GEOLOGICAL MAPPING AND MINERALOGICAL EXAMINATION OF ZINC MINERALIZATION ON THE BOUND AND TANIS CLAIMS

by Timothy Liverton Ph.D FGS

Watson Lake Mining Recorder's District
NTS 105B-3
Latitude and Longitude: 60°10'N, 131°16W to 60°06'N, 131°08'W

Claims: Bound 1 to 36 (YB15809-YB16140)
Tanis 1 to 50 (YB16408- YB16457)
Owners: Hardy Hibbing, Saïd R. Secerbegovic
Work performed: fieldwork 19th. & 20th; 25th. to 27th. July 1997;
laboratory work 28th. & 29th.November 1997.

This report has been examined by
the Geological Evaluation Unit
under Section 53 (4) Yukon Quartz
Mining Act and is allowed as
representation work in the amount
of $ 7300.00 .

for Regional Manager, Exploration and
Geological Services for Commissioner
of Yukon Territory.

CONTENTS

HISTORY OF PROSPECTING IN THE REGION

The first systematic programme of mineral exploration attempted in the upper Swift River region was prospecting by the Hudson Bay Mining and Smelting Company in 1947. Pyrrhotite-zinc mineralization on the Bar (Dan) property was discovered at that time. A comprehensive exploration programme over the Swift River area was carried out by Boswell River Mines in 1968 to investigate airborne geophysical anomalies. Access roads and survey grids were laid out at that time and various geochemical and ground geophysical methods were employed. Anomalous areas were tested by a limited amount of diamond drilling (McLeod and Sevensma, 1969). The current claim block covers portion of the original Rex and Rusty Valley prospects and surrounds the Mod prospect. Prior to the current work in the region mineralization had been assumed to be of skarn type, associated with metasomatism introduced peripheral to the Seagull batholith.

CURRENT WORK

Work during 1997 consisted of reconnaissance geological mapping over two parts of the Bound and Tanis claim blocks, with the following aims:

(i) To investigate eastward continuity of a known mineralized carbonate unit eastward from the the TBMB claims past the Mod block;

(ii) At the eastward end of the Tanis block to examine the sediments close to the Seagull batholith and to determine whether this portion of the claim block has obvious potential for mineralization and whether it should be retained.

Rock specimens were collected and sent for either thin section or polished thin section preparation to investigate mineralogy of prospects from these claims and to make comparison with material from the TBMB and Bar prospects ('Window' and 'Lucy' showings) in order to develop a model for mineralization in this region.

TERRANES AND REGIONAL GEOLOGY

The Swift River area is at the eastern edge of what has been called the Dorsey terrane (Wheeler et al., 1988). The western part of the terrane in in the Thirtymile Range to the west of the Swift River region contains siliciclastic and minor carbonate units that, although discontinuous and largely unfossiliferous, bear similarity to North American stratigraphy from Proterozoic to Mississippian age (Gordey, 1991, 1992; Harms, 1992; Liverton 1990, 1992; Gordey and Stevens, 1994). Mylonitic zones and flat-lying pressure-solution fabric, with top-to-east shear sense (Liverton, 1992) indicate that this part of the terrane has been deformed and probably imbricated prior to the mid Jurassic since basic to acid plutons of that age lack penetrative deformation (Liverton, 1992;

Liverton and Alderton, 1994; Gordey and Stevens, 1994). The eastern part of the Dorsey terrane (the Dorsey assemblage of Stevens and Harms, 1995) have three recognisable major units. The lowest is greenschist to amphibolite grade siliciclastics and metaplutonic rocks which are in turn intruded by the Ram Stock. Much of the Tanis claim block contains this unit. According to the latter authors this unit of the Dorsey assemblage is in thrust-faulted contact with their Imbricate assemblage that separates the faulted units from undisputed North American strata. This assemblage of metavolcanics, siliciclastics and carbonate contains the Zn-Pb-Ag mineralization of the Dan (Bar) property and includes basic volcanics along the Swift River previously mapped as Slide Mountain terrain. The existence of the Dorsey assemblage as a distinct terrane is in doubt: the various units are likely to represent displaced portions of North American strata and Yukon-Tanana terrane (J.K. Mortensen, pers. comm., January 1998).

Mineralization at the Bar (Dan) prospect consists of finely-bedded largely strata-bound sulphides in black shale, sphalerite-pyrrhotite and banded magnetite in chloritic or amphibole-rich metavolcanics and finely-banded sphalerite and galena in marble and calc-silicate lithologies. Mineralization is distributed over a strike-length of >7 km between the Bar ('Window') showing and Crescent Lake. This mineralization was previously interpreted to be skarn (Bremner and Liverton, 1991) on the basis of calc-silicate gangue mineral assemblages, however the finely-banded nature of much of the sulphide, consistency over a considerable strike length and recent discovery of a tubeworm fossil at the 'Window' exposure indicate that these prospects are of VMS type proximal to a hydrothermal vent. There exists the possibility that the mineralization at the Tanis claims is of similar type.

THE TANIS AND BOUND CLAIMS: GEOLOGY

Eastern Part of the Claims

A small apophysis of the Seagull batholith crops out on the southern part of the Tanis 40 claim. The intrusive rock is an even-grained biotite leucogranite. Boulders in the creek immediately NE of the outcrop show frequent fine-grained, quartz-rich miarolitic cavities. Sediments at the granite contact are chert. At the head of the dry north fork of the creek {Fig 1, loc. A} black argillite is interbedded with chert. Frequent quartz veins and tension-gashes cut the sediments. At {loc. B} S-C fabric in a fine-grained sandstone bed indicates the existence of a NW-SE trending sinistral shear zone with steep S dip. No carbonate sediments were noted in this region of the claim block.

Analyses of the Seagull leucogranite from immediately SW of the Tanis 29 and 39 claims (Table 1) indicates that this lithofacies of the batholith is an extremely 'evolved'

granite: n.b. high Fe to Mg contents, Differentiation Index and Rb/Sr ratio, and such a granite might be expected to have proximal cassiterite-bearing stockworks in the aureole. No sign of any quartz stockwork veins were seen.

Table 1. Analyses of Seagull granite.

Field No.	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	TiO_2	MnO	P_2O_5	Total
07/21-1	76.53	12.65	1.64	0.08	0.6	3.40	4.91	0.12	0.02	0.04	99.96
07/21-2	76.23	12.45	1.55	0.05	0.6	3.50	5.21	0.10	0.01	0.02	99.72
08/21-1	76.20	12.60	1.44	0.06	0.5	3.55	5.13	0.09	0.01	0.03	99.56
	LOI	Ga	Sr	Rb	Ba	Zr	Nb	Th	Y	"D"	Rb/Sr
07/21-1	0.44	27	12.6	588	39	169	81	68	127	93.6	47
07/21-2	0.47	28	2.6	631	15	201	92	100	164	94.2	243
08/21-1	0.24	28	4.6	618	26	175	82	79	122	94.5	134

Analysis by X-Ray fluorescence spectrometry of fused glass disks for major elements and pressed powder pellets for trace elements. Analyses are shown as anhydrous totals for major elements. LOI is 'loss on ignition'; 'D' is the calculated Thornton-Tuttle differentiation index.

Western Part of the Claims. (A) Carbonate Horizon

Traversing across the Bound claim block eastward from the TBMB claims indicates that there is a general continuity of an impure carbonate horizon southeatward across the Mod property and to the top of the ridge to the east {Loc. C}. On the Bound 24 claim this horizon crops out as 2 to 3 metre thick interbedded marble and calc-silicate units with some quartzite, with an estimated thickness of over 20m. A south-easterly strike and 60° SW dip prevails. At least part of the mineralization on the TBMB property is contained within this calc-silicate horizon. On the east spur of the ridge {Loc. D} the horizon appears as white marble, but continuity eastward could not be followed due to scree cover of much of the slope. The trace of the carbonate horizon on the next ridge {Locs. E & F} is consistent with little change in attitude and no fault displacement along Rusty Springs vallley. Again, attempts to follow the horizon down the east face of the next ridge {Loc. G} were foiled by extensive scree cover.

(B) Fault Zones

Existence of a possible low-angle thrust-fault zone on these claims is provided by a zone of metre-scale phacoids of marble and siliciclastics exposed in the saddle at {H}. Immediately below this level and towards the STQ prospect {Loc. I} a pervasive shallow north-dipping pressure solution cleavage in the siliclastics attests to some shearing, which may represent the footwall of a thrust zone. Mylonite blocks may be found in scree at {Loc. J}: see Fig 11. Continuity of the marble horizon indicates that such a fault must crop

out immediately above the trace of the carbonates at {Loc. K}. A rapid change in dip of the sediments from 60° to 35° above may mark the fault. Since this fault crops out above the trace of the mineralized carbonate bed it does not affect the potential for mineralization along that horizon.

The existence of a pervasive flat-lying pressure-solution cleavage, often with S-C fabric evident in the silicilastic sediments on the claim block does indicate that the whole metsedimentary package has been sheared. This deformation, however, may not represent a high amount of strain and observed stratigraphy and continuity of mineralized horizons may not be greatly affected.

(C) New Mineralization Found

At {Loc. L} at elevation approximately 5200 ft., magnetite and sphalerite in banded to massive form were found (during the current work) within the carbonate horizon described in section (A). At this locality the thickness of the marble-calc silicate exceeds 15 metres, but exposure is not continuous, much of the ridge being obscured by grass or scree. This mineralization is a continuation of the horizon on the Mod claims.

PETROGRAPHY. (a) BOUND CLAIMS: EXTENSION OF THE MOD MINERALIZATION

Three specimens were collected from grid reference 777688 {Loc. L}. A summary of their mineralogy from thin and polished section microscopy is as follows:

Specimen 777688a Approximately 75% of the rocks is compposed of euhedral magnetite crystals of 1-2mm grainsize. A little remnant calcite is present which contains 0.2mm sized crystals of allanite. Much of the matrix is acicular tremolite. Part of the matrix also has ragged, elongate grains <1mm long of (?) phengite. Some pyrrhotite is also present.

Specimen 777688b This rock is finer-grained than (a), but of similar mineralogy. Magnetite forms clusters of tiny crystals, ≤0.03 mm, enclosed in randomly oriented anhedral tremolite of ≤1mm long. A faint foliation is defined by magnetite banding, but some crystals obviously have formed along cross-cutting fractures.

Specimen 777688c

This rock is distinctly banded in hand specimen but is very like (b) in thin section. Magnetite forms clusters of tiny crystals. The tremolite matrix is of anhedral 0.5mm grains. Magnetite forms hollow clusters (0.3mm size) at one end of the section.

(b) Bound Claims: Examination of Siliciclastic Metasediments Immediately Below the Marble Horizon.

A specimen of the siliciclastic sediments was taken from below the marble horizon, 300m east of the Mod prospect for identification.

{Loc. M} UTM 760701: Micaceous Quartzite.

Consists of alternating bands of quartzite to 12mm thick alternating with more micaceous layers of around 2mm. The quartzite layers have a strong foliation: quartz grains 0.3x0.1mm are formed of sub-grains, some showing polygonisation. Iron hydroxides, muscovite and chlorite (rarer) highlight the foliation. Occasional clasts of K-feldspar, plagioclase and epidote are seen. Weak shear bands (C-S fabric) are developed. A few 0.8mm long lozenge-shaped grains now containing opaques may be remnants of garnet. Pelitic layers (<2mm thick) have >60% coarse muscovite (0.5mm long crystals) with a little chlorite.

DISCUSSION: MINERALIZATION IN THE SWIFT RIVER AREA

Mineralization on the original Bar (Dan) prospect (the current Park claims) is now recognised by the currently operating exploration company to be of VMS type rather than being skarns associated with a hidden apophysis of the Seagull batholith. Silicate mineralogies are dominated by actinolite-chlorite, however some pyroxene-garnet assemblages are noted, both from the 'Window' showing of the Bar prospect and from the 'Lucy' showing further to the NW. Alternating layers of amphibole with differing iron content (tremolite versus actinolite) are observed. Distinct separate bedding layers of magnetite-, pyrrhotite- and sphalerite-rich mineralization are seen.

At the TBMB prospect sphalerite and sulphide mineralization is seen in amorphous carbonate with epidote group mineral assemblages. Ore-minerals again vary according to layering in the rock.

At the new showings seen on the easternmost Bound claims during this work, which are likely to be an extension of the TBMB/Mod horizon, the silicate mineralogy is tremolite rather than actinolite with magnetite, although some possible phengite was noted. Such a mineral assemblage is common to either a metasomatic origin with a greisen overprint (Kwak, 1987) or to an exhalative source. It is posible, therefore, that the mineralization following the carbonate horizon on the Bound-Tanis claims is of exhalative origin.

FUTURE WORK ON THE BOUND-TANIS GROUP: RECOMMENDATIONS

The known mineralization within the carbonate unit crossing the Bound-Tanis claims offers the best prospect on these claims. Future work should be:

(i) Detailed geological mapping of the showings at {Loc. L} to see if there is a zonation between sphalerite and magnetite mineralization;

(ii) Representative sampling of exposures and assays should be attempted to determine zinc and precious metal grades;

(iii) A reconnaissance surface magnetic survey should be attempted to determine if the magnetite horizon has continuity (although there may not necessarily be a spatial relationship between magnetite and sphalerite: the geological mapping should help to determine this). This geophysical work may aid prospecting over the areas of scree cover.

APPENDIX 1. Mineralogy of Zinc Mineralization in the Swift River Region.

(B) BRIEF NOTES OF THE MINERALOGY OF THE TBMB PROSPECT FOR COMPARISON

Specimen numbers refer to trenches as identified in the report by Hibbing (1993). PTS indicates that a polished section was available for identification of opaques.

Trench 2 sample a: the specimen collected is a quartzite showing a distinct pressure-solution cleavage. It contains some thin layers of tremolite. The larger quartz clasts in the quartzite have sub-grains showing undulose extinction. Amphibole is also developed in tension gashes and veins parallel to the shear bands (C-S fabric). One 4mm scale intrafolial fold was noted.

Trench 2 sample b: This rock is of very fine-grained sideritic carbonate and clinochlore. Of the 'ore' minerals sphalerite predominates, forming irregular masses that enclose some iron sulphides (<1%), up to 1/4 of the slide area. Occasional euhedral allanite is associated with the sulphides.

Trench 5 sample b: Half of the section consists of anhedral unstrained quartz, brown garnet and opaques with ragged sideritic carbonate. Some quartz is in 0.3mm basal section crystals. The other part of the section consists of granulated quartz with ≈10% ragged sideritic carbonate in fine layers with some clinochlore which defines a foliation giving one tight fold closure. Some of the more euhedral quartz crystals have thin layers of white mica (<0.05mm thick) along their interlocking grain boundaries.

Trench 7 sample a: Carbonate-bearing pelite. Shows highly foliated layers (≈0.5mm thick) of biotite-siderite-clinozoisite-opaques alternating with quartz (angular to sub-rounded grains) in biotite. Opaques (anhedral, but often elongate with some recognisable pyrite cubes) are contained within the foliation planes.

Trench 7 sample b: Siderite-clinochlore-clay mineral rock. Contains bands of marcasite (PTS) with pyrite. The carbonate is very turbid, however the opaques are rimmed by more transparent, probably recrystallised, material.

(C) BRIEF SUMMARY OF THE MINERALOGY OF THE 'LUCY' SHOWING (PARK CLAIMS) FOR COMPARISON

Specimens were taken over a stratigraphic width of only about 4 metres. Mineralogies exhibited on this property are consistent with the protolith being an altered basic volcanic. The various mineral assemblages seen in this exposure are:

Magnetite-actinolite alternating with bands of epidote;

Pyrrhotite-coarse actinolite with quartz;

Banded epidote-actinolite-quartz-pyrrhotite;

Actinolite- epidote-sphalerite-pyrrhotite;

Section entirely of chlorite.

100 metres SE, the 'Upper Lucy' showing, in addition to similar assemblages has an outcrop of diopside/hedenbergite-actinolite-garnet-chlorite-sphalerite.

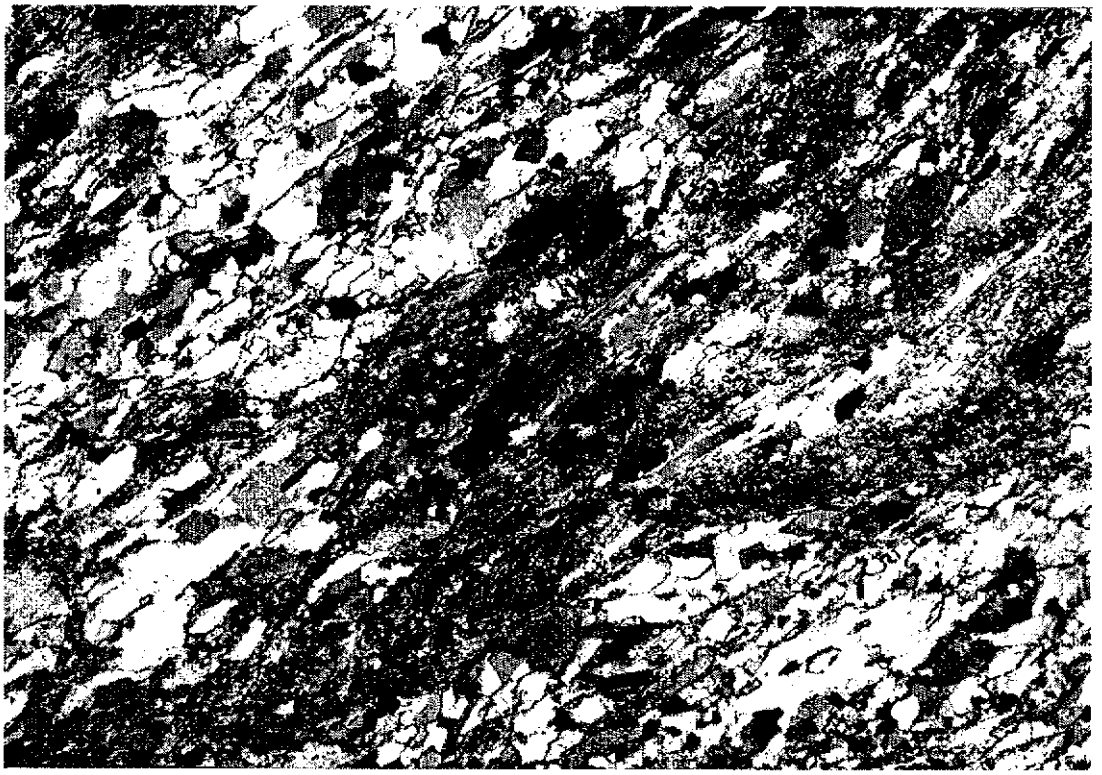

Figure 2. Locality {760701} Photomicrograph of micaceous quartzite. Crossed polarizers, width of field= 1.2 mm. Note shear band (near horizontal and 1/3 of way up photograph).

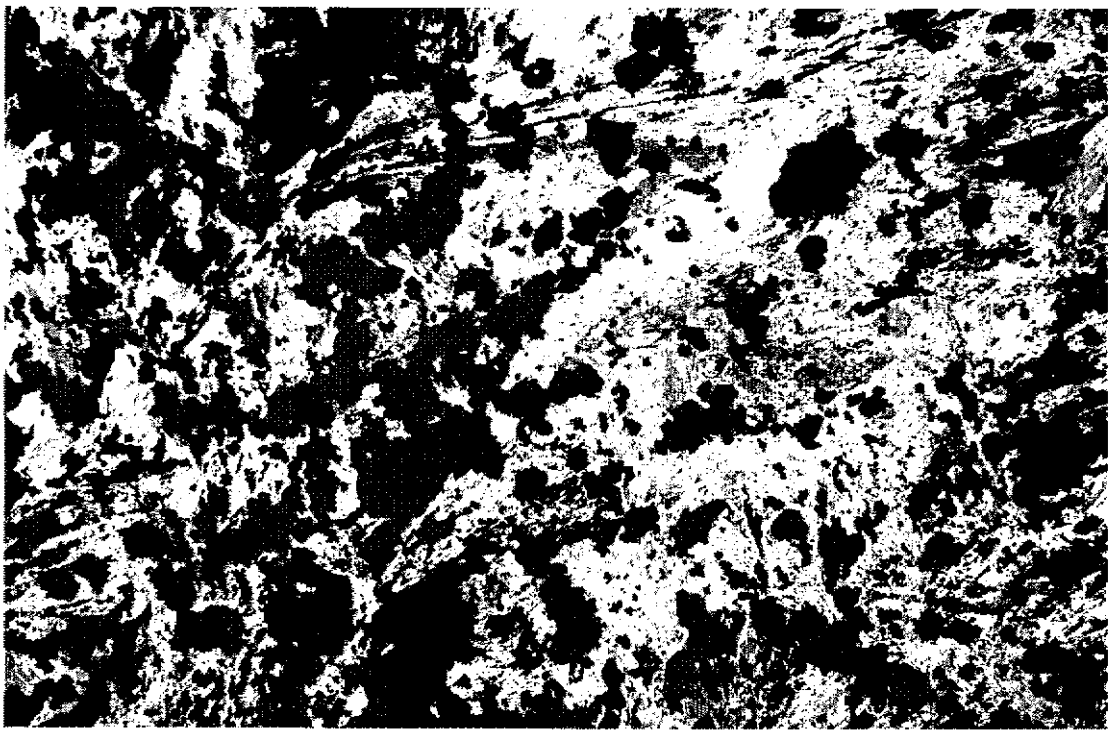

Figure 3. Locality {777688} spec. b. Photomicrograph under crossed polarisers. Width of field 5mm. Banding in magnetite is SW-NE, vein is NW-SE.

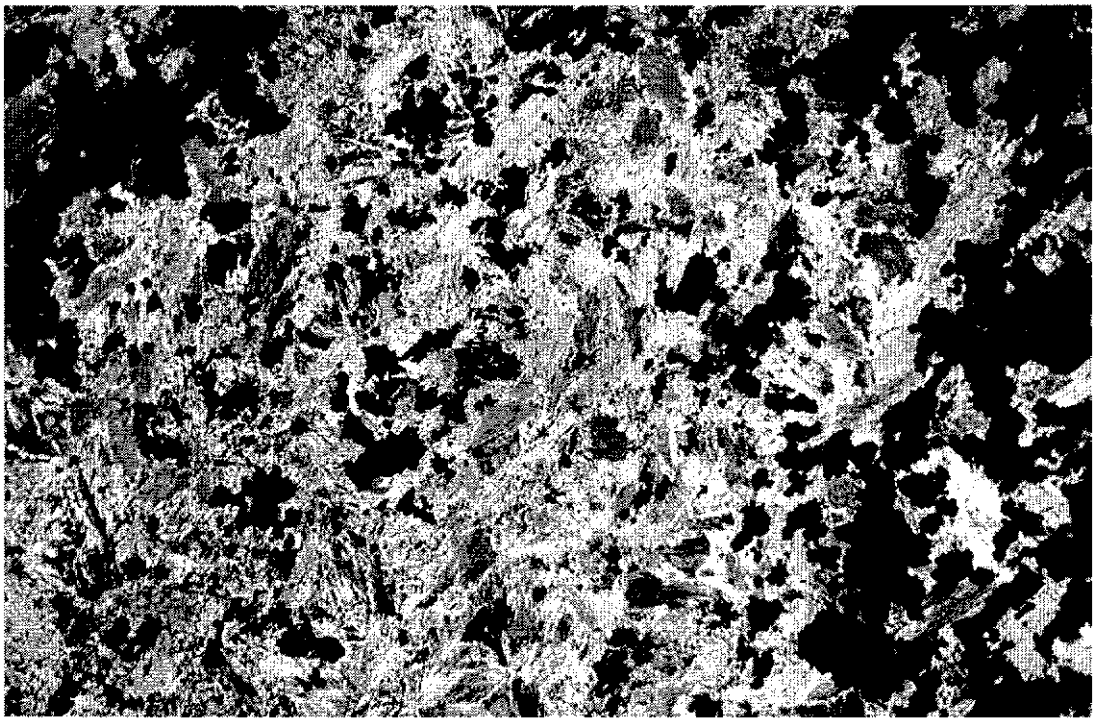

Figure 4. Locality {777688} spec. c. Photomicrograph under crossed polarisers. width of field 5 mm. Magnetite and phengite.

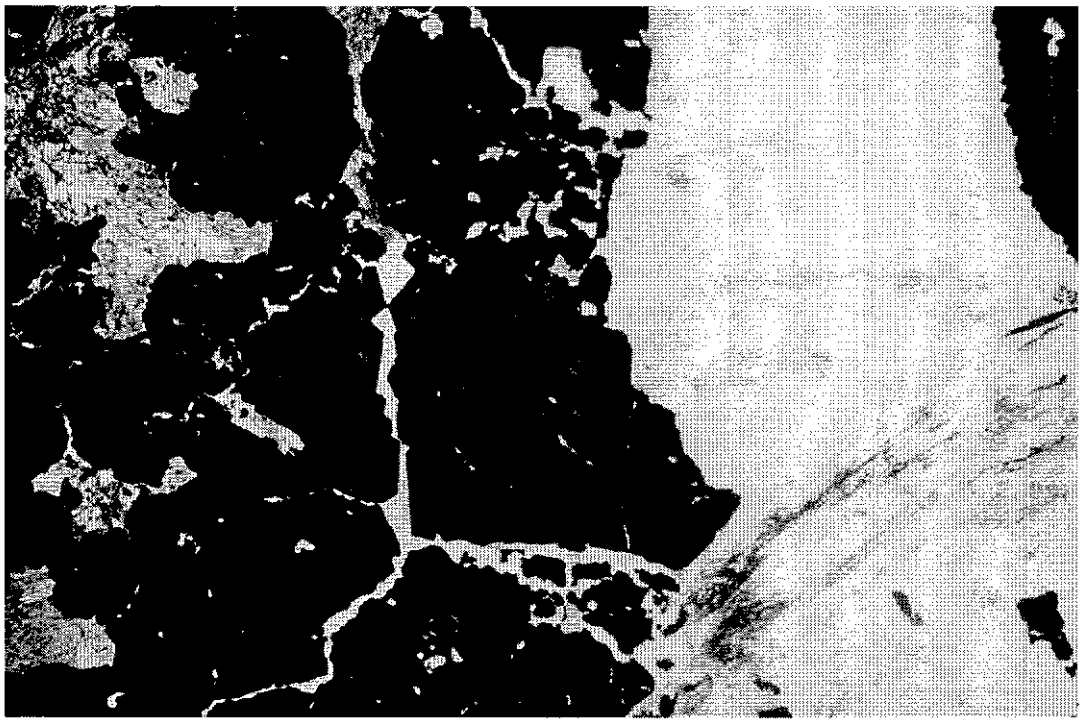

Figure 5. Locality {777688} spec. a. Photomicrograph under crossed polarisers. Width of field 5 mm. Coarse magnetite, carbonate and amphibole.

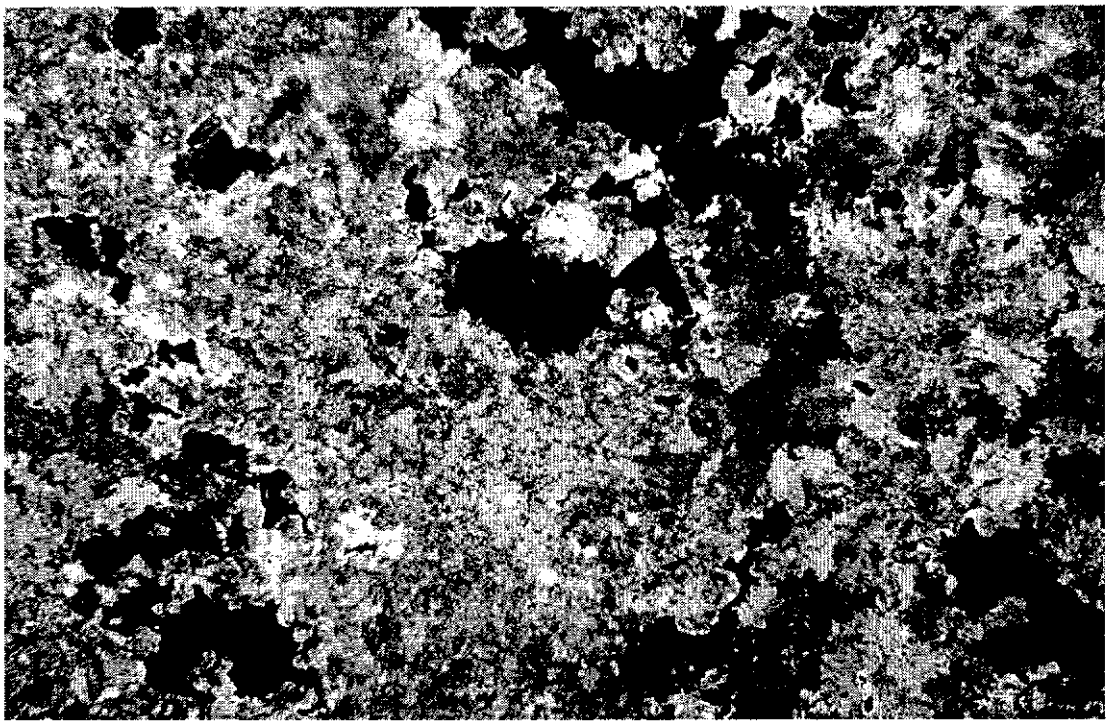

Figure 6. TBMB trench 2b. Photomicrograph under crossed polarisers. Carbonate, chlorite, clays (mid grey), sphalerite (black). Width of field 5 mm.

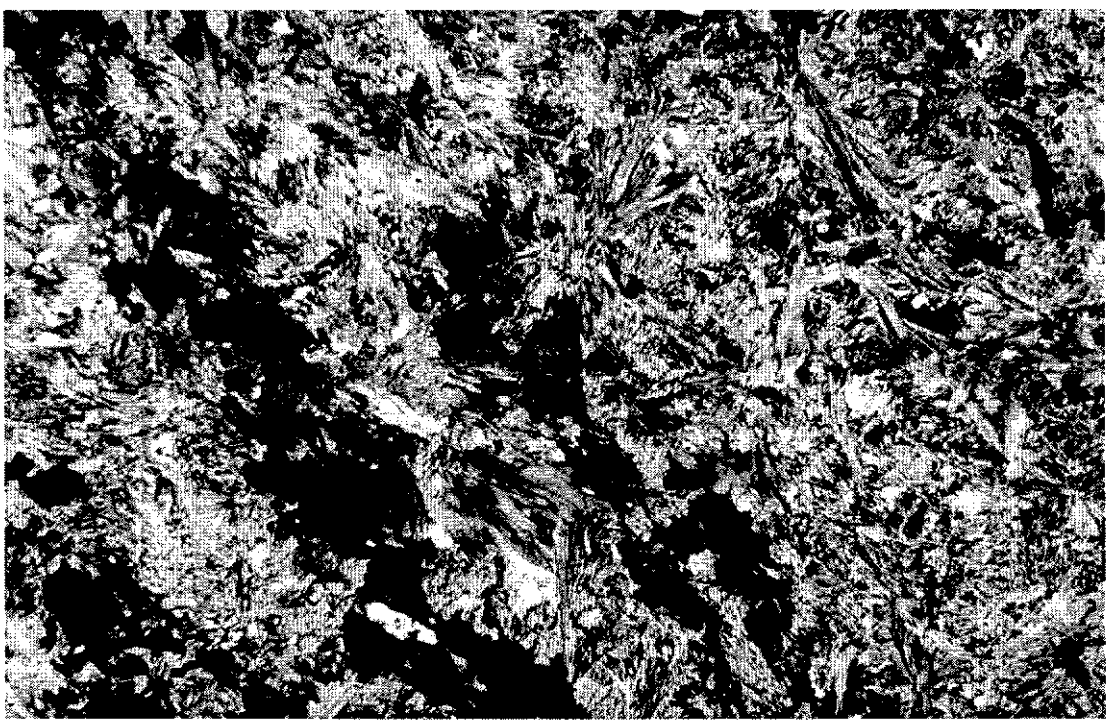

Figure 7. 'Lucy' showing. Spec. 25-2. Banded pyrrhotite in actinolite. Crossed polarisers. Width of field 5 mm.

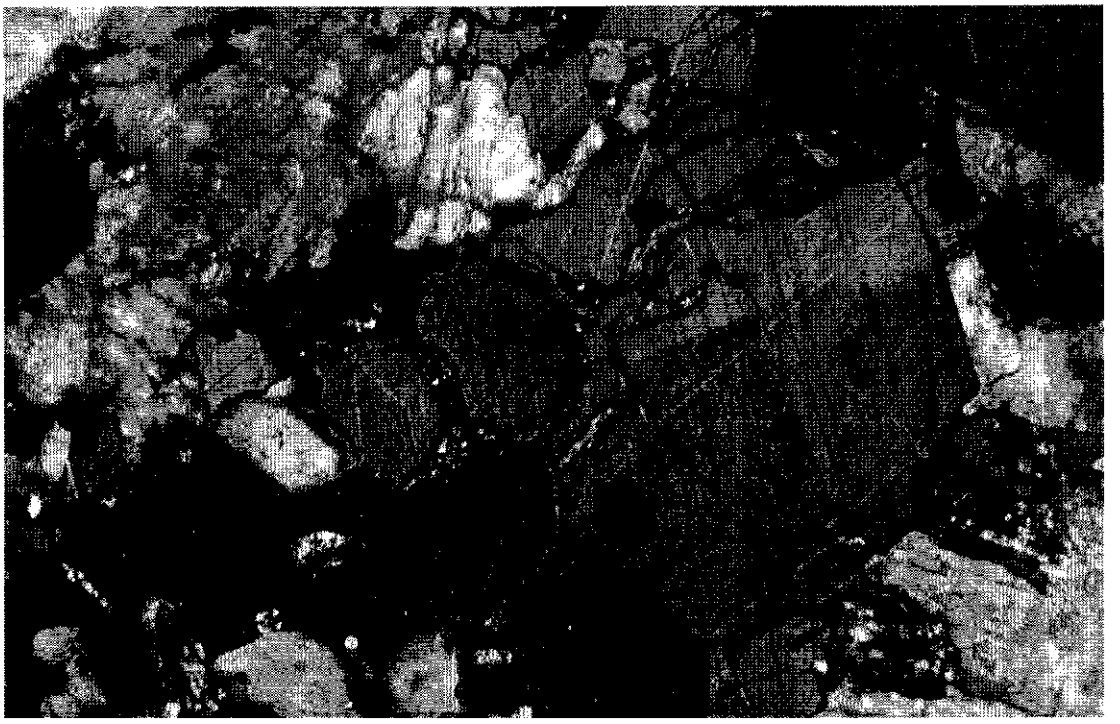

Figure 8. Locality {777688} spec. a. Pyrrhotite crystals in carbonate. Reflected light crossed polarisers (oil immersion 20x objective). Width of field ≈1.5mm.

Figure 9. TBMB trench 5b. Pyrite and galena in sphalerite. Reflected p.p. light. Oil immersiion, 20x objective. Width of field ≈1.5mm.

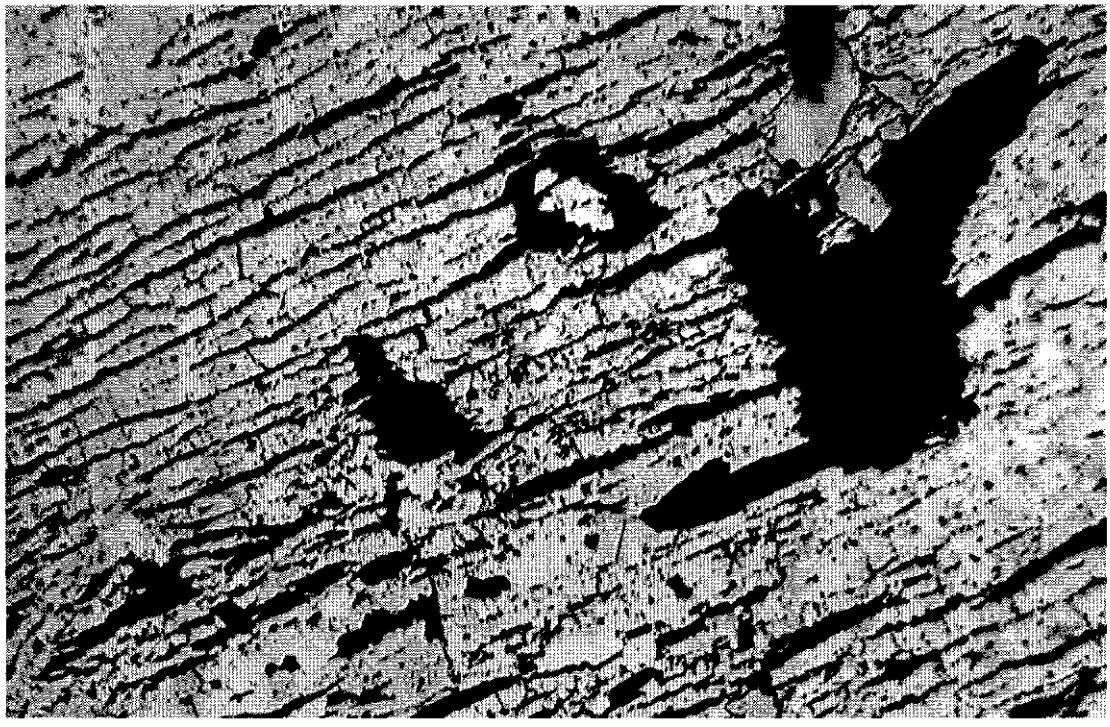

Figure 10. TBMB trench 7b. Marcasite and pyrite. Reflected p.p. light. Oil immersiion, 20x objective. Width of field ≈1.5mm.

Figure 11. Refolded folds in mylonite from the Bound 24 claim: sawn and polished slab, scale 85%.

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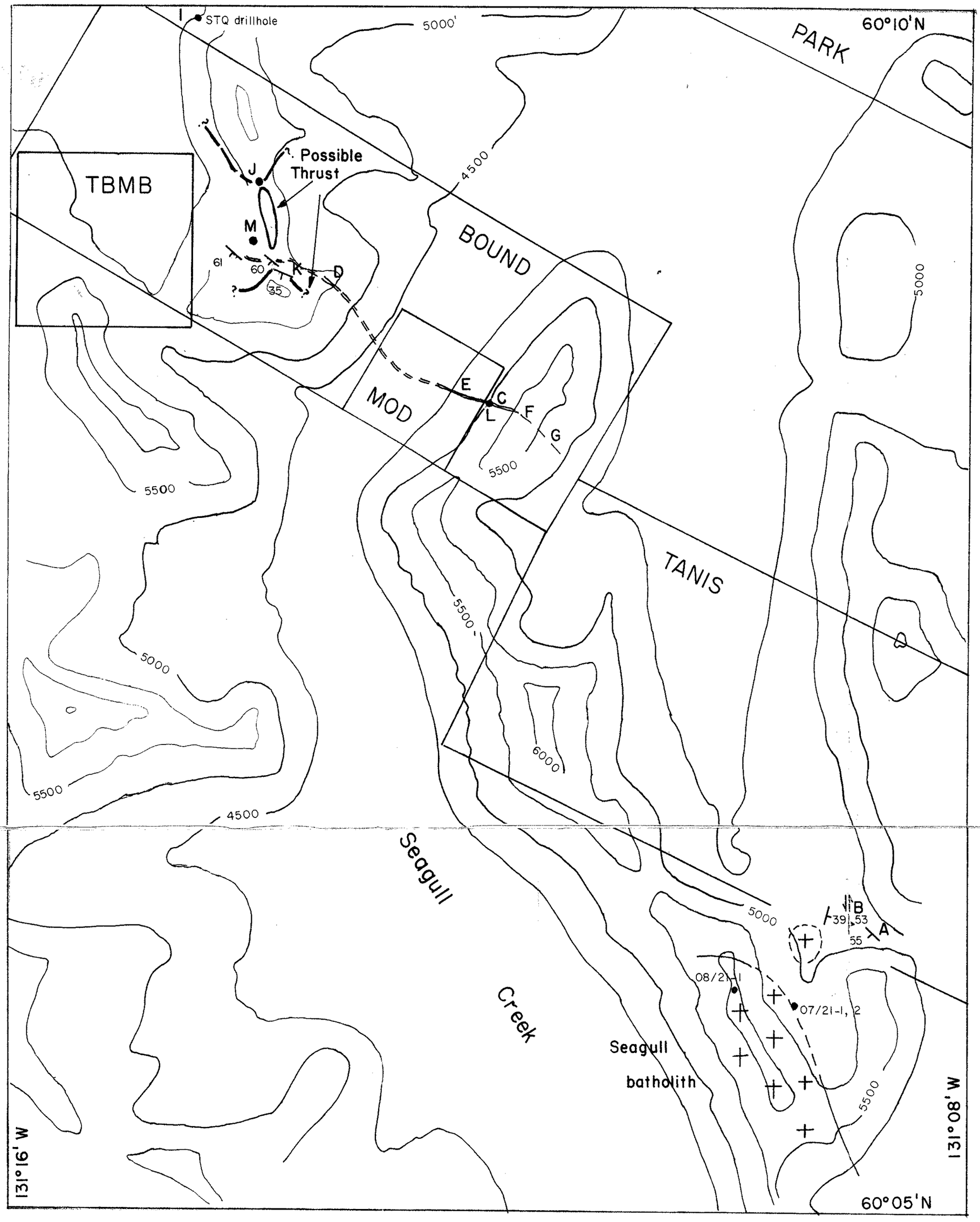
STATEMENT OF QUALIFICATIONS

TIMOTHY LIVERTON:

Degrees obtained: B.Sc. in Geology and Geophysics, University of Sydney, 1965; B.Sc. Hons. in Economic Geology, University of Adelaide, 1967; Ph.D. Royal Holloway, University of London, 1993.

Experience: 25 years in mineral exploration and mining in Australia, Greenland, Norway, Portugal, Brazil, U.K., U.S.A. and Canada; 5 years in museums and as a university lecturer.

Professional Membership: Fellow of the Geological Society, Member of the Geological Society of America, Member of the Geological Association of Canada.



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GEOLOGICAL RECONNAISSANCE 1997

T. Liverton, January 1998.