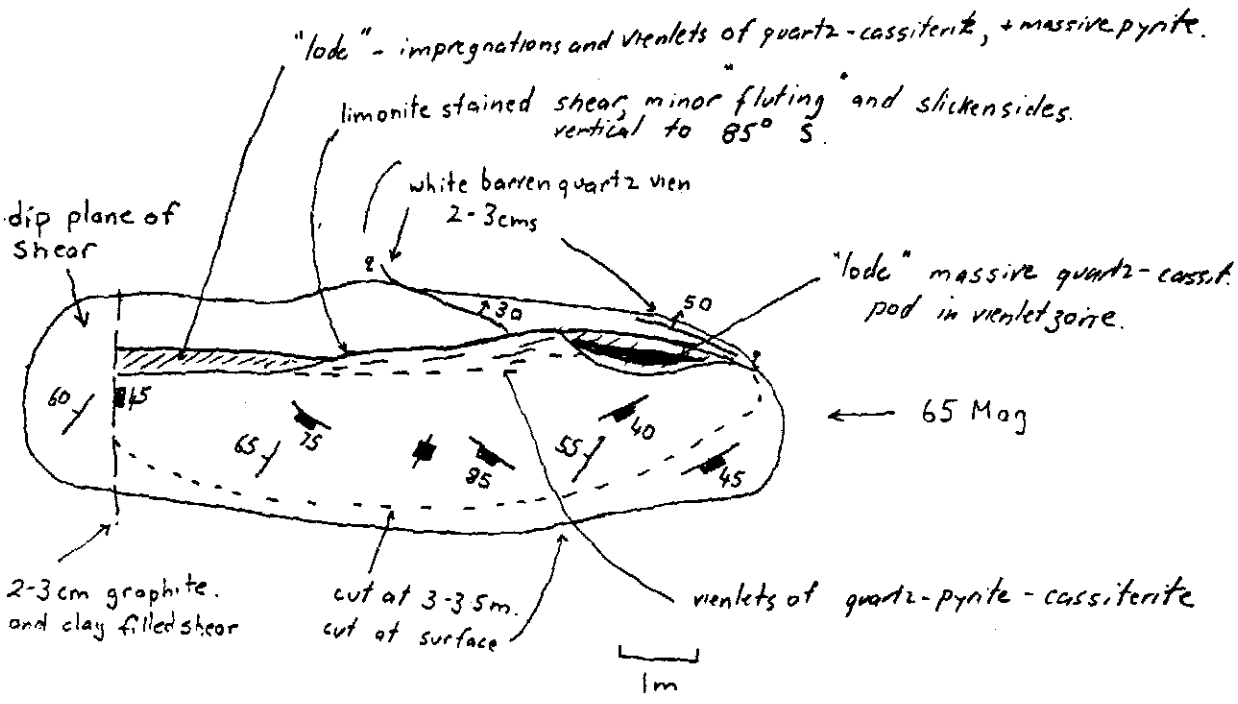


Fig 3

CRA EXPLORATION PTY. LIMITED

POLES TO QUARTZ VEINS
MAIN QUARTZ VEINING AREA
SPECIMEN HILL.

Ref: SK55 - 3	
Scale:	Drawn: R. T.
Author: N. R. L.	Report N°:
Date: JANUARY 1983	Plan N°: TASh 1118



Host rock is a thinly laminated silky green siltstone

Geological Sketch Map "Robbie's" Workings"

N.R.L. 12/8/92

1 : 100 Tape and compass.

5 cm

Fig 5

C.R.A. EXPLORATION . GEOCHEMICAL SAMPLE LEDGER

Tenement name BALFOUR No. .... Sample numbers .... Collected by NRL Sheet no. 1

Area / Prospect .... Date ....

Map / Photo reference .... Analysed by ANALABS DPO no. ....

Sample No.	Type ss * oc f s	ss channel **						Carbon	Metal content ppm or %										Grid ref	Geological Observations
		fl	wi	al	co	ca	pH		Cu	Pb	Zn	Ag	~~Mo~~ W	~~Mn~~ Sn	~~Au~~ Bi	As				
		o/c sample type ***																		
		s sample type ****																		
S1	oc								240	10	10	x	49	54	–	–				Spoil from prospecting trench Tourmalinised siltstone 45m 31°M from 9450N 10000
S2	oc								5	–	5	–	13	561	–	–				10m chip sample centre 9380N 10000E
S3									440	5	145	0.5	31	2880	–	–				limonitic pyritic siltstone prospect pit 9305N 10040E
S4									10	–	10	–	36	73	20	–				Brown siltstone beccia 52m 218°M from 9450N 10000E
S5									3350	45	1200	8.5	39	1.12%	40	2.4%				Quartz - sulphide viens from Peter's Flat. 35m, 105°M from 9700 N 10350 E
S6									15	–	10	–	104	222	–	–				Pale green tourmalinised friable silty sandstone adjacent to quartz veins 9690N 10075E

* Sample type ss = stream sediment oc = outcrop f = float s = soil

** Stream sed. sample description fl = flow m3/sec wi = width m al = alluvial co = colluvial ca = catchment km2

*** Outcrop sample type gs = grab sample rc = rock chip (state interval & length) cs = channel sample (state length)

**** Soil sample type auger hole or pit depth m A B or C horizon

028

617029

C.R.A. EXPLORATION . GEOCHEMICAL SAMPLE LEDGER

Tenement name BALFOUR No. .... Sample numbers .... Collected by NRL Sheet no. 2

Area / Prospect .... Date ....

Map / Photo reference .... Analysed by ANALABS DPO no. ....

Sample No.	Type	ss channel **						Carbon	Metal content ppm or %										Grid ref	Geological Observations
	ss * oc f s	fl	wi	al	co	ca	pH		Cu	Pb	Zn	Ag	~~Mo~~ W	~~Mn~~ Sn	~~Ao~~ Bi	As				
		o/c sample type ***																		
		s sample type ****																		
S7									10	–	5	–	54	3390	–	–				Quartz- tourmaline breccia, quartz viens. 50 cms thick. 9515N 1080 E
S8									10	–	10	–	27	93	–	–				10m chip sample in brown sandy siltstone bx. 9515N 10050- 10060 E
S9									5	–	5	0.5	21 ~~65~~	84 ~~23~~	–	–				As above 9515N 10060E - 10070E
S10									25	15	20	–	31	821	20	1200				10m chip sample. Yellow orange red clays. below quartzite, Peter's Ridge. Weathered laminated siltstone. 9670N 10450E - 10460E
S11									25	5	15	0.5	31	332	20	1200				As above 9670N 10460E - 10470E
S12									10	–	10	–	14	29	–	100				As above 9900N 10520E - 10530E
S13									25	5	10	–	4	139	–	300				As above 9900N 10530E 10540E

* Sample type ss = stream sediment oc = outcrop f = float s = soil

** Stream sed. sample description fl = flow m3/sec wi = width m al = alluvial co = colluvial ca = catchment km2

*** Outcrop sample type gs = grab sample rc = rock chip (state interval & length) cs = channel sample (state length)

C.R.A. EXPLORATION . GEOCHEMICAL SAMPLE LEDGER

Tenement name BALFOUR No. Sample numbers Collected by NRL Sheet no. 3
Area / Prospect Date
Map / Photo reference Analysed by ANALABS DPO no

Sample No.	Type	ss channel **						Carbon	Metal content ppm or %										Grid ref	Geological Observations
	ss * oc f s	fl	wi	al	co	ca	pH		Cu	Pb.	Zn	Ag	~~Mo~~ W	~~Mn~~ Sn	~~Au~~ Bi	As				
		o/c sample type ***																		
		s sample type ****																		
S14									35	–	20	–	21	368	10	300				As above 9860N 10530E - 10540E
S15									5	–	15	–	173	86	10	–				Orange clays, jig road.
S16									5	–	10	–	65	510	–	–				10 m chip sample, brown sandy breccia 9580N 10100E – 10110E
S17									5	–	10	–	64	419	–	–				As above 9580N 10110E – 10120E
S18									10	165	5	1.5	207	4850	20	–				Brecciated quartz vein - brown breccia 9520N 10100E
S19									4.78%	35	20	11.0	–	101	–	300				Quartz - pyrite - chalcopyrite ore, Murrays Reward.
S20									420	55	585	0.5	74	972	–	–				6m chip sample, parallel to lode in Robbie's Working. Green siltstone
S21									180	5	95	0.5	16	–		100				Green siltstone, identical to above away from min. 9100N 10640 - 10650E

* Sample type ss = stream sediment oc = outcrop f = float s = soil

** Stream sed. sample description fl = flow m3/sec wi = width m al = alluvial co = colluvial ca = catchment km2

*** Outcrop sample type gs = grab sample rc = rock chip (state interval & length) cs = channel sample (state length)

**** Soil sample type auger hole or pit depth m A B or C horizon

030 617031

C.R.A. XPLORATION . GEOCHEMICAL SAMPLE LDGER

Tenement name BALFOUR No. Sample numbers Collected by NRL Sheet no. 4

Area / Prospect Date

Map / Photo reference Analysed by ANALABS DPO no.

Sample No.	Type	ss channel **						Carbon	Metal content ppm or %										Grid ref	Geological Observations
	ss * oc f s	fl	wi	al	co	ca	pH		Cu	Pb	Zn	Ag	~~Mo~~ W	Mn Sn	~~Au~~ Bi	As				
		o/c sample type ***																		
		s sample type ****																		
S27									10	—	15	–	65	49	—	—				10 m chip sample. Green lam. siltstone, quartzite interbeds. 9530N 10125E
S28									25	–	10	–	94	4320	—	200				Sandy grey tourmaline breccia 9565N 10080
S29									15	–	5	–	15	428	–	200				Brown sandy breccia 9500N 10048E – 10036E
S30									10	–	10	–	66	40	–	100				As above 9500N 10036E-10032E
S31									5	–	10	–	47	172	-	200				As above 9500N 10025E - 10018E
S32									5	–	5	–	46	264	–	–				As above 9390N 9980 - 9970E
S33									5	5	5	–	33	72	–	–				Brown - green tourmaline siltstone 9390N 9962E - 9964E

* Sample type ss = stream sediment oc = outcrop f = float s = soil

** Stream sed. sample description fl = flow m3/sec wi = width m al = alluvial co = colluvial ca = catchment km2

*** Outcrop sample type gs = grab sample rc = rock chip (state interval & length) cs = channel sample (state length)

C.R.A. EXPLORATION . GEOCHEMICAL SAMPLE LEDGER

Tenement name BALFOUR No. Sample numbers Collected by N.R.L. Sheet no. 5
Area / Prospect Date
Map / Photo reference Analysed by ANALABS DPO no.

Sample No.	Type ss * oc f s	ss channel ** fl	wi	al	co	ca	pH	Carbon	Metal content ppm or % Cu	Pb	Zn	Ag	Mo W	Mn Sn	Au Bi	As			Grid ref	Geological Observations
		o/c sample type ***																		
		s sample type ****																		
534									5	–	10	–	42	535	–	–				9 brown alteration bx 9390N 9958E - 9946E
535									5	–	5	–	33	100	–	–				Tourmalinised siltstone. 9390N 9946E - 9964E
536									5	–	10	–	30	93	–	–				Brown altered shale 9390N 10030E - 10040E
537									740	55	160		43	4810	50	2900				Sulphide bearing grey quartzite. 9700N 10320E
538									100	–	2600		43	431	–	–				As above 9620N 10350E
539									380	70	1·31%		117	1150	–	–				As above 9630N 10300E
540									105	–	200		28	1070	–	400				Chloritic fault bx, Spec. Hill adit.
541									·5	–	45		8	229	–	–				10 m. chip sample, quartzites on Peter's Ridge new road.

* Sample type ss = stream sediment oc = outcrop f = float s = soil

** Stream sed. sample description fl = flow m3/sec wi = width m al = alluvial co = colluvial ca = catchment km2

*** Outcrop sample type gs = grab sample rc = rock chip (state interval & length) cs = channel sample (state length)

032 617033

C.R.A. EXPLORATION . GEOCHEMICAL SAMPLE LEDGER

Tenement name.......... No. .... Sample numbers.......... Collected by N.R.L. Sheet no. ....
Area / Prospect Balfour - Specimen Hill. Date..........
Map / Photo reference.......... Analysed by.......... DPO no..........

Sample No.	Type ss * oc f s	ss channel ** fl	wi	al	co	ca	pH	Carbon	Cu	Pb	Zn	Ag	As	Mn	Au	Bi	W	Sn	Grid ref	Geological Observations
		o/c sample type *** s sample type ****																		
SV1	oc								15	10	15	0.5	x			x	55	1.14%		Composite sample from 1×10cm, 1×15cm, 1×5cm veins. Limonit st? white massive to vuggy quartz veins, minor inclusio of brown altered sediment brown clay. Minor visible Cassiterite.
SV2.	oc								5	x	5	0.5	x			x	76	4.04%		Single vein sample 10-15cm wide vein. White massive quartz c̄ brown cg zoned S vein country rock is sandy tourmaline bx? siltstone/ sandstone 22m/600m from 9700N 10000E
SV3	oc								5	x	5	x	x			x	28	647		Composite sample 3×5-10cm 1× 10cms. Massive to granu vuggy white quartz, in country rock of "pyjama" silt and brown alt. siltstone. Some visible SnO_2

* Sample type ss = stream sediment oc = outcrop f = float s = soil

** Stream sed. sample description fl = flow m3/sec wi = width m al = alluvial co = colluvial ca = catchment km2

033

C.R.A. EXPLORATION . GEOCHEMICAL SAMPLE LEDGER

Tenement name.. No. .... Sample numbers.. Collected by.. Sheet no. ....

Area / Prospect..   Date..........................

Map / Photo reference..   Analysed by.. DPO no..........................

Sample No.	Type	ss channel **						Carbon	Metal content ppm or %										Grid ref	Geological Observations
	ss * oc f s	fl	wi	al	co	ca	pH		Cu	Pb	Zn	Ag	Bi	Mn	Au	As	W	Sn		
		o/c sample type ***																		
		s sample type ****																		
SV4	oc								10	x	5	05	x			x	105	4630		Composite sample; 3 × 5-10cms qtz viens of approx GridN trend, arround 9630 N 10020E. Massive to granular white quartz, minor musc. selvage; minor incolsions of brown alt. country rock. Some mg brown cassiterite.

* Sample type ss = stream sediment oc = outcrop f = float s = soil

** Stream sed. sample description fl = flow m3/sec wi = width m al = alluvial co = colluvial ca = catchment km2

*** Outcrop sample type gs = grab sample rc = rock chip (state interval & length) cs = channel sample (state length)

**** Soil sample type auger hole or pit depth m A, B or C horizon

617034

034

GEOLOGY

- > > Tertiary Basalt
- Tertiary Conglomerate
- Green to yellow finely laminated siltstone and shale. Siltstones and quartzite interbeds common
- Irregularly laminated rock which consists of beds and laminae which exibit grading from white fine grained sandstone / coarse siltstone to grey green or brown chloritic or tourmaline rich siltstone. Sedimentary features include trough cross stratification sandstone dykelets and load structures. Soft sediment deformation is common
- White fine to very fine grained sericite rich sandstone
- White fine grained silica cemented sandstone or quartzite. Sedimentary features include cross stratification and symmetric ripple marks
- Black massive carbonaceous siltstone
- Grey hard laminated siliceous siltstone. Limonitic
- △ △ Tourmaline zone (brecciated)
- Breccia zone
- ▨ Chloritic, iron stained alteration zone
- Dip and strike of bedding
- General dip and strike in areas of variable dip
- Vertical dip and strike of bedding
- Strike and dip of cleavage
- Trend and plunge of lineation
- Geological boundary inferred
- Fault observed inferred
- Mine
- Direction of movement of sediment bearing currents. Sense unknown
- Quartz (cassiterite, wolframite) - vein showing strike and dip
- Structural trendlines

LEGEND

- SOIL GEOCHEM SAMPLES (C-Horizon)
- ROCK CHIP CHANNEL SAMPLES (Vein material not sampled)
- × ROCK CHIP SAMPLES
- ⦿ B.H.P. DIAMOND DRILL HOLES
- ○ GEOPEKO JACRO DIAMOND DRILL HOLES
- ⊗ **CRAE/GEOPEKO DIAMOND DRILL HOLES**

B.H.P. Diamond Drill Holes (coords approx.)

DDB 1. Coords: 9640 N 9960E
Inclin: Vertical
Depth: 88·6 m

DDB 2 Coords: 9810 N 9940E
Inclin : Vertical
Depth : 73·15 m

DDB 3 Coords: 9640N 9860E
Inclin : Vertical
Depth: 30·6 m

DDB 4 Coords: 9440N 9860 E
Inclin : Vertical
Depth : 167·49 m

DDB 5 Coords: 8860 N 9730 E
Inclin : Vertical
Depth : 281·54

DDB 6 Coords: 10 000 N 10 000 E
Bearing: 236° M
Inclin : -55°
Depth : 181·87 m

'GEOPEKO Jacro Diamond Drill Holes

DDB 7 Coords: 9500 N 10460 E
Bearing: 227° M
Inclin : -60°
Depth : 40·1 m

DDB 8 Coords : 9100 N 10240 E
Bearing: 227° M
Inclin : -60°
Depth : 40·3 m

DDB 9 Coords : 10900 N 10050 E
Bearing : 47° M
Inclin :-60°
Depth : 15·5 m

DDB 10 Coords : 10 100 N 9770 E
Bearing : 227° M
Inclin : 55°
Depth . 39 m

CRAE/GEOPEKO Diamond Drill Holes

DDB 11 Coords : 9630 N 10075 E
Bearing : 227° M
Inclin : -45°
Depth : 11·9 m

DDB 12 Coords : 9585 N 10 060 E
Bearing : 260° M
Inclin : -45°
Depth 210·5 m

DDB 13 Coords : 8800 N 9275 E
Bearing : 260° M
Inclin : -45°
Depth : 143·1 m

DDH 14 Coords : 9387 N 10425 E
Bearing : 227° M
Inclin : -55°
Depth : 211·4 m

DDB 15 Coords = 9175 N 10460 E
Bearing = 047° M
Inclin = -55°
Depth = 100 m

DDB 16 Coords = 9200 N 10100 E
Bearing = 047° M
Inclin = -45
Depth = 274·55 m

SHEET A
SHEET B
SHEET C

SCALE 1:2500
20 0 20 40 60 80 100 Metres

5 cm

83-1932R

C.R.A. EXPLORATION PTY. LIMITED

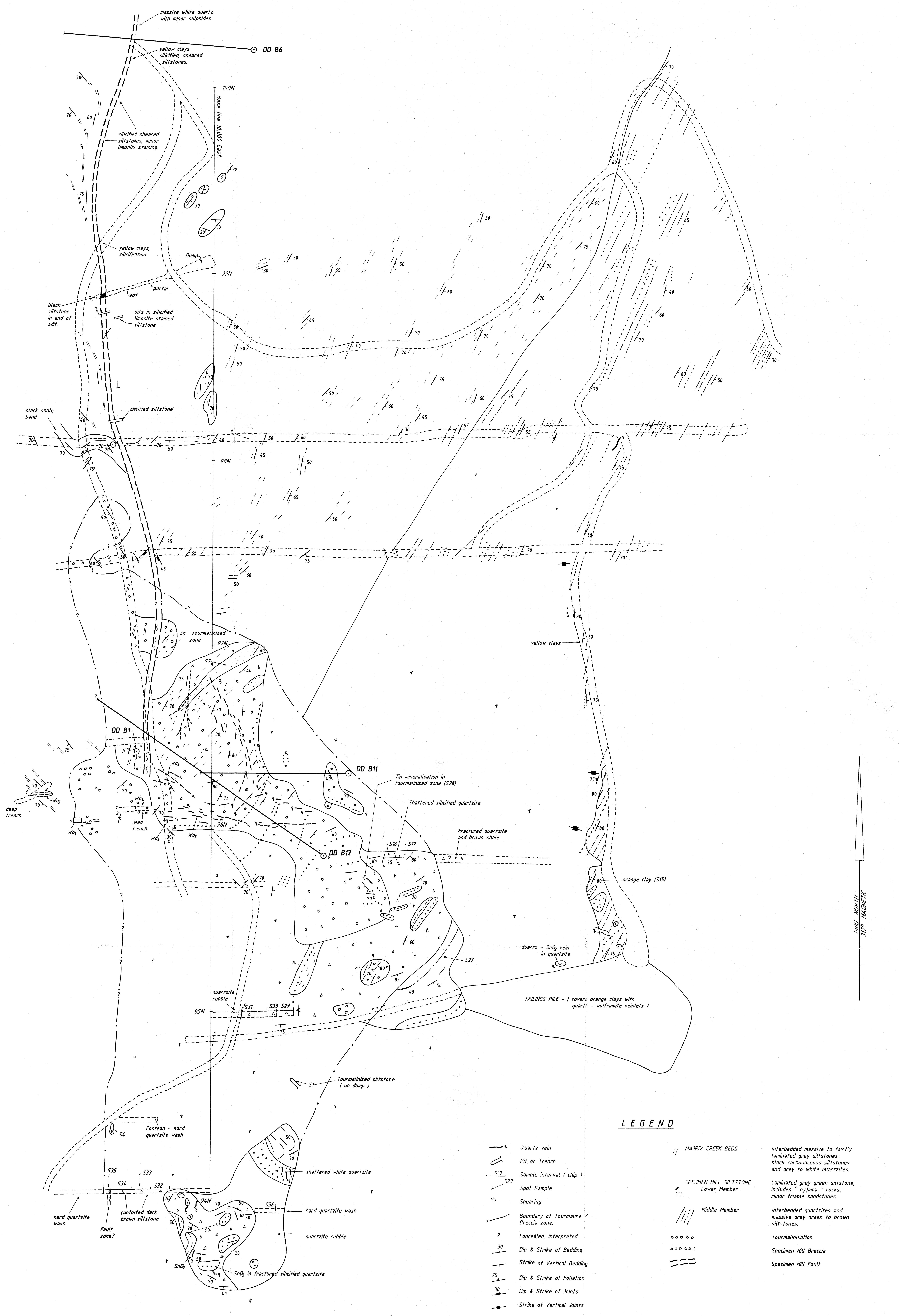
C.R.A.E / GEOPEKO J.V. - BALFOUR GRID

GEOLOGY PLAN

Fig. 1

geologist: P.H. & N.R.L.	scale: 1:2500	report no: 2
drawn: T.G.D.S.	date: December 1981	TASH 656

617035



617030

83-1932R

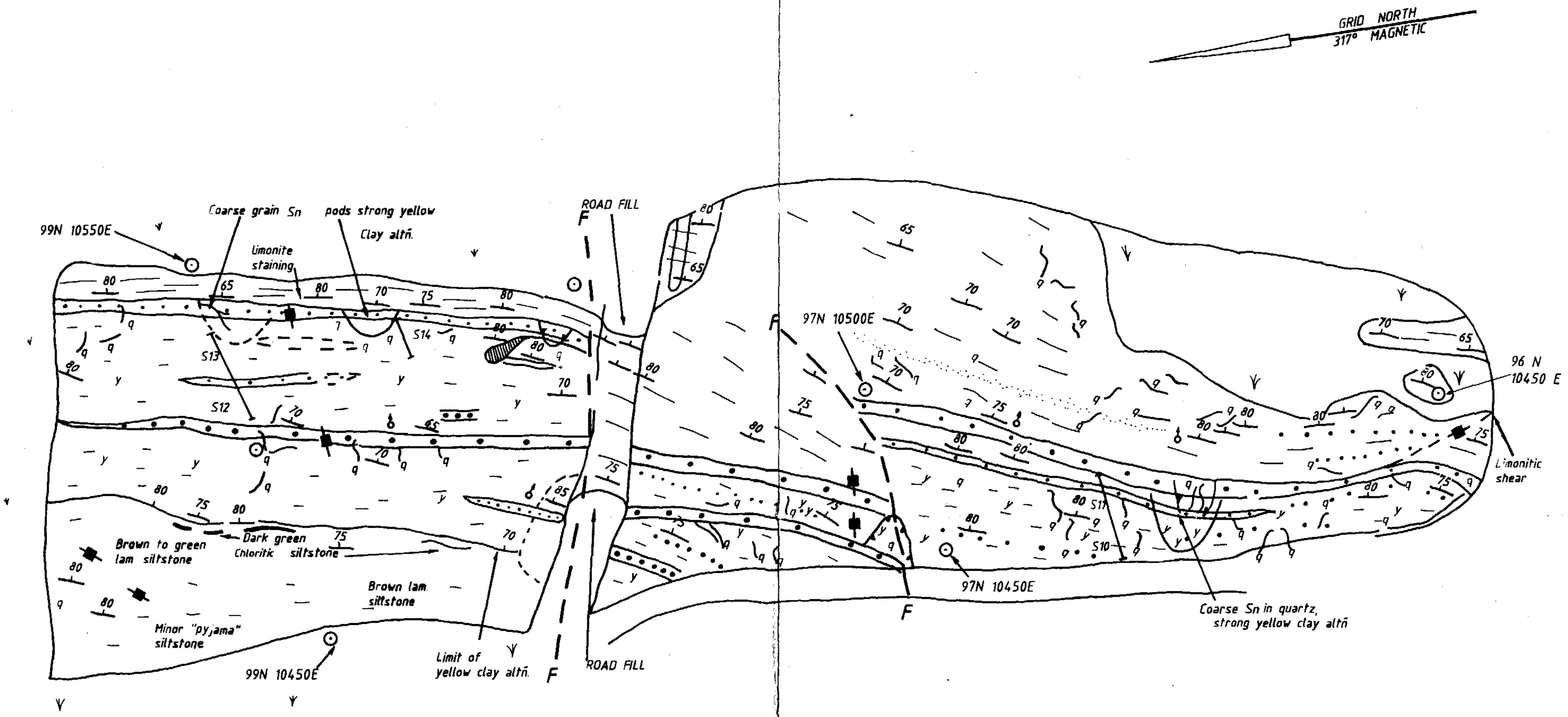
CRA EXPLORATION PTY. LIMITED

GEOLOGICAL MAP
of part of
SPECIMEN HILL BALFOUR

Fig. 2

REF	SK55 - 3		
AUTHOR	N.R.L	PROJECT Nº.	
SCALE	1 : 1000	DRAWN	R. T.
DATE	20 - 12 - 1982	Plan Nº.	TASh 994

035



LEGEND

Irregular Quartz vein with variable ammounts of cassiterite

Quartz " blow "

Yellow clay " alteration "

Pit excavated on qtz - SnO2 Pads" in fractured quartzite

Fault: - Definite
- ? inferred

Peat cover

Sample traverse

BALFOUR SHALE

Thinly regularly laminated green to brown green to brown siltstone.

Minor black siltstones, interbedded quartzites.

Laminated friable fissile Mg sandstone

SPECIMEN HILL SILTSTONE

Massive to faintly laminated white quartzites silicified in part, interbedded green siltstones.

Laminated to massive grey - green to brown siltstones, interbedded "pyjama" siltstones.

Green chloritic siltstone

617037

5 cm

83-1932R

CRA EXPLORATION PTY. LIMITED

GEOLOGICAL MAP
PETERS RIDGE AREA BALFOUR
(20M / 76 & 103M / 77)
Fig. 4

REF.	SK55-3		
SCALE.	1 : 1000	DRAWN.	R. B. G.
AUTHOR.	N. D. L.	REPORT N°.	
DATE.	15 - 12 - 1982	TASh N°.	993