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THE LIVINGSTONE CREEK TIN GOSSANS

EL 53/70

VICINITY OF MT. LIVINGSTONE

NORTH WEST

TASMANIA

REGISTERED

OPEN FILE

88-2848

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22nd July, 1988.

FORWARD

An introduction to exploration work previously undertaken within exploration licence 53/70 is outlined in previous report dated 21/6/88.

This report summarises previous exploration work specifically undertaken over the Livingstone Creek gossans detailing interpretation of previous work together with conclusions and recommendations.

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LIVINGSTONE CREEK TIN GOSSANSGEOLOGICAL SETTING.

Situated in contact with the eastern flank or outer sill section of the Devonian Meridith Granites (Ademellite Pluton) the Livingstone Creek gossans are directly related to carbonate rocks of the Precambrian Success Creek Group, which have previously been mapped as contacting the Meridith Granites for a considerable distance southerly. Westerly of the gossans are quartz, sandstones, siltstones and cherts of the Proterozoic Onam formation.

The zone near the top of the Onam quartzites and overlying formations of lower Cambrian is one of the main mineralised zones on the west coast of Tasmania. It includes the Success Creek phase, as above the Onam quartzites.

The favourable mineralisation horizon is characterised regionally by carbonate rocks of the Success Creek group overlain by cherts and shales of the Crimson Creek formation (red rock marker horizon).

THE LIVINGSTONE CREEK TIN GOSSANS

The tin gossans outcrop as two (perhaps faulted) units in the vicinity of grid lines 6500 N, 5100 W (map two previous reports). The gossan outcrops trend in a north-south direction, are each approximately 120 metres in length, up to 50 metres in width and up to 15 metres high, with indicated extensions in a southerly direction.

Assays taken over both gossans and from various sections of the gossans indicate values ranging from 0.2% to 0.5% Sn.

SUMMARY OF PREVIOUS EXPLORATION WORKPETROGRAPHY

The Livingstone Creek tin gossans have been classified as, Limonitic, Hendenberiterich, (calcium, iron, pyroxens) skarn rock.

Limonite as a replacement mineral, possibly derived from original sulphides and iron-bearing sulphides.

Chalcopyrite and iron pyrite boxworks are noted, along with ilmenite and radio-active zircons. (CRYTOLITE?)

The upper sections, or cap of the gossan skarn has been consolidated by secondary silica enrichment.

GEOPHYSICS

I.P. geophysical profiles peak over the gossans and indicate that the gossans have a shallow westerly dip.

GEOCHEMICS

Geochemical assays taken over both northern and southern gossans show anomalous up to 0.5% sn and up to 0.4% cu values, with 20 PPM. zn 30 PPB ag. Two geochemical assays show 50 PPB au. A section taken over 20 metres along the wall of an old adit driven into the northern gossan, assayed 0.4% sn 0.2% cu 20 PPM pb 20 PPM zn 20 PPB ag 10 PPB au.

DIAMOND DRILLING

During 1973, Paxminex Pty. Ltd. undertook a diamond drilling programme, drilling three holes in the vicinity of the Stanley Reward gossans, designated D.D.H.^s LCD One LCD Two and LCD Three.

(For drill hole locations etc. refer plan one this report).

Diamond drill holes LCD One and LCD Two were drilled into the approximate central section of the northern gossan.

D.D.H. LCD ONE

0 - 8.5 M	Boulder Terrace.
8.5 - 40.5 M	Altered Granite (weathered?)
40.5 - 70.0 M	Partly altered granite (weathered?)
	End Hole.

D.D.H. LCD TWO

Diamond drill hole LCD Two was drilled in close proximity to D.D.H. One, and directly under the sampled adit as mentioned above.

0 - 4.4 M	Boulder Terrace
4.4 - 7.9 M	2.5 M 0.2% sn 0.15% cu
7.9 - 9.5 M	Narrow granite dyke (apophyse)
9.5 - 19.5 M	10 M of 0.4% sn 0.1% cu
19.5 - 39.9 M	Altered granite end hole.

D.D.H. LCD THREE

Diamond drill hole LCD Three was drilled approximately 75 metres west of the collar of D.D.H. Two to intercept shallow dipping gossan as inferred by geophysics.

0 - 4.1 M	Screg
4.1 - 31.3 M	Sediment (fine grained quartz serilite)
31.3 - 46.3 M	Granite.

No mineralisation.

INTERPRETATION OF PREVIOUS EXPLORATION WORKPETOGRAPHY

The Livingstone Creek gossans have been classified as limonitic pyroxene skarn rock, with limonite replacing much of the original rock. The limonite being derived from original iron bearing sulphides, chalcopryrite and iron pyrite boxworks are notable. Cassiterite is present as fine silica bound grains. The gossan skarn cap rock has been bound by silica enrichment traces of sediment are present.

Traces of sediment and cassiterite within the gossan skarn confirm that the gossan is an in-situe deposit (not transported, or false gossans).

Limonite replacement and silica enrichment is indicative of hydrothermal metasomatic replacement, with silica stabilisation of cap rock.

A high degree of limonite replacement indicates a high original pyritic content within the skarn rock and this is confirmed by iron pyrite and chalcopryrite boxworks within the gossan cap rock.

A high degree of pyritic mineralisation within the original skarn rock is indicative of a high degree of oxidisation and alteration leading to the possibility of metasomatic ENRICHMENT at depth.

During the metasomatic process, acid leaching solutions are formed which may completely dissolve sulphide minerals within the oxidised zone (above water table) forming a leached zone. The leaching solutions also affect a pronounced kaolinization and cericitisation of hydrothermally altered country rock, the degree of alteration depending on the intensity of oxidisation within the original sulphide lode, an intense degree of alteration within the sulphide section, leads to an intense degree of wall rock alteration.

A study of petrographic reports and drill logs (appended to this report) for D.D.H. LCD One and D.D.H. LCD Two, indicates that both drill holes have passed through zones of intense alteration.

D.D.H. LCD Two intercepted cherty carbonate with possible volcanics.

D.D.H. LCD Three intercepted red shale bands.

This subsurface data suggests the likely presence of the favourable red rock marker horizon.

DIAMOND DRILL HOLE LCD THREE was drilled to check geophysical work, which strongly suggested a westerly shallow dip to the Livingstone Creek gossans.

Later exploration work and diamond drilling (G.S.R. 14, 15 and 16) has shown that skarn rocks up to 20M in thickness follow the boundary contact of the Oonah formation and underlying Meridith Granites as shallow dipping in a westerly direction.

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The above condition would explain the geophysical anomaly as ERONEOUSLY APPLIED to the Livingstone Creek gossans.

D.D.H. LCD THREE established granite contact at a depth of 31.3M the contact being 85 metres west of the collar of D.D.H. LCD Two.

DIAMOND DRILL HOLE LCD TWO entered the gossan zone immediately under 4.4 metres of boulder wash, (4.4M - 6.1M 0.37%sn 0.13%cu) drilling highly altered gossan or leached lode zone, with associated tin values (0.42%sn) to 21.5 metres, from 21.5 metres to end of hole at 39.9M.)

The drill penetrated highly altered kaolinitic granite, (no core recovery from 29.0 - 32.6M) with stronger granite (porphyry) core recovered towards the end of the hole.

Core and sludge samples from the altered wall rock drill section show no sn or cu values.

DIAMOND DRILL HOLE LCD ONE. From 8.5 metres to 40.5 metres, no core recovery, sludge only probably highly altered granite, from 40.5 metres stronger granitic core recovery to end of hole at 70.1M.

No sn or cu values in hole.

The granite intercept at 40.5 metres would be approximately 15 metres below the fresh granite contact in LCD 3 (70 metres easterly) with granite alteration continuing for a further 10 to 15 metres, vertically the granite contact at 40.5 metres would be 30 metres below the drill collar.

CONCLUSIONS

It is concluded that the Livingstone Creek Tin Gossans are as in situ deposits.

Diamond drill holes LCD Two and Three suggest the gossans are within geological units considered to be highly favourable as to mineralisation (red rock marker horizon).

Petrographic reports suggest that the gossans are limonitic pyroxene skarn rocks in origin. Exhibiting a high degree of replacement (gossan) and silica restabilisation strongly suggesting hydrothermal metasomatic alteration and replacement.

Wall rock as drilled in LCD One and LCD Two exhibits a high degree of alteration (with kaolinisation) confirming a high degree of hydrothermal leaching and metasomatisation.

The gossan lode skarn as drilled in LCD Two exhibits a high degree of alteration and replacement, it is considered that the non sulphide mineral cassiterite has not been to a large extent affected by leaching solutions, sulphide minerals, as copper lead and zinc would be highly affected, chalcopyrite boxworks together with copper values of 0.3% suggest copper enrichment at depth. Lead and zinc values within the gossans are low, however I would not preclude the possibility of zinc enrichment at depth.

In considering the drill intercepts as plotted, plan one this report, it would appear that the southern section of the northern gossan has an oval or circular central plug of tin mineralisation some 20 metres in width, suggesting a pipe-like structure. In section the gossans appear to mushroom out from this central core (a not unusual feature of gossans).

The metasomatised cap rock of a mineralised limonitic pyroxene skarn, with a central circular or oval plug of tin mineralisation 20 metres in width (or diameter). Tin mineralisation closed to the south open to the north. Dipping easterly at 45° and exhibiting a high degree of lode zone and wall rock alteration to over 30 metres in depth.

RECOMMENDATIONS

The central tin skarn is closed to the south open to the north.

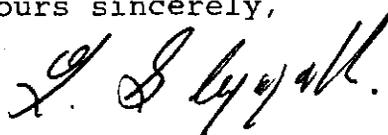
It is recommended that a surface channel chip sampling programme be undertaken to outline the northern extension of the central tin skarn.

Having defined the tin skarn boundaries it is recommended that a single diamond drill hole be drilled vertically.

The drill hole located to co-inside with the central portion of the tin skarn, (as outlined above) and collared at a point 30 metres east of the collar of D.D.H. LCD One, and drilled to a depth of 110 metres.

Such a drill hole would intercept the projected easterly dipping tin skarn at a depth of 54 metres below surface.

Yours sincerely,



T. Sloggett, M.I.M.M.

APPENDIX ONE

LOGS OF DIAMOND DRILL HOLES
LIVINGSTONE CREEK TIN GOSSANS
D.D.H. LCD ONE TO THREE

EL 53/70

TASMANIA

PROJECT AREA: STANLEY RIVER: EL 53/70, TAS.

PROJECT No. 600

SUDDDED: 26.1.74

COMPLETED: 6.2.74

LOCATION: LIVINGSTONE CREEK (LC)

CO-ORDS: X: 556CP569832 Y:

ELEVATION: 295m (approx.)

DIRECTION: 219°M

INCLINATION: -55°

TOTAL DEPTH: 70.1m

HOLE TYPE: D.D.H. / F30 RT DRILL

DRILLING CONTRACTOR: Assoc. D.D.

DRILLER: R. O'NEAL

LOGGED BY: P. MACH.

DATE: 14.2.74

BIT SIZE: NX TO 6.1m;

NQ TO 21.3m;

BQ TO 70.1m.

CORE RECOVERY	METRAGE	DESCRIPTION	Core bedd'g angle and joint spacing	LOG SCALE: 1:100	SAMPLE No.	Assayed length	ASSAY VALUE	
							% Sn	Cu
50%	0	0-8.5m : BOULDER TERRACE. rounded boulders of fine grained (f.g.) hornfelsed(?) quartz-senecite sediment, minor granite.		0				
15	1.2							
75	1.8							
86								
10	5							
6								
SLUDGE	8.53	8.5-40.5m : Non-Core - Sludge only - 0.2-0.5mm felspar + mica (+quartz) light colour sandy. Probably altered granite. Alteration due to pyrite weathering? In nearby gossan.		10				
	10			10.7	A12750	1.5	<0.01	<0.01
	10.7			12.2	A12751	1.5	<0.01	<0.01
	12.2			13.7	A12752	1.6	<0.01	<0.01
NON-CORE	15			15.3	A12753	1.5	<0.01	0.01
	15.3			16.8	A12754	1.5	<0.01	<0.01
				18.3				
	20			19.8	A12755	1.5	<0.01	0.02

CORE RECOVERY	METRAGE	DESCRIPTION	Core bedd'g angle and joint spacing	LOG SCALE: 1:100	SAMPLE No.	Assayed length	ASSAY VALUE	
							% Sn	Cu
86%	42.5	5-10mm quartz and feldspar - 2-5mm biotite granite, with feldspar to 20mm in places; fairly uniform texture to 70.1m			A12772	3.0	<0.01	<0.01
96	45	Limonite on fractures to 70.1m, Limonitic FeMgs to 42.7m, then minor only - nil in white granite: Feldspar creamy to pale yellow (Jadinite? Epidote?)			12773	3.0	<0.01	<0.01
99	50	40.5-42.7m: Core crumbly 13-20 breaks/metre.			12774	3.0	<0.01	<0.01
96	50	42.7-57.3 - fresher granite minor limonite only replacing mica past 52m 6-9 breaks/metre.			12775	3.0	<0.01	<0.01
98	55				12776	3.0	<0.01	<0.01
60	60	57.3-63.6: 12-15 breaks/m.			12777	3.0	<0.01	<0.01
48	60				12778	3.0	<0.01	<0.01
81%	62	63.4-63.7: dark tourmaline rich patches 63.6-70.1m: 6-12 breaks/m.			12779	3.0	<0.01	<0.01

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HOLE No. LCD2

PAGE 1 OF 4

PROJECT AREA: STANLEY RIVER: EL53/70, TAS. PROJECT No. 600
 SPUNNED: 8.2.74 COMPLETED: 12.2.74
 LOCATION: LIVINGSTONE CREEK CO-ORDS: X: 5560569832 Y:
 ELEVATION: RL295m (approx.) DIRECTION: 244° M INCLINATION: -40° TOTAL DEPTH: 39.9m
 HOLE TYPE: D.D.H./F30 RT DRILLING CONTRACTOR: Assoc. D.D. DRILLER: R. O'NEAL
 LOGGED BY: P. MACN. DATE: 15.2.74 BIT SIZE: NX(HQ) TO 6.1m; NQ TO 131 } NX ~ 67cm TO
 } NQ ~ 4.5cm

CORE RECOVERY	METRAGE	DESCRIPTION	Core bedd'g angle and joint spacing	LOG SCALE: 1:100	CORE SAMPLE No.	Assayed length	ASSAY VALUE				
							% Sn	% Cu	% Zn	% Pb	% Ni
31%	0	0-4.4m: Boulder terrace possibly on scree. Mainly schistose quartz sericite hornfels, minor granite and gossan boulders.			A12782	2.1m	<0.01	<0.01	<0.01	<0.01	<0.01
25	0-2.1m	hornfels + minor granite.			12783	2.3	0.35	0.01	0.02	<0.01	<0.01
	2.1-3.1m	Gossan - SCREE?									
	3.1-4.4m	hornfels + gossan scree.									
32	5	4.4-7.9m: Gossan, in situ?									
	4.4-6.1m	blue black fibrous gossan.			12784	1.7	0.37	0.13	0.03	<0.01	0.01
	6.1-7.3m	brown, clayey and cherty limonitic gossan; platy 50-70° to C.A.									
47		7.3-7.9m: d. brown earthy and black metallic gossan, planar structures 50° to C.A. (core axis)			12785	1.2	0.12	0.24	0.03	<0.01	<0.01
45		7.9-9.5m: Granite, highly altered, fine grained in part, crumbly.			12786	0.6	0.03	0.21	0.04	<0.01	<0.01
25		contacts/flow lines 20-40° to C.A.			12787	0.7	<0.01	0.16	0.03	<0.01	0.01
35		9.5-19.5m: Gossan - dark brown to blackish, limonitic, metallic to clayey: possible sediments, including red chert (Renison Horizon?); granite(?) 19-19.3			12788	0.6	<0.01	0.03	0.01	<0.01	0.02
60		blue-black heavy gossan speckled green 12.8-13.4m, 13.7-18.0m. Elsewhere banded 20° to C.A. in places.			12789	0.3	<0.01	0.04	0.01	<0.01	0.01
50	10	13.6-13.7: pink-brown cherty pitted rock some brown clay - possibly "red chert" horizon?			A12790	0.3	0.02	0.14	0.03	<0.01	<0.01
60		dark brown clayey, crystalline(?) rock, speckled green "clay" - altered basic rock? 9.5-9.8m, 18.0-19.0m			12791	1.0	0.45	0.18	0.03	<0.01	<0.01
73					12792	0.5	0.11	0.23	0.03	<0.01	<0.01
15					12793	0.6	0.27	0.25	0.03	<0.01	<0.01
10					12794	0.6	0.36	0.17	0.03	<0.01	<0.01
60					12795	0.3	0.13	0.24	0.05	<0.01	<0.01
60					12796	0.3	0.71	0.03	0.03	<0.01	<0.01
20					12797	0.3	0.77	0.09	0.03	<0.01	<0.01
40					12798	0.3	0.24	0.18	0.05	<0.01	<0.01
15					12799	0.5	0.48	0.07	0.02	<0.01	<0.01
15	15				A12800	0.6	0.47	0.10	0.02	<0.01	<0.01
0					No	RECOVERY					
25					12801	0.6	0.63	0.08	0.02	0.01	<0.01
35					12802	0.7	0.43	0.10	0.03	<0.01	<0.01
65					12803	0.6	0.45	0.04	0.02	<0.01	<0.01
90					12804	0.6	0.41	0.13	0.02	<0.01	<0.01
90	18.1	19-19.3m: granite(?) - 1mm quartz felspar yellow, kaolinitic soft rock.			12805	0.6	0.34	0.13	0.03	<0.01	<0.01
45					12806	0.4	0.50	0.07	0.03	<0.01	<0.01
65					12807	0.3	0.10	0.05	0.02	<0.01	<0.01
0	20	19.5-21.0m: No Core recovered.			No	RECOVERY					

CORE RECOVERY	METRAGE	DESCRIPTION	Core bedd'g angle and joint spacing	LOG SCALE: 1:100	SLUDGE SAMPLE No.	Assayed length	ASSAY VALUE	
							% Sn	% Cu
		SLUDGE SAMPLES						
	0							
	5							
	6.1	6.1-7.9m: blackish-brown fine grained sand.			A12825	1.2	0.08	0.16
	7.3				12826	0.6	0.11	0.15
	7.9	7.9-9.6m: yellowish sand clayey in part.			12827	0.7	0.06	0.11
	8.6				12828	1.0	0.02	0.03
	9.6	9.6-13.1m: moderately dark brown clayey sand.			12829	0.6	0.34	0.11
	10.2				A12830	0.6	0.32	0.14
	10.8				A12831	0.5	0.18	0.16
	11.3				12832	0.6	0.16	0.22
	11.9				12833	0.6	0.19	0.16
	12.5	13.1-21.6m: fine grained blackish brown sand and silt, black sand only in places. (As for 6.1-7.9m).			12834	0.6	0.14	0.21
	13.1				12835	0.6	0.40	0.13
	13.7				12836	0.6	0.46	0.09
	14.3				12837	0.6	0.48	0.10
	14.9				12838	0.6	0.37	0.15
	15.5				12839	0.6	0.47	0.12
	16.2				A12840	0.6	0.47	0.09
	16.8				12841	0.6	0.48	0.09
	17.4				12842	0.6	0.44	0.08
	18.0				12843	0.6	0.34	0.09
	18.6				12844	0.9	0.36	0.08
	19.5				12845	0.9	0.34	0.08
	20.4				12846	0.9	0.21	0.06
	21.3	21.6-22.9m dark grey silty fine sand.			12847	0.9	0.12	0.04
	22.2							
	22.5							

D.D.H. LCB2LIVINGSTONE CREEKSTANLEY RIVER, TASMANIA1. 0 - 4.4 m

Boulder terrace (or scree ?) possibly on scree.
Mainly schistose quartz sericite hornfels, minor granite and gossan

1.1 0 - 2.1 m

Boulders 0.03 - 0.2 m in core of schistose quartz sericite hornfels (country rock) and minor granite.

1.2 2.1 - 3.1 m

Boulder ? - blue black 'metallic' cellular gossan with radiating goethitic structure. Scree ?

1.3 3.1 - 4.4 m

Boulders ? , mixed, of blue black 'metallic' gossan and hornfels. Base of colluvial scree ?

2. 4.4 - 7.9 m

Gossan, in situ.

2.1 4.4 - 6.1 m

Gossan; in situ; blue black cellular with radiating fibrous ('woody') texture forming bands at 70-80° to C.A. (Core Axis) minor MnO₂. 8-20 breaks/m in the core.

2.2 6.1 - 7.3 m

Gossan; red brown, yellow brown and blackish brown, earthy (clayey) and cherty, dense, limonitic platy structure 50-70° to C.A., some fibrous structure 20° to C.A.; 10-40 breaks/m.

2.3 7.3 - 7.9 m

Gossan; dark brown limonitic earthy and black 'metallic' types planar structure 50° to C.A.; 10-40 breaks/m.

3. 7.9 - 9.5 m

Granite, highly altered, possible chilled or finer phases; crumbly.

3.1 7.9 - 8.6 m

Granite; brown goethite studded with quartz 7.9-8.3 m, then goethitic coarse grained granite 8.3 - 8.6 m.

3.2 8.6 - 9.2 m

Granite, fine grained (2mm) cream to salmon altered clayey, crumbly. Limonite fracture and contact of coarse and fine grained granite at 20° to C.A. at 8.6 m (parallel felspar laths - flow lines ?).

3.3 9.2 - 9.5 m

Granite, coarse grained (10 mm quartz grains), highly altered, crumbly; 5 - 10 mm grain size. Contact at 9.2 m is 45° to C.A. Contact (?) at 9.5 m at 20-40° to C.A. (granite-sediment contact).

4. 9.5 - 19.5 m

Gossan, possible sediments, including red chert (Renison horizon indicator ?), and possible basic igneous rock. Dark brown to blackish, limonitic clayey moderately heavy and dense.

4.1 9.5 - 9.8 m

Green (serpentine ? malachite ?) and brown clayey rock (ultramafic - check nickel content)

4.2 9.8 - 10.8 m

Brown banded clayey limonite and 'metallic' limonitic goethitic gossan; bands 20° to C.A. 'Contact' at 9.8 m is an irregular limonitic vein 25° to C.A.

4.3 10.8 - 11.3 m

As for 9.8 - 10.8 m yellow brown, clayey; slickensides with pink clay 10° to C.A.

4.4 11.3 - 11.9 m

As above - banded and yellow earthy gossan; bands 20° to C.A.

4.5 11.9 - 12.5 m

'Metallic' goethite, pink clay 'banding' 20° to C.A.

4.6 12.5 - 12.8 m

Green clay, and pink and yellow brown clayey gossan limonitic clay contacts 15 and 14° to C.A.

4.7 12.8 - 13.4

As for 4.4 - 6.1 m; blue black solid gossan, fibrous structure; fibres 20^o to C.A.

4.8 13.4 - 13.6 m

Yellow and brown clayey gossan similar to 9.5 - 12.8m; some green clay 13.5 - 13.6.

4.9 13.6 - 13.7 m

Pink cherty pitted rock, some brown clay. Possibly Renison type 'Red Chert' (or contact rock or lateritized ultramafic.).

4.10 13.7 - 18 m

Gossan (as for 4.4 - 6.1 m) blue black, 'cellular' in places, heavy, 'metallic'.

4.10.1 13.7 - 14.3 m

Gossan, heavy metallic; some clay and some fibrous structure.

4.10.2 14.3 - 14.9 m

Blue black fibrous heavy gossan, pink clay at 14.9 m.

4.10.3 14.9 - 15.5 m

No recovery.

4.10.4 15.5 - 16.1 m

Gossan, blue black, heavy massive and porous sections.

4.10.5 16.1 - 16.8 m

As for 15.5 - 16.1 m with yellow brown clayey sections.

4.10.6 16.8 - 17.4 m

Blue black heavy (?) gossan with green clay speckling and yellow brown clayey sections (check basic rock possibility).

4.10.7 17.4-10.8 m

Metallic blue black (?) gossan; green clay fracture 60° to C.A.

4.11 18.0 - 19.0 m

Gossan (?) - dark brown limonitic clayey rock, no quartz grains; slickensided.

4.11.1 18.0 - 18.6 m

Altered light to dark brown speckled rock (1 mm (?) crystals), green clay in places. Minor heavy fine grained blue black 'metallic' bands (altered basic rock ?).

4.11.2 18.6 - 19.0 m

Limonitic, green and blue speckled altered (?) rock (basic volcanic ?) Talcose at 19.0 m.

4.12 19.0 - 19.3 m

Granite ? - 1 mm quartz-felspar kaolinitic rock, white to yellowish red, sericitic, soft.

4.13 19.3 - 19.5 m

1 mm dark brown non-cellular heavy fine grained rock with very fine elongate crystals (? felspar) - possibly a basalt ?.

5. 19.5 - 21.0 m

No Core.

6. 21.0 - 21.5 m

Red limonitic pitted chert - possibly only cave in.

6.1 21.0 - 21.3 m

Cave in ? Hard very fine grained red brown 'quartzite' or chert similar to 13.6 - 13.7 m limonitic and pitted.

6.2 21.3 - 21.5 m

Cave in ? - rounded and redrilled 3 cm pieces of core. Red brown chert (as for 13.6 - 13.7 m) and blue black fine grained heavy massive gossan.

7. 21.5 - 39.9 m

Granite, mostly uniformly medium grained, kaolinitic, limonite on fractures to 28.9 m; tourmaline veinlets in places; kaolinitic fractures 10° to C.A. Core in 2-18 cm sticks (average 5 cm) and can be just broken by hand. Fractures $10-20^{\circ}$ and 60° to C.A.

7.1 21.5 - 21.65 m

Granite fine grained; 1 mm quartz - biotite - kaolinised felspar - chilled margin ?

7.2 21.65 - 22.3 m

Granite, porphyritic, 5 mm quartz in 1 mm quartz - biotite - felspar matrix. kaolinised; 10° pegmatite vein.

7.3 22.3 - 22.9 m

Granite, porphyritic, 3.5 mm quartz, felspar and biotite in a finer (1.2 mm) quartz - felspar - biotite matrix. Cream colour, kaolinitic, moderately hard.

7.4 22.9 - 23.5 m

Granite (as above), 3-10 mm quartz and felspar in 1-2 mm quartz - felspar - biotite matrix. cream; slightly limonitic and chloritic.

7.5 23.5 - 25.9 m

As for 22.9 - 23.5, crumbly, slight limonitic impregnation.

7.6 25.9 - 26.8 m

As for 22.9 - 23.5, but harder. Tourmaline, veinlets, (20°, 50°, 70° to C.A.) limonite on fractures, weakly impregnating.

7.7 26.8 - 28.00 m

Granite (texture as above; pink; after sulphide ?) veinlets of goethite and quartz - tourmaline; green chlorite - epidote clay on fractures; limonite impregnations and on fractures.

7.8 28.00 - 29.00 m

Granite as above; soft; no limonite; minor clay (green), 10 cm quartz - tourmaline vein at 29.0 m.

7.9 29.0 - 32.6 m

No core. Sludge is light coloured 0.3 mm sand 29 - 30.8 m with magnetite around 29 m. Sand (0.7 mm) 30.8 - 34.4 mm with (?) magnetite and biotite specks.

7.10 32.6 - 36.3 m

Granite porphyry, coarser grained than above. No obvious veining.

7.10.1 32.6 - 33.2 m

Porphyry, coarse grained biotite felspar porphyry - no quartz seen.

1-10 mm red felspar 5mm green chloritised biotite in a yellow and pink felspar - biotite matrix. Xenolith ? Crumbly. Slickensides 80°, 45° to C.A.

7.10.2 33.2 - 33.8 m

No core.

7.10.3 33.8 - 34.4 m

Granite, coarse grained; 5-10 mm quartz 5-15 mm felspar 2mm biotite. Cream, crumbly, kaolinitic, minor 60° slickensides.

25
7.10.4 34.4 - 35.0 m

No recovery.

7.10.5 35.0 - 36.3 m

As for 33.8 - 34.4 m with green chlorite, epidote. Moderately hard. Slickensides 10° , 45° to C.A.

7.10.6 36.3 - 39.9 m

No core. Recovery - sludge only.

SUMMARY

Limonite : 0 - 19.5 m - strong
 19.5 - 28.9 m - mainly on fractures
 28.9 - 36.3 m - none seen.

PMM/LMB

14/3/74

CORE RECOVERY	METRAGE	DESCRIPTION	Core bedd'g angle and joint spacing	LOG SCALE: 1:	SAMPLE No.	Assayed length	ASSAY VALUE				
							%	%	%	%	%
							Sn	Cu	Zn	Pb	
20	15.24 - 28.5 (cont'd)	Minor quartz-pyrite-chalcopyrite-pyrrothite in bands on fractures and in veinlets.				20.5					
100	5cm dyke of chloritic granite (5mm quartz-2mm feldspar-chlorite) at 26.7m with contacts 30° & 45° to C.A.				A 27009	2.1	<0.01	<0.01	0.02	<0.01	
100	Broken core 19.8-20.0m (2-8cm pieces); also 27.1-27.5m with slickensides 0-30° to C.A. (slickenside ridges 90° to C.A. on slick. face)				A 27010	1.9	<0.01	<0.01	0.01	<0.01	
25	Minor limonite on fractures 15.24 - 16.3m.					24.5					
100	Bedding (to C.A.): 10°/16m, 16.8m; 15°/17.4m; 20°/17.8m				27011	1.8	<0.01	<0.01	0.01	<0.01	
100	30°/18.6m; 35°/18.9m; 30°/20.4m					26.3					
100	35°/21.3m; 30°/22.5m; 20°/23.8m				27012	2.1	<0.01	<0.01	0.01	<0.01	
100	15°/24.4m; 10°/25.3m; 20°/25.6m to 27.7m; 30°/28.5m;					28.4					
100	45°/28.9m; 40°/30.3m.				27013	0.8	<0.01	<0.01	0.03	<0.01	
80	28.5-28.9: granite; 1-3mm quartz + 2mm feldspar-chlorite. Limonitic.					29.2					
30	Altered cream feldspar.				27014	0.9	<0.01	<0.01	0.05	<0.01	
90	28.9-29.2m: As for 15.24-28.5m.					30.1					
100	45° bedding; limonitic fractures. Slickensides at 0° to C.A.				27015	1.3	<0.01	<0.01	0.02	<0.01	
100	29.2-29.7m: c.g. porphyritic granite moderately hard. (15mm feldspar 5mm qtz in 1-3mm qtz-feldspar-chloritic matrix); <10% FeMg; feldspar yellowed, limonitic.					31.4					
100	29.7m-31.3m: Sediments - as for 15.24-28.5; bedding 40°-50°.				27016	2.2	<0.01	<0.01	0.03	<0.01	
35	(crosscutting biotite zone (10cm) at 31m.					33.6					
100	31.3-31.7m: Porphyritic granite - 5-10mm quartz-feldspar-green chlorite (after biotite)				27017	2.7	<0.01	<0.01	0.01	<0.01	
100	31.7-46.3: GRANITE					36.3					
100	Porphyritic 1-6mm qtz 1-15mm feldspar in 1-2mm qtz-feldspar-biotite matrix. Biotite <10%.				27018	3.5	<0.01	<0.01	0.01	<0.01	
40	Fine grained (1-3mm) with increased biotite (15%) - 5mm quartz - 15mm feldspar phenocrysts 32.6-33.5m and 36.6-38.7m.					39.8					

APPENDIX TWO

PETROGRAPHIC REPORT

D.D.H. LCD ONE AND LCD TWO

LIVINGSTONE CREEK TIN GOSSANS

EL 53/70

TASMANIA

1. SUMMARYDDH LC1

A9537	39.6-40.6m	Granite
A9527	54.3m	Granite. No cassiterite.
A9528	67m	Potash granite. No cassiterite.

DDH LC2

A9529	3.7m	A hornfelsed tourmalinised, argillite.
A9530	5.7m	Metasomatised skarn rock.
A9531	10.7m	Ferruginised shaly carbonate rock, chalcopryrite and pyrite boxworks.
A9532	12.9m	A hornfelsed basic igneous rock.
A9533	13.6m	A crenulated silicified shale with igneous fragments (?).
A9534	17.1m	Boxworks indicates the original presence of chalcopryrite.
A9535	18.3m	Possible peridotite with olivine and/or pyroxene forms now filled with montmorillonite. Boxwork structure indicates sulphide mineralisation (chalcopryrite) and some fine montmorillonite structures are seen.
A9536	26.7m	A part tourmalinised granite with traces of cassiterite in altering biotite.

Please note that some specimens are very heavily oxidised and altered (silicified) so as to make identification of primary rock types very difficult.

2. INVESTIGATION

A9537 D.D.H. L.C.1, 39.6 - 40.6m

A sample was immersed in immersion oil and examined under low power (60 diameters). Mainly consists of sharp angular fragments (~0.25mm) of clear quartz, fragments of potash feldspar, plagioclase feldspar (?): fairly abundant biotite and a little perthite, from a granitic source. Contaminating chert and a little chlorite are also present.

A9527 D.D.H. L.C.1, 54.3m

A coarse grained granitic rock with large plates of feldspar and biotite and coarse quartz.

In thin section the rock is seen to have a typically granitic texture and consists of mainly replacement perthite and quartz and minor plagioclase (An_9), anti-perthite and biotite. The plagioclase in anti-perthite is undergoing sericitisation along cleavages. Faint zoning of some plagioclase feldspar plates is noted. Replacement perthite is probably due to late stage potash metasomatism of an original more granodioritic rock. The biotite is riddled with radioactive zircon, some sphene and tourmaline inclusions; also some epidote is intergrown with the biotite. A little apatite is seen associated with feldspar.

No cassiterite is seen in the granite which is undergoing alteration.

A9528 D.D.H. L.C.1, 67m

A coarse granitic rock shows weathering and oxidation of biotite with penetration of emanating limonite stain along cleavages of

feldspar and interstices.

Similar to section of A9527, coarse plates of replacement perthite and quartz. Less of smaller plagioclase plates (with few large plates) much sericitised and some are zoned with albite mantles which are clear. Brown biotite occurs with abundant inclusions, including radioactive zircon, apatite, topaz and sphene. The biotite is rather ragged in places and intergrown with epidote locally. Alteration of plagioclase is producing some quite coarse plates of muscovite from growths of fine sericite. Myrmekite development in small clear plagioclase grains is observed.

No cassiterite is seen. This rock is potash granite, rather more altered by potash metasomatism than A9527.

A9529 D.D.H. L.C.2, 3.7m

A fine grain, black and white, evenly banded rock showing a fine cross fracture.

A tourmaline quartz hornfels rock or tourmalinised sediment. The grain size is fairly even, (0.02 to 0.2mm, median 0.08mm) for all the quartz and much of the tourmaline. The tourmaline is sieved with abundant quartz left behind during replacement of shale minerals (?) and quartz shows triple junctions of annealed recrystallised masses. Some quartz bands in the rock are free from tourmaline. The tourmaline is optically negative and uniaxial; pleochroic, red-brown, green and colourless. Specks of high R.I. cassiterite prisms are seen associated with the tourmaline and are finely scattered throughout, and some coarser masses (~ 0.08mm) occur

with tourmaline. Very few occur in the quartz.

A hornfelsed, tourmalinised argillite.

A9530 D.D.H. L.C.2, 5.7m

Radial prisms as stellate clusters, now goethite and secondary hematite, of original hedenbergite (?). Interstitial euhedra (~ 0.1mm) of titanomagnetite are pseudomorphed by parallel intergrowths of hematite and titanohematite.

Highly ferruginised radiate crystals, originally hedenbergite and possibly with associated andradite (?) though it is more likely that euhedral shapes of octahedra and dodecahedra were titanomagnetite because of the presence of secondary titanohematite within them.

A metasomatised (?) skarn rock

A9531 D.D.H. L.C.2, 10.7m

Possible pyrite replicas and chalcopyrite boxworks are present? A fine schistosity, delineated by secondary hematite may indicate ferruginised shales? Bands above this formation show rhombohedral partings delineated by secondary hematite. Possible carbonate present.

A ferruginised shaley carbonate (?) rock with some sulphides shown by rudimentary boxworks.

A9532 D.D.H. L.C.2, 12.9m

A mass of red hematite aggregates which are

commonly surrounded by transparent marginal zones of anhedral goethite. Fibrous and granular greenish montmorillonite occupies interstices as clots. Quartz occurs in rare grains (0.010 to 0.015mm) with the clay.

A radiate fine prism structure for the hematite is seen in polished section. Some hematite pseudomorphs of pyroxene are also observed and may be indicative of rock type (?).

A possible basic rock structure is seen, with absence of silica, and radiate prismatic hematite pseudomorphs which may be after amphibole. Possible metamorphosed ultramafic rock, much ferruginised by weathering process, is a possible interpretation. No gossan or sediment features are discernible.

A hornfelsed basic igneous rock?

A9533 D.D.H. L.C.2, 13.6m

Brownish chert with attached clay mineral.

Fine chalcedonic silica intergrowths of coarse vein framework encompassing fine growths of the mineral. Fine anhedral clear goethite is scattered lightly through the interstices associated in places with a rubbly brown-green tourmaline and possible fine high B.R. and R.I. fine aggregates of cassiterite. Zoning of parallel elongate, fine chalcedony growths with some crenulation around a pseudomorph containing limonitised, fine magnetite is seen under low power, a possible palimpsest texture. More recent secondary silicification took place and so the texture appears only as a 'ghost' form through the recrystallisation fabric. Clots of

39
clear and opaque goethite occur but only as secondary segregations in the chalcedony framework. No other textural characteristics are seen.

Possible crenulated then silicified shale with igneous fragments as xenoliths?

A9534 D.D.H. L.C.2, 17.1m

Radiating needles or decussate prisms of hematite pseudomorphs of hedenbergite (?).

Interstices are filled with equally fibrous clay mineral (montmorillonite) and rubbly granular goethite. Suggests a hornfelsed basic igneous rock? Intermittently with igneous structures are jasperite partitions of pyrrhotite or garnet boxworks shapes and possible bornite structures of curvy lines boxworks.

Hornfelsed basic igneous rock with some pyrrhotite and chalcopyrite mineralisation?

A9535 D.D.H. L.C.2, 18.3m

Some chrysocolla is seen in cellular quadrangular box works, most likely of chalcopyrite (?). Elsewhere typical segregations of form of olvine or pyroxene. A possible peridotite with montmorillonite pseudomorphing forms and at one end of section, some monmorillonite fibres show replacement by hematite.

Fibrous montmorillonite occurs in interstices and in coarse vein.

Possible ultrabasic igneous rock texture discernible but original sulphide mineralisation

40
is seen.

A9535 D.D.H. L.C.2, 26.7m

A coarse granite consisting of coarse irregular quartz; large perthites, part sericitised and large orthoclase masses showing penetration and part erosion by veins of brown tourmaline. Replacement of coarse plates of plagioclase by tourmaline is also seen. Large plates of part-sericitised biotite also occur. A little topaz is seen as euhedra embedded in feldspar. Traces of cassiterite and some zircon occur as inclusions in altering biotite, also some epidote. Grains of cassiterite are 0.003 to 0.005mm in size, are fairly abundant and coloured yellow-brown to brown.

A part tourmalinised and altered granite containing a little cassiterite in biotite.

P.J. CURTIS
(IM)

PACMINEX PTY. LIMITED

MEMORANDUM TO: DR. J.H. RATTIGAN
MR. P.M. MACNAMARA

OUR REF: PJC/SS

FROM: P.J. CURTIS

DATE: 4th January, 1974.

LIVINGSTONE CREEK AREA, TASMANIA, PROJECT 600Introduction

Rocks were submitted for identification of rock type and minerals present.

Summary

A9980 (A12424)

A hornfelsed then pneumatolysed pyritic shale meta-sediment of sericite, quartz, albite, tourmaline, rutile, traces of cassiterite and limonitic pseudomorphs of sulphide.

A9981 (A12426)

Pneumatolysed shaley siltstone of quartz, sericite, phlogopite, actinolite and albite. A contact metamorphosed altered rock. Traces of cassiterite are present.

A9982 (A12439)

A tourmalinised shale of fine tourmaline, sericite and quartz. A little cassiterite may also be present and traces of chalcopyrite. Shearing of this rock has occurred.

A9983 (A12448)

A recrystallised quartz-sericite rock of mainly quartz. Phlogopite and stumpy tourmaline prisms are seen sparsely, more abundant rutile and traces of cassiterite are seen along parallel horizon intervals associated with limonite/specularite.

Pneumatolysed shale rock after contact metamorphism.

A9984 (A12449)

Skarn, metamorphosed rock possibly originally diopside hornfels (?) altered to hedenbergite (shapes of cross sections confirm this), by iron metasomatism. Then weathered to limonite pseudomorphs of hedenbergite.

Details of Investigation

A9980 (A12424) : Pale greenish-brown fine grained flaggy rock.

A fine grained quartz-sericite-albite rock of grain size mainly about 0.10 mm and larger sericite flakes, quartz and albite. Many limonite rich pseudomorphs of sulphide

(probably pyrite) occur, which vary in concentration along different bedding planes. Some of these pseudomorphs now contain albite and others sericite and kaolinite as well as dense iron oxide. About 1 percent of perfectly formed tourmaline prisms occur scattered with rutile and a little irregular cassiterite. Possibly topaz but no fluorite is seen.

In the alternative section provided, occurs a greater density of rutile as fine acicular needles and also ragged irregular biotite flakes are seen and irregular chlorite, quartz, albite and kaolinite. Sericite in this section shows an orientation of flakes in parallel to sub-parallel alignment.

The presence of albite was confirmed by mineral stain.

A hornfelsed then pneumatolysed pyritic shale metasediment

A9981 (A12426) : Massive limestone ?

A shale metasediment but coarser grained than for A9980 and the rock probably was not pyritic.

Pale ragged phlogopite and greenish fibrous actinolite bundles (approx. 3 volume percent) associated with limonite are present showing a parallel orientation of crystals along bedding planes. The phlogopite is sometimes somewhat chloritised.

Sericite varies in density from 5 to 30 volume percent, the difference being made up mainly by recrystallised quartz (approx. 0.10 mm) which as linearly oriented mosaic lamellae shows banding. The phlogopite and actinolite are more patchy in distribution. Scattered water clear albite as simple grains or aggregates were indicated by mineral stain.

Appreciable tiny prismatic tourmaline (0.005 to 0.01 mm) grains are scattered throughout, rutile and apatite in moderate abundance (1 volume percent) with possible cassiterite which is present in traces. Less than 1 volume percent fine specularite also occurs.

Pneumatolysed, contact metamorphosed shaley siltstone.

A9982 (A12439)

Mainly quartz as sheared quartz grains and quartz rock fragments. Minimal sericite is seen between the quartz, mainly fine black needles of tourmaline ($< 5 \times 1 \mu$) as aggregates (stellate or sheaf forms) or solitary grains within many quartz grain boundaries showing that tourmalinisation of quartz-sericite-shale began before

shearing of the rock took place. Also between the quartz grains and part replacing them are clumps of brown rutile with possibly a little cassiterite.

Polished section indicates scattered specularite (approx. 0.030 mm and less) to less than 1 volume percent. Chalcopyrite occurs only as traces of tiny grains. Abundant tiny rutile flakes are seen, up to 3 volume percent as clumps showing grey reflection and yellow internal reflection. Replacement of quartz grains is noted.

A tourmalinised shale which was subsequently sheared.

A9983 (A12448)

A recrystallised quartz sericite rock showing quartz in irregular sutured mosaics and as polygonal forms showing stress relief as lenticles alternating with fine sericite; and as poikiloblastic grains with fine sericite inclusions. Quartz and sericite in laminae aggregation indicate banding to the rock. Brownish rutile aggregates form laminae parallel with the banding. Tourmaline (brownish-green) occurs as stumpy prisms oblique to banding. Scattered pale phlogopite as ragged and faintly pleochroic plates also occur associated with the sericite.

Cassiterite is seen in fractures parallel to banding associated with more abundant tourmaline and some rutile. The cassiterite is more irregular and paler and with slightly lower birefringence than the rutile. There is an association of cassiterite with recrystallised sericite along the fractures.

Polished section shows specularite (up to .030 mm in size and less) and goethite grains to less than 1 volume percent of the section. Traces also of chalcopyrite (approx. 5 μ size) are seen.

A9984 (A12449) : Livingstone Creek Adit

A skarn type of contact metasomatism by iron bearing solutions, the result of possible conversion of diopside hornfels rock to hedenbergite at some little distance from a granite contact. The mineral is now represented by iron oxides pseudomorphing radiate groupings of slender prisms. No other minerals are seen.

Hedenbergite rock.

..... J. Arthur

VALLEY EXPLORATION HOLDINGS
PTY LTD

LIVINGSTONE CREEK TIN GOSSANS

5 cm

SCALE 1:5000
DRAWN T.M.S.
DATE 25/7/88

PLAN ONE

- MEREDITH GRANITE
- DONAH FORMATION
- ALTERED LORE ZONE
- ZONE OF INTENSE WALL ROCK ALTERATION
- GOSSAN
- COLLUVIUM

