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E.L. 48/70 AND E.L. 49/70

DEPARTMENT OF MINES

NORTH-WESTERN TASMANIA

JOINT VENTURE EXPLORATION

BY

AUSTRALIAN CONSOLIDATED INDUSTRIES LTD.

CONSOLIDATED GOLD FIELDS AUSTRALIA LTD.

MT. LYELL MINING AND RAILWAY CO. LTD.

RENISON LIMITED

REPORT WRITTEN BY: D.H. BELL,
SENIOR GEOLOGIST,
A.C.I. LTD.

DATE: JUNE, 1972.

A B S T R A C T

Regional field investigations during the report period were concentrated in the coastal plain area from Granville Harbour north to the Pedder River, with stream sediment sampling, reconnaissance geological mapping and rock sampling designed particularly to test any association of tin mineralization with the three Devonian granite bodies in the Exploration Licence areas. Detailed evaluation was carried out in areas of known mineralization within the coastal plain area (specifically, the Interview River tin-tungsten workings and the Copper and Silver Reward workings), and of a number of aeromagnetic and geochemical anomalies located during preliminary investigations.

The wolfram-bearing veins of the Interview River tin-tungsten workings are late-stage magmatic products occurring within the granite body, and are small (less than 0.5 metres in width and 10 to 30 metres in length) and irregularly mineralized: The possibility of developing an economic open-cut tungsten mining operation is considered extremely unlikely, particularly in view of the remoteness of the area, and the nature of the veins would certainly preclude any large-scale underground mining. Satisfactory interpretation of soil geochemical data cannot be made without follow-up costeaning and sampling, although it is probable that further tungsten-bearing veins could be located: There does not appear to be any possibility of developing alluvial tin deposits in the area.

The Copper Reward and Silver Reward workings have been developed on narrow (maximum exposed width 0.5 metres), steeply-dipping hydrothermal veins occurring within the Interview Siltstone, and possibly genetically related to the nearby Interview River Granite: Relatively rich copper and silver-lead ore are associated with the respective workings, and further prospecting may be warranted as the area has been inadequately appraised geologically. However, there is certainly no indication that major ore bodies outcrop in the area, and the massive, "recrystallized" quartzites (which locally carry pyrite and haematite) are not regarded as hydrothermal "lodes".

Anomalous stream sediment tin values were obtained from an area of approximately 400 hectares including part of the South Pieman Head Granite and the adjacent Precambrian sediments, and subsequent pitting, geochemical sampling and mineralogical studies have shown that cassiterite is being shed immediately from a thin veneer (less than 1 metre thick) of Tertiary quartzose sands and gravels. The mineralogical investigations suggest that both the sub-angular cassiterite and the coarse, fresh sulphides (including pyrrhotite-cassiterite intergrowths) are being shed from a bedrock source in the immediate vicinity, possibly the granite-sediments contact.

A number of the aeromagnetic anomalies interpreted by C.G.G. were evaluated on the ground, and most were attributed to differing magnetic susceptibilities associated with contrasting lithologies. The Rupert Point anomaly, which is marginal to the Interview River Granite, was inadequately appraised, since the source is apparently located at some depth below the ground surface. The Hoyle Creek anomaly occurs at the south-western extremity of the major aeromagnetic anomaly extending through Corinna to the Savage River iron ore deposits, and coincides with rocks of the Arthur Lineament:

The anomaly source is attributed to magnetite (either disseminated or in lenses) associated with amphibolite bodies, and the occurrence of further major iron ore deposits at depth in the area is probable.

As a result of the field investigations carried out during the report period, and from a consideration of previous mining and exploration activities in the areas not evaluated on the ground, it is recommended that E.L. 49/70 be relinquished in its entirety, and that E.L. 48/70 be reduced to approximately 100 km^2 including specifically the South Pieman Head Tin Prospect and the Rupert Point aeromagnetic anomaly. A limited exploration programme is proposed for 1972-73 in the South Pieman Head area, involving ground magnetometry, costeaning, geochemical sampling and mineralogical investigations designed to locate the bedrock source of the detrital cassiterite: A budget allocation of $36,000 is recommended.

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SYNOPSIS

1. SCOPE OF REPORT:

This report has four principal aims, as follows:-

1.1. To present the results of investigations carried out on E.L. 48/70 and E.L. 49/70 (North-Western Tasmania) during the 1971-72 exploration year.

1.2. To synthesize and evaluate the data obtained, with particular reference to areas of known mineralisation and to those in which geophysical and/or geochemical anomalies have been delineated.

1.3. To formulate further evaluation programmes for selected areas whose retention is recommended.

1.4. To recommend for deletion from the two Exploration Licences those areas from which results to date are considered sufficiently unpromising as to warrant NO further investigation.

It is noted that this report incorporates results of the proposed exploration outlined in the 1970-71 Annual Report for E.L. 48/70 and E.L. 49/70 (Newnham, 1971), and the data presented here should be considered in conjunction with that earlier report. It is further noted that this report incorporates the results of investigations carried out by, or under the direction of Renison Limited geological staff in the period prior to the writer's involvement in the project in November, 1971, and due acknowledgement is made.

2. SUMMARY AND CONCLUSIONS

2.1. Outline of Geological Investigations during Report Period

2.1.1. Preliminary Investigations

Preliminary investigations were carried out in the period August to November, 1971, and included:-

1. Preliminary ground magnetometry and reconnaissance stream sediment sampling in the coastal section south of the Pieman River mouth.
2. Hand-auger sampling of the dune sands developed between Granville Harbour and the mouth of the Pieman River.
3. Reconnaissance stream sediment sampling in the Corinna area.

2.1.2. Summer Field Programme

A major field programme was planned and implemented in the period November 1971 to February 1972, involving:-

1. Regional investigations in the coastal area from Granville Harbour north to the Pedder River, with stream sediment sampling, reconnaissance geological mapping and rock sampling designed particularly to test any association of tin mineralization with the three Devonian granite bodies in the Exploration Licence areas.

2. Detailed evaluation in areas of known mineralization within the coastal area (specifically, the Interview River tin-tungsten workings and the Copper and Silver Reward workings), and of a number of aeromagnetic and geochemical anomalies located during the preliminary investigations.

2.1.3. Subsequent Field Investigations

Field investigations were carried out during March to April 1972 to provide additional data on the geochemically anomalous tin areas at South Pieman Head.

2.2. Evaluation of Areas of Known Mineralization

2.2.1. Interview River Tin-Tungsten Workings

2.2.1.1. Past Production:- Limited prospecting for alluvial tin (cassiterite) has been carried out in a number of coastal streams draining the Interview River Granite in the area between the Interview River and Chimney Creek: Total production of concentrates appears to have been negligible, and the tin has apparently been derived from the tungsten-bearing veins in the area.

Tungsten mineralization has been worked in a number of quartz-tourmaline veins occurring within the Interview River Granite pluton in this same area, the principal prospects being Cooney's workings and Kenny's workings: Total tungsten production has probably not exceeded 5 long tons of 65% WO_3 concentrates.

2.2.1.2. Nature of Vein Deposits:- At least three types of vein appear to be recognizable, viz.

1. Quartz veins (which are entirely barren of other mineralogical constituents);

2. Quartz-tourmaline-muscovite veins; and

3. Quartz-tourmaline-muscovite veins carrying sporadic sulphide (pyrite and arsenopyrite) and tungsten (wolfram and minor scheelite) mineralization. The veins vary in width from a fraction of an inch ("veinlets") to an observed maximum of 0.4 metres, with strike lengths from a matter of metres to a maximum of 120 metres: Generally, exposed vein lengths are of the order of 5 to 20 metres, and widths in the range 0.2 to 0.35 metres.

The veins generally strike between 20° and 60° east of true north, with a majority striking between 25° and 45°: Dips are near vertical, varying between 80° to the north-west and 80° to the south-east. There does not appear to be any preferred orientation of the individual "productive" veins (although exposures are inadequate to verify this), while the vein system developed

in Cooney's workings appears to have an en echelon (?) north-south trend, and this may have some relationship to ore distribution.

Henderson (1943) records that the wolfram ore occurs in "shoots" or lenses within the veins, the length of these shoots being of the order of only 3 to 4 metres: No preferred orientation or elongation of these shoots is suggested.

Henderson (1943) estimates the average grade of ore (presumably within ore shoots) as approx. 25% by volume of wolfram, although grades of this order are not evident in the observed mine dumps and vein workings: Again, the incidence of ore shoots would probably not exceed 25% of the vein lengths, and Henderson's estimate applies only to the vein width (and does not allow for dilution by a factor of about 5 during even selective underground mining).

2.2.1.3. Distribution of Geochemical Tin Values:-

Stream sediment sampling in the area of the Interview River tin-tungsten workings has revealed minus 85 mesh tin values generally in the range 200 to 400 ppm Sn, with isolated higher values up to 1,000 ppm: Some major branches of streams reveal values in the range less than 10 to 200 ppm. The existence of stream sediment tin values up to 200ppm Sn in some streams to the east (upstream) of the Interview River Granite and the tin-tungsten workings suggests that the tin, although possibly derived from the tungsten-bearing deposits, has been redistributed by processes of erosion, possibly during the Tertiary.

Soil sampling on the southern, and particularly the south-eastern, part of Cooneys' Shaft Soil Grid has yielded minus 85 mesh tin values in the range 50 to 200 ppm Sn, with a significant proportion (about 10%) in the range 200 to 1,000 ppm, and isolated values in excess of 1,000 ppm: To the north of Cooney's workings, and in the vicinity of Kenny's workings, minus 85 mesh tin values are generally less than 10 ppm. The soil sampling does not show any obvious association of minus 85 mesh tin values with the known workings, the highest values occurring in an apparently north-south trending (?) zone about 300 metres east of Cooney's Shaft: The tin values are apparently randomly distributed between the A (humic) and B-C (leached soil - weathered bedrock) soil horizons.

2.2.1.4. Distribution of Geochemical Tungsten Values:

Close interval soil sampling over parts of both Cooney's and Kenny's workings has

revealed that some 70% of the samples have minus 85 mesh tungsten values in the range 50 to 200ppm WO_3, with about 15% of the values above 200ppm WO_3 (with a maximum of 350 ppm) and a similar proportion less than 50ppm: On this evidence, soil values in excess of 50ppm WO_3 may be indicative of the presence of tungsten-bearing vein mineralization.

To the north and south of Cooney's workings, minus 85, mesh tungsten values on Cooney's Shaft Soil Grid are in the range less than 10 to 90ppm WO_3: The only significant anomalous area is that about the old Tungsten Reward workings. In the vicinity of Cooney's Workings, soil samples contain between 30 and 174ppm WO_3, which may be indicative of further undisclosed tungsten-bearing veins in the area, or be a function of dispersion about the existing vein system.

2.2.1.5. Economic Potential of the Deposits:-

The possibility of developing alluvial tin deposits in the area is extremely doubtful, and in view of its remoteness and the existence of better prospects at South Pieman Head, further work does not appear justified.

From the nature of the vein deposits and the relative remoteness of the area, the possibility of developing an economic open-cut tungsten mining operation is considered extremely unlikely: The nature of the veins would certainly preclude any large-scale underground mining.

The writer does not consider that satisfactory interpretation of the geochemical soil values (both tin and tungsten) can be made without follow-up sampling and costeaning, and it is probable that at least further tungsten-bearing vein systems could be located: This however, would be most unlikely to alter the economic potential of the area.

2.2.2. Copper Reward and Silver Reward Workings

2.2.2.1. Copper Reward and Associated Workings:-

The Copper Reward workings have been developed on a single steeply dipping "vein" varying in exposed width from 0.2 to 0.5 metres, and carrying chalcopyrite and covellite: Production has been minimal. Three grab samples from an ore dump at the Copper Reward workings indicated an average grade of 11.5% Cu, 1.9 ozs. per ton of silver and 0.04 ozs. per ton of gold.

Similar copper mineralization occurs in collapsed surface workings some 200 metres north-west of the Copper Reward shafts, although a Precambrian dolerite body separates the two prospects.

2.2.2.2. Silver Reward Workings:-

The Silver Reward shaft has been sunk on rich argentiferous galena ore occurring in a steeply dipping "vein" essentially concordant with the enclosing siltstones: The "vein" was reportedly 0.6 metres in width at the surface, and could only be traced for 1 to 2 metres along strike. Three grab samples from an ore dump indicated an average grade of 40.8% Pb, 16.5 ozs. per ton of silver and 0.02 ozs. per ton of gold.

2.2.2.3. Other Prospects:-

Prospecting has been carried out on a number of massive "recrystallized" quartzites outcropping in the area, which locally carry pyrite and haematite: No other metallic minerals were apparently found.

2.2.2.4. Economic Potential:-

The Copper Reward and Silver Reward workings have been developed on hydrothermal veins occurring within the Interview Siltstone, and are possibly related genetically to the Interview River Granite: Further prospecting may be warranted, as the area has been inadequately appraised geologically, although the vein exposures are certainly not extensive nor particularly encouraging.

Further prospecting of the massive "recrystallized" quartzites does not appear warranted, as the writer does not consider these to be hydrothermal "lodes" (c.f. Ward, 1911).

2.3. Evaluation of the South Pieman Head Tin Prospect

2.3.1. Stream Sediment Sampling

2.3.1.1. Minus 85 mesh tin values in stream sediments from a north-south elongated area approximately 1200 metres by 4000 metres, and including part of the south Pieman Head Granite and the intruded sediments to the north, ranged generally from 200 to 2,000 ppm Sn, with isolated values as high as 7,000 ppm: Comparative assay data on the minus 52 plus 85 mesh fraction of some of these samples confirmed that significant coarser tin was also present, although mineralogical examination of a panned stream sediment sample revealed that the cassiterite was well rounded, and presumably some distance from its source.

2.3.1.2. Minus 85 mesh stream sediment tin values ranging from 200 to 500 ppm, with isolated higher values up to 5,000 ppm, were obtained from Webster's Creek, which entirely drains Precambrian sedimentary rocks to the north of the South Pieman Head Granite: Values from other streams in the area were generally in the range less than 10 to 200 ppm Sn, with occasional higher values.

2.3.1.3. Copper determinations on these stream sediment samples revealed values generally less than 50 ppm Cu, although isolated higher values were obtained over the granite, and five samples over a 500 metre length of Violet Rivulet (entirely within sedimentary rocks) yielded total copper values ranging from 230 to 830 ppm: These higher copper values were not obviously associated with higher tin concentrations.

2.3.2. Soil Geochemical Data

2.3.2.1. Soil sampling on a 200 feet square grid over part of the anomalous stream sediment area within the granite body yielded minus 85 mesh tin values generally in the range less than 10 to 200 ppm Sn, with isolated values up to 1,000 ppm and an exceptional sample containing in excess of 16,000 ppm: Copper values were generally less than 100 ppm Cu, although higher values (up to 500 ppm) were obtained, with no obvious relation to tin.

2.3.2.2. Subsequent pitting and costeaning in the area has shown that soil sampling was confined to a veneer of Tertiary quartzose sands and gravels covering the granite, and these values are therefore unrelated to underlying bedrock mineralization (although an obvious source of the stream sediment tin values): The later mineralogical identification of coarse cassiterite and sulphides carrying cassiterite (ranging up to 16 mesh B.S.S.) suggests that the selection of the minus 85 mesh fraction was unsatisfactory.

2.3.3. Pit Sampling Data

2.3.3.1. A total of thirteen pits were sunk over the principal anomalous stream sediment area, including both the granite and the immediately adjacent contact sediments: These pits were sunk by hand to an average depth of 1.5 metres, and the area was found to be covered by a thin veneer of Tertiary quartzose sands and gravels ranging in thickness from 0.40 to 1.16 metres, and averaging 0.73 metres.

2.3.3.2. Weighted assays of minus 5 mesh Tertiary gravel samples from nine of the pits gave a mean value of 0.067% Sn over 74.7 cms, with tin contents ranging from 0.03% to 0.22% Sn: The assay method used, however, has a lower limit of detection of 0.03% Sn, and the "true" mean is probably somewhat lower.

2.3.3.3. A fossil humic horizon averaging 0.18m in thickness was developed on weathered bedrock in twelve of the thirteen pits (layers of clay and sand being found in one pit), and samples from eight pits assayed contained a mean of 0.065% Sn over 20 cms, individual samples ranging from

0.03% to 0.18% Sn: The same comments as in 2.3.3.2. apply regarding reliability of assay data.

2.3.3.4. Incomplete geochemical assays on weathered bedrock samples have yielded tin values generally less than 10 ppm Sn, both in weathered granite and siltstone: However, some weathered granite samples have yielded tin values as high as 2,500 ppm Sn, the higher values apparently corresponding with tourmaline development.

2.3.3.5. Mineralogical studies of selected Tertiary gravel and weathered bedrock samples have revealed the presence of significant concentrations of coarse to fine-grained, sub-angular cassiterite (occasionally intergrown with quartz): Minor fresh, relatively angular, and generally coarse sulphides have also been identified, including pyrite, pyrrhotite, chalcopyrite and pyrrhotite-cassiterite-tetrahedrite intergrowths.

2.3.4. Source of Tin Values

2.3.4.1. Although the principal anomalous stream sediment tin values have been derived immediately from the Tertiary gravels, it appears probable that the tin has been derived from a bedrock source in the immediate vicinity: The values in Webster's Creek have probably been derived from Tertiary gravels outcropping in the area, although further geological investigation is clearly required.

2.3.4.2. Further prospecting will be directed toward locating and evaluating the source of the tin, which could be
1. Quartz-tourmaline-sulphide cassiterite veins within the granite (as at Mt. Heemskirk); or
2. Mineralization within the marginal contact sedimentary rocks, such as that at Renison Bell and Mt. Cleveland, where tin is associated with pyrrhotite and carbonate rocks (although no granite bodies outcrop in the immediate mine areas).

The presence of significant quantities of spinel minerals in the Tertiary gravel samples studied suggests a contact occurrence, although both could be developed.

2.3.4.3. The fact that the aeromagnetic survey did not reveal any anomalies in the area (as could be expected with major pyrrhotite mineralization) is not regarded favourably, although the main flight lines were sub-parallel to the regional strike of the Precambrian sedimentary rock units.

2.3.5. Economic Potential

2.3.5.1. The tin concentrations within the Tertiary gravels appear to be too low, and the thicknesses of gravels themselves too small, to support an economic alluvial mining operation: However, insufficient sampling has been carried out to reliably estimate mean grades and thicknesses.

2.3.5.2. Any economic potential of the prospect would appear to be related to the location of an orebody within the intruded sediments adjacent to the stanniferous (?) South Pieman Head Granite, and preferably associated with carbonate rock types: Vein mineralization within the granite body, as at Mt. Heemskirk, is regarded less favourably, although the possibility of open-cut operations on the granite could be considered.

2.4. Evaluation of Selected Aeromagnetic Anomalies

2.4.1. Chimney Creek Anomaly

2.4.1.1. The Chimney Creek aeromagnetic anomaly appears to be related to differing magnetic susceptibilities of the Lagoon River Quartzite and Interview Siltstone outcropping in the area, the anomaly coinciding with the latter unit.

2.4.1.2. A ground magnetometer peak extending over some 300 feet, and located in evaluating the aeromagnetic anomaly, coincides with laterite development within the Interview Siltstone: Geochemical data from soil and rock sampling did not indicate any significant trace element concentration, and the ground magnetometer peak can probably be attributed to magnetite development.

2.4.2. Rupert Point Anomaly

2.4.2.1. This was interpreted by C.G.G. as possibly corresponding with mineralization marginal to the Interview River Granite, and it was noted that the anomaly was not located at the ground surface.

2.4.2.2. Ground magnetometer traverses in the area did not locate any sharp peaks, although background values increased in the sedimentary rocks away from the granite margin: Limited penetration of the magnetometer used may account for the results obtained.

2.4.2.3. Stream sediment sampling in the area yielded tin values generally less than 200 ppm Sn, with isolated values up to 900 ppm:

However, as the source of the aeromagnetic anomaly is apparently at depth, these values are probably unrelated to it, and the tin derived either from the granite, or more probably from Tertiary gravels developed over part of the area drained.

2.4.3. Hoyle Creek Anomaly

2.4.3.1. Five ground magnetometer traverses were carried out over this anomaly, and all yielded composite "peaks" several times background extending for up to 500 feet across the aeromagnetic axis (and offset slightly to the north).

2.4.3.2. Stream sediment sampling did not reveal any anomalous tin values in the area drained, although copper values ranged up to 100 ppm, and were slightly higher than away from the anomaly.

2.4.3.3. The anomaly coincides with the Arthur Lineament, which has pronounced aeromagnetic expression throughout the report area, and is attributed to magnetite associated with the Whyte Schist and Bernafai Volcanics (and is probably similar in nature to the Savage River iron ore deposits): The anomaly is not related to Tertiary basalt which outcrops over part of the inland area.

2.5. Beach Sands Evaluation

2.5.1. South of the Pieman River

2.5.1.1. Quantitative heavy mineral separations were not carried out on dune samples from the area south of the Pieman River mouth, although indirect computation methods suggest a total heavy fraction content in the range 0.2 to 0.7% by weight.

2.5.1.2. Mineralogical examination indicates that the relative abundance of the economic minerals rutile, zircon and monazite would generally not exceed 10% by volume of the total heavy fraction: Opaques (principally chromite and leucoxene, with minor iron and titanium oxides, and traces of sulphides) comprise some 50 - 60% by volume of the heavy fraction, and tourmaline, pyroxenes and garnet some 25-35%.

2.5.2. North of the Pieman River

Minimal assessment of dune sands from the area between the Interview River and the Pedder River indicates that total heavy fraction contents are again low, and that the percentage of the economic minerals rutile plus zircon would certainly not exceed 0.3% by weight of the original samples.

2.5.3. Economic Potential

Despite the fact that considerable tonnages of dune sands are developed in the Exploration

Licence areas, both to the south and the north of the Pieman River mouth, they are regarded as having no economic potential (even in the long term future) for the following reasons:-

1. The percentage of economic heavy minerals (particularly rutile) is significantly below the concentrations presently being exploited in Australian beach-sand mining operations.

2. The remoteness of the area would present major problems in the economic development of the deposits.

3. The world market for beach-sand heavy minerals is currently in an "over-supply" situation.

2.6. Evaluation of Remaining Exploration Licence Areas

2.6.1. North of the Pieman River

2.6.1.1. Stream sediment sampling in the coastal area from the Pedder River south to Lagoon River yielded tin values generally less than 10 ppm Sn, with isolated samples up to 300 ppm: These values are not regarded as significant, the area drained consisting principally of Lagoon River Quartzite.

2.6.1.2. No geological investigations were carried out in the area of the Norfolk Ranges, where aeromagnetic anomalies probably related to magnetite-bearing quartzites were located by the C.G.G. survey: The possibility that these correspond to local copper or other ore mineralization is noted, but is considered to be most unlikely.

2.6.1.3. Stream sediment sampling of creeks draining into the Pieman River from the north was carried out in the area downstream from the Donaldson River: No significant tin or copper values were obtained in these samples (tin values invariably being less than 10ppm Sn).

2.6.1.4. No geological investigations were carried out in the area of the Donaldson River and its tributaries.

2.6.2. South of the Pieman River

No geological investigations were carried out in the inland area between the coastal section evaluated and the old Zeehan-Corinna Track: The possibility of ore occurrence in this area cannot be discounted, although the area is heavily timbered and relatively inaccessible.

2.6.3. Corinna Area

2.6.3.1. Stream sediment sampling in the area of the major aeromagnetic anomaly about Corinna was carried out, with tin values in excess of

200 ppm Sn being obtained from a limited number of streams: The majority of samples showed very low tin and copper values.

2.6.3.2. The area drained is underlain by rocks of the Arthur Lineament, and further evaluation of this aeromagnetic anomaly is not warranted: However, the probable existence of major magnetite bodies (of a similar nature to those developed in the Savage River iron ore deposits) is noted.

3. RECOMMENDATIONS

3.1. Retention of Areas

3.1.1. Exploration Licence 49/70

It is recommended that E.L. 49/70 be relinquished in its entirety, since

1. field investigations in the coastal section have not yielded encouraging results; and

2. geophysical data from the inland area (the Norfolk Ranges), together with the reported results of past prospecting, do not justify a major exploration programme in this relatively inaccessible locality.

3.1.2. Exploration Licence 48/70

3.1.2.1. It is recommended that the area of E.L. 48/70 be substantially reduced to approximately 100 km^2, and including specifically the South Pieman Head Tin Prospect and the Rupert Point Aeromagnetic Anomaly: The adjacent inland areas should also be retained.

3.1.2.2. It is felt that neither the Interview River tin-tungsten deposits, nor the Copper Reward and Silver Reward workings, offer sufficient potential to warrant further evaluation: The possibility, however, of locating additional "ore" in both areas is noted.

3.1.2.3. Further evaluation of the major aeromagnetic anomaly extending from Hoyle Creek through Corinna to the Savage River iron ore deposits is not recommended: The probable existence of considerable tonnages of magnetite "ore" associated with the anomaly a depth is, however, noted.

3.2. Forward Exploration Programme

3.2.1. Proposed Investigations

3.2.1.1. It is recommended that a limited exploration programme be undertaken during 1972-73 on the South Pieman Head Tin Prospect, including ground magnetometry, geochemical sampling, pitting and costeaning, and additional geological mapping: This programme should be designed specifically to locate the source of the detrital cassiterite reporting in the Tertiary gravels covering both the granite and the adjacent Precambrian sedimentary rocks, with the aim that a

decision be made at the conclusion of these investigations as to any future work on the prospect (such as drilling and geophysics).

3.2.1.2. It is recommended that one geologist and three field assistants be engaged for the 12 week period December 1972 to February 1973, with reports being finalised for consideration by 31st March, 1973: It is felt that the dry summer months are the most suitable for pitting and costeaning in the area.

3.2.2. Cost Estimates

A budget allocation of $36,000 is recommended for the proposed investigations.

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REPORT

4. INTRODUCTION

4.1. Investigations Carried out During Report Period

4.1.1. Preliminary Investigations

During August, 1971, reconnaissance stream sediment sampling was carried out over the South Pieman Head Granite, and preliminary ground magnetometer traversing and stream sediment sampling completed in the area of the major aeromagnetic anomaly near the mouth of Hoyle Creek. In September, stream sediment sampling was carried out in the vicinity of the major aeromagnetic anomalies in the Corinna area.

During October, 1971, the dune sand system developed between Granville Harbour and the mouth of the Pieman River was sampled by hand auger. Between October and November, road access was constructed from the Top Farm road north of Granville to South Pieman Head, and a field camp constructed for the Summer field programme.

4.1.2. Summer Field Programme

A major field programme was planned and implemented in the period November 1971 to February 1972, employing one geologist full time, and a second during January and February 1972: Up to eight student field assistants were directly involved in the project in this period. Helicopter access was used for a two week period in late January 1972 in the evaluation of the area from Ford Creek north to the Lagoon River.

Regional investigations were concentrated in the coastal area from Granville Harbour north to the Pedder River, with stream sediment sampling, reconnaissance geological mapping and rock sampling designed particularly to test any association of tin mineralization with the three Devonian granite bodies in the Exploration Licence areas: Dune sands developed between the Interview River and the Pedder River were also sampled.

Detailed evaluation was carried out of old mine workings in the coastal area (specifically, the Interview River tin-tungsten workings and the Copper and Silver Reward workings), and of a number of aeromagnetic and geochemical anomalies located as part of the preliminary investigations. Work was concentrated in the South Pieman Head area, where some anomalous stream sediment tin values had been obtained both within the granite and over the adjacent Precambrian sediments.

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4.1.3. Subsequent Field Investigations

Field investigations were carried out during March and April 1972 to provide additional data on the anomalous tin areas at South Pieman Head. Road access in the South Pieman Head area was also extended in this period, and a new field camp established in anticipation of further evaluation of the prospect during the Summer of 1972-73.

4.2. Outline of Present Report

In Section 5, the results of geological, geochemical and geophysical investigations in the areas of E.L. 48/70 and E.L. 49/70 are reviewed and synthesized on a regional basis. Data from the Summer 1971-72 field programme are specifically considered, and the reliability of coverage of the various parts of both Exploration Licences is shown in Fig. 1. The results obtained are integrated with those from earlier investigations, in particular the aeromagnetic survey conducted by C.G.G. for the Joint Venture, and the regional stream sediment sampling carried out by Pickands Mather and Co. in the early 1960's. Data from a reconnaissance evaluation of the beach sands of Western Tasmania, conducted by Consolidated Gold Fields Australia Ltd. in 1966, are also included.

Results of a more detailed assessment of six selected areas in which anomalies (either geophysical or geochemical) had been located, or in which past mining and/or prospecting has taken place, are considered in Section 6 of this report. The extent of specific plans covering the anomalies investigated, and their general location, is shown in Fig. 2.

The economic potential of the remaining Exploration Licence areas is considered in Section 7, and data from all available sources are integrated with a view to evaluating the likely development of ore mineralization within these areas.

5. REGIONAL SYNTHESIS OF EXPLORATION DATA

5.1. Regional Geology

5.1.1. Reconnaissance Geological Investigations

Geological investigations in the report period were concentrated in the coastal area between Granville Harbour and the Pedder River, with limited traverses along the north bank of the Pieman River between its mouth and Corinna, and in the area of the old Corinna-Zeehan Track. These investigations included out-crop geological mapping and rock sampling, and were carried out in conjunction with the regional stream,

sediment sampling programme (and with local ground magnetometer traversing). Reconnaissance geological mapping was carried out at scales of 1:10,000 (in the area from Granville Harbour north to Lagoon River) and 1:20,000 (in the area north of Lagoon River), with a regional compilation at a scale of 1:50,000 given in Fig, 3.

The principal aims of the regional geological investigations were as follows:-

1. To provide a regional geological compilation and representative rock specimens to assist in the interpretation of geochemical and aeromagnetic data.

2. To verify and correlate previous geological mapping in parts of the Exploration Licence areas, specifically that by Spry (1964) between Corinna and Granville Harbour, and that by the Mines Department (1969) from the mouth of the Pieman River north to Lagoon River.

3. To evaluate the economic potential (with particular reference to tin and tungsten mineralization) of the three Devonian granite bodies in the report area (here named the South Pieman Head Granite, the Interview River Granite and the Sandy Cape Granite) and the adjacent, intruded Precambrian sedimentary rock types.

5.1.2. Revision of Stratigraphic Nomenclature

5.1.2.1. General:- The geology of the Exploration Licence areas, as interpreted by Spry (1964), is discussed in some detail by Newnham (1971), and it is not proposed to reproduce that summary. However, as a result of the reconnaissance geological mapping carried out during the report period, and in the light of the Mines Department mapping, a number of modifications have been made to the stratigraphic units of Spry, and to the regional structural interpretation. The revised stratigraphic nomenclature, as presently recognized for the report area, is given in Table 1, although it is stressed that geological understanding is still incomplete in many areas, due to paucity of outcrop and to the necessary primary orientation of the programme towards economic appraisal.

5.1.2.2. Precambrian Geological Units:- The principal modifications to the Precambrian geological units given by Newnham (1971) are as follows:-

1. In the area to the north of Lagoon River the recognition in the coastal section of the

Pedder River Siltstone and the Lagoon River Quartzite: This area was previously mapped as undifferentiated Precambrian sediments.

2. In the area to the east of the Interview River Granite pluton, the subdivision of the former "Interview Slate and Quartzite" into the Lagoon River Quartzite and the Interview Siltstone, confirming largely the mapping of the Mines Department (1969).

3. To the west of the Interview River Granite, the tentative recognition of the Chimney Creek "Hornfels" as a unit containing minor acid volcanics, and apparently separating stratigraphically the Pedder River Siltstone from the Interview Siltstone and its lateral equivalent to the north, the Lagoon River Quartzite.

4. To the south of the Pieman River, the relocation of the geological boundary mapped by Spry (1964) between the Donaldson Group and the "Interview Slate and Quartzite", and the at least temporary re-naming of the latter unit as the Surprise Creek "Beds" in the area immediately to the north and east of the South Pieman Head Granite.

5.1.2.3. Recognition of Tertiary Quartzose Sands and Gravels:-

Geological mapping by the Mines Department (1969) recognized a distinct Tertiary unit, defined as:
"Pebble and granule conglomerate, of rounded quartzite, vein quartz and granite - proved sub-basalt in part, with occasional silicification".
This unit carries detrital cassiterite in the South Pieman Head area, and reconnaissance geological mapping has confirmed the presence of a similar unit in isolated outcrops as far north as the Interview River.

5.1.3. Revision of Precambrian Stratigraphic and Structural Interpretation

5.1.3.1. General:- Following Gee (1967) four major Precambrian stratigraphic and structural elements are recognised in the report area, these being, from north-west to south-east, as follows:-

1. Rocky Cape Group sediments.
2. Smithton Dolomite "equivalents".
3. Arthur Lineament.
4. Burnie Quartzite and Slate "equivalents".

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The approximate location and extent of these four elements within the report area is shown in Fig. 4, together with the aeromagnetic survey data.

5.1.3.2. Rocky Cape Group Sediments:-
The Rocky Cape Group is the basal of three major Proterozoic sedimentation regimes in north-western Tasmania, and consists dominantly of siltstones and orthoquartzites. These rocks are relatively unmetamorphosed, in that primary sedimentary features such as cross bedding and slumping are clearly preserved (particularly within the siltstones), although the sequence as a whole is quite complexly folded and deformed. Rocky Cape Group sediments occupy a major part of the report area, and include the following units, in apparent stratigraphic order:

Top	(Surprise Creek "Beds")
	Interview Siltstone
	Lagoon River Quartzite
	Chimney Creek "Hornfels"
Bottom	Pedder River Siltstone

The Pedder River Siltstone is a distinctive unit of dominantly dark grey siltstones, in which slump and scour-and-fill sedimentary structures are prominent. The unit appears relatively unmetamorphosed at least in hand specimen, although bedding attitudes are difficult to determine. The Pedder River Siltstone appears to conformably underlie the Lagoon River Quartzite in the Sandy Cape area, and the transitional boundary is marked by interbedded siltstones and quartzites, with some conglomerate developed: A minor depositional break may be indicated here, and could possibly be correlated with the volcanic activity recorded in the Chimney Creek "Hornfels", which occupy an apparently equivalent stratigraphic position to the south of Lagoon River.

The Chimney Creek "Hornfels" is tentatively recognized to the west of the Interview River Granite as a distinctive unit containing minor acid volcanics: Thin section study suggests rhyolitic affinities. The sediments grouped with this unit include quartzose sand-stones and siltstones, generally displaying relict sedimentary layering, which are frequently extensively hornfelsed (with the development of spotted and banded types). In the area of Chimney Creek, the sedimentary rocks appear to be more intensely hornfelsed than elsewhere observed around the margins of the granite body, although this by itself is not regarded as a valid criterion for definition of the unit. The existence of volcanic rock types within the sequence indicates a depositional break, which is tentatively correlated with the transitional boundary between the Pedder River Siltstone and the Lagoon River Quartzite to the north, and an influx of relatively "immature" sediment accompanying this event could account for the greater degree of subsequent hornfelsing by the granite.

The boundaries between the Chimney Creek "Hornfels" and the overlying and underlying sediments are somewhat arbitrary, and the validity of the unit requires further study.

The Lagoon River Quartzite is a distinctive white, massive, apparently "recrystallized" quartzite, with rare shale units generally preserved in the cores of folds. The quartzites appear to be composed almost entirely of quartz, thin section study of one specimen revealing quartz grains set in a matrix of finely crystalline quartz (which has probably been derived from metamorphism of an original siliceous cement). Field observation suggested that bedding was rare, although the Mines Department (1959) record that the quartzite is "cross-bedded and well sorted".

The Interview Siltstone is also a distinctive rock unit (at least in the Interview River area), consisting of light to medium grey finely laminated siltstones displaying original sedimentary features, particularly truncation of bedding, and containing relatively thin quartzite beds. Thin section study of selected, typical specimens of the siltstone revealed that they are composed dominantly of quartz, with variation in grain size responsible for the observed sedimentary layering: Some grain boundary resorption is evident, and the finer layers are relatively rich in sericite. The quartzite beds probably represent sandier layers deposited during the siltstone sedimentation, and subsequently metamorphosed: The basal Interview Siltstone appears to lense to the north with the Lagoon River Quartzite.

To the immediate north and east of the South Pieman Head Granite, the Surprise Creek "Beds" have been mapped, comprising dominant siltstone, micaceous sandstone, grey shale, black pyritic shale, and occasional thin pebble conglomerate and quartzite members. The sequence is relatively unmetamorphosed, although structural studies indicate that the original bedding has undergone one phase of deformation, with the development of an axial plane cleavage (parallelling the bedding except in the cores of folds, which are rarely exposed) and with accompanying mica recrystallization on the cleavage planes. The Surprise Creek "Beds" are probably laterally equivalent to the upper part of the Interview Siltstone.

Lateral facies changes within the Rocky Cape Group sediments make correlation between the recognized units difficult, although a tentative correlation is given in the section accompanying Table 1. Further geological

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mapping would be required to satisfactorily interpret the regional Precambrian stratigraphy and structure, and its resolution is of no significance in the present economic context.

5.1.3.3. Smithton Dolomite "Equivalents":-

Post Rocky Cape Group sedimentation to the west of the embryonic Rocky Cape Geanticline is referred to the Smithton Dolomite in north-western Tasmania, and equivalent rocks occur within the report area. The sequence consists of basal conglomerates (containing ortho-quartzite boulders), sandstones, chert, dolomite and volcanics, and is approximately equivalent to Burnie sedimentation (Section 5.1.3.5. below) to the east of the emerging geanticline. Within the report area, the following mapped units are included:-

Top	Savage Dolomite
	Delville Chert
	(Bernafai Volcanics)
	Corinna Slate
Bottom	Donaldson Group

The above rock units have been described in some detail by Newnham (1971) and further discussion is not warranted. However, the following comments are made:-

1. The position of the Bernafai Volcanics within the sequence is uncertain, at least in the coastal section north of Granville Harbour, and the writer considers that, on aeromagnetic and petrological evidence, the southern belt mapped by Spry (1964) should be included with the Whyte Schists as part of the Arthur Lineament. The northern sequence of tuffaceous and basaltic types ascribed to the Bernafai Volcanics is retained as part of the succession.

2. In the report area, the rock units equivalent to the Smithton Dolomite association are moderately to highly deformed, this being ascribed to proximity to the Arthur Lineament, at least in the south. The existence of highly deformed conglomerates and quartzites, referred to the Donaldson Group by Spry (1964), in the Rupert Point area to the north of the Pieman River mouth is difficult to explain structurally and stratigraphically.

3. The Donaldson Group of Spry (1964) has been mapped as the Rupert Beds by the Mines Department (1969), although the earlier nomenclature has been adopted in the present report.

5.1.3.4. Arthur Lineament:-

The Arthur Lineament is defined by Gee (1967) as "a ribbon-like belt of sheared metamorphic rocks stretching for 70 miles in more or less a straight line from Granville Harbour to

Wynyard", and is considered by him to represent "the fundamental tectonic structure of the Proterozoic in north-west and west Tasmania". The sequence consists of pelitic schists, greenschists and amphobilites, which were metamorphosed to lower to middle greenschist facies during tectonic movements accompanying the Penguin Orogeny: The Arthur Lineament is equated by Gee (1967) to the core rocks of the Rocky Cape Geanticline, with shearing and localised metamorphism along this "hinge line for Proterozoic sedimentation".

The Arthur Lineament within the report area includes the Whyte Schists and at least the southern belt of the Bernafai Volcanics. It has a broad definitive aeromagnetic expression, with two pronounced elongate anomalies (probably coinciding with magnetite-bearing amphibolites) flanking the Whyte Schists, which locally carry haemitite. To the east of the report area, the Arthur Lineament rocks contain the magnetite lenses of the Savage River iron ore deposits, and these give a similar aeromagnetic profile to that developed in the coastal section to the north of Granville Harbour.

5.1.3.5. Burnie Quartzite and Slate "equivalents":-

The Burnie Quartzite and Slate is a flysch-type sequence containing minor pillow lavas, and the equivalent unit within the report area is the Oonah Quartzite and Slate: This unit has been described by Newnham (1971), and no investigations were carried out in its area of outcrop in the south-east of E.L. 48/70.

5.1.3.6. Penguin Orogeny:-

Gee (1967) considers that the recognition by Spry (1964) of the "older" and "younger" Precambrian is incorrect, and that the differing degrees of deformation observable in the field are a function of tectonic setting. He regards the Penguin Orogeny as a single pre-Middle Cambrian post-Smithton Dolomite event terminating Proterozoic sedimentation, with principal tectonic activity occurring along the line of the Arthur Lineament and accompanied by extensive intrusion of dolerite bodies. The dolerite dyke swarm in the Interview River area is correlated with the Penguin Orogeny, and radiometric dating (of the (?) equivalent Cooee Dolerite) indicates a late Proterozoic age for the event.

Cambrian sedimentation and volcanism (with which the major ore bodies of western Tasmania are associated) subsequent to the Penguin Orogeny was confined to the east of the Arthur Lineament.

5.1.4. Distribution of Tertiary Quartzose Sands and Gravels

Much of the coastal area south of the Pieman River is covered by a thin veneer of

quartzose sands and gravels, generally 1-2 metres thick. The quartz is mostly angular material derived from both granite and quartzite (and quartz veins within the Precambrian sediments), with occasional rounded pebbles indicating sporadic influx of transported sediment. The quartzose sands and gravels outcrop beneath Tertiary basalt at the Top Farm, north of Granville, and are extensively silicified: On this evidence, and from observations outside the report area, all similar unconsolidated (and semi-consolidated) sand and gravel deposits are regarded as Tertiary in age.

To the north of the Pieman River, similar deposits of quartzose material have been mapped locally, particularly in the area south of the Interview River. It would appear that much of the coastal plain area was a Tertiary erosion surface, with possible accumulation of the quartzose material essentially in situ (and derived from weathering of immediately adjacent rock types) in shallow marsh areas protected from the action of the sea. In several areas south of the Pieman River, evidence of remnant dune and/or river sands has been found some 60-100m. above present sea level, indicating a drop in sea level of this order since the Tertiary. A majority of the more extensive quartzose accumulations are less than 120m. above the present sea level.

The Tertiary sands and gravels are of significance in the report area, as those on South Pieman Head are known to carry detrital cassiterite, and similar deposits (admittedly somewhat thicker) have been worked with limited success for alluvial tin both at Balfour and in the Tasman River area at Mt. Heemskirk. The possibility that remnant Tertiary quartzose deposits (carrying very minor cassiterite concentrations) are developed over much of the report area (beneath the button grass cover), and represent at least one possible source of the stream sediment tin values, is therefore noted.

5.2. Aeromagnetic Survey Results

5.2.1. Summary of C.G.G. Report

The aeromagnetic survey interpretation report by C.G.G. was briefly discussed by Newnham (1971), and is summarized in Table 2 and Fig. 4 of this report. The great majority of anomalies located by this survey appeared to relate to regional (Precambrian) stratigraphic and structural trends: A limited number of possible ore associations were suggested by C.G.G.

5.2.2. Ground Evaluation of Selected Anomalies

Ground evaluation was carried out on five of the aeromagnetic anomalies located by the C.G.G. survey, as follows:-

1. Lagoon River Anomaly (a_{13}), a small isolated low-contrast anomaly located to the north of Lagoon River on the coastal plain.

2. Chimney Creek Anomaly (a_{12}), another low-contrast anomaly which appears to relate to regional stratigraphy.

3. Rupert Point Anomaly (F_1), which was apparently located below the topographic surface, and may represent mineralization marginal to the Interview River Granite.

4. South Pieman Head Discontinuity, which was interpreted by C.G.G. as a possible dolerite body, although it is marginal to the South Pieman Head Granite.

5. Hoyle Creek Anomaly (a_5), which coincides with the Arthur Lineament and is of similar magnitude to the Savage River iron ore deposits. The suggestion by C.G.G. that this could represent possible sulphide mineralization associated with serpentinized rocks was considered unlikely.

Results of ground evaluation of the Chimney Creek, Rupert Point and Hoyle Creek anomalies are given in Section 6 of this report. Ground magnetometer traverses failed to substantiate the existence of the Lagoon River anomaly and the South Pieman Head discontinuity interpretted by C.G.G.

5.3. Stream Sediment Geochemical Data

5.3.1. Stream Sediment Sampling Programme

A major stream sediment sampling programme was carried out during the report period in the coastal area from Granville Harbour north to the Pedder River, with particular emphasis on the possible association of tin mineralization with the three Devonian granite bodies. Samples of sediment from the "active" parts of streams were collected at 100-400 metre spacing (the closer spacing being used if encouraging values had previously been obtained), and geochemical assays were carried out, usually on the minus 85 mesh fraction, for tin, arsenic and total copper. In excess of 1,000 stream sediment samples were collected during the programme.

The results of an extensive stream sediment sampling programme over much of the present Exploration Licence areas, conducted by Pickands Mather and Company in the early 1960's, have been integrated with the geochemical data obtained during the report

period: Nickel, lead and zinc values discussed here are principally from this earlier survey.

5.3.2. Distribution of Tin Values

The distribution of geochemical tin values (parts per million Sn) obtained during the present survey is shown in Fig. 5: Limited tungsten determinations on samples from the Interview River area (parts per million WO_3) are also plotted.

In the area from the Pedder River south to Lagoon River, the stream sediment samples have been derived from quartzites and siltstones, and in general show low tin concentrations, with a majority containing less than 10 ppm Sn. However, isolated samples contain up to 300 ppm Sn, and some 5-10% of the samples contain in excess of 10 ppm Sn: There is no apparent grouping of higher values suggestive of an anomalous source of tin, although the absolute values are many times "background". It is possible that the tin has been derived from remnant (unmapped) Tertiary quartzose gravel deposits in the area, with significant concentration by stream action. In the Lagoon River itself most values are in the range 10 to 100 ppm Sn from both side streams and the main river, and the sediment is coarse quartzitic material.

Stream sediment tin values over the Interview River Granite pluton are generally of the order 10 to 200 ppm Sn, with isolated higher values: Some major branches of streams show tin concentrations below 10 ppm Sn. A greater density of sample values in the range 200 to 1000 ppm Sn occurs between Chimney Creek and the Interview River, where alluvial cassiterite has been prospected, and is probably derived from tungsten-bearing veins occurring within the granite body in the immediate area. Tin values up to 200 ppm Sn occur in sediment samples from streams to the east (that is, upstream) of the granite body, although values tend to diminish fairly rapidly with distance from the granite. It is suggested that a majority of the tin occurring in the stream sediment samples has been derived from the Interview River wolfram vein deposits (or some other source in the area) as cassiterite, dispersed over the granite mass and the adjacent sedimentary rocks by Tertiary erosion processes, and reconcentrated by the present active streams: Some of the tin at least is probably occurring in minerals derived from the granite and in which tin substitutes in certain lattice sites (such as biotite). An isolated value in excess of 6000 ppm Sn in Ford Creek to the east of the granite mass is thought to have been derived from a contaminated source, although this has not been definitely established.

In the area of the South Pieman Head Granite, stream sediment values from a restricted drainage area including both granite and adjacent sediments (the whole being covered by a thin veneer of Tertiary gravels) are extremely high, over one third of the samples containing tin concentrations in the range 500 to 7,500 ppm Sn. Subsequent investigations (which are as yet incomplete) suggest that the immediate source of most of the tin is detrital cassiterite within the gravels, although the ultimate source of the tin is still uncertain. Samples from surrounding parts of the granite mass have yielded values generally in the range 10 to 200 ppm Sn, with a large proportion of samples in some streams containing less than 10 ppm Sn. To the north of the granite mass in Webster's Creek, stream sediment values in the range 200 to 1000 ppm Sn (with isolated higher values) occur, and the immediate source of the tin is probably Tertiary gravels outcropping on the ridges above the creek, although the area clearly warrants further evaluation.

To the south of South Pieman Head, limited stream sediment sampling has been carried out in the principal drainage systems (particularly, Newdegate and Hoyle Creeks) with unpromising results: Values in the range 10 to 100 ppm Sn have generally been obtained, with a major proportion less than 10 ppm Sn. The country drained by these streams includes rocks of the Arthur Lineament and the Smithton Dolomite "equivalents", and, with the exception of the Savage Dolomite, are unlikely host rocks for tin mineralization.

Limited stream sediment sampling was carried out in the area draining the Arthur Lineament (and the coincident aeromagnetic anomalies) at Corinna during September, 1971. Woodward (1971 a) reports:

"Very low values for tin were recorded north of the Pieman River except for two streams draining westward into the Whyte River. Samples from these two creeks contained 650 ppm and 260 ppm. Values from creeks south of the Pieman were only slightly higher, with the exception of Corinna Creek and its tributaries, and also a creek draining east from the south-western end of Lefroy Ridge into the Pieman. Values from these two creeks were generally over 200 ppm but less than 400 ppm, with 2 isolated maxima of 750 ppm and 1010 ppm".

Although the above higher values are possibly anomalous by comparison with data obtained from the coastal area, the rocks of the Arthur Lineament (Whyte Schists and Bernafai Volcanics) are considered unlikely hosts for tin mineralization. The stream sediment tin values may well have been derived from the Meredith Granite (where tin mineralization is known) by Tertiary erosion processes, being shed immediately by remnant Tertiary gravel deposits in the area.

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5.3.3. Distribution of Copper Values

The stream sediment sampling carried out by Pickands Mather and Co. revealed generally low copper values over the whole of the coastal area: Cold-extractable copper values ranged from 1 to 5 ppm, while total copper was of the order of 1 to 10 ppm. The cx Cu: Cu ratio ranged from about 10 to 50%, although this is probably not significant in view of the low absolute values. In streams draining into the Pieman River, however, Pickands Mather and Co. did obtain isolated total copper values in excess of 100 ppm, and groups of values in the range of 20 to 50 ppm: These values coincide in most cases with rocks of the Arthur Lineament.

The distribution of total copper values from the present survey is given in Fig. 5, and again results in the area to the north of the Pieman River are low, generally ranging from less than 10 to 30 ppm Cu. Even in the vicinity of the Copper Reward workings on the Interview River, only one isolated high value of 620 ppm was obtained. To the south of the Pieman River, total copper values were likewise generally less than 30 ppm, with two significant exceptions:-

1. In Violet Rivulet, in the immediate vicinity of the new field camp, five sediment samples over a 500 metre length of the stream yielded total copper values ranging from 230 to 830 ppm Cu.

2. In the Hoyle Creek area, which drains rocks of the Arthur Lineament, copper values in the range of 20 to 100 ppm Cu were obtained, with isolated values in excess of 100 ppm.

In the Corinna area, only four of the 51 stream sediment samples contained more than 50 ppm total copper, with a maximum value of 160 ppm (Woodward 1971a). As noted previously these samples are from streams draining rocks of the Arthur Lineament.

5.3.4. Distribution of Nickel Values

The distribution of selected nickel values from the survey conducted by Pickands, Mather and Co. is plotted in Fig. 5, and again results in the coastal area are low, ranging from less than 5 to 50 ppm Ni: No anomalous areas are indicated.

Values in the Pieman River and its tributaries (particularly the Whyte River) upstream from Corinna are somewhat higher, ranging from 20 to 100 ppm Ni, and are probably attributable to the presence of amphibolitized dolerites in this area.

A number of stream sediment values in excess of 100 ppm Ni occur in the area around Granville Harbour, and are probably related to the presence of Tertiary basalt.

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5.3.5. Distribution of Lead and Zinc Values

The distribution of selected lead and zinc stream sediment values from the Pickands Mather and Co. survey is given in Fig. 6. Lead values generally range from less than 5 to 20 ppm Pb, with isolated values in excess of 100 ppm in the upper parts of the Pieman River and in the Donaldson River. Zinc values are generally less than 50 ppm Zn, with isolated values both in the coastal area, and in the Pieman River and its tributaries, in excess of 1,000 ppm.

During the report period, no attempt has been made to evaluate any of the anomalous lead and zinc values indicated by the Pickands Mather and Co. survey. The Silver Reward workings to the south of the Interview River were located during the period, and, in view of the presence of galena in this prospect, selected samples from streams in the area were assayed for both lead and zinc, with values less than 10 ppm Zn and Pb being obtained in all cases.

5.4. Beach Sands Evaluation

5.4.1. South of the Pieman River

5.4.1.1. Dune Sampling Programme:-
The extensive dune sands developed in the Four Mile Beach area between Granville Harbour and South Pieman Head were sampled in reconnaissance fashion during October 1971 (Woodward, 1971b): The extent of the dune sands is plotted in Fig. 8, borehole locations also being shown on this plan. Holes were drilled by hand auger to 6 metres, except where the water table was reached at a shallower depth: Both active and vegetated dunes were sampled.

It is not proposed to discuss the Quaternary geology of the area in any detail, as this has been adequately covered by Woodward (1971b) and the results of the sampling programme were particularly discouraging.

5.4.1.2. Heavy Mineral Content of Samples:-
Selected dune samples were superpanned, and the resultant concentrates examined microscopically (Fander, 1972b): The heavy mineral content of the samples was not determined directly, although assuming that heavy minerals comprised 15% by weight of the superpanned concentrates (as determined for one "typical" sample), the percentage by weight of heavy minerals would have ranged between 0.2 and 0.7%. This is particularly low, especially in view of the heavy fraction mineralogy.

5.4.1.3. Heavy Fraction Mineralogy:-
Detailed mineralogical data are given by Fander (1971b). In summary, the mineral suites were found to be remarkably constant throughout, and a typical sample gave the following

volume percentages of mineral species:

Opaques	50 - 60%	
Zircon	5 - 7%	
Rutile	Trace	
Tourmaline	5 - 7%	
Pyroxene, garnet, Epidote, topaz, corundum, staurolite, andalusite, cassiterite (?)		Traces only

The opaques consisted of the following, in relative order of abundance:-

Chromite

Leucoxene

Magnetite

Minor geothite

Minor haematite

Minor ilmenite (partly altered to leucoxene)

Minor pyrrhotite/chalcopyrite composites

Traces of pyrite spheres.

In all samples, the opaques, tourmaline, pyroxene and garnet were far more abundant than the economic minerals rutile, zircon and monazite, and in fact comprised some 75 - 95% by volume of the total heavy mineral fraction. These figures suggest that the total rutile plus zircon content of the sands would range from 0.02 to a maximum of 0.2% by weight, which is clearly uneconomic by present beach-sand mining methods.

5.4.2. North of the Pieman River

5.4.2.1. Dune Sampling Programme:-
A total of 19 holes were drilled (by hand auger) in the dune sand area between the Interview and Lagoon Rivers during January, 1972, using helicopter access. A further 25 holes were drilled in the area between Lagoon River and the Pedder River during February 1972, operating from a base camp at Sandy Cape. Holes were drilled both in active and vegetated dunes to seven metres, unless the water table was encountered at a shallower depth.

Detailed logs of holes drilled are not appended, in view of the unpromising results obtained. However, a great majority were located in relatively "immature" fine to coarse yellow sand, which contained significant shell and feldspar fragments. The location of boreholes is shown in Fig. 8.

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5.4.2.2. Heavy Fraction Contents and Mineralogy:-

Selected samples from the dune sand system to the north of the Pieman River (about 25% of the total holes drilled) were examined by heavy liquid separation and binocular microscopy. Results are fully reported by O'Toole (1972b), and in summary, none of the samples contained the economic heavy minerals (rutile plus zircon) in concentrations greater than 0.3% by weight.

5.4.3. Economic Potential

Reserves of dune sands in the areas of both E.L. 48/70 and E.L. 49/70 are considerable, but mineralogical data confirm the results obtained by Best (1966) from a reconnaissance sampling of the beach sands of northern and western Tasmania for Consolidated Gold Fields Australia Limited: He found "that most of the sand contains very little heavy mineral..... some samples were found to contain more than 0.5% heavy mineral, but even these were found to contain very little zircon and rutile".

It is now apparent that the dune sands themselves do not warrant any further evaluation as a source of heavy minerals, for the following reasons:-

1. The percentage of economic heavy minerals (particularly rutile) is significantly less than the concentrations presently being exploited in Australian beach-sand mining operations.

2. The remoteness of the area would present major problems in the economic development of the deposits.

3. The world market for beach-sand heavy minerals is presently in an "over-supply situation, and a number of far more promising prospects in Australia have been indefinitely shelved.

6. DETAILED EVALUATION OF SELECTED ANOMALOUS AREAS

6.1. Interview River Tin-Tungsten Workings

6.1.1. Introduction

6.1.1.1. Location

The Interview River tin-tungsten workings are situated some seven miles north of the mouth of the Pieman River and at elevations generally between 100 and 125 metres above sea level on the narrow button-grass covered coastal plain: The known prospects lie to the north of the Interview River, and between one and three miles inland. The original mining leases, plotted approximately in Fig. 9, indicate the extent of the area in which tungsten bearing vein (lode) mineralization has been locally outcropped and prospected.

Evidence of alluvial tin workings is to be found in several of the now heavily regrown streams draining this area.

The location of individual prospects is shown in Fig. 10, the principal lode workings being Cooney's in the southern part of the formerly leased area (within Section 5121-M) and Kenny's in the northernmost Section 5120-M.

6.1.1.2. Mining History:-

Alluvial tin was apparently first found in the Interview River area in about 1890, and subsequent prospecting led to the discovery of the tungsten-bearing veins. Available records of the alluvial tin workings are extremely limited, but it would appear that concentrate production was negligible and most uneconomic, Henderson (1935) stating:-

"The tin ore is confined to the short coastal streams and does not extend far west below the outcrop of the wolfram lodes to which the tin ore can undoubtedly be traced. The tin is fine, even grain size, no coarse material being observed, and very poor prospects were obtained where prospecting was possible. The most work on the tin deposits appears to have been done in a small deeply entrenched creek, about a mile and a half north of the Interview River (and here named Race Creek, see Fig. 10), where the wash was very coarse, and required considerable man-handling".

Principal prospecting of the tungsten bearing vein deposits appears to have been carried out prior to 1900, with some limited development of Kenny's workings about 1910. No records of ore production for this period are available, although it is extremely doubtful that any significant concentrate production occurred. With regard to Kenny's workings, Ward (1911) notes that "..... the discovery of wolframite ore of good grade ..... has been reported .....".

During 1937-8, Cooney's shaft was deepened, and "..... a trial parcel of ore, obtained in sinking, was sold with a very unfavourable return and the prospect was abandoned" (Henderson, 1943). Further prospecting in the area of Cooney's workings was carried out during the Second World War, and it it understood that limited additional work was carried out during the early 1950's (possibly in response to the marked increase in world tungsten prices at the time of the Korean War). Although no records are available, it would appear that production of tungsten concentrates during these periods was again insignificant.

As far as the writer can ascertain, total production from the vein deposits has been minimal (and has probably not exceeded 5 long tons of 65% WO_3 concentrates).

6.1.1.3. Previous Geological Investigations:-

The Interview River tin and tungsten workings were first inspected by G.A. Waller, Assistant Government Geologist, in 1901, and later by L.K. Ward, Assistant Government Geologist, in 1910. Apparently the prospects were inaccessible at the time of both visits (the area having been abandoned), and little geological data were obtainable. The most comprehensive geological report available on the tungsten-bearing vein deposits is that by Henderson (1943), his investigations being undertaken specifically to evaluate their potential as an emergency source of tungsten during the Second World War. Although many of the prospects were still either collapsed or inaccessible at the time of Henderson's inspection, his geological observations have proved particularly relevant in the present investigations.

As noted previously, available records of the alluvial tin workings are limited to a brief report by Henderson (1935), and relevant geological data are virtually non-existent.

6.1.1.4. Outline of Current Investigations:-

During the period January to April 1971, some 25,000 line feet of soil grid (here referred to as Cooney's Shaft Soil Grid) were cut and pegged at 100 feet intervals to cover the Southern vein workings of the Interview River tungsten deposits: This grid consisted of a base line of length 3,600 feet, oriented 330° Magnetic (342½° Grid or 341.¾° True), with grid lines normal to the base line (and essentially sub-parallel to the strike of a majority of the mineralized veins) at 400 feet spacing and extending 1600 feet on each side. The results of random sampling of mine dumps and soils in the grid area were reported briefly by Newnham (1971), and are not discussed further.

Investigations during the period under review have been confined to a two-week programme in late January, 1972, utilising helicopter access to the Interview River area and the long Summer daylight periods available. During this programme, in excess of 700 man-hours were directly attributable to field evaluation of the economic potential of the area, and the following were achieved:-

A. Geochemical Soil Sampling

1. Completion of limited cutting and line pegging on Cooney's Shaft Soil Grid, only 80% of the planned gridding having been carried out prior to abandonment of the field camp because of flooding in April, 1971.

2. Hand-auger sampling of 22,400 feet of grid line at 100 feet intervals on Cooney's Shaft Soil Grid, grid-lines 00'N, 400'S, 800'S, 1200'S, 1600'S, 2000'S and 2400'S having been completed:

Continuous samples of approximately 1-2 lbs. weight were recovered from each of the A (humic) and B-C (leached soil-weathered bedrock) soil horizons, where developed.

3. A close-interval soil sampling grid, involving sample positions at 25 feet spacing on three lines 100 feet apart and normal to the 1600 feet South grid line, was pegged and sampled in the immediate area of Cooney's workings. A total of 36 sample positions were pegged and samples taken as in 2. above, the programme being designed to provide additional data for use in the interpretation of results from Cooney's Shaft Soil Grid.

4. Extension of Cooney's Shaft Soil Grid by some 6,500 feet in a northerly direction to include Kenny's workings (which were located during the programme), and the cutting, pegging, and sampling of some 1,200 feet of close interval soil grid (similar to that outlined in 3. above) over the northern part of the vein exposure.

B. Geological Mapping and Sampling:

1. Outcrop geological mapping on a scale of 1:10,000 (with associated sampling of rock types) of the area surrounding and including the Interview River tin-tungsten workings, and extending into the intruded sedimentary rocks to the east and west of the (here named) Interview River Granite pluton.

2. Outcrop geological mapping of the gridded area on a scale of 1:4,000, with particular reference to vein attitudes and the nature of mineralization in old working, and to any distribution of granitic rock types.

3. Detailed geological mapping of the principal vein workings (Cooney's and Kenny's) on scales, respectively, of 1:500 and 1:1,000; and bulk sampling (100-200 lbs. wt.) from two of the vein exposures at Cooney's workings for mineralogical and grade assessment.

C. Stream Sediment Geochemical Sampling

Stream sediment sampling, at 1-200 metres spacing in general and collecting samples of 2-3 lbs. wt. from active parts of the watercourse, of all creeks draining the area surrounding the Interview River tin-tungsten deposits.

6.1.2. Geology and Vein Mineralization

6.1.2.1. General:-

The current investigation is principally concerned with the tungsten-bearing vein deposits, and the alluvial tin deposits have not been evaluated from a geological standpoint (although geochemical samples have been assayed for tin, and the significance of these data are discussed later).

The work of Henderson (1943) has been used extensively in the present compilation, for the following reasons:-

1. Initial geological appraisal confirmed the reliability of Henderson's observations.

2. The workings are now more overgrown, and even less accessible, than at the time of Henderson's investigations.

3. Henderson visited the area at a time when it was being actively prospected, which has a number of advantages.

4. Without dewatering of the old mine workings, or costeaning with earth-moving equipment, no new geological data could become available.

6.1.2.2. Regional Geological Setting:-

As shown on Fig. 9, the Interview River tungsten workings lie within the Interview River Granite pluton, which extends from the Pieman River in the south north to Lagoon River, and underlies the western part of the coastal plain. The Devonian granite body is markedly elongated in a north-south direction, and may have been emplaced along a zone of structural weakness, in view of the apparently differing degrees of deformation of the sedimentary rocks flanking the pluton to the east and west, and their differing petrography. Mineralogically, the Interview River Granite appears to be a uniform, medium-grained quartz-orthoclase-biotite type, with muscovite occasionally present in minor amounts. Local porphyritic phases are evident, and pegmatitic and microgranitic phases are observable adjacent to some contact exposures.

To the north of the Interview River, the granite body intrudes to the west the Chimney Creek "Hornfels", a sequence of (?) Upper Precambrian sediments and acid volcanics which have been locally hornfelsed to a greater degree than other intruded sediments. To the east, the granite intrudes both the Lagoon River Quartzites (a sequence of distinctive white, massive, "recrystallized" quartzites, with minor shales) and the Interview Siltstone (a typical sequence of grey, finely laminated siltstones displaying original sedimentary features such as cross bedding, and containing relatively thin quartzite beds).

In the vicinity of the Interview River tungsten deposits, local "veneers" of (?) Tertiary quartzose sands and gravels, consisting dominantly of angular quartz and generally less than 1 metre in thickness, have been mapped during the present investigation.

Similar deposits (although up to 5 metres thick in some areas) have been worked for alluvial tin at Balfour (to the north) and in the Tasman River area at Mt. Heemskirk.

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Extensive tin-bearing quartzose grits and sands have also been located covering parts of the South Pieman Head Granite during the present investigation, and their thickness generally does not exceed 1 metre.

The outcrop geology of the area surrounding the Interview River tin-tungsten workings, as mapped during the current investigation, is shown in Fig. 10; rock specimen localities also being shown on this plan.

6.1.2.3. Vein Type and Mineralogy:-

To the north of the Interview River, the Interview River Granite is traversed by a number of quartz-tourmaline veins, at least some of which are tungsten-bearing. Paucity of outcrop (most of the area being covered by humic-rich granitic soil), and heavy regrowth in streams, limit exposures of the veins available for examination to those which have previously been prospected. The location of various old workings is shown in Figs. 10 and 13, and the nature of the vein mineralogy indicated.

It would appear that at least three types of veins can be recognised, as follows:-

1. Quartz veins (which are entirely "barren" of other mineralogical constituents);

2. Quartz-tourmaline-muscovite veins; and

3. Quartz-tourmaline-muscovite veins carrying sporadic sulphide (pyrite and arsenopyrite) and tungsten (wolfram and minor scheelite) mineralization.

However, it is noted that at least some quartz "veins" may in fact represent local accumulations of derived angular quartzite boulders (of Lagoon River Quartzite, which resembles vein quartz in outcrop); and that the distinction between mineralized and "unmineralized" quartz-tourmaline-muscovite veins (3 and 2 above) may not be strictly valid, in view of the apparently erratic distribution and enrichment of the tungsten minerals within these veins.

The veins vary in thickness from a fraction of an inch ("veinlets") to an observed maximum of 38 cms., "although greater widths have been recorded" (Henderson, 1943). Strike lengths vary from about one metre up to a maximum stripped length of 120 metres in Kenny's Workings (although vein continuity is not certain in this case). Generally, exposed vein lengths would be of the order of 6 to 20 metres, and widths of the order of 0.1 to 0.3 metres.

Greisenization of the wall-rock is locally evident, and appears to be common to all quartz-tourmaline-muscovite veins, whether "mineralized" or not (Henderson, 1943).

The veins are typical medium to high - temperature late stage magmatic products, which have apparently crystallized in fractures within the cooling, stressed granite mass. The vein mineralogy is typical of similar deposits occurring throughout the world, at least some of which are significant producers of tungsten ores.

6.1.2.4. Vein Attitudes and Structure:-

Because of the collapsed condition of a majority of the workings, it is not possible to obtain reliable data on vein attitudes. Henderson (1943) concluded that "a study of the fracture-pattern in this area clearly demonstrates the stress - orientation of the rock mass, and indicates that it has been fractured by compressive stresses from a north-easterly and south-westerly direction. The result was the development of two shear directions, one North 10° West (magnetic -?) and the other north 50° - 60° east, the latter being developed almost to the exclusion of the former, while a third direction of relief was fracturing in the tension direction, which is north 25° - 30° east".

However, the vein attitudes recorded by Henderson, and the writer's own observations, indicate that the veins generally strike between 20° and 60° east of true north, with a majority of the exposed veins striking between 25° and 45° east of true north. Dips are near vertical, varying between 80° to the north-west and 80° to the south-east.

There does not appear to have been any prefecred orientation of the individual "productive" veins, although exposures are inadequate to verify this. The assemblage of veins in the Interview River area appears to trend approx. north-south (at about 30° to the strike of the veins), this being evidenced by the orientation of the old mining leases (see Fig. 9), and particularly by Cooney's Workings. However, the significance of this apparent trend cannot be assessed without further extensive prospecting, and may be a function of the current stage of development.

6.1.2.5. Ore Distribution and Grades:-

Henderson (1943) notes that the wolfram ore occurs in "shoots" or lenses within the veins, the length of these shoots being of the order of only 3 metres. He describes "a shoot of exceptionally high grade wolfram ore over a length of eleven feet, with an average width of four inches". No preferred orientation or elongation of these shoots is suggested by Henderson, although he notes the following:-

"A series of joints cross the veins in a general westerly direction, some times dipping to the north and sometimes dipping to the south

but always at a very high angle. Undoubtedly, there is some definite relationship between the joints and the ore shoots, but the exposures are too limited to determine the actual control".

Henderson (1943) attempts to estimate the grade of ore occurring within the veins, and this presumably applies specifically to the grade within an ore shoot. From "a series of intercept measurements upon a grab sample of vein material", and noting the limitations of accuracy of the method, he deduces a mineralogical composition of:

Quartz	40.9%
Wolfram	27.3%
Arsenopyrite	10%
Pyrite	9.8%
Tourmaline, muscovite, etc.	2%
"Voids"	10%

Even allowing that such a high estimated average grade could be obtained from ore shoots, and the writer considers that this is extremely unlikely from his observations of the mine dumps and vein workings, it must be stressed that the incidence of shoots of ore within the veins, whilst unknown; would probably not exceed 25% of the vein length, and may well be somewhat lower. Again, it must be appreciated that Henderson's average grade estimate applied to a vein width of 0.1 to 0.3 metres, and that a dilution factor of some five times would result even from selective underground stoping.

6.1.3. Description of Individual Prospects

6.1.3.1. General:-

Henderson (1943) describes in some detail the various prospects comprising the Interview River tin-tungsten workings, and as no new data are available from the present investigations, it is planned to discuss the more important deposits only briefly, and in particular to consider their areal extent.

6.1.3.2. Kenny's Workings:-

This is the northernmost prospect in the area and is situated on old mineral section 5120/M of 80 acres. The geology and extent of Kenny's workings, as presently exposed, are shown in Fig. 17.

The vein has been prospected by trenching and shallow (?) shafting along a strike length of some 120 metres, although vein continuity over this entire distance is uncertain. The vein is about 25 cms. thick, and strikes approximately 20° east of true north,

dipping steeply to the south-east. Mineralogically, quartz predominates, with minor muscovite and tourmaline.

Henderson considers that there were three shoots of ore worked on Kenny's vein, but provides no data to substantiate this observation, and the writer found only minor wolfram in dump material beside the northern part of the main trench.

6.1.3.3. Tungsten Reward Workings:-

These could be termed the central workings, and are situated on the old reward section 5119/M of 80 acres (see Figs. 10 and 13). A narrow vein of maximum width 12 cms. is exposed in the eastern of two shafts, striking about 25° east of true north and dipping to the north-west at 85°. The vein consists of quartz, with tourmaline and minor wolfram. Limited costeaning has been carried out in an attempt to trace the vein (veins -?) to the north, with inconclusive results.

6.1.3.4. Cooney's Workings:-

These are the most southerly and extensive of the vein workings, being situated on old mineral section 5121/M of 40 acres. A geological sketch plan of Cooney's workings is given in Fig. 15, and the location of surrounding workings on Fig. 13.

According to Henderson (1943), "the group of prospects consist of a series of six roughly parallel veins, extending over a width of 90 feet and extending en echelon for nearly 300 feet, although the maximum length exposed on any one vein would not exceed 50 feet, while the observed length of the shoots of ore was only twelve feet. With three other apparently parallel veins exposed in shallow cuts some 250 feet north of Cooney's Shaft. Including these veins, the total width of the series of veins is 225 feet, with a total length of 500 feet".

The dump material at the mouth of Cooney's shaft contains the largest mineralogical suite observed, consisting dominantly of quartz (some of which has a grey, "mineralized" appearance), with tourmaline, muscovite pyrite, arsenopyrite, minor wolfram and very minor scheelite. Henderson records five shoots of ore in the veins comprising Cooney's immediate workings, and a further two small shoots in the workings to the north. However, during the present investigation, little evidence was found of wolfram in the "mullock" dumps beside the various trenches and shafts.

6.1.3.5. Other Small Prospects:-

A number of minor prospects are shown in Figs. 10 and 13, these generally consisting of a series of costeans with an occasional shallow shaft. Quartz is usually evident in these costeans, but, as noted elsewhere, some at least may be angular quartzitic material derived from the Lagoon River Quartzites. The potential of these prospects is uncertain, as time did not allow geochemical soil sampling over the workings, although tourmaline was associated with quartz in at least one locality.

6.1.4. Interpretation of Soil Geochemical Data:

6.1.4.1. General:-

All soil samples were screened on 85 mesh, and geochemical assays carried out on the minus 85 mesh fraction for tin, arsenic, copper and tungsten (as WO_3): The selection of the minus 85 mesh fraction was based on orientation work carried out in the 1970-71 field programme, although it is noted that analysis of the complete sample would probably have been preferable, as both cassiterite and wolfram are resistant minerals (and the latter occurs in large crystals where developed in the veins). Complete analysis of the B-C soil horizon samples was carried out, although only limited work was done on the A horizon samples and values have not been plotted.

6.1.4.2. Distribution of Tin and Copper Over Known Workings:-

Geochemical tin and copper assay data for the close-interval grid over Kenny's Workings are plotted in Fig. 18A. Tin values are generally less than 10 ppm Sn, although isolated values in excess of 100 ppm (with a maximum of 610 ppm Sn) were obtained: These higher values are not considered to be indicative of undisclosed vein mineralization, and probably relate to (?) Tertiary dispersion over the granite surface. Copper values range from less than 10 to 45 ppm Cu, with no obvious association with the higher tin values or with the wolfram-bearing vein.

Minus 85 mesh tin and copper values for the B-C soil horizon developed over Cooney's Workings are given in Fig. 16A. Tin values are again generally less than 10 ppm with occasional values in excess of 100 ppm (and a maximum of 225 ppm Sn): These higher tin values do not obviously correspond with higher copper or tungsten values, nor do they coincide with the mapped veins. The geochemical copper assays range from less than 10 ppm to 43 ppm Cu, with two isolated values of 76 and 310 ppm to the south of Cooney's

Shaft: The significance of these higher values is uncertain.

In summary, the close interval soil sampling does not show any obvious association of minus 85 mesh tin or copper values with the known tungsten-bearing veins exposed in Cooney's and Kenny's workings: The tin values are apparently distributed randomly between the A (humic) and B-C (leached soil-weathered bedrock) soil horizons.

6.1.4.3. Distribution of Tungsten and Arsenic Over Known Workings:-

Minus 85 mesh fraction tungsten and arsenic assay data from the close-interval soil grid over Cooney's Workings are given in Fig. 16B: Similar data for Kenny's Workings are given in Fig. 18B, although geochemical assay data for tungsten are incomplete.

The above soil sampling revealed that some 70% of the samples have minus 85 mesh tungsten values in the range 50 to 200 ppm WO_3, with about 15% of the values above 200 ppm WO_3 (with a maximum of 350 ppm) and a similar proportion less than 50 ppm: On this evidence, soil values in excess of 50 ppm WO_3 may be indicative of the presence of tungsten-bearing vein mineralization, although the possibility that at least some of these samples have been contaminated by the former mining operations cannot be discounted. The distribution of higher tungsten values in a broad zone trending approximately north-west from Cooney's Shaft may be indicative of undisclosed veins in this area, or may be a function of dispersion about the workings: The former interpretation would confirm Henderson's (1943) observation of an en echelon trend of the veins in this direction.

Arsenic geochemical assays are generally less than 10 ppm As, with isolated values in excess of 10 ppm (and a maximum of 190 ppm). The higher arsenic values correlate with tungsten values in excess of 100 ppm WO_3, and in general are associated with the known vein workings. The significance of the higher arsenic values is uncertain, although Granier (1958) found that arsenic was a satisfactory indicator of tungsten-bearing veins mineralogically similar to those at the Interview River (although not within a granite body).

6.1.4.4. Evaluation of Tin and Copper Values from Cooney's Shaft Soil Grid:-

Geochemical tin and copper assays on B-C soil horizon samples from Cooney's Shaft Soil Grid are given in Fig. 13.

On the southern, and particularly the south-eastern, part of the Grid minus 85 mesh tin values are generally in the range 50 to 200 ppm Sn, with a significant proportion (about 10%) in the range 200 to 1,000 ppm, and isolated values in excess of 1,000 ppm. To the north of Cooney's Workings, and in the vicinity of Kenny's Workings, minus 85 mesh tin values are generally less than 10 ppm Sn. The soil sampling does not show any obvious association of minus 85 mesh tin values with the known workings, the highest values occurring in an apparently north-south trending (?) zone about 300m. east of Cooney's Shaft.

Geochemical copper values range from less than 10 to a maximum of 132 ppm Cu. The values show a similar distribution to the tin values (although the statistical correlation between tin and copper assays on individual samples may not be high), and values around 100 ppm Cu again occur in the north-south trending zone about 300m. east of Cooney's shaft. The possibility that tin-bearing "veins", or disseminated cassiterite within the granite, occur in this locality is noted: The zone appears to broaden to the south of Grid Line 2400 feet South, and may also represent an area of Tertiary alluvial concentration.

6.1.4.5. Evaluation of Tungsten and Arsenic Values from Cooney's Shaft Soil Grid:-

The minus 85 mesh tungsten and arsenic geochemical assay data from Cooney's Shaft Soil Grid are plotted in Fig. 14: Data relate to the B-C soil horizon only.

Tungsten values to the south of Cooney's Workings (lines 2400 ft. and 2,000 ft. South) are in the range less than 10 to 90 ppm WO_3, with a majority of samples between 10 and 30 ppm: The higher tungsten values are probably not significant, although close interval sampling in two localities 500 to 1,000 ft. west on Grid Line 2400 ft. South, and 100 to 600 ft. east on Grid Line 2000 ft. South) should confirm this observation.

In the vicinity of Cooney's Workings, soil samples between 400 ft. East and 400 ft. West (on line 1600 ft. South) contain between 30 and 174 ppm WO_3, which may indicate that further undisclosed tungsten-bearing veins occur in the area (see also section 6.1.4.3.). To the north of Cooney's Workings, minus 85 mesh tungsten values generally range from less than 10 to 90 ppm WO_3, with further sampling being indicated in a limited number of localities. The only anomalous area of probable significance is that about the old Tungsten Reward Workings, on Grid Line 00 ft. North.

6.1.5. Interpretation of Stream Sediment Geochemical Data

The distribution of stream sediment tin values over the area of the Interview River tin tungsten workings is shown in Fig. 11, and the data have been discussed briefly in Section 5.3.2.

Minus 85 mesh tin values generally range from 200 to 400 ppm Sn, with isolated high values up to 1,000 ppm: Some major branches of streams reveal values in the range less than 10 to 200 ppm. The existence of stream sediment tin values up to 200 ppm Sn in some streams to the east (upstream) of the Interview River tin-tungsten workings suggests that the tin, although possibly derived from the tungsten-bearing vein deposits, has been redistributed by processes of erosion, possibly during the Tertiary.

Minus 85 mesh copper values are generally in the range less than 10 to 50 ppm Cu, with isolated higher values. The higher values are not regarded as significant, and have no apparent relation to the tin values. Arsenic values are generally less than 10 ppm As, with isolated values up to 35 ppm: Again, these do not appear to be significant. Stream sediment copper and arsenic values are given in Fig. 12.

Limited assaying of samples was carried out for tungsten, and with the exception of one contaminated sample (the sediment being derived in part from an old water race above the stream), values did not exceed 100 ppm WO_3, and were generally less than 10 ppm. The samples assayed were from the stream draining Cooney's Workings, and in view of the results, further samples were not assayed geochemically for tungsten. Tungsten values are plotted in Fig. 11.

6.1.6. Economic Potential of the Deposits

6.1.6.1. Alluvial Tin Prospects:-

The possibility of developing alluvial tin deposits in the area is extremely doubtful, particularly in view of the remoteness of the area. The geochemical data obtained both from soil sampling and stream sediment sampling are not regarded as encouraging, and further work does not appear justified.

It is noted that the immediate derivation of the alluvial cassiterite from the tungsten-bearing vein deposits has not been substantiated, although Henderson (1943) provides some confirmation of this. The possibility that the immediate source of the tin values is located about 300m. east of Cooney's Shaft is noted.

6.1.6.2. Tungsten Vein Prospects:-

In view of the nature of the vein deposits (particularly their width and apparently low average grade values), and the relative remoteness of the area, the possibility of developing an economic open-cut mining operation for tungsten is considered extremely unlikely. The nature of the veins would certainly preclude any large scale underground mining.

It is stressed that satisfactory interpretation of the soil tungsten values cannot be made without follow-up geochemical sampling and costeaning, although the existence of further vein systems of similar extent to Cooney's workings does not appear likely. However, the wide spacing of the Cooney's Shaft Soil Grid lines (in view of the areal extent of the known workings), and their orientation sub-parallel to the vein strike, is noted. The writer considers it probable that further tungsten-bearing veins could be located in the area, although this is unlikely to alter the economic potential of the deposits.

6.2. Chimney Creek Aeromagnetic Anomaly

6.2.1. Introduction

Reconnaissance ground magnetometry traverses were carried out in the Chimney Creek area in an attempt to evaluate the significance of the north-south trending aeromagnetic anomaly (referred to as a_{12} on Fig 4) interpreted there by C.G.G. As shown in Fig. 9, this is a low contrast "anomaly", and appears to coincide with a "wedge" of Interview Siltstone flanked by Lagoon River Quartzites to the west, north and east. It appeared probable that differing magnetic susceptibilities of the two stratigraphic units would account for this "anomaly", but in view of its proximity to the Interview River tin-tungsten workings, the possibility of pyrrhotite mineralization associated with the Interview River Granite could not be entirely discounted.

Two ground magnetometer traverses were carried out, using helicopter access in late January, 1972, and rock specimens were collected in an attempt to identify a source of contrasting magnetization. The location of lateritic material coinciding with a significant ground magnetometer peak on the more northerly traverse was followed by limited, random soil sampling.

The location of the northern and southern traverse lines is shown in Fig. 10, and it is stressed that these were reconnaissance lines only, and were not pegged and chained.

6.2.2. Geophysical Data

6.2.2.1. North Traverse Line:-

A plot of magnetometer scale reading (in gammas) against distance along the traverse line is given in Fig. 19. From magnetometer stations 1 to 13, a uniform background of 450 ± 25 gammas was obtained, this comparing with a base reading of 220 gammas (with negligible daily fluctuation)at the Surprise Creek field camp. The minor "peak" between stations 13 and 21 is probably only background variation. The sharp peak about station 23, which is approximately three times background, may well have some significance, but lack of outcrop prevented further evaluation. The "anomaly" extends over about 5 metres. The principal anomaly, which comprises four peaks respectively 0.5, 2.5, 2 and 4 times background, extends over some 100 metres between stations 29 and 39. The shape of the "composite" peak may be somewhat distorted by the spacing of magnetometer stations (which did not exceed 15 metres).

6.2.2.2. Southern Traverse Line:-

No ground magnetometer peaks were identified on the southern traverse, which extended for some 300m. on either side of the aeromagnetic axis interpreted by C.G.G. Magnetometer stations were spaced at approximately 15m. intervals, and instrument scale readings ranged between 400 and 650 gammas, which is regarded as only background variation.

6.2.3. Geological and Geochemical Data

6.2.3.1. Geological Observations:-

Rock specimens were collected along the northern traverse line, at points coinciding both with ground magnetometer peaks and background values. Sample locality and rock type are shown in Fig. 19 in relation to the ground magnetometer profile. It is noted that outcrop was by no means continuous, and no attempt was made to map geologically beyond the reconnaissance traverse line.

Specimens Gx 18 and 19 are white, massive, extensively "recrystallized" quartzites, and resemble specimens of the Lagoon River Quartzite. However, the presence of probable relict bedding in specimen Gx 18, and its finely crystalline nature, suggest that it could represent a quartzite bed within the Interview Siltstone, as mapped by the Mines Department (see Fig. 9). In the absence of geological data to the west of specimen Gx 18, the statigraphic unit to which the quartzites belong cannot be resolved,

although on the basis of hand specimen petrography the writer favours the Lagoon River Quartzite. Certainly, the magnetometer results do not indicate that the quartzites are magnetite-bearing, and are not therefore the source of the aeromagnetic anomaly. The presence of cavities within both quartzite specimens, possibly after weathered sulphides, is noted but is of unknown significance.

Specimens Gx 20, 22, 23, 26 and 27 are all typical of the rock type mapped as the Interview Siltstone. They are finely laminated, grey (-green) siltstones, in which sedimentary features such as truncated bedding are strongly developed. Original bedding is possibly accentuated by metamorphic segregation into quartz-rich and mica-rich layers, typical of some higher grade schist rocks. Thin section examination of specimen Gx 26 indicates that the finer laminae are sericite-rich, and that variation in grain-size of the quartz is responsible for much of the "bedding" visible in hand specimen. The siltstone consists dominantly of quartz grains, which show partial grain boundary resorption accompanying metamorphism, and contains abundant opaque brown grains, which may be ferruginous or titaniferous. As specimen Gx 26 coincides with the principal ground magnetometer peak, the possibility that this opaque mineral is a magnetite alteration product is noted.

Specimens Gx 24 and 26 are typical laterites, the former coinciding with a possible, small magnetometer peak, and the latter with the principal peak obtained. Both specimens are dark reddish-brown in colour, and consist dominantly of limonitic material. Cavities within the lateritic specimens are not box work types typical of leached sulphide gossans, and the laterites may be derived from a basic igneous rock type. The (?) Precambrian dolerite dykes intruded the sedimentary rocks of this area (see Fig. 3) are commonly lateritized in outcrop.

6.2.3.2. Soil Geochemical Data:-

Six hand-auger holes (Gz 1 to 6) were drilled randomly in the vicinity of the major ground magnetometer peak about station 37, with the following geochemical data being obtained from the minus 85 mesh fraction of each sample.

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SAMPLE REFERENCE	GEOCHEMICAL ASSAY DATA (ppm)					
	Sn	As	Cu	Pb	Zn	Ni
Gz 1	<10	<10	13	<10	20	<10
Gz 2	<10	30	15	<10	70	<10
Gz 3	<10	<10	13	<10	40	<10
Gz 4	<10	20	15	<10	15	<10
Gz 5	<10	60	20	<10	10	<10
Gz 6	<10	30	10	<10	30	<10

These data do not indicate any significant trace element concentration in the fine, clayey soil horizon, which is derived largely from the laterite, and are not suggestive of any possible economic ore association with the ground magnetometer peak.

6.2.3.3. Rock Specimen Geochemistry:-

Laterite samples Gx 24 and 26 were assayed geochemically for trace element content, and were both found to contain less than 10 parts per million of copper, lead, zinc, nickel, cobalt and chromium.

6.2.4. Geological and Economic Significance of the Geophysical Anomaly

The Chimney Creek aeromagnetic anomaly appears to be related to differing magnetic susceptibilities of the Lagoon River Quartzite and the Interview Siltstone outcropping in the area, the anomaly coinciding with the latter unit.

The ground magnetometer peak coincides with laterite development within the Interview Siltstone, and is attributed to magnetite development, either

1) associated with a particular siltstone bed; or

2) related to an unexposed Precambrian dolerite body.

The former interpretation is favoured, as the dolerites developed elsewhere do not generally trend parallel to the bedding of the Precambrian sediments, nor do they have any obvious magnetic expression. Certainly, the geochemical data obtained do not suggest that the ground anomaly has any economic significance, particularly in so far as tin mineralization is concerned.

6.3. Copper Reward and Silver Reward Workings

6.3.1.1. Location of Workings:-

The Copper Reward and Silver Reward workings are situated on the Interview River, some 8 km inland from its mouth. The general location of the workings, and of the former mining leases covering the area, is shown in Fig. 9.

A more detailed geological sketch plan (at a scale of 1:10,000) is given in Fig. 20, with the various workings located during the present survey (and the nature of mineralization evident from the old dumps) being indicated.

6.3.1.2. Mining History:-

The Copper Reward and associated workings were apparently commenced about 1900, probably at the same time as initial development of the Interview River tin-tungsten workings. The Silver Reward "vein" was discovered about 1910, with minimal subsequent development.

There is no recorded production from the area, and dumps of rich ore are still in evidence at the collars of both the Copper Reward and Silver Reward Shafts. Ward (1911), in discussing the Copper Reward mine, records that "from these workings some 12 tons of ore have been raised, and lie on the surface". This relatively rich ore still lies beside the southern shaft at the Copper Reward workings, although it is now in a somewhat oxidized state.

6.3.1.3. Previous Geological Investigations:-

The only known previous geological investigation of the Copper Reward and Silver Reward Workings is that by L.K. Ward in about 1910, in connection with the Balfour mining field. His observations are recorded in Bulletin No. 10 of the Tasmanian Geological Survey, dated 1911.

6.3.1.4. Present Evaluation:-

The present evaluation of the Copper Reward and Silver Reward workings has been restricted to some 25 man hours in late January, 1972, utilising helicopter access to the area.

The following were carried out:-

1. Location of various old workings, both from the air and from subsequent ground traverses.

2. Geological examination and appraisal of workings, with both chip and bulk sampling of any ore (in dumps or in situ) and associated rock types.

3. Stream sediment sampling of watercourses draining the area surrounding the Copper Reward Workings.

Subsequent laboratory investigations of the samples collected has included geochemical and conventional assaying of sediment, ore and rock samples, and thin section study of selected rock specimens. Time did not permit mineragraphic study of ore specimens.

6.3.2. Description of Individual Prospects

6.3.2.1. Copper Reward Workings:-

The Copper Reward workings are the most extensive in the area, comprising two shafts (one vertical, one inclined at about 45°) and some 100 feet of trenching along the outcrop of the mineralized "vein". The "vein" is clearly exposed to the south in the bed of the Interview River, varying in width from about 0.1 to 0.5 metres, and carrying locally rich chalcopyrite and covellite (up to a maximum thickness of 7.5 cm). To the north of the shafts, Ward (1911) records that prospecting along the projected strike revealed minor copper mineralization in one of two localities tested, although these were not located during the present evaluation.

The dump of now-oxidized ore beside the southern shaft (see also 5.3.1.2.) consists of chalcopyrite and films of covellite, in a gangue of pyrite, quartz, chlorite and "undigested" country rock.

Ward (1911) records that the now inaccessible shaft is 10 metres deep, with a "vein" thickness of 60 cms. reported at the bottom. Three separate "grab" samples from a bulk sample of some 70 kg. of ore collected from the dump gave the following assay data:-

Sample	% Cu	Ag (oz/ton)	Au (oz/ton)
A	10.5	2.02	0.04
B	12.5	1.88	0.04
C	Not assayed	1.82	0.04
Mean	11.5	1.91	0.04

An XRF scan of Sample C failed to reveal significant concentrations of other elements of economic importance: Traces of nickel and zinc were present in the sample. While the significance of the mean values computed above are uncertain, and the grab samples taken cannot be regarded as truly representative the grades indicate a relatively rich copper ore.

The only "vein" exposure available for examination is that crossing the Interview River and outcropping on the northern bank, the "vein" having a strike of 121° true and a south-westerly dip of about 60°. It appears to be essentially concordant with the strike of the enclosing sediments, although its

relationship to the dip of the beds is uncertain but probably transgressive. The sediments are typical greyish specimens of Interview Siltstone, and within a matter of feet of the "vein" still display primary sedimentary features (such as cross-bedding) and are relatively unaltered. Ward (1911) records that the shaft (the southern -?) had been sunk "immediately on the contact of an amphibolite dyke and slate", although the dump material clearly contains relatively unaltered specimens of Interview Siltstone: Certainly, a large dolerite body outcrops some 30 to 60m. to the north of the workings.

Ward (1911) records that the initial workings on the northern bank of the Interview River disclosed "a narrow vein of excellent ore", and considered the "vein" to be a branch of the major "lode" recognised by him to the north in what is here referred to as the Copper No. 1 Prospect. No grade data are available from the exposed "vein". In hand specimen (particularly AgCuR 7), the "vein" material consists of recrystallized quartz and elongate chloritic "stringers", with chalcopyrite apparently parallelling a relict "bedding" and occurring as discontinuous lenses associated with the crystalline quartz. In thin section, the rock type (AgCuR 7) is seen to be a siltstone composed of quartz grains of fine, uniform grainsize, with a general absence of layering (although some elongate sericite is locally developed). The siltstone is traversed by coarsely crystalline quartz veinlets possibly representing hydrothermal solutions which introduced the copper mineralization, although there is not an obvious association of chalcopyrite with transgressive quartz veinlets in this particular specimen.

6.3.2.2. Copper No. 1 Prospect:-

The copper No. 1 Prospect is located some 180 m to the north west of the Copper Reward Workings, and is approximately on the projected strike of the "vein" exposed in the latter workings. The two are separated, however, by a body of dolerite. The only workings are a small cut in the eastern bank of the creek.

Ward (1911) considers this prospect to be located on the "major lode" which consists of up to 3m of massive, white quartz striking approximately east-west and dipping to the south at about 80°. According to Ward, "two feet of the formation on the hanging-wall side carry chalcopyrite, covellite and traces of malachite", and the quartz "lode" can be traced to the east as far as the Interview River, with occasional untested gossanous patches. The "lode" quartz carries

pyrite, and is flanked on both sides by typical, grey Interview Siltstone.

The old workings have now collapsed, and "vein" attitudes cannot be clearly deduced. However, copper mineralization appears to be associated with silicified and chloritised siltstone, and a chalcopyrite-pyrite association is evident. In thin section, specimen Ex 82 from the workings was found to be a siltstone, with differing sized quartz grains and minor sericite responsible for the observed layering: The siltstone is traversed by coarsely crystalline quartz veinlets, which are presumably related to the ore-bearing fluids. Dark brown to black opaque grains are present (although not identified), and some iron staining, probably after sulphides is evident. In hand specimen, chalcopyrite veinlets up to 0.5 mms. are present, and the rock has a somewhat brecciated appearance, with chloritic veins derived from the siltstones incorporated in a quartzose "ore fluid". A sample of approximate weight 0.5 kg., but not representative of the grade of ore, gave the following assay results:

Copper	2.90%
Zinc	260 ppm
Lead	Less than 10 ppm
Nickel	Less than 10 ppm

Of particular importance is the recognition by Ward (1911) of the massive white quartz outcropping in this prospect, and in fact throughout the area, as "lode" material. One specimen of this quartzose material (Ex 81) from the Copper No. 1 prospect was examined in thin section, and was found to consist dominantly of euhedral quartz, with minor orthoclase showing kaolinite alteration, very minor muscovite, and iron oxides (probably derived from sulphides). The textural evidence suggests an igneous derivation (possibly by crystallization from hydrothermal, siliceous solutions), and specimen Ex 81, which contained fairly extensive fine pyrite crystals up to 0.05 mm., was assayed with the following results:-

Sulphur	1.5%
Copper	200 ppm
Zinc	80 ppm
Lead	Less than 10 ppm
Nickel	Less than 10 ppm

These geochemical data are similar to those from the specimen of chalcopyrite ore from the Copper No. 1 prospect (which was discussed earlier), in that both contain significant zinc, but lead and nickel concentrations are less than 10 ppm.

6.3.2.3. Copper No. 2 Prospect:-

The Copper No. 2 Prospect is located some 450 m. south-south-west of the Copper Reward workings, an adit having been driven for a distance of about 10 m. beneath the outcrop of a massive, white recrystallized "quartzite" which strikes east-west and dips nearly vertically. The "quartzite" unit appears to be 15 to 30 m. in thickness, although outcrop is somewhat restricted, and carries finely crystalline dark grey-black haematite.

The adit is still open, but no geological information could be obtained from the underground exposures. Dump material at the mouth of the adit consisted of massive, white "recrystallized" quartz, chlorite and large masses of finely crystalline haematite, with pyrite crystals up to 3 mm. relatively abundant. There is no evidence of any other metallic mineral in hand specimen.

Although Ward (1911) considers the "quartzite" to represent "a strong lode", it resembles both in hand specimen and in thin section (of similar specimens from the immediate area) a recrystallized quartzite, and does not appear to be of hydrothermal or igneous origin. The specimen (Ex 81) described from the Copper No. 1 Prospect is an exception, but copper mineralization is developed there (and not in the Copper No. 2 Prospect).

6.3.2.4. Copper No. 3 Prospect:-

This prospect is some 480m. south-south-east of the Copper Reward workings, a shaft having been sunk apparently on an outcrop of massive recrystallized quartzite carrying relatively abundant pyrite. Ward (1911) records that the shaft was 12m. deep, although it has now filled to within 2m. of the ground surface. He also noted the presence of very minor specular haematite, although the writer was unable to verify this.

There is no evidence of copper or other metallic mineralization in the dump material.

6.3.2.5. Silver Reward Workings:-

The Silver Reward Workings are located about 1500m. south-east from the Copper Reward, and a shaft has been sunk to a probable depth of 8-10m. Very rich galena ore is evident on the dump, together with siderite and (?) sphalerite, but the existence of the "vein" in either direction beyond the mouth of the shaft could not be established. Ward (1911) records the following:

"The vein has a course of N48^{o}W (magnetic -?), and appears to dip to the south-west. The excavation which had been made (immediately prior to Ward's inspection) showed the lode to be 2 feet wide and to carry a fair proportion of clean ore, free from zinc blende.

A proportion of the lode was assayed and proved to contain 68.4 per cent of lead and 34 oz. of silver per ton.

The outcrop of this vein is insignificant, and it cannot be traced more than a few feet. The slate in the vicinity carries stringers of quartz, but no other signs of any continuation of the lode are apparent".

The Silver Reward "vein" occurs within an outcrop of typical Interview Siltstone, and the writer gained the impression that the ore was essentially concordant with the near-vertically dipping beds. The gangue material in the dump consists of recrystallized or vein quartz, with fine chloritic stringers often showing random orientation. The ore appears in part at least to parallel the elongation of the chloritic gangue, but the majority of the galena is associated with a later generation of quartz. Thin section study of one typical ore specimen (AgCuR 5) indicated that the country-rock was a finely laminated siltstone, composed almost entirely of quartz grains of differing size (giving rise to the observed "bedding"): Minor iron oxides and sericite occur in the finer laminae. The siltstone is transgressed by more coarsely crystalline and heavily fractured quartz veinlets with which galena is associated, suggesting hydrothermal introduction of the ore fluids.

The Silver Reward ore consists dominantly of galena, which is presumably argentiferous, with dark brown siderite (and/or sphalerite -?), minor pyrite and very minor chalcopyrite. The identification of siderite and (?) sphalerite proved somewhat ambiguous, streak and chemical tests suggesting the latter mineral, but an XRF scan of one ore sample revealed only a slight trace of zinc (and major iron): It is probable that at least some marmatite is present in the ore. Three "grab" samples from some 100 kg of Silver Reward ore gave the following assay results:-

Sample	%Pb	Ag (oz/ton)	Au (oz/ton)
A	34.0	14.39	0.01
B	Not assayed	13.89	0.02
C	47.6	22.39	0.02
Mean	40.8	16.49	0.02

As with assay data from the Copper Reward samples, the above mean data can only be regarded as indicative of the grade of ore, as the extent of dilution is unknown. An XRF scan of sample B also revealed some copper (less than 0.2% Cu), with traces of zinc and antimony present.

6.3.3. Stream Sediment Geochemical Data

6.3.3.1. General:-

Stream sediment geochemical data for watercourses draining the area surrounding the Copper Reward workings are given in Fig. 21. Time did not permit further stream sediment sampling in the Silver Reward area.

6.3.3.2. Interpretation of Copper Values:-

The only obviously significant copper value was that obtained immediately below the point where the Copper Reward "vein" crosses the Interview River, a value of 620 ppm Cu (total) being determined on the minus 85 mesh fraction, Adjacent downstream samples (at about 50 metres spacing) contained only low copper values, however, ranging from less than 10 to 14 ppm Cu. In view of this, copper values of the order of 20 to 50 ppm Cu in various side streams (see Fig. 21) in the area may be significant, although differences in stream characteristics may in part account for the values obtained.

6.3.3.3. Other Geochemical Assay Data:-

All stream sediment samples in the area contained less than 10 ppm lead, zinc and nickel, and the values are not indicative of any major repetition of the Silver Reward mineralization.

The isolated value of 50 ppm tin (as Sn) obtained above the Copper No. 1 Prospect is not regarded as significant, possibly being derived from remnant Tertiary sedimentation in the area.

The isolated value of 20 ppm arsenic (as As) in a side-stream some 1100 metres south west of the Copper Reward may have some significance, although arsenopyrite has not been noted in either the Copper or Silver Reward Workings.

6.3.4. Economic Potential of the Copper Reward and Silver Reward Workings

The Copper Reward and Silver Reward workings have been developed on hydrothermal veins occurring within the Interview Siltstone, and a possible genetic relationship with the nearby Interview River Granite is noted. The The veins have apparently carried relatively rich copper and silver-lead ore, although the strike extent of the veins does not appear to be great, and their exposed width is less than 0.6m. There exists a possibility that the veins may widen at depth, but there is certainly no surface geological evidence that major ore bodies outcrop in the area.

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It is stressed that the area has been inadequately appraised geologically (because of time limitations), and that further prospecting may be warranted: However, the relative remoteness of the area, and the fact that the vein exposures are not particularly encouraging, suggests that the prospects should be given only a low priority.

Further investigation of the massive "recrystallized" quartzites (which locally carry pyrite and haematite, but apparently no other metallic minerals) does not appear warranted, because the geological evidence available (particularly thin section studies) indicates that these are not hydrothermal "lodes" as suggested by Ward (1911): They appear to have been metamorphically derived, although the presence of apparently unmineralized quartz veins (of similar origin -?) transgressing the regional structure of the siltstones has been noted, both by the Department of Mines (1969) and during the present study.

6.4. Rupert Point Aeromagnetic Anomaly

6.4.1. Aeromagnetic Survey Interpretation

The Rupert Point Aeromagnetic Anomaly is shown as f1 in Fig. 4 and Table 2: C.G.G. made the following comments regarding this anomaly, which is of moderate contrast:

"It was not possible to make a valid quantitative interpretation of f1, as this is only defined by one flank. Nevertheless, it could appear that this contrast is not located at the surface. It seems to correspond to a marginal type of mineralization such as is spoken of by M. Solomon (1965)".

It is regarded as corresponding to a fault strucutre marginal to the Interview River Granite pluton.

6.4.2. Ground Magnetometry

Four ground magnetometer traverses, varying in length from 1,000 to 1,200 m., and oriented essentially at right angles to the aeromagnetic axis (that is, approximately east-west), were carried out: The spacing of the traverse lines varied between 600 and 900 m., and covered the area from the mouth of the Pieman River north to Rupert Point (the extent of the aeromagnetic anomaly on land). The location of the four traverse lines is shown in Fig. 22, and the ground magnetometer profiles in Fig. 23.

It is noted that the traverse lines were not pegged and chained, and the orientation varied somewhat to allow for topography and ease of access: Magnetometer stations were spaced at approximately 30m. intervals along the traverse lines.

The southern most traverse line (Line 6) shows a marked increase in scale reading from east to west, increasing from about 600 gammas to about 900 gammas between 150 and 450 m. West. This appears to correspond with the granite-intruded sediments contact. Further to the west, scale readingsincreased to about 1,000 gammas, with an isolated peak of 1,400 gammas: This coincides in part with the outcrop of Precambrian quartzites of the Rupert Beds (Donaldson Group).

Traverse Line 7 profile increases from a background of 600 gammas in the east (approximately at the mapped granite-sediments contact) through a broad "peak" of about 850 gammas between 840 and 600 m. east, then decreases again to about 700 gammas: An isolated "peak" of 950 gammas appears to coincide with an outcrop of Precambrian quartzite.

Traverse Line 8 ground magnetometer profile increases gradually from a background of 600 gammas through a broad "peak" of 850 - 900 gammas extending over some 300 m., then decreases again to 700 gammas: An isolated peak of 980 gammas corresponds approximately with an outcrop of Precambrian quartzite.

The magnetometer profile on Traverse Line 9 increases from about 700 gammas adjacent to the granite-sediments contact, then fluctuates between 700 and 850 gammas over the Precambrian sediments.

The ground magnetometry results do not show any sharply contrasting "peak" coinciding with the aeromagnetic anomaly axis, although there is a general increase in scale reading away from the granite margin: A broad low-contrast north-south trending zone extending over some 600 m. on each of the traverse lines could, however, be interpreted. This would appear to be related to the outcrop of Precambrian sediments, although limited penetration of the magnetometer used may account for the results obtained.

6.4.3. Outcrop Geology

The outcrop geology of the area under consideration is shown in Fig. 22, and the regional geological interpretation (largely after the Mines Department, 1969) is given

in Fig. 3. From field observation, the area is intensely deformed, and the structure of the Precambrian sedimentary rocks is extremely complex, and incompletely understood.

The Interview River Granite apparently intrudes an upper unit of the Interview Siltstone, consisting of black mudstone and siltstone, although outcrop is very limited and direct observation of the contact is seldom possible. To the west, the Rupert Beds outcrop fairly extensively, and consist of interbedded quartzite (which is a massive, white, "recrystallized" type in hand specimen) and siltstone, with three prominent conglomerate units each up to 100 feet thick: Chert and dolomite have been reported from the Rupert Beds (Spry and Ford,1957).

The Rupert Beds as here defined are regarded by Spry (1964) and the Mines Department (1969) as stratigraphically and lithologically equivalent to the Donaldson Group, as exposed in the lower Newdegate Creek area: The Rupert Beds are considered to overlie the Interview Siltstone, and represent sedimentation equivalent to the Smithton Dolomite in north-western Tasmania. However, the Rupert Beds appear to be far more complexly deformed than the Interview Siltstone outcropping immediately to the South of the Pieman River mouth, and the reasons for this are by no means clear: The possible equivalence of the Rupert Beds to the depositional break represented by the Chimney Creek Hornfels (between the Pedder River Siltstone and the Lagoon River Quartzite of the Rocky Cape Group "equivalents") is therefore noted, although the reported existence of minor dolomite in the Rupert Beds favours the presently accepted interpretation.

6.4.4. Stream Sediment Geochemistry

Minus 85 mesh stream sediment values for tin, arsenic and total copper are shown in Fig. 24 for the area of the Rupert Point aeromagnetic anomaly.

Tin assays are generally in the range less than 10 to 100 ppm Sn, with isolated values up to 900 ppm and with occasional lengths of streams yielding consecutive sample values in excess of 100 ppm. Arsenic values are invariably less than 10 ppm. As; and copper is in the range less than 10 to 37 ppm. Cu, with isolated values of 90 and 170 ppm.

In view of the fact that the source of the aeromagnetic anomaly is apparently located at depth, the above stream sediment values are probably unrelated to it. The tin is therefore derived either from the granite itself, or more probably from the veneer of Tertiary gravels developed over part of the area drained (see fig. 22). The isolated higher copper values may have some significance, although this is not considered likely.

6.4.5. Economic Potential of the Aeromagnetic Anomaly

The investigations carried out have not established the existence of a geochemical and/or geophysical anomaly in the Rupert Point area. However, if the source of the aeromagnetic anomaly is located below the ground surface (as suggested by the C.G.G. interpretation), then the possibility of mineralization marginal to the granite body at some depth has likewise not be disproved.

In view of the results obtained in the South Pieman Head area, and the likely existence of a source of pyrrhotite-cassiterite mineralization in the immediate vicinity, it is felt that the Rupert Point area should be retained until evaluation of the South Pieman Head prospect is completed. The reported existence of dolomite beds in the Rupert Point area may be of some significance in this regard.

6.5. South Pieman Head Tin Prospect

6.5.1. General

Reconnaissance stream sediment sampling in the South Pieman Head area in August 1971 revealed a number of anomalous tin values (with isolated samples containing in excess of 10% Sn), and in fact the investigations by Pickands Mather and Co. has also indicated the possibility of tin mineralization in the area.

During Summer 1971-72, field investigations were concentrated in this area, and included

1) detailed outcrop geological mapping (at a scale of 1:10,000) over the South Pieman Head Granite and the adjacent Precambrian sedimentary rock types.

2) follow-up stream sediment sampling to confirm the results obtained in the reconnaissance investigations, and to delineate those streams which carried anomalous tin values.

3) geochemical soil sampling over the principal anomalous area within the granite body, on a 200 feet square grid.

4) reconnaissance costeaning and pitting over both the granite and the adjacent sediments, with geochemical assaying and mineralogical assessment of samples.

The above evaluation has provided sufficient data to indicate that the anomalous tin values are being shed by a "bedrock" source in the immediate vicinity, possibly a contact "ore" body.

6.5.2. Mapped Geology

6.5.2.1. Outcrop Geology:-

The outcrop geology of the South Pieman Head area, as mapped during the Summer 1971-72 field programme, is shown in Fig. 25. To the south, the South Pieman Head Granite outcrops and occupies the whole of the "headland" area: Outcrop is generally good in the coastal section, although inland the exposure is poor in the button-covered areas (where thin Tertiary gravel cover exists). To the north, the granite intrudes the Precambrian Surprise Creek "Beds", which consist dominantly of micaceous siltstones, and to the east similar beds are in contact (possibly faulted) with the granite: Exposure of the Precambrian sedimentary rocks is generally restricted to the beds of the major streams in the area.

6.5.2.2. Precambrian Stratigraphy:-

The Surprise Creek "Beds" include dominant grey to green siltstone, micaceous sandstones, grey shale, black pyritic shale, and occasional thin pebble conglomerate and quartzite members. No attempt has been made to subdivide the Surprise Creek "Beds" in Fig. 25 (although the dominant black pyritic shale units are indicated), as insufficient hand specimen and thin section study has been carried out to satisfactorily identify a number of lithological units: Again, field correlation between the limited creek-bed exposures is difficult, and observations suggest a regular gradation between the dominant shale - siltstone - sandstone lithologies, even within isolated outcrops. Colour of the sedimentary rock types varies between localities, although it does not appear to be definitive of lithological units. Many of the units show relatively extensive muscovite and/or sericite development, and this is secondary recrystallization on cleavage planes (parallel to the axial plane of mesoscopic folds within the sedimentary units).

Extensive pyrite development occurs locally, particularly within the black shale units, and crystals up to 2 mm. are not uncommon. Sulphide occurrence in veinlets within the Surprise Creek "Beds" has been noted from two exposures near the contact with the granite, one in the northern branch of Surprise Creek and the other from the wave-cut platform to the west of South Pieman Head: No genetic association with the granite is indicated in the latter locality. Minor pyrrhotite (?) has been tentatively identified in restricted occurrences, although no other mineralization is evident. The pyrite has most probably been derived from sedimentary or metamorphic processes.

The Precambrian sediments at the granite margin do not appear to have been extensively hornfelsed, although minor spotting and banding is evident up to 100 metres from the contact. The sedimentary rocks are generally quartz-rich, and little contact metamorphic effect would be anticipated.

The Surprise Creek "Beds" are regarded as probably equivalent to the upper parts of the Interview Siltstone, although stratigraphic correlation is not possible with the limited investigations carried out. There appears to be a marked change intensity of deformation of the Precambrian sediments to the north and south of the Pieman River, with the Surprise Creek "Beds" being far less intensively deformed: This may be a function of the extent of outcrop in two areas, however.

6.5.2.3. Precambrian Structure:-

The structure of the Precambrian sediments has not been fully elucidated during the present survey, due in part to lack of outcrop. The regional strike of the sediments appears to vary between 20° and 60° east of True North, with steep dips to both the north and south. Observations on the beach at the mouth of the Pieman River indicate that the sediments have been folded about NNE trending axes, and plunge shallowly to the north. Local outcrops also reveal that the mesoscopic structure is considerably more complex than would appear from the investigations to date, and in many outcrops cleavage attitudes can only be measured: These are presumably parallel to the original bedding, and to the axial planes of the observed folds.

No major faulting is evident in the South Pieman Head area, although the granite - sediments contact to the east is a definite linear feature resembling a fault structure. No field evidence has been found of a major fault, however, although outcrop in the critical area is absent. The deep, linear incision of Surprise Creek is essentially parallel to the regional strike of the

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Precambrian sediments, and it is possible that the steep granite escarpment parallels an original, steeply-dipping granite - sediments contact: Both Spry (1964) and the Mines Department (1969) have mapped this as a fault structure, Spry suggesting that it had a 500 feet displacement, west - block up.

The possibility of a major fault in the bed of the Pieman River at its mouth, as mapped by Spry (1964), is noted, particularly in view of the apparently differing intensities of deformation of the Precambrian sediments to the north and to the south.

6.5.2.4. Devonian Granite:-

The South Pieman Head Granite is a medium to coarsely crystalline biotite granite, with both muscovite and tourmaline developed locally: The tourmaline occurs in clusters, nodules and veinlets, although there is no sulphide association with this late-stage mineral. Very limited thin section study indicates that there is a relative abundance of andesine, and that the rock may in fact be a granodiorite. There is also a suggestion in thin section that the tourmaline may be replacing feldspars, and minor apatite and zircon are present. The muscovite is present both as a primary mineral (in minor amounts), and as an alteration of plagioclase.

A distinctive blue-grey "phase" of the granite is evident locally, particularly in the eastern part of body. The relationship between this "phase" and the main granite is not clear in the field, because critical contact areas are not exposed. Thin section study indicates that the rock is very siliceous, and may be a hornfelsed siltstone: Further study of this "phase" is necessary, as it could possibly be related to tin mineralization (although preliminary geochemical assays did not indicate this).

6.5.2.5. Tertiary Gravels:-

Much of the South Pieman Head area is covered by a thin veneer of quartzose sands and gravels, generally 1-2 metres thick, which resembles weathered granite. The quartz is mostly angular material, derived both from the granite itself and from Precambrian quartzites (together with quartz veins within the Precambrian quartzites), with occasional rounded pebbles indicating sporadic influx of transported sediment.

It would appear that the area formed a Tertiary erosion surface, with the accumulation of much of the quartzose material essentially in situ, possibly in shallow marsh areas.

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Evidence of remnant dune or river sands some 60 to 100 metres above present sea level has been found in the area, indicating a drop in sea level of this order since the Tertiary.

The Tertiary gravels in the area are the immediate source of the anomalous stream sediment tin values, carrying detrital cassiterite and cassiterite-bearing sulphides.

6.5.3. Stream Sediment Geochemistry

6.5.3.1. General:-

Stream sediment sampling was carried out at 100 - 200 metres spacing, with 0.5 to 1.0 kg. samples being taken from the active parts of streams: This close sample spacing was adopted

1) to confirm the results from the reconnaissance sampling in August, 1971; and

2) to delineate those streams in which anomalous tin values were being shed, so that a realistic area could initially be gridded and geochemically sampled.

Geochemical assays for tin, arsenic and copper were carried out on the minus 85 mesh fraction of all samples obtained: Coarser fractions of those samples yielding anomalous tin values were assayed to confirm the validity of using this fine fraction. It is appreciated that use of a coarser fraction would have been preferable, although the majority of the tin did report in the minus 85 mesh fraction in virtually all samples verified.

6.5.3.2. Distribution of Tin Values:-

Distribution of minus 85 mesh tin values is plotted in Fig. 26, and it is seen that anomalous results have been obtained in two principal areas, viz.:-

1. From a north-south elongated area approximately 1200 metres by 4,000 metres, including one major stream entirely draining the granite body and the upper reaches of Panel Creek, which drains the adjacent Precambrian sediments.

2. From Webster's Creek discontinuously over its length, and from the side streams draining into it: The area drained is entirely within Precambrian sedimentary rock types.

Within the granite body, minus 85 mesh tin values from the anomalous stream system ranged generally between 200 and 2,000 ppm Sn, with isolated values up to 7,000 ppm: Comparative assay data on selected -52 + 85 mesh fractions indicated that coarser tin was present, although values were generally of the order 10 to 50% of the minus 85 mesh

values (with very occasional values up to 150% of the finer fraction assay). The reliability of the geochemical assay method employed was also verified by an independent laboratory (AMDEL), and correlation was extremely high: Precentage determinations by a different technique showed that the higher geochemical assays tended to significantly under-value the absolute tin content of the samples. Away from the anomalous area, stream sediment values were generally less than 200 ppm Sn (with occasional values as high as 350 ppm), and many samples yielded values less than 10 ppm. It is noted that most streams drained areas in which a thin veneer of Tertiary gravels covered the granite, and the obvious confinement of anomalous values to one stream system is therefore probably significant in relation to any bedrock mineralization (although it may relate to Tertiary stream patterns).

Minus 85 mesh stream sediment values from the main branches of Panel Creek ranged generally from 200 to 5,000 ppm, with the upper reaches of the streams containing a majority of values in excess of 1,000 ppm: Downstream, the values tended to diminish, and were commonly less than 500 ppm. It would appear that the principal anomalous area in the Panel Creek system is located to the north of the granite anomaly, and is probably continuous with it. The development of Tertiary gravels over most of this area is again noted, although the streams drain Precambrian sedimentary rocks adjacent to the granite margin.

Stream sediment sampling in Webster's Creek has yielded minus 85 mesh tin values generally in the range 200 to 500 ppm, with isolated higher values up to 5,000 ppm: The higher values appear to be located in the upper reaches of the main creek, and in some of the side streams. The area drained is underlain by the Precambrian Surprise Creek "Beds", although a thin veneer of Tertiary gravels covers the higher parts of the area. Much of the detritus in Webster's Creek is coarse quartzose material, there being a general absence of fine sediment.

Stream sediment values in other streams draining the Precambrian sedimentary rocks to the north of the South Pieman Head granite are generally in the range less than 10 to 100 ppm, with isolated values as high as 1300 ppm. The obviously higher stream sediment values are usually confined to side streams, and are in the proximity of Tertiary gravel outcrops. Minus 85 mesh tin values from Surprise Creek are similar, and a majority are less than 100 ppm:

Anomalous values (in excess of 1,000 ppm) noted in the August 1971, reconnaissance sampling have not been confirmed.

6.5.3.3. Distribution of Copper and Arsenic Values:-

Minus 85 mesh copper and arsenic stream sediment values are plotted in Fig. 27, the arsenic assays generally being less than 10 pp, As: Isolated samples contain up to 35 ppm As, although there is not obvious correlation with the higher tin or copper values.

Stream sediment copper assays from the principal anomalous area over the granite body are less than 20 ppm total copper, with an isolated value of 50 ppm: These results do not show any association of copper with the anomalous tin values. The streams draining the remainder of the granite area yielded minus 85 mesh copper values generally less than 50 ppm, with isolated values (particularly from the heads of a number of streams) up to 200 ppm. The reason for the higher copper values away from the anomalous tin area is not clear although it may be a function of the degree of transport of the cassiterite from its bedrock source, or of the fine mesh fraction assayed (as coarse, discrete chalcopyrite was identified in some of the Tertiary gravel samples).

Stream sediment copper values from the anomalous tin area in Panel Creek are generally less than 20 ppm, with values of 100, 170, 370 and 670 ppm from the south branch adjacent to the granite contact: The lower assays are from streams draining Precambrian Surprise Creek "Beds" overlain by Tertiary gravels. Two anomalous copper areas have been indicated, viz.

1) In Surprise Creek upstream from the granite contact (where sulphides are prominent in some of the Precambrian sediments), with values in the range 100 to 350 ppm Cu and other isolated assays in excess of 100 ppm.

2) In Violet Rivulet, immediately upstream from the new field camp, five sediment samples over a 500 metre length of the stream yielding total copper values ranging from 230 to 830 ppm.

In neither case were the anomalous copper values associated with higher tin concentrations.

In Webster's Creek, copper values were generally less than 50 ppm, with an isolated value of 360 ppm: The Precambrian sediments outcropping in the bed of the stream commonly carry pyrite, and a ferruginous "spring" was located near the mouth of the main gorge (and requires further evaluation). Minus 85 mesh copper values from other streams in the area not carrying anomalous tin were generally less than 20 ppm Cu.

6.5.3.4. Mineralogical Studies:-

A panned concentrate from a number of stream sediment samples from the anomalous tin area over the granite were submitted for mineralogical evaluation, and Fander (1972a) reports as follows:-

"A grain mount of the sample showed that it consisted of the following minerals (with approximate percentages):-

Ilmenite	60%
Quartz	15%
Zircon	20%
Rutile	2-3%
Monazite	1-2%
Cassiterite	< 1%
Garnet	< 1%

The cassiterite is generally well rounded and thus presumably some distance from its source. The zircon and rutile grains too are sub-rounded to rounded, but the ilmenite is platy and fairly euhedral".

Selected stream sediment samples from Webster's Creek were examined mineralogically by O'Toole (1972a), and detailed data are given in Appendix 2. Sample DB11 (Cy 231), from the upper reaches of Webster's Creek, contained some 8-10% of fine (0.1 to 0.5 mm) sub-angular cassiterite in the heavy mineral fraction, which suggests either proximity to a bedrock source or minimal transport (both during the Tertiary and during the present erosion cycle). The composite sample DB12 (Cy 216 and 219), from the central part of the Creek system, contained sub-rounded to sub-angular cassiterite, together with dominant leucoxene and spinel, and minor rutile, garnet and tourmaline: The greater degree of rounding of the cassiterite indicates greater transportation.

6.5.4. Geochemical Soil Sampling

6.5.4.1. General:-

A limited soil sampling programme was undertaken over the anomalous granite area, being designed

1) to assess the applicability of conventional soil sampling in the evaluation of the anomalous stream sediment tin values; and

2) to indicate suitable areas for costeaning in an attempt to locate the source of the detrital cassiterite.

The soil grid was laid out as shown in Figs. 26 and 27, and was extended to cover the anomalous contact area to the north. The soil sampling programme was discontinued when initial costeaning revealed that sampling had been confined to a layer of Tertiary (?) gravels, generally less than 1 metre thick, covering the area: This fine to medium grained angular quartzose material resembles weathered granite where exposed in button grass covered areas, but occasional rounded and obviously water-transported pebbles (of quartzose material) are associated with the angular quartz. It is still probable, however, that much of the angular quartz (at least in the granite areas) has been derived from essentially in situ weathering of the granite, possibly by preferential dissolution of the feldspar minerals, as angular tourmaline is locally associated with the quartzose accumulations. The nature of the Tertiary (?) gravels is further discussed in Section 6.5.5., and additional data given in Appendix 1.

Geochemical assay data for tin, arsenic and copper were obtained on the minus 85 mesh fraction of the soil samples, although subsequent mineralogical investigation has shown that the choice of this fine fraction was not satisfactory, as significant coarser cassiterite (up to plus 16 mesh) was present: Soil geochemical data are plotted in Fig. 28.

6.5.4.2. Distribution of Tin Values:-

Reference to Fig. 28 shows that a majority of the tin values lie in the range less than 10 to 200 ppm Sn, with occasional values up to 1,000 ppm and an exceptional sample containing in excess of 16,000 ppm. The contouring in Fig. 28 suggests that some of the higher tin values occur in a narrow, north-south elongated area about Line 800' West, between 400' S and 1000' N: The "zone" appears to broad to the north, about 800'N. The remaining higher values appear to be isolated maxima, and randomly distributed.

In view of the fact that these values have been obtained from a Tertiary (?) gravel layer, they are almost certainly unrelated to any anomalous source in the underlying

bedrock: However, the results indicate that the gravels are an obvious source of the stream sediment tin. Again, mineralogical study of the gravel samples may provide useful data, and the selection of the minus 85 mesh fraction may have significantly affected the assay results obtained.

6.5.4.3. Distribution of Copper and Arsenic Values:-

"B" horizon (that is, non-humic gravel) copper values are generally less than 50 ppm total Cu, with isolated higher values up to 200 ppm. There is no obvious association of higher copper values with higher tin assays, although a number occur in the narrow "anomalous" area about Line 800' West.

"A" horizon (that is, humic gravels) copper values are somewhat higher than corresponding "B" horizon samples, and range up to 850 ppm Cu: Correlation between "A" and "B" horizon copper values in individual holes is not great.

Arsenic values are generally less than 10 ppm As in both "A" and "B" horizon samples, although values as high as 80 ppm have been obtained. Higher values are generally associated with the "A" horizon samples, although there is no obvious association of higher arsenic concentrations with anomalous tin or copper values.

6.5.5. Pit Sampling Data

6.5.5.1. General:-

A total of thirteen pits were sunk over the principal anomalous stream sediment area, including the granite and the immediately adjacent contact sediments: The pits were spaced at 800 feet on the soil grid, as shown in Figs. 26 and 27. The pits were sunk by hand to an average depth of 1.5 metres, and the area was found to be covered by a thin veneer of Tertiary (?) quartzose sands and gravels ranging in thickness from 0.4 to 1.1 metres, and averaging 0.7m. All pits were channel sampled over their total depth, individual samples being taken over distinct stratigraphic intervals (where developed), or over an average depth of 0.1 to 0.3m.

Individual channel samples were initially screened on 5 mesh (B.S.S.) to remove coarse quartz pebbles, and the minus 5 mesh fraction subjected to the "auto-assay" technique: This has a lower limit of detection about 0.03% Sn (so that the significance of values of this order are uncertain), although assays above 0.1% are generally reliable. Those samples in which significant tin (usually greater than 0.1% Sn) was indicated were further screened

TABLE 1

STRATIGRAPHIC UNITS RECOGNISED IN REPORT AREA

AGE	UNIT	LITHOLOGY	REMARKS
QUATERNARY	Alluvium		Including swamp and marsh deposits
	Beach Sand		
	Active Dune Sands		Unvegetated mobile yellow sand
	Semi-stable Dune Sands		Partly vegetated dunes, generally active on predominant windward faces
	Stable Sand Dunes		Vegetated dunes, with some soil profile development
TERTIARY	Basalt	Olivine basalt types	Occurs as remnant caps, often greater than 100m thick
	Quartzose Sands and Gravels	Dom. fine to medium grained angular quartzose material, occ. silicified: Proved sub-basaltic locally. Often 1-2m thick in uncapped areas	Carries detrital cassiterite in South Pieman Head area
DEVONIAN	Granite	Biotite types, with some muscovite: Local development of late-stage minerals (e.g. tourmaline)	Interview River Granite contains late-stage wolfram veins: South Pieman Head Granite shows anomalous soil geochemical tin values.
ORDOVICIAN	Sediments	Locally fossiliferous sedimentary rock types (sandstones, etc.)	(?) Ordovician to Devonian
PRECAMBRIAN	Dolerite	Dyke swarms and bodies	Often lateritised in outcrop

TABLE 1 (ctd.)

AGE	UNIT	LITHOLOGY	REMARKS
PRECAMBRIAN (ctd.)	Savage Dolomite and Delville Chert	Partly silicified and recrystallised dolomite, associated with thin black slaty chert	Grouped in report area, as not differentiated in field
	Bernafai Volcanics	Distinctive green basic lavas and tuffaceous types: Metamorphosed and partly sheared.	
	Corinna Slate	Thinly bedded, weakly cleaved slaty siltstones	Outcrop rare in report area
	Donaldson Group	Basal conglomerate (containing orthoquartzite boulders), quartzite, minor sandstone, slate and siltstone	Moderately to highly deformed in report area, with extensive (metamorphic ?) recrystallisation of quartz
	Surprise Creek "Beds"	Dom. siltstone, micaceous schistose sandstone, shales (grey and black pyritic), minor conglomerate and quartzite	Probably laterally equivalent to the upper members of Interview Siltstone
	Interview Siltstone	Dom. grey-green siltstone with bedding features (eg cross bedding) well preserved: Minor thin quartzite units	Metamorphic grade rel. low, although unit quite highly folded: Some vein quartz developed
	Lagoon River Quartzite	Massive white "recrystallised" orthoquartzite, with minor shales preserved in fold cores: Bedding rare.	
	Chimney Creek "Hornfels"	Extensively hornfelsed sandstones and siltstones. Unit contains minor acid volcanics.	Validity of unit doubtful, although depositional break indicated.
	Pedder River Siltstone	Dark grey to black siltstones, with sedimentary features such as slumping and scour-and-fill distinctive	

TABLE 1 (ctd.)

AGE	UNIT	LITHOLOGY	REMARKS
PRECAMBRIAN (ctd.)	Whyte Schist	Pelitic and psammitic schistose rocks, with major amphibolite bodies.	Haematite associated with schists in report area: Disseminated and massive magnatite lenses occur with amphibolites at Savage River iron ore deposits to north of report area
	Oonah Quartzite and Slate		Outcrops to east of Whyte Schist belt

TENTATIVE CORRELATION BETWEEN ROCKY CAPE GROUP "EQUIVALENTS" IN REPORT AREA

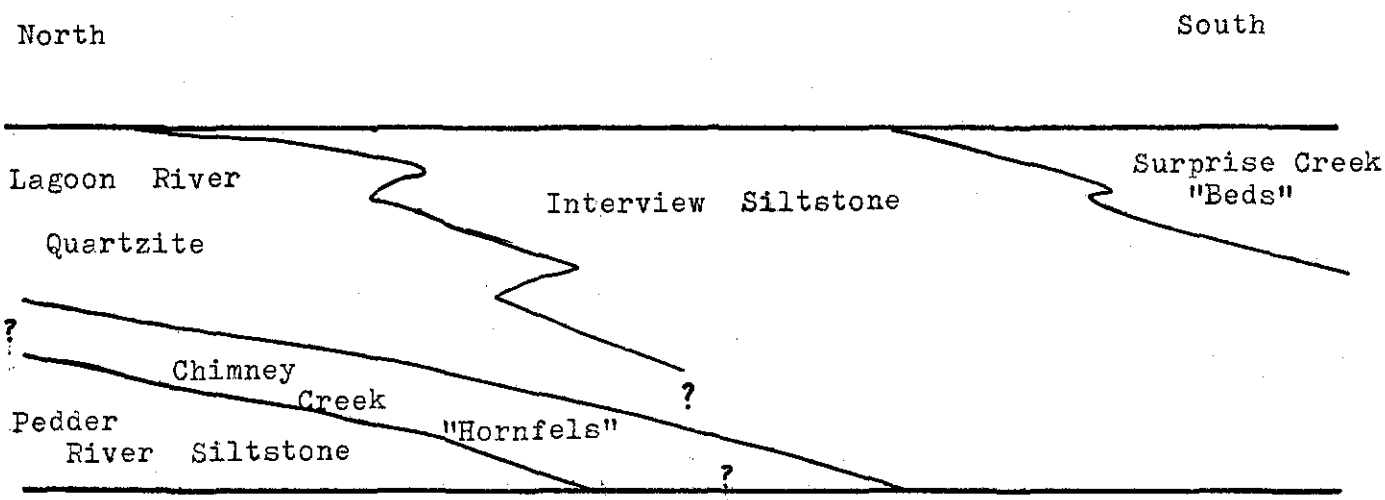


TABLE 2.

SUMMARY OF C.G.G. AEROMAGNETIC SURVEY.

Anomaly Reference	Description of Anomaly: Apparent Magnetic Intensity (γ)	Description of Anomaly: Estimated Depth (*metres above sea level.*)	Probable Source and/or *Comments.*
a_1 (north)	20–40	+ 250 to 400	Magnetic mineralization, most probably disseminated magnetite or pyrrhotite in a particular layer.
a_1 (south)	160	+ 300	WNW–ESE discontinuity between a_1 (north) and a_1 (south) possible zone of mineral interest.
a_1'	30	+ 150	Probable similar significance to a_1 (north) and a_1 (south).
a_2	100–130	+ 150 to 350	Magnetite quartzites associated with Precambrian amphibolites : a_3 of undoubted significance. (Savage River iron ore deposits.) Anomalies coincide with rocks of the Arthur Lineament.
a_3	1000–2400	+ 100 to 150	
a_4	100–800	-100 to 1200	
a_5	70–300	+ 50 to 200	Volcanic rocks, (Bernafai Volcanics) in discordant (?) contact with Whyte Schists : Possibility of serpentinized rocks acting as hosts to sulphide deposits.
a_6	100	+ 100	Appear to coincide with amphibolites but with less magnetite development than $a_2 - a_4$.
a_6'	-	+ 200 (?)	
a_7	30–40	-250 to -200	Coincide with the alignment of Mts. Norfolk, Mabel, Lily and Hazelton. Anomaly located near topographic surface and probably related to magnetic mineralization, (disseminated magnetite or pyrrhotite) in a particular layer.
a_8	30–45	+ 280 to 380	
a_9	20–50	+ 100 to 250	

..../-

TABLE 2 (cont'd)

SUMMARY OF CGG AEROMAGNETIC SURVEY.

Anomaly Reference	Description of Anomaly: Apparent Magnetic Intensity (γ)	Description of Anomaly: Estimated Depth (metres above sea level.)	Probable Source and/or Comments.
a_{10}	20	+ 150 (?)	Coincides with a layer of Bernafai Volcanics, and probably related to magnetite (or pyrrhotite) development. Transverse discontinuity separating a_{10} and a_{11} may represent structural feature of interest in mining exploration.
a_{11}	-	+ 150 (?)	
a_{12}	-	-	Very low contrast anomalies :
a_{13}	-	+ 110 (?)	No probable source given.
f_1	-	-	Moderate contrast anomalies, interpreted as fault structures.
f_2	150	+ 100-150	May correspond to mineralization marginal to granite plutons. f_1 below ground surface. f_2 beneath Tertiary basalt.

(into -36 + 52 mesh, -52 + 85 mesh and -85 mesh fractions) and subjected to geochemical assay: Further work was also done to evaluate "auto-assay" results about the limit of detection. Pit profiles and corresponding assay data are given in Appendix 1.

6.5.5.2. Pit Profiles:-

The following profile was obtained in twelve of the pits sunk (layered sand and clay being found to a depth of 2 metres in one pit):-

Depth (cms) →

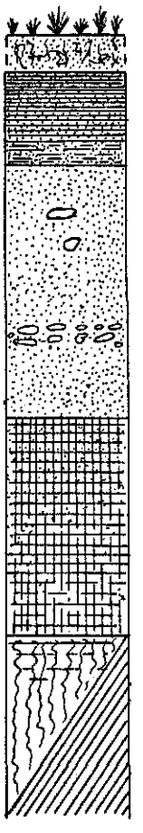
0

Tertiary (?) 10

Gravels

→70

90



Humic horizon of angular quartz < 5mm. set in organic matrix.

Quartzose sands and gravels of fine angular quartz <5mm, occasionally cemented, with minor unidentified black "specks" and organic material.

Rounded pebbles of quartz (with minor tourmaline and feldspar) up to 2.5cms, occasionally in layers up to 15cms thick.

Fossil humic horizon developed on weathered bedrock, with minor detrital quartz and considerable organic material.

Weathered bedrock. In granite areas, generally clay-rich with quartz, micas and relict feldspar crystals (with occasional tourmaline). In siltstones, in situ partly weathered rock becoming fresher at depth.

The Tertiary (?) gravels have been deposited on a fossil humic horizon, which had been developed on weathered bedrock over much of the area, presumably during the Tertiary. There is no indication that rounded quartzose pebbles are concentrated toward the base of the gravel profile, and the dominantly fine angular quartz appears to have been derived from both the granite and the adjacent siltstones and quartzites by leaching under particular chemical conditions, with minimal transport to the depositional site. The fine "black specks" occurring with the angular quartz were not identified in the field, although they are probably spinels or (?) tourmaline, and possibly some cassiterite is present. The quartzose horizon is occasionally cemented and virtually impenetrable, the cement apparently being fine silica and its origin related to prolonged elevation of the water table.

The occurrence of sporadic, rounded pebbles within the finer, angular quartz suggests periodic influx of stream transported sediment: These pebbles are generally significantly larger than the angular quartz, ranging up to 2.5 cms. Mineralogically, they consist dominantly of quartz (which appears to have been derived from Precambrian siltstones, quartzites and metamorphic (?) vein quartz), although both tourmaline and feldspar were identified in rounded pebbles in one pit (suggesting derivation from a nearby granite source). The pebbles are occasionally concentrated in layers up to 15 cms. thick, although elsewhere they occur sporadically through the gravel horizon, and were not present in all pits. It would appear that the angular quartzose sands and gravels have accumulated in a swamp or marsh environment close to their source, with periodic influx of stream transported sediment from beyond the immediate source area: There appears to be an increase in rounded pebbles over the Precambrian sediments to the north of the granite and the principal anomalous area.

The weathered granite exposed in most pits consisted of light to dark brown clay, in which quartz and mica were generally prominent, and relict feldspar crystals usually present: Tourmaline, both as nodules and in veinlets, was found in several pits, and was relatively unaltered. In only one pit was relatively unweathered granite encountered, suggesting an irregular but moderate depth of weathering over the granite body.

Three pits were sited in weathered schistose siltstones adjacent to the granite contact, the siltstones being white to light-brown in colour and relatively unweathered, although somewhat friable to about 1 metre. Bedding attitudes were determinable in all pits, the siltstone being in situ, although some root and clay penetration is evident. The siltstones are quartzose, fine grained types, with mica recrystallization on the laminae: No sulphide development was noted.

In one pit, interbedded fine quartz sand and clays were found beneath the gravel horizon, with no bedrock being encountered. A fossil humic horizon appears to be developed in part of the quartz sands, a grey black colouration being evident which is probably organic in origin, and panning indicated that the sample contained bronze biotite and fine "heavy" minerals.

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It is suggested that the lower part of the exposed section may represent earlier Tertiary fluvial or estuarine accumulations, and it is probable that further costeaning and mapping will enable elucidation of the Tertiary stratigraphy of the area: This may be critical for the location of the bedrock cassiterite source.

6.5.5.3. Head Sample Tin Assays:-

Tin percentages as determined by the "auto-assay" technique on minus 5 mesh fraction samples are recorded in Appendix 1 as "head sample" assays.

Weighted assays of Tertiary gravel samples from nine of the pits gave a mean value of 0.067% Sn over 74.7 cms., with tin contents ranging from 0.03% (the lower limit of detection) to 0.22% Sn. Fossil humic horizon samples from eight pits contained 0.065% Sn over a mean thickness of 20.3 cms., individual sample assays ranging from 0.03 to 0.18% Sn. Combining the two sample intervals, a mean grade of 0.066% Sn over 95.0 cms is indicated.

Assays of bedrock samples revealed tin contents in the range 0.03 to 0.06% Sn, although the significance of these assays near the limit of detection is uncertain: Subsequent geochemical assaying showed that 0.03% Sn by the "auto-assay" method could in fact be less than 10 ppm.

6.5.5.4. Geochemical Tin Assay Data:-

Minus 85 mesh Tertiary gravel assays ranged from less than 10 to 2,000 ppm Sn, with some pits yielding values less than 100 ppm and others in the range 100 to 1000 ppm. Fossil humic horizon values are generally slightly less than those for the overlying Tertiary gravels, and significantly greater than the bedrock assays. Coarser fraction assays in one pit (400 East: 00 North) revealed the presence of significant plus 85 mesh tin, concentrations in the minus 36+52 mesh fraction being some four times the minus 85 mesh values: However, data from gravel samples in other pits showed the reverse trend.

Bedrock geochemical assay data from weathered granite in the area of the principal anomalous stream sediment tin values (as far as 1600' North on the soil grid) yielded results generally in the range 100 to 500 ppm Sn, with isolated higher values up to 2,500 ppm: The higher values appeared to coincide with tourmaline development (see Appendix 1). Assay data on coarser fractions indicated that virtually all the tin was minus 85 mesh, although the results were not quantitiatively reproducible: It is noted that some of the

tin reporting in the weathered granite may have "gravitated" from the overlying gravels.

Tin values from weathered granite and siltstone in the contact area were generally less than 10 ppm Sn, although geochemical assay data are incomplete. Tin values of 600 and 185 ppm Sn were obtained from the clay horizons developed in the pit in which bedrock was not encountered (400 East: 5600 North).

6.5.5.5. Geochemical Arsenic and Copper Assay Data:-

Minus 85 mesh arsenic values from less than 10 to 335 ppm As were obtained from both the Tertiary gravels and weathered granite in the principal anomalous stream sediment area (up to 1600 North on the soil grid). Arsenic values in the contact area are generally less than 10 ppm both in the gravels and the weathered bedrock, although arsenic in the weathered siltstone samples assayed ranged up to 45 ppm: In the clay horizons in the pit in which no bedrock was encountered, exceptional arsenic values of 300 and 890 ppm were obtained (and corresponded to moderately high tin assays).

Copper values in both the Tertiary gravels and weathered granite samples were in the range 10 to 100 ppm Cu, with isolated higher values up to 230 ppm: Copper values less than 10 ppm were obtained from the siltstone samples assayed.

Tungsten values on selected minus 85 mesh fraction samples from both the Tertiary gravels and the granite ranged from less than 10 to 100 ppm WO_3: The siltstone samples contained less than 10 ppm WO_3.

6.5.5.6. Mineralogical Investigations:-

Selected pit samples (both from the Tertiary gravels and from weathered bedrock) were assessed mineralogically by O'Toole (1972a): Because of the significance of this work, his report is reproduced in full in Appendix 2. In summary, his conclusions were as follows:-

"1. The cassiterite occurs as single grains, crystal fragments, and as an intergrowth with sulphides.

2. The cassiterite morphology is principally angular to subangular, indicating that the mineral has not travelled far from the source.

3. Associated minerals are tourmaline, spinel and sulphides; the latter being dominantly pyrite and pyrrhotite, with lesser chalcopyrite and traces of tetrahedrite and galena.

4. The host rock is probably the granite and associated hornfels inliers".

6.5.6. Economic Potential

6.5.6.1. Tertiary Gravels:-

The tin concentrations within the Tertiary gravels appear to be too low, and the thicknesses of gravels themselves too small, to support an economic alluvial mining operation: However, insufficient sampling has been carried out to reliably estimate mean grades and thicknesses.

The sampling data to date indicate the existence of some 5 million cubic yards of Tertiary gravels (to a depth of slightly less than 1 metre) over the principal anomalous area, at a grade of approximately 1.5 lbs. of tin per cu. yd.

6.5.6.2. Bedrock Mineralization:-

Any economic potential of the prospect would appear to be related to the location of an orebody within the intruded Precambrian sediments adjacent to the (?) stanniferous South Pieman Head Granite, and preferably associated with carbonate rock types (as at Renison Bell and Mt. Cleveland). Quartz-tourmaline-sulphide mineralization within the granite body (as at Mt. Heemskirk) is regarded less favourably, although the possibility of open cut operations could be considered.

The mineralogical data discussed in Section 6.5.5.6. suggest that the source of the detrital cassiterite is located in the immediate vicinity, possibly at the granite - sediments contact. The sulphide mineralogy indicates pyrrhotite-tetrahedrite-cassiterite associations, which could be indicative either of Renison-type or Heemskirk-type mineralization. The fact that the aeromagnetic survey did not reveal any anomalies in the area (as could be expected with significant pyrrhotite mineralization) is not regarded favourably, although the spacing and orientation of the flight lines may have been such as to miss the expression of a small orebody.

6.5.7. Forward Exploration Programme

6.5.7.1. General:-

It is recommended that a limited field and laboratory programme be undertaken during 1971-72 on the South Pieman Head Tin Prospect, with the specific aim of locating the source of the detrital cassiterite reporting in the Tertiary gravels covering the area. At the conclusion of this programme, and as a consequance of costeaning and surface evaluation, a decision can then be made on any further exploration (such as geophysical investigations and/or drilling).

6.5.7.2. Field and Laboratory Programme:-

A three month field and laboratory programme is suggested, confined to the Summer period December 1972 to February 1973, when ground conditions are most suitable for pitting and costeaning, and student field assistants are available. The following programme outline is recommended:-

1. Completion of pitting at 800 feet spacing on the soil grid already established over the anomalous stream sediment tin area within the granite body.

2. Establishment of a metric grid over the anomalous contact area, with initial pitting at 200 metre spacing.

3. Ground magnetometry, with maximum station spacing of 20 metres, on each of the above grids.

4. Establishment of a metric grid over the anomalous, upper part of Webster's Creek, with reconnaissance pitting and ground magnetometry.

It is suggested that geochemical assaying be carried out on minus 5 mesh samples from each of the pits (with screening of samples in the field), and that mineralogical assessment be carried out on a selected majority (?) of the samples with particular emphasis on cassiterite and sulphide mineralogy. It is felt that this work should delineate a likely source area, in which further pitting or costeaning could then be carried out: It is anticipated that any contact deposit would occur in the area between Surprise Creek and Yarrana Hill.

The work in the Webster's Creek area should probably be carried out after initial pitting in the granite and contact areas, and in addition evaluation should be made of anomalous copper values in Surprise Creek and Violet Rivulet. Further stream sediment sampling in the upper reaches of the eastern branch of Violet Rivulet should be carried out, as accessibility did not permit coverage of this area during the 1971-72 field season.

6.5.7.3. Staff Requirements:-

It is felt that the above limited programme can be adequately carried out by one geologist and three student field assistants: One field assistant could be partially engaged in maintaining supplies and equipment requirements. Extensive use should be made of mineralogical and geochemical consultants to ensure satisfactory completion of the programme, and limited hireage of suitable equipment for bulk supply of fuel etc. should be considered.

6.5.7.4. Budget Allocation:-

A budget allocation of $36,000 is suggested, being computed as follows:-

1.	Salaries	
	1 Geologist (16 weeks)	6000
	3 Field Assistants (12 weeks)	4000
	General Overheads	6000
2.	Field Expenses	
	Camp Improvements	1000
	Track Cutting	1000
	Food	1500
	Miscellaneous Supplies	1000
3.	Assay and Consultant Charges	
	Mineralogical Investigations	2000
	Geochemical Assaying	1000
	General Consulting	2000
4.	Miscellaneous Expenses	
	Drafting Allowance	1000
	Surveys	1000
	Roadworks and Costeaning	5000
	Vehicle Hire	500
5.	Contingency Allowance	2000
	Total	$36,000

It is noted that the full amount allocated for roadworks and costeaning may not be required if only minimal upgrading of the access road is carried out and greater use is made of boat access via Corinna and the Pieman River: It is felt that any significant outlay on roadworks is not justified until the conclusion of the proposed investigations. Such an approach would also only require one vehicle in the field, with consequent savings in maintenance, although this vehicle would need to be serviced regularly (but preferably in the field).

It is stressed that the above budget is only a preliminary guide to likely expenditure, and that some adjustments and modifications will prove necessary: Nonetheless, it is considered a realistic estimate for the proposed work programme.

6.6. Hoyle Creek Aeromagnetic Anomaly

6.6.1. Aeromagnetic Survey Interpretation

The Hoyle Creek anomaly is the south-western extremity of the major aeromagnetic anomaly in the Exploration Licence areas, which is continuous (although offset by faulting) through Corinna to the Savage River iron ore deposits. The anomaly (a_5 on Fig. 4 and in Table 2) has a broad, definitive profile, and coincides with the mapped trend of the

Precambrian rocks of the area. The C.G.G. interpretation report comments as follows:-

"There remains the a_5 anomaly, which we would tend to attribute to the presence of volcanic rocks (Bernafai Volcanics) in (discordant-?) contact with Whyte Schists. Could it be that this represents *serpentized* rocks that would act as hosts to deposits of sulphides?".

6.6.2. Ground Magnetometry

Five ground magnetometer traverses were carried out over the axis of the aeromagnetic anomaly near the mouth of Hoyle Creek, and their location is shown in Fig. 29: The magnetometer profiles are given in Fig. 30. The traverse lines varied in length from 900 to 2400 m., and were cut and pegged at 100 feet intervals. Background scale readings away from the aeromagnetic axis are in the range 500 to 600 gammas on all traverse lines, rising to values in excess of 1,000 gammas for distances of between 600 and 900m. *along each* of the lines: These can be regarded as composite "peaks", comprised generally of three peaks of minimum width 150m. and yielding scale readings in the range 2,000 to 4,000 gammas. The principal ground magnetometer axis is offset slightly to the north of the aeromagnetic axis, and trends in approximately the same direction.

6.6.3. Outcrop Geology

The outcrop geology of the area is shown in Fig. 29, and the regional interpretation is given in Fig. 3. There is only very restricted outcrop in the area of the Hoyle Creek aeromagnetic anomaly, and it has not been possible in the field to locate a source of contrasting magnetization.

The rock units outcropping in the area include the Precambrian Whyte Schist and Bernafai Volcanics, with the development of Tertiary basalt as a veneer up to 100 metres thick over much of the inland section: The possibility that the Bernafai Volcanics in the more southerly outcrop (flanking the Whyte Schist to the north) are amphibolites is noted. Minor haematite is associated with the Whyte Schist, which is a sequence of psammitic and pelitic micaceous schist and quartzite, and has been highly deformed. The Tertiary basalts do not appear to be magnetic, and the source of the aeromagnetic anomaly is located in the underlying Precambrian basement rocks.

On the basis of

1) similarities in Precambrian stratigraphy and lithology; and

2) similar broad, definitive aeromagnetic profiles (which are continuous between the two areas), the source of the aeromagnetic anomaly is considered to be magnetite

(either disseminated or in lenses) as in the Savage River iron ore occurrences. These deposits have been described by Urquhart (1966), and may be summarized as follows:-

"Magnetite is associated with amphibolite or disseminated in meta-sediments..... Silica, feldspar and/or carbonate metasomatism is generally associated with the magnetite deposits.

Folded, steeply dipping Precambrian Whyte Schist underlies most of the area, bodies and concordant sheets of amphibolite (occuring within) the Whyte Schist.

Structural control of magnetite deposition, texture and structure of the ore, wall-rock alteration, gangue minerals and paragensis indicate a magmatic hydrothermal origin for the magnetite".

The apparent magnetic intensity of the aeromagnetic anomaly in the Hoyle Creek area is significantly less than in the area of the Savage River iron ore deposits, and this is probably due to lower magnetite concentrations: It may also in part be a function of the depth of the anomaly source below the ground surface. As discussed in Section 5.1., this major aeromagnetic anomaly coincides with, and in fact defines, the Arthur Lineament, which Gee (1967) regards as a "meridional belt of pelitic and psammitic schist with amphibolite bodies and magnetite lenses.....(which)..... appears to represent the fundamental tectonic structure of the Proterozoic in northwest and west Tasmania".

6.6.4. Stream Sediment Geochemistry

Stream sediment sampling did not reveal any anomalous minus 85 mesh tin values, geochemical assays ranging from less than 10 to 95 ppm Sn: None of the higher values are regarded as significant.

Arsenic values were invariably less than 10 ppm As, with total copper values in the range less than 10 to 100 ppm Cu, with isolated values up to 330 ppm: The total copper values were slightly higher than values obtained away from the anomaly (and the rocks of the Arthur Lineament).

The stream sediment geochemical data are plotted in Fig. 31.

6.6.5. Economic Significance

The Hoyle Creek aeromagnetic anomaly appears to be related to magnetite development in rocks of the Arthur Lineament (amphibolites and schists) similar to the Savage River iron ore deposits. It is probable that considerable tonnages of magnetite exist in the area, although grades and reserves could only be determined by detailed drilling and geological appraisal.

In view of the present world situation regarding iron ore supplies, the relative remoteness of the area and the probable depth of the "ore" bodies below the ground surface, further prospecting is not considered justified: However, in the long term future, development of additional magnetite lenses associated with rocks of the Arthur Lineament may well become economically feasible, and the Hoyle Creek area could then warrant detailed evaluation.

7. GEOLOGICAL APPRAISAL OF REMAINING EXPLORATION LICENCE AREAS

7.1. North of the Pieman River

7.1.1. Thornton River - Lagoon River Coastal Plain Area

7.1.1.1. General:-

The location of the area is shown in Figs. 1 and 2. Field investigations in the area were limited to a three-week period in February 1972, operating from a base camp at Sandy Cape and using a Haflinger for access. Time and accessibility did not permit ground coverage of the inland part of the coastal plain.

7.1.1.2. Geology:-

The geology of the coastal section has been discussed in some detail in Section 5.1, and the regional geological interpretation is given in Fig. 3.

To the west, the Pedder River Siltstone outcrops discontinuously along the coast, being intruded by a small (?) body of granite (here termed the Sandy Cape Granite) which forms Sandy Cape itself. The granite is a coarsely crystalline biotite-muscovite variety, with occasional pegmatitic othoclase veins up to 0.2 metres wide.

To the east, the Pedder River Siltstone apparently passes stratigraphically upwards into the Lagoon River Quartzite (a minor depositional break possibly being indicated by the presence of conglomerate). The writer understands that quartzites (probably referable to the Lagoon River Quartzite) underlie the inland part of the coastal plain, and this appears probable from aerial observation.

There is extensive development of Quaternary dune sands (mostly stabilized by vegetation) in the coastal area, the inland section being covered by button grass,

7.1.1.3. Geophysical Data:-

Only one minor aeromagnetic anomaly was interpreted by C.G.G. in the area, this being shown as a_{13} in Fig. 4 and Table 2. The anomaly has a very low contrast, and no comments were made regarding it in the C.G.G. report.

One ground magnetometer traverse was carried out over the axis of this aeromagnetic anomaly, using helicopter access in late January 1972. The magnetomer scale reading varied between 400 and 650 gammas over the entire traverse length, which extended some 600 metres on either side of the interpreted axis, and no "peaks" were obtained. Quartzites outcropped discontinuously along the traverse line, and there was no apparent development of magnetite.

Although it is possible that limited penetration of the ground instrument could have failed to detect a contrasting source of magnetization at depth, it is considered more probable that the aeromagnetic anomaly was incorrectly interpreted: Certainly, the area does not warrant further evaluation as a possible source of "ore" mineralization.

7.1.1.4. Stream Sediment Geochemical Data:-

Stream sediment geochemical data from the area has been discussed in Section 5.3., and values are plotted in Figs. 5,6 and 7.

Minus 85 mesh tin values in the area were generally less than 10 ppm Sn, with isolated samples containing up to 300 ppm: These values are not regarded as significant. No anomalous geochemical values for copper, lead zinc, or nickel were obtained from the present survey, or from the work carried out by Pickands Mather and Co.

7.1.1.5. Economic Potential:-

The geophysical and geochemical data obtained do not indicate the existence of any "ore" mineralization in the area, and the Precambrian sedimentary units (dominantly quartzites) are unlikely host rocks. Minor development of quartz veins carrying pyrite was noted in the Pedder River Siltstone, although this is not regarded as being of any significance (and is probably metamorphic in origin). The Sandy Cape Granite does not appear to have any mineralization associated with it, there being no development of late-stage minerals (such as tourmaline).

There is no justification for further exploration in the area, in view of the difficulties of access and the absence of any encouragement from the limited field programme carried out.

7.1.2. Norfolk Ranges

7.1.2.1. General:-

No geological investigations were carried out in the Norfolk Ranges area during the report period. The location of the area under consideration is shown in Figs. 1 and 2.

7.1.2.2. Geophysical Data:-

A number of aeromagnetic anomalies were located in the Norfolk Ranges area by the C.G.G. survey, specifically a_7, a_8 and a_9 shown in Fig. 4 and Table 2: Anomalies a_1 and a_1' represent a southerly extension of the area. The C.G.G. report states the following:

"No geological information whatever was available for this part of the survey. Nevertheless, one can note the remarkable coincidence between the location and the north-south direction of the magnetic compartments a_7, a_8 and a_9, and the alignment of the crests of Mts. Norfolk, Mabel Lily and Hazelton.

The quantitative interpretation shows that the marker is located very near to the topographic surface. The anomalies have amplitudes of some 80 to 100 gammas overall, and apparent magnetic intensities between 20 and 50. This contrast indicates the presence of a magnetic mineralization, most probably disseminated magnetite or pyrrhotite in a particular layer.

The same phenomenon seems to repeat itself at the foot of Mt. McDougall (where the Leigh River flows) and at the feet of Mts. Bolton and Pyramid Hill. The significance of the anomaly groups a_1 and a_1' would thus be similar. To the south of Mt. McDougall the presence of a west-northwest/east-southeast fault, and axes of relatively intense anomalies (a_1), could indicate a zone of mineral interest".

7.1.2.3. Economic Potential:-

It is known that the Norfolk Ranges area was extensively prospected about 1900, and that a number of small copper and silver-lead deposits were located. Apparently no extensive development of these prospects was carried out, and they were probably somewhat similar to the Copper Reward and Silver Reward workings discussed in Section 6.3.

The geology of the Norfolk Ranges area is not known in any detail, although they consist of Precambrian sedimentary types, probably quartzites and related rocks referable to the Rocky Cape Group. It is considered likely that the aeromagnetic anomalies are due to disseminated magnetite associated with differing lithologies. However, it is possible that in part at least, they may be related to the known mineralization in the area.

7.1.3. Interview River Granite and Adjacent Sedimentary Rocks

7.1.3.1. General:-

The geology of part of the Interview River Granite has already been considered in some detail with reference to the Interview River tin-tungsten workings: The adjacent Precambrian sediments have been discussed in connection with the Copper Reward and Silver Reward workings, and the Rupert Point aeromagnetic anomaly. In this Section, those areas which have not been specifically discussed in Section 6 are briefly considered.

7.1.3.2. Geology:-

The Interview River Granite is a medium-grained biotite granite, carrying minor muscovite: Late stage minerals are not evident, except in the area of the tin-tungsten workings to the north of the Interview River. To the south of the Interview River, the granite body intrudes the Interview Siltstone to both the east and the west, this Precambrian unit having been mapped as far as the Pieman River.

The regional geology of the area is given in Fig. 3, and is further discussed in Section 5.1.

7.1.3.3. Geophysical Data:-

No aeromagnetic anomalies are evident over the Interview River Granite pluton, and the body does not appear to have any distinctive magnetic expression. As can be seen from Figs. 4 and 9, there are two relatively low contrast anomalies to the east of the granite (a_{12} and a_9), and the significance of both of these has already been discussed. Anomaly a_{12} (see also section 6.2.) is attributed to a wedge of Interview Siltstone interbedded with Lagoon River Quartzite, and associated with the former unit: The contrasting magnetization is probably due to differing magnetite development within these two lithologies. The southern extension of anomaly a_9 likewise corresponds to a wedge of Interview Siltstone (see Fig. 9), and a similar origin is suggested. The Rupert Point anomaly (f_1) occurs to the west of the granite body, and its significance has been discussed in Section 6.6.

7.1.3.4. Stream Sediment Geochemical Data:-

Stream sediment geochemical data from the Interview River Granite pluton and adjacent sediments have been discussed in Section 5.3., values being plotted in Figs. 5, 6 and 7.

Minus 85 mesh tin values from the area of the granite range from less than 10 to 200 ppm Sn, with isolated higher values: Tin values from

streams draining the sedimentary rocks to the east of the Interview River Granite vary up to 200 ppm Sn, although values diminish fairly rapidly away from the granite. As discussed in Section 5.3., the source of this stream sediment tin is attributed to isolated Tertiary gravel outcrops in the area, derived originally from the wolfram veins of the Interview River deposits or some other basement source. The isolated value of some 6,000 ppm Sn from Ford Creek above the granite-sediment contact is thought to be from a contaminated source, although this has not been definitely established.

There are no apparent copper, nickel, lead or zinc stream sediment anomalies in the area, although sampling did not extend for any distance to the east of the Interview River Granite.

7.1.3.5. Economic Potential:-

With the exception of the anomalous areas discussed in Section 6, the geophysical and geochemical data obtained (both from the present survey and from the work by Pickands Mather and Co.) do not indicate the existence of significant "ore" mineralization in the area of the Interview River Granite. The possibility of repetitions of Copper Reward and Silver Reward - type mineralization within the Precambrian sediments to the east of the granite pluton is noted, although a genetic association with the granite is not definitely established.

In view of the results obtained, and the relative inaccessibility of much of the area, further exploration does not appear to be warranted (although the southern part of the granite body should be retained until the Rupert Point anomaly is further evaluated).

7.1.4. North Bank of the Pieman River

Stream sediment sampling and reconnaissance geological mapping were carried out along the north bank of the Pieman River down-stream from the Donaldson River. The Interview Siltstone outcrops in the area.

No significant tin or copper values were obtained from the stream sediment sampling programme, tin values being invariably less than 10 ppm Sn. Isolated high zinc and lead values were obtained during the Pickands Mather and Co. investigations, although these were not followed up during the present survey.

In view of the results obtained, further prospecting does not appear warranted: Certainly, there is no likelihood of tin mineralization in the area.

7.1.5. Donaldson River Area

No investigations were carried out in the Donaldson River area during the present survey, and little is known of the geology. Stream sediment sampling of the lower reaches of the Donaldson River by Pickands Mather and Co. did not reveal any significant tin, copper, nickel or zinc values, although lead concentrations in the range 100 to 300 ppm Pb were obtained.

7.2. South of the Pieman River

No geological investigations were carried out in the inland area between the coastal section evaluated and the old Zeehan-Corinna Track. The possibility of ore occurrence in this area cannot be discounted, although the area is heavily timbered and relatively inaccessible. Reconnaissance stream sediment sampling in the area by Pickands Mather and Co. (particularly in Delville Creek) did not reveal any significant tin, copper, nickel, lead or zinc values, and further evaluation is not considered to be justified.

7.3. Corinna Area

7.3.1. General

Stream sediment sampling was carried out in September 1971, over the major aeromagnetic anomalies in the Corinna area. Results of these investigations are discussed in some detail by Woodward (1971a), and have been briefly considered in Sections 5.1. and 5.3. Geological and geophysical data are given in Figs. 3 and 4, stream sediment values being plotted in Figs. 5, 6 and 7.

7.3.2. Stream Sediment Geochemistry

Very low tin values were obtained in the area, with the exception of

1. two streams draining westwards into the Whyte River (with values of 650 and 260 ppm Sn); and

2. Corinna Creek, with values generally in the range 200 to 400 ppm, with isolated higher values.

Arsenic concentrations were invariably less than 10 ppm, and total copper generally less than 50 ppm.

These stream sediment data have been discussed in Section 5.3.

7.3.3. Geology

The whole of the area is underlain by rocks referable to the Arthur Lineament, and includes the Whyte Schist and associated amphibolites, and the Bernafai Volcanics. As discussed elsewhere in this report, the source of the major, regional aeromagnetic anomalies in the Corinna area (which lies in the central part of the anomaly a_5 extending from Hoyle Creek to the Savage River iron ore deposits) are attributed to magnetite associated with amphibolites and meta-sediments, either disseminated or in lenses.

7.3.4. Economic Potential

Although the higher stream sediment tin values are possibly anomalous by comparison with data obtained from the coastal area, the rocks of the Arthur Lineament are considered to be unlikely hosts for tin mineralization: The higher values may have been derived from Tertiary gravel development in the area.

In view of the results obtained, and the mapped geology of the area, further exploration in the Corinna area is not warranted: However, the probable occurrence of significant tonnages of magnetite "ore" (of unknown grade or reserves) associated with the major aeromagnetic anomalies is noted, and may justify further investigation in the long-term future.

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APPENDIX 1

SOUTH PIEMAN HEAD TIN PROSPECT

PIT PROFILES AND GEOCHEMICAL ASSAY DATA

NOTE: "% Sn. IN HEAD" REFERS TO "AUTO-ASSAY" ON MINUS 5 MESH FRACTION: TECHNIQUE HAS LOWER LIMIT OF DETECTION ABOUT 0.03% Sn.

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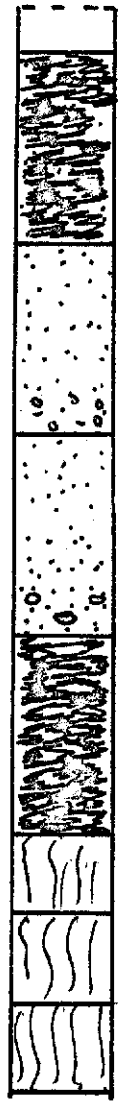
PIT SAMPLE N° 1 . 400 ft. East : 00 ft. North

	Depth (CMS)	Sample Ref.	% Sn in Head	Geochemical Assay -85 mesh (ppm)			
				Sn	As	Cu	WO_3
Dark-grey humic horizon, with angular quartz up to 2 mm.	0 – 16.5	A		765			
Dark grey-light grey quartz gravel, with minor roots. Dominant angular quartz, with some rounded pebbles <2mm	16.5 – 36.8	B1		1230			
Light grey quartzose material, grainsize increasing with depth and with distance. Rounded pebbles at base. Majority of quartz angular.	36.8 – 61.0	B_2		1970			
Fossil humic horizon with angular quartz on top of weathered granite (clay) and mica. Dark grey at base with organic remains	61.0 – 83.8	C		380			
As for basal C, with weathered feldspar and mica	83.8 – 108.0	D		<10			
As for D, (with feldspar and mica)	108.0 – 132.1	E		<10			
Weathered granite, lighter grey with some organic material	132.1 – 151.1	F		200			



ASSAY DATA ON COARSER FRACTIONS FROM RESAMPLE (Separate Samples)

Sample	ppm Sn in Mesh Fraction		
	-36+52	-52+85	-85
A	655	660	405
B_1	1020	60	355
B_2	1670	1010	480
C	1690	810	400

5 cm

100

No. 2.

400 ft. East : 00 N

	Depth (cms.)		Sample Ref.	% Sn in Head	Geochemical Assay on -85 mesh fraction (ppm)			
					Sn	As	Cu	WO_3
Dark grey humic horizon, becoming lighter with depth. Angular quartz <3mm.	0	11.4	A	0.19	1040	30	90	25
Light grey quartzose sand and grit, with organic material. Quartz pebbles mostly angular, with some rounded, up to 4.5mm	11.4	29.3	B	0.16	755	20	60	40
Light grey sand: Quartz mainly angular but some rounded pebbles.	29.3	48.3	C	0.25	450	15	30	35
Dark grey quartz sand, with some rounded quartz pebbles. (mostly angular quartz)	48.3	63.5	D	0.27	1080	40	65	65
Weathered granite, with humic horizon on top. Weathered feldspar and mica (?muscovite)	63.5	85.1	E	0.06	570	20	70	30
As for E, dark grey with organic matter, quartz, mica and feldspar	85.1	105.4	F	0.03	435	40	70	15
As for F, whitish and with tourmaline	105.4	127.0	G	0.06	560	30	70	30

COMPARATIVE ASSAY DATA ON COARSER FRACTIONS (Same sample)

Sample	ppm Sn in Mesh Fractions		
	-36-52	-52-85	-85
A	945	385	1040
B	260	785	755
C	1150	1150	450
D	3010	1995	1080

5 cm

753102

PIT SAMPLE — 400 ft. East : 800 ft. North

Depth (cms)	Not to Scale	Sample Ref.	Description	% Sn in Head (-5)	Geochemical Assay on -85 mesh fraction (ppm) Sn	As	Cu	WO_3
0								
		A	Light brown organic horizon, consisting dom. of quartz <1mm		90			
16.5								
		B	Unconsolidated fine-grained gravels, of angular quartz with minor 'black specks' Minor rounded pebbles, including feldspar and tourmaline.		15			
31.8								
		C	Cemented horizon, very similar to B, again only minor rounded pebble development. Probable concretionary surface (silicification)		15			
57.2								
		D	Light grey-brown weathered granite with black fossil humic horizon. Granite contains mica and feldspar with large tourmaline nodule.		60			
80.0								
		E	As for D, but whitish yellow in colour		<10			
92.7								
		F	As for E, but including 1 cm. vein of tourmaline and quartz		2500			
102.9								
		G	Decomposing granite (NOT fresh) as for D, but with tourmaline? relics		1705			
133.4								

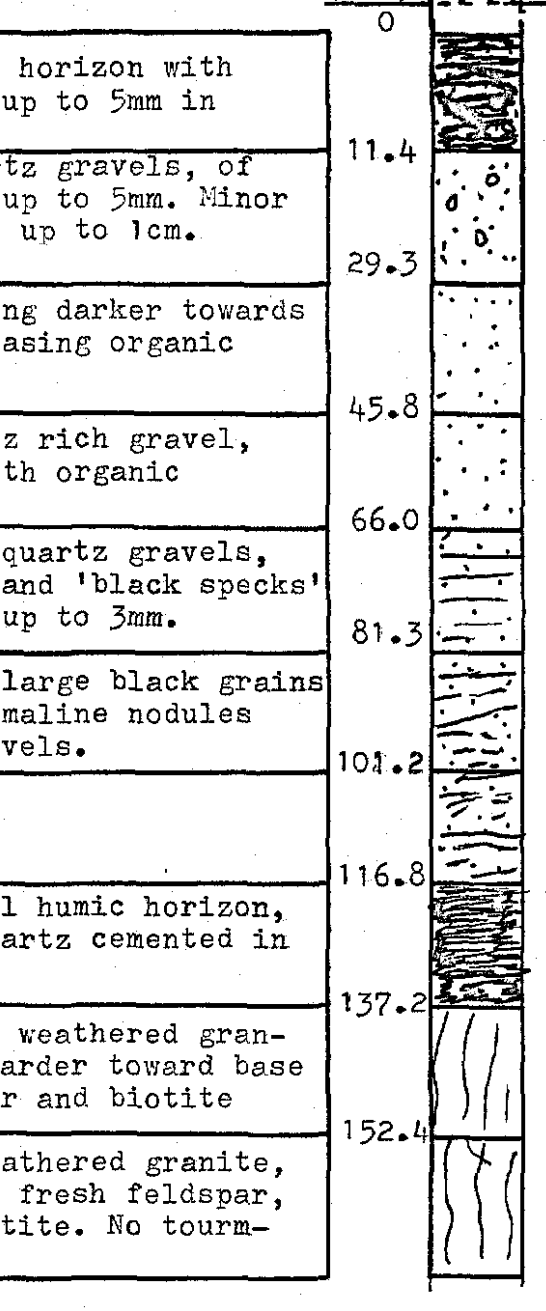
COMPARATIVE ASSAY DATA ON COARSER FRACTIONS FROM RESAMPLE:

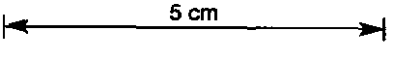
Sample	ppm Sn in Mesh Fractions		
	-36+52	-52+85	-85
F	<10	11	425
G	<10	<10	40

753103

PIT SAMPLE 400 ft. West : 800 ft. North

	Depth (cms)	Sample Ref.	% Sn in Head	Geochemical Assay -85 mesh fraction (ppm)			
				Sn	As	Cu	WO_3
Dark grey humic horizon with angular quartz up to 5mm in organic matrix	0	A	0.07	405	30	75	30
Light grey quartz gravels, of angular quartz up to 5mm. Minor rounded pebbles up to 1cm.	11.4	B	0.05	650	20	50	60
As for B, becoming darker towards base with increasing organic content	29.3	C	0.03	895	100	160	25
Dark grey quartz rich gravel, as in C (and with organic material)	45.8	D	0.03	495	<10	60	100
Cemented white quartz gravels, with fine clay and 'black specks' Quartz angular up to 3mm.	66.0	E	0.03	325	335	75	<10
As for E, with large black grains up to 1mm. Tourmaline nodules in parts of gravels.	81.3	F	0.05	60	35	40	25
As for F.	101.2	G	0.03	30	<10	25	35
Dark grey fossil humic horizon, with angular quartz cemented in black matrix.	116.8	H	0.03	265	15	20	<10
Dark grey-black weathered granite, becoming harder toward base Quartz, feldspar and biotite	137.2	I	0.03	200	25	35	65
Relatively unweathered granite, with relatively fresh feldspar, unweathered biotite. No tourmaline	152.4	J	0.04	i.s.	i.s.	i.s.	i.s.





753104

103

PIT SAMPLE No. 5 (Costean)

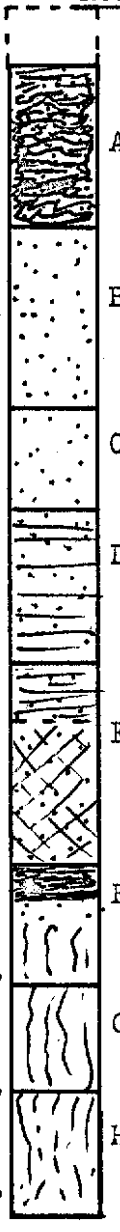
1200 ft. West : 800 ft. North

Depth (cms)		Sample Ref.	% Sn in Head	Geochemical Assay -85 Mesh (ppm)			
				Sn	As	Cu	WO_3
0	Dark grey humic horizon, with fine angular quartz <1mm.	A	0.05	320	<10	50	<10
20.3	Whitish quartz grit, dominantly of angular quartz up to 5 mm, with occasional larger rounded pebbles >2.5 mms	B	0.05	345	35	50	80
43.3	As for B, with fine 'black specks'	C	0.03	120	10	10	70
55.9	Cemented quartz grit, with angular quartz up to 3 mm. Fine, dark mineral(?) in matrix						
66.0	Dark grey fossil humic horizon, with quartz and mica	D	0.04	360	25	25	80
83.8	As for D	E	0.37	3075	75	110	65
96.5	Weathered granite, with mica and quartz and much brown clay (and roots)	F	0.05	810	30	35	40
115.5							

COMPARATIVE ASSAY DATA ON COARSER FRACTIONS

Sample	ppm Sn in Mesh Fractions		
	-36+52	-52+85	-85
E	95	145	3075

5 cm



Depth (cms)		Description	Sample Ref.	% Sn in Head	Geochemical Assay -85 Mesh (ppm)			
					Sn	As	Cu	WO_3
0		Base of humic horizon transitional into quartz grits. Dominantly angular quartz < 4mms.	A	0.03				
7.6		Dominantly quartz grits (grain-size < 5mm) in light brown matrix. 'Black specks'. Root development	B	0.22	870	60	140	20
25.4		As for B (unconsolidated)	C	0.05	240	60	40	50
47.2		Cemented white quartz grit in white siliceous matrix. Some tourmaline nodules and abundant 'black specks'.	D	0.04	150	<10	30	<10
71.1		White cemented grits, as in D	E	0.03	425	15	30	<10
78.8		Brown (?humic) cemented grits, quartz and 'black specks' in matrix. (Probably related to F below)						
98.7		Fossil humic horizon, probably on weathered granite, with feldspar and quartz.	F		275	<10	40	<10
110.5		As for F, also with mica	G					
128.3		Decomposed granite as for G	H		440	105	75	20
153.7								

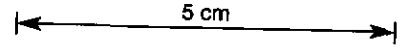
COMPARATIVE ASSAY DATA ON COARSER FRACTIONS

Sample	ppm Sn in Mesh Fraction		
	-36+52	-52+85	-85
B	170	45	870

5 cm

PIT SAMPLE NO. 1 — 400 ft. East : 2400 ft. North

	Depth (cms)	Sample Ref.	% Sn in Head	Geochemical Assay -85 mesh (ppm)			
				Sn	As	Cu	
Dark grey humic horizon with angular quartz up to 1 mm.	0 – 19.1	A	0.05				
Grey-brown gravels of angular quartz up to 3 mm. Minor root development	19.1 – 36.8	B	0.07				
As for B, with some feldspar grains.	36.8 – 54.7	C	0.03				
As for C above	54.7 – 79.4	D	0.03				
a) To 78.8 cm, basal quartz as in D. b) Dark grey-black fossil humic horizon, with angular quartz	79.4 – 99.0	E	0.05				
Dark brown weathered granite with some humic material. Rich in clay, some mica. Fossil 'B' horizon	99.0 – 113.0	F	0.06				
Weathered granite, with feldspar, mica and quartz. (To 119.3 cm, transitional from F)	113.0 – 142.2	G	0.03				

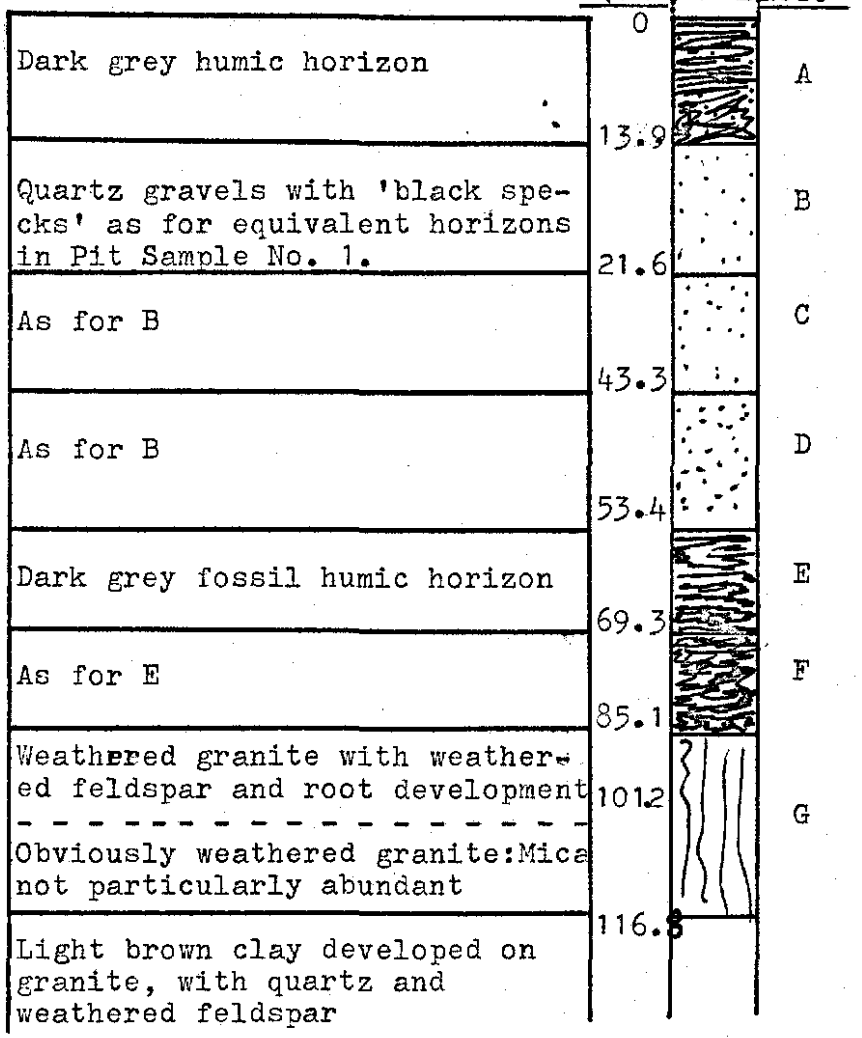


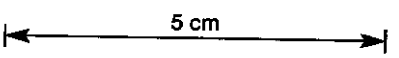
753107

PIT SAMPLE No 2.

400 ft. East : 2400 ft. North

	Depth (cms)	Sample Ref.	% Sn in Head	Geochemical Assay -85 mesh (ppm)			
				Sn	As	Cu	WO_3
Dark grey humic horizon	0	A	0.05				
Quartz gravels with 'black specks' as for equivalent horizons in Pit Sample No. 1.	13.9	B	0.05				
As for B	21.6	C	0.04				
As for B	43.3	D	0.02				
Dark grey fossil humic horizon	53.4	E	0.04				
As for E	69.3	F	0.12				
Weathered granite with weathered feldspar and root development - - - - - - - - - - - - - - - - - Obviously weathered granite: Mica not particularly abundant	85.1 101.2	G	0.04				
Light brown clay developed on granite, with quartz and weathered feldspar	116.8						



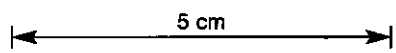


753108

PIT SAMPLE

400 ft. East : 3200 ft. North

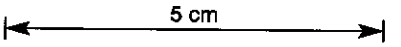
	Depth (ems)	Sample Ref.	% Sn in Head	Geochemical Assay -85 mesh (ppm)			
				Sn	As	Cu	WO_3
Black humic horizon with angular quartz grits up to 1-2mm	0 – 15.2	A	0.03	55	10	40	15
Dark grey to light grey gravels, becoming lighter with depth. Predominantly angular quartz ≤2mms. in sandy matrix Some roots.	15.2 – 45.8	B	0.03	15	<10	40	<10
As above, 61cm to 66 cm consolidated	45.8 – 67.7	C	0.05	120	<10	15	<10
Layer of dark brown and black consolidated gravel. Angular quartz as for C and B.	67.7 – 83.8	D	0.03	<10	<10	70	40
Black fossil humic horizon, consolidated, with angular quartz 1-2mm	83.8 – 96.5	E	0.03	<10	15	20	45
Light brown weathered granite with feldspar. Black mineral possibly tourmaline	96.5 – 125.7	F	0.03	<10	30	30	20
As above (F), although lighter in colour. No solid granite	125.7 – 146.0	G	0.04	<10	25	25	30



PIT SAMPLE

400 ft. East : 4000 ft. North

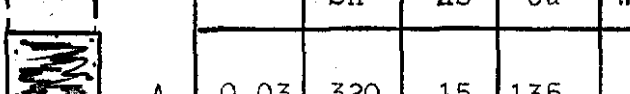
	Depth (cms)	Sample Ref.	% Sn in Head	Geochemical Assay -85 mesh (ppm)			
				Sn	As	Cu	WO_3
Dark grey humic horizon with angular quartz up to 2 mm.	0 – 7.6	A	0.07	80	<10	15	10
Light grey grit with angular quartz up to 4mm. Occasional rounded quartz pebbles.	7.6 – 30.5	B	0.05	<10	<10	20	<10
As for B, but less roots	30.5 – 49.6	C	0.03	330	<10	40	<10
As for C.	49.6 – 62.3	D	0.04	15	<10	10	15
Dark grey to black fossil humic horizon, with fragmentary quartz.	62.3 – 85.1	E	0.03	25	<10	15	<10
Dark brown weathered granite with feldspar	85.1 – 108.0	F	0.05	<10	15	15	20
As for F, some (?)humic material	108.0 – 128.8	G	0.03	<10	25	20	<10
Light brown soft clay quartz, weathered feldspar. No obvious large feldspar 'relics'	128.8 – 161.3	H	0.03	<10	15	15	<10



753110

PIT SAMPLE 400 ft. East : 4800 ft. North

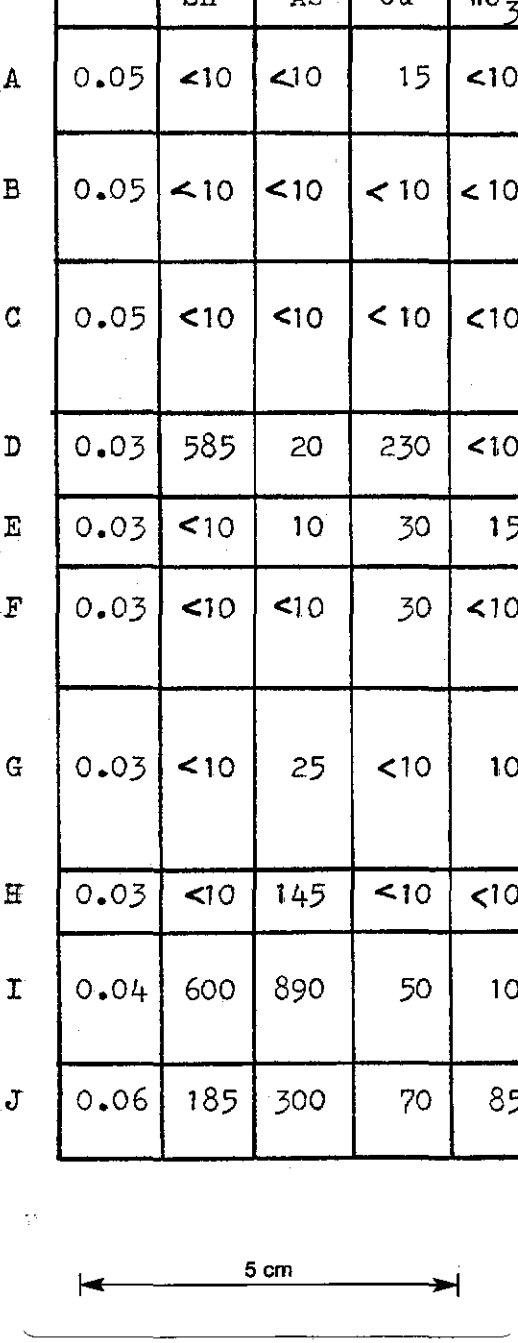
	Depth (cms)	Sample Ref.	% Sn in Head	Geochemical Assay -85 mesh (ppm)			
				Sn	As	Cu	WO_3
Dark grey humic horizon with quartz up to 2 mms. Root developed.	0 – 15.2	A	0.03	320	15	135	15
Light grey quartz grit, angular quartz <4 mm.	15.2 – 31.8	B	0.03	65	55	20	30
Light-dark grey angular quartz up to 5mm. Rounded quartz up to 3-4 cms	31.8 – 52.2	C	0.04	155	65	25	45
Cemented organic-rich layer with angular quartz up to 5mm and rounded quartz <3cms. Transitional to E	52.2 – 69.3	D	0.04	70	35	40	15
True fossil humic horizon, unconsolidated 'black' angular quartz 3-4 mms in black humic matrix. Detrital weathered granite.	69.3 – 88.9	E	0.03	440	35	25	15
Weathered granite, dominant quartz with some feldspar in clayey matrix	88.9 – 108.0	F	0.03	<10	25	45	<10
As for F- No mica	108.0 – 128.8	G	0.03	<10	35	45	<10



753111

PIT SAMPLE 400 ft. East : 5600 ft. North

Depth (cms)		Sample Ref.	% Sn in Head	Geochemical Assay -85 mesh (ppm)			
				Sn	As	Cu	WO_3
0	Humic horizon with angular quartz <1mm.	A	0.05	<10	<10	15	<10
17.7	Light grey fine quartz sand, with occasional rounded quartz pebble up to 5 mm.	B	0.05	<10	<10	<10	<10
38.1	Pebble layer 15cm thick distributed irregularly in fine sand. Pebbles of quartz, sub-rounded up to 3 cms.	C	0.05	<10	<10	<10	<10
59.8	Fine sand, with some root development.	D	0.03	585	20	230	<10
80.0	As above	E	0.03	<10	10	30	15
100.3	As above, becoming grey towards base (?organic matter)	F	0.03	<10	<10	30	<10
118.0	Dark grey-black quartz sand colour probably organic. Containing bronze biotite and fine heavy mineral (on panning)	G	0.03	<10	25	<10	10
140.9	As above	H	0.03	<10	145	<10	<10
153.7	Brown clay with large rounded to sub-angular pebbles up to 5 cms.	I	0.04	600	890	50	10
171.5	Layered greenish clay, finely laminated 2-3 mm. Glauconitic?	J	0.06	185	300	70	85
191.7	Unsampled quartzose sand with rounded pebbles up to 2mm diameter.						

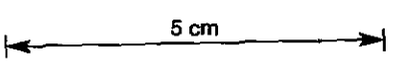


753112

PIT SAMPLE

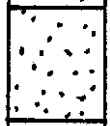
400 ft. East : 6400 ft. North

	Depth (cms)	Sample Ref.	% Sn in Head	Geochemical Assay -85 mesh (ppm)			
				Sn	As	Cu	WO_3
Humic horizon with dark grey organic material and some fine whitish sand (quartz).	0	A	0.05				
As above, becoming lighter toward base. Angular quartz up to 2 mms.	11.4	B	0.03				
Grey pebble horizon, with rounded quartz up to 1 cm in organic matrix. Extensive roots	24.1	C	0.03				
a) As for C to 40 cm, with sub-rounded pebbles <5mms. b) Passes into light brown clayey-sand with some roots. Suspect fossil humic.	35.5	D	0.03				
As for lower D to 59 cm, then into weathered clayey siltst-one. Light brown with schist-ose laminations but friable.	50.8	E	0.03				
Weathered schistose siltstone as for lower E, but with org-anic colouration to 72 cm.	64.8	F	0.03				
As for lower F.	80.0	G	0.04				
Light grey weathered schist (?), fresher G.	103.7	H	0.03				
As for H to 126 cm, then very clay rich, derived from weath-ering of sediment.	115.5	I	0.03				
As for I to 151 cm, then relatively unweathered micaceous schistose siltst-one	130.8	J	0.05				
	161.3						

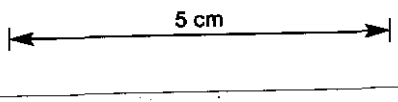


753113

PIT SAMPLE 1200 ft. East : 6400 ft. North

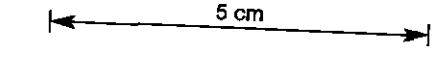
	Depth (cms)		Sample Ref.	% Sn in Head	Geochemical Assay -85 mesh (ppm)			
					Sn	As	Cu	WO_3
Dark grey humic horizon with abundant roots:Minor very fine quartz.	0		A	0.07	300	10	10	<10
As above, with decreasing root development toward base.	15.2		B	0.06	80	<10	35	<10
As for A, with minor root development	35.5		C	0.04	20	<10	<10	<10
Top 5 cm of pebbles generally <5mm (but up to 1 cm) of rounded quartz. Passes downwards into finer gritty sand with angular quartz and weathered siltstone.	55.9		D	0.06	20	10	<10	<10
As for lower part of D, passing into rounded quartz pebbles up to 3 cm at 79 cm.Large angular quartz toward base.	69.3		E	0.06	<10	<10	<10	<10
Clay rich light brown sand containing angular quartz generally < 2 mm and some large (2 cm-) pebbles of white schistose siltstone.	83.8		F	0.04	<10	<10	<10	<10
Top 7.6cm fossil humic horizon developed on white siltstone,which is quite friable. Siltstone schistose, with mica on laminae.	99.0		G	0.06	20	20	<10	<10
Weathered bedrock, with some clay and root penetration.	118.0		H		<10	45	<10	<10
	133.4							

Note: Arsenic values up to 65 ppm in -36+52 mesh and -52+85 mesh fraction of samples F,G and H.



PIT SAMPLE 2000 ft. East : 6400 ft. North

	Depth (cms)	Sample Ref.	% Sn in Head	Geochemical Assay -85 mesh (ppm)			
				Sn	As	Cu	WO_3
Dark grey humic horizon with fine white (quartzose-?) silty material. Roots abundant.	0	A	0.29				
Dark grey peaty silt, similar to A, but with less root development.	15.2	B	0.06				
As for B above.	18.0	C	0.06				
As for B, but with pebble layer approx. 2.5 cm thick (up to 5cm elsewhere) 48 cm below top. Pebbles sub-angular to rounded quartz.	38.1	D	0.03				
Fossil soil horizon on whitish-brown siltstone. Extremely weathered in situ, but no clay. Lighter in colour toward base.	55.9	E	0.25				
Weathered brownish-white siltstone, in situ. Quite friable but compact.	68.5	F	0.05				
As for F.	78.7	G	0.04				
As for G, becoming harder with depth but still quite friable	90.2	H	0.05				
	109.3						



753115

APPENDIX 2

SOUTH PIEMAN HEAD TIN PROSPECT

MINERALOGICAL REPORT

BY

A.O'TOOLE (CONSULTANT)

JUNE, 1972

1. OBJECT

To determine the source of cassiterite found in samples taken from the South Pieman Head tin prospect, Tasmania : Submitted by D.Bell of A.C.I.

2. INTRODUCTION

The South Pieman Head tin prospect is located close to the north west coast of Tasmania to the west of Renison Bell and Heemskirk-Zeehan tin mines. Sampleshave been collected from gravel beds, soil horizons, stream sedimends and weathered granite. The heavy minerals were extracted in the A.C.I. Laboratory, stained for tin and the total mineralogy determined using a binocular microscope. The cassiterite morphology was used to determine the degree of transport affecting the heavy mineral suite.

3. SUMMARY

3.1. The cassiterite occurs as single grains,crystal fragments, and as an intergrowth with sulphides.

3.2. The cassiterite morphology is principally angular to subangular, indicating that the mineral has not travelled far from the source.

3.3. Associated minerals are tourmaline, spinel and sulphides; the latter being dominantly pyrite and pyrrhotite with lesser chalcopyrite and traces of tetrahedrite and galena.

3.4. The host rock is probably the granite and associated hornfels inliers. The tin values within the weathered granite are very encouraging as they range up to 800 ppm. Sn.

3.5. To complete evaluation fresh granite samples require tin assays, while additional prospective ground should be sought closer to the more massive contact zones and about sediment inliers. Possible tectonic controls should also be determined.

4. CONCLUSION.

The area requires further evaluation to determine the mineral potential of a) the granite, b) the hornfels inliers, c) other contact zones.

5. RECOMMENDATION

Commence a costeaning programme over the subject area to discern accurately the cassiterite values in fresh and altered granite together within associated sediments and alluvial beds.

6. DISCUSSION

Thirteen samples were presented byD. Bell of A;C.I. for cassiterite evaluation, particularly with regard to morphology and associated minerals. Assay data was on hand of screen fractions taken from the original samples. Table 1 records the samples and tin assay obtained.

The test samples were deslimed, screened at 1b mesh and a bromoform heavy mineral fraction obtained from the + or - 16 mesh fraction.

The results are given in Table 2.

The heavy mineral fractions were examined under a binocular microscope with the cassiterite morphology and associated minerals determined. A few polished sections were examined to determine intergrowth relations.

The above data is given in Appendix 1.

A summary of Appendix 1 is given in Table 3.

Table 3 shows that there is a close association between high cassiterite values and spinel. Spinel is a mineral typical of silica poor hornfels rocks and thus suggests that the more prospective areas are associated with contact zones, either sediment inlier or massive contacts. Another important mineralogical feature is the amount of cassiterite intergrown with sulphides. Most of the cassiterite in samples DB 4, 6 and 10 is bound in sulphide intergrowths.

The tin values in the weathered granite are high and suggest that the area is highly prospective and thus requires further evaluation, particularly into the fresh granite. Other highly prospective areas are about the more massive contact zones in addition to any sediment inliers encountered. As with the Renison and Heemskirk mines, tectonic controls will also be important and should be evaluated.

APPENDIX 1.

MINERALOGY OF SOUTH PIEMAN HEAD HEAVY MINERAL FRACTIONS.

DB 1. GRAVELS

Cassiterite. Very angular fragments, wedge and prismatic shaped with several exhibiting a pyramidal habit. The +16# cassiterite exhibits 50% subrounded, 50% angular grains.

Other Minerals.

Tourmaline, spinel, pyrite, chalcopyrite.

DB 2. WEATHERED GRANITE

Cassiterite. Crystalline, small grains with angular fragments; Similar to DB 1, also in that the larger grains exhibit 50% rounded grains. One grain sized 0.5 x 0.5 mm is a crystal fragment showing little evidence of transportation.

Other Minerals.

Pyrrhotite,pyrite.

DB 3. GRAVEL

+ 16#.

Cassiterite. little present in this fraction.

Other Minerals.

Leucoxene with 50% containing ilmenite, tourmaline, zircon (some with a bi-pyramidal habit), perovskite.

DB 4. GRAVEL

Cassiterite, only a few small grains.

Other Minerals.

Sulphides abundant, pyrite, chalcopyrite enclosing slivers of cassiterite. Tourmaline is the dominant mineral present with lesser spinel, the latter containing needles of rutile.

DB 5 WEATHERED GRANITE

Cassiterite. contained principally within sulphide intergrowths.

Other Minerals.

Leucoxene abundant as angular fragments. Tourmaline and biotite with

lesser very fine zircon. Sulphides are pyrrhotite and chalcopyrite.

DB 6 GRAVEL

Cassiterite Coarse grained, angular, up to 1 x 1.5 mm, 1.5 x 3 mm and abundant, very fine grain. Also abundant as an intergrowth with pyrite and pyrrhotite, where the cassiterite occurs up to 0.3 x 1.2 mm to fine lenses and veins sized below 0.3 x 0.03 mm.

Other Minerals

Sulphides, pyrite, pyrrhotite, minor chalcopyrite and a trace of tetrahedrite and galena. Abundant fine grained leucoxene, tourmaline, zircon and rutile with lesser perovskite and spinel.

DB 7 WEATHERED GRANITE

Cassiterite very fine grains. The dominant mineral present is biotite with lesser tourmaline.

DB 8 TERTIARY SANDS.

Cassiterite. possibly intergrown with the sulphides, only traces seen. Sulphides are abundant with fine marcasite dominant, lesser chalcopyrite with several grains at 1 x 1.5 mm. Zircon and tourmaline constitute the remaining minerals.

DB 9 GRAVEL COMPOSITE

Cassiterite. About 0.5%, principally as fine grains. The majority of cassiterite present is possibly intergrown with the abundant sulphides.

Other Minerals.

Pyrite and pyrrhotite are abundant and sized up to 1 x 1.5 mm. Lesser chalcopyrite. The very fine sizes 1.0 x 1.5 mm contain abundant rutile and zircon with minor leucoxene and possibly traces of ruby cassiterite. A siliceous hematite is the dominant mineral present.

TABLE 1.

TIN ANALYSES SOUTH PIEMAN HEAD PROSPECT

SAMPLE NO.	LOCALITY	TYPE	TIN			P.P.M.
DB 1	4E OON	Gravels	A	B	C	D
	PS 2/A-D	-36 + 52#	945	260	1150	3010
		-52 + 85#	385	785	1150	1795
		-85#	1040	755	450	1080
DB 2	4E OON	Weathered Granite	F	G		
	PS2/FG	-85#	435	560		
DB 3	4W.8N	Gravel	B	C	D	
	PS1/B-D	-85#	650	895	495	
DB 4	12W.8N	Fossil humic horizon		E		
	PS5/E	-36 + 52#		95		
		-52 + 85#		145		
		-85#		3075		
DB 5	12W.8N	Weathered Granite		F		
	PS5/F	-85#		810		
DB 6	4E.16N	Gravels		B		
	PS 1/B	-36 + 52#		170		
		-52 + 85#		45		
		-85#		870		
DB 7	4E.16N	Weathered Granite	G	H		
	PS1/GH	-85#	0	440		
DB 8	4W.56N	Tertiary Sands	I	J		
	PS Y/IJ	-85#	600	200		
DB 9	20W.64N.	Gravel Composite	A	B	C	D
	PS1/A-D	- 5#	2900	600	600	300
DB 10	20W.64N	Fossil humic horizon	E	F		
	PS 1/EF	Weathered ss.				
		- 5#	2500	500		
DB 11	Cy 231	Stream Sediment		5760		
DB 12	Cy 216	Stream Sediment		505		
	Cy 219	- 85#		590		
DB 13	Cy 217	Stream Sediment		1035		
	218	- 85#		165		

DB 10 FOSSIL HUMIC HORIZON

Cassiterite not seen.

Other Minerals.

Large sulphide grains sized at 0.5 x 1 mm are dominant; chalcopyrite, pyrite, pyrrhotite. The very fine sizings are composed of rutile, zircon and tourmaline.

DB11 STREAM SEDIMENT - 16#

Cassiterite : 8-10% principally as 0.1 - 0.5 mm. subangular grains.

Other Minerals.

Leucoxene and spinel dominant with zircon sized up to 0.5 x 0.7 mm. Minor rutile and ilmenite.

+ 16# Principally coarse spinel up to 2 x 2 mm and minor leucoxene.

DB12 STREAM SEDIMENT

Cassiterite. approximately 2% subrounded to subangular.

Other Minerals.

Leucoxene and spinel dominant with lesser zircon. Minor rutile, garnet and tourmaline.

DB13 STREAM SEDIMENT

Cassiterite : little seen

Other Minerals.

Spinel (80%) dominant with minor rutile, tourmaline, leucoxene, schist fragments. Trace of chalcopyrite and pyrite.

TABLE 2.

SOUTH PIEMAN HEAD TIN PROSPECT - DESLIME SCREEN HEAVY MINERAL DATA.

REF. NO.	LOCALITY	WEIGHT PERCENT MATERIAL			WEIGHT % MINERAL FRACTION.	
		+ 16#	- 16#	Washing Loss 'Fines'	+16#	-16#
DB 1	4E OON PS2.ABCD	24.0	68.0	8.0	0.110	1.08
2	4E OON PS2 FG	27.1	52.5	20.4		
3	4W8N PS1 :BULK	52.7	27.2	20.1	0.006	0.58
4	12W8N :PS5 E	22.7	63.8	13.5		0.68
5	12W8N : PS5:F	10.9	51.6	37.5		0.16
6	4E 16N PS1 B	71.3	19.3	9.4	0.019	1.38
7	4E16N :PS1: GH	23.7	62.7	13.6		2.69
8	4E 56N:PS1 : IJ	15.2	51.8	33.0		1.45
9	20E 64N:PS1 ABCD	9.4	64.8	25.8		24.9
10	20E 64N:PS1: EF	0.3	74.1	25.6		1.90
11	Cy 231	61.0	37.4	1.6	0.044	1.97
12	Cy 216 + Cy 219	25.2	67.4	7.4		1.93
13	Cy 217 + Cy 218	14.8	76.4	8.8		1.38

TABLE 3.

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SOUTH PIEMAN HEAD MINERALOGY SUMMARY

SAMPLE NO.	CASSITERITE	TOURMALINE	SPINEL	ZIRCON	LEUCOXENE	BIOTITE	PYRITE	PYRRHOTITE	C'PYRITE	OTHERS
DB 1	S - M	S	m				m		m	
DB 2	S						S	S		
DB 3	S	S		S	M					PEROV.
DB 4	S - M (in sulphides)	M	S				M		M	
DB 5	S	M		S	M	M		S	S	
DB 6	S (in sulphides)	S	m	S	M		M	M	m	GAL
DB 7	m	S				M				
DB 8	m	S		S			M (Marcasite)		S	
DB 9	S			S	m		S - M	S - M	S	SIL HEM
DB 10	Tce (M) (in sulphides)	S		S			M	M	M	
DB 11	M		M	S	M					
DB 12	S - M		M	S	M					
DB 13	Tce	m		M	m		Tce		Tce	

M Major - for cassiterite over 2%, others over 10%
S Secondary - " " " 1%, " " 5%
m Minor - " " under 0.5% " " 2%

631

1000

PROJECT PIEMAN

Geological Reliability Diagram and Locality Plan

753125

72-876

E.L. 49/70

E.L. 48/70

INTERVIEW RIVER TIN-TUNGSTEN WORKINGS

COPPER AND SILVER REWARD

CHIMNEY CREEK AEROMAGNETIC ANOMALY

RUPERT POINT AEROMAGNETIC ANOMALY

HOYLE CREEK AEROMAGNETIC ANOMALY

SOUTH PIEMAN HEAD TIN PROSPECT

Mt. Hazelton 2200'

Mt. Lily

Mt. Norfolk 2490'

MT SUNDAY

437 △ MT DONALDSON

△ 93

Johnston Bay

Kenneth Bay

Bare Rock

Sandy Cape

Hardwicke Bay

Conical Rocks Point

Rupert Point

Pieman Head

Ahberg Bay

Granville Harbour

Interview Pinnacle

The Longback

Hades Ridge

Corinna

Ahrberg Hill

Yarrana Hill

Delville Saddle

Brookes Ck

Greens Ck

Thornton River

Lindsay River

Pedder River

Lagoon River

Hunt Creek

Chimney Creek

Donaldson River

Badger Plains Creek

Savage River

Sabbath Creek

Destination Creek

Ford Creek

PIEMAN RIVER

Foam Ck

Violet Rivulet

Panel Creek

Rocky Creek

Tikkawoppa Creek

Delville Creek

Bernafai Creek

Newdegate Creek

Gutheie Ck

Club Foot Ck

Tunnelrace Creek

Timbs Creek

Bracken Creek

Savage River

Poodie Ridge

Elizabeth Creek

Middleton Creek

Corinna Ck

Whyte Bluffers Ck

Little Hunter Creek

Plains Ck

Brown River

Frenchman Creek

Nancy Creek

Lucy Creek

Letroy Ridge

Owen Meredith River

Hangmans Creek

PIEMAN RIVER

George Town Packet Creek

Hoyle Creek

Top Earth Creek

Duck Creek

Track

Gowlays Creek

Healy Creek

Granville Harbour

Donnellys Lookout

Hut

Plateau

Corinna Ridge

Creek

Road

Track

Ridge

Lagoon River

Donaldson River

Lindsay River

Pieman Head

Misery Is

Huts

Rivulet

Creek

Track

Road

Ridge

Plateau

Creek

River

Creek

Creek

Creek

1001

15 25 35 45

120 120

110 110

100 100

90 90

80 80

145°00'

41°30'

Ck Brookes

Greens Ck

Thornton River

Lindsay River

Mt. Hazelton 2200'

Pedder River

Mt. Lily

Kenneth Bay

Bare Rock

Sandy Cape

E.L. 49/70

Mt. Norfolk 2490'

Donaldson River

Johnston Bay

Lagoon River

Hunt Creek

Chimney Creek

Interview River

MT SUNDAY

Interview Pinnacle

Badger Plains Creek

Savage Creek

The Longback

Longback Creek

FIGS. 17, 18A & B (1:1000)

FIGS. 20 & 21

1:10,000

FIGS. 13 & 14

FIGS. 15, 16A & B (1:500)

1:4000

FIGS. 10, 11 and 12

Rocky Creek

FIG. 9

1:50,000

Ford Creek

Destination Creek

Sabbath Creek

437▲ MT DONALDSON

Guthrie Ck

Club Foot Ck

Tunnerface Creek

Timbs Creek

Bracken Creek

Road

Plains Ck

Brown River

PIEMAN RIVER

Savage River

Boodie Creek

Elizabeth Ridge

Middleton Creek

Corinna Ck

Brothers Ck

Whyte River

Little Hunter Creek

Ahrberg Hill

Frenchman Creek

Corinna

Plateau

Corinna Ridge

Nancy Creek

Letroy Ridge

Lucy Creek

Hades Ridge

Owen Meredith River

PIEMAN RIVER

Hangmans Creek

Rupert Point

Foam Ck

FIGS. 22 & 24

Huts

Pieman Head

Misery Is.

Hardwicke Bay

Violet Rivulet

Conical Rocks Point

Panel Creek

Yarrana Hill

93

FIG. 28

1:4000

FIGS. 25, 26 & 27

Ahberg Bay

1:10,000

Trkkawoppa Creek

Delville Creek

Bernafai Creek

Ridge Creek

E.L. 48/70

Delville Saddle

Newdegate Creek

George Town Packet Creek

FIGS. 29 & 31

Hoyle Creek

Top Creek

Puck Creek

Earth Creek

Duck Creek

Track

Track

Gourlays Creek

Healy Creek

Rocky Creek

Granville Harbour

Granville Harbour

Donnellys Lookout Huts

FIGS. 1 to 8 (1:50,000)

5 370 000m N

315 000m E

PROJECT PIEMAN

INDEX PLAN SHOWING REPORT FIGURES

753126

TR-876 042/1

BASE PLAN compiled from sheets 7814 and 7914 (edition 1) series R.661: Australia 1:100,000 Topographic Survey and from Tasmania 1:250,000 sheet 3 (1st. edition)

GRID in metres on Australian metric grid.

5 cm

DATE OF COMPILATION	JUNE 1972
COMPILED BY	D.H.BELL
SCALE	1:50,000

FIGURE 2 1001

1002

PROJECT PIEMAN

REGIONAL GEOLOGICAL COMPILATION

753127

72-876

42/1

LEGEND

QUARTERNARY

- Qa — Alluvium & marsh deposits.
- Qba — Beach & active dune sand.
- Qds — Stable & partly vegetated sand dunes.

TERTIARY

- V, Tb V — Basalt.
- Tg — Quartzose sands & gravels.

DEVONIAN

- + Dg + — Granite.

ORDOVICIAN

- Os — Sedimentary rock types.

PRECAMBRIAN

- Pdol — Dolerite dyke swarms & bodies.
- Pd-c — Savage Dolomite & Delville Chert. (Smithton Dolomite "equivalents")
- Pv — Bernafai Volcanics. (Smithton Dolomite "equivalents")
- Pcs — Corinna Slate. (Smithton Dolomite "equivalents")
- Pdg — Donaldson group. (Smithton Dolomite "equivalents")
- Psc — Surprise Creek Beds. (Rocky Cape Group "equivalent")
- Pi — Interview Siltstone. (Rocky Cape Group "equivalent")
- Pl — Lagoon River Quartzite. (Rocky Cape Group "equivalent")
- Pc — Chimney Creek "Hornfels".
- Pp — Pedder River Siltstone.
- Pw — Whyte Schist.
- PwAm — Amphibolite bodies within Whyte Schist. (Arthur Lineament)
- Po — Oonah Quartzite & Slate.

- F — Fault.
- Approx. Geological Boundary.
- Inferred Geological Boundary.
- Concealed Geological Boundary.
- Geological Boundary. (unconformity)
- Prominent Quartz vein outcrops.

BASE PLAN compiled from sheets 7814 and 7914 (edition 1) series R.661: Australia 1:100,000 Topographic Survey and from Tasmania 1:250,000 sheet 3 (1st edition).

GRID in metres on Australian metric grid.

PLAN compiled from geological mapping by Spry (1969) in the Corinna - Granville Harbour area, & by Tas. Dept. of Mines (1969) in area between Pieman River & Lagoon River: supplemented by field traverses & detailed mapping in Pieman River mouth & Interview River area during Summer 1971 - 72.
Mapping north of Lagoon River carried out during February 1972.

DATE OF COMPILATION	JUNE 1972
COMPILED BY	D.H. BELL.
SCALE	1:50,000.

5 cm

FIGURE 3 1002

1003

PROJECT PIEMAN

Aeromagnetic Survey Results (C.G.G)

753128

72-876

BASE PLAN compiled from sheets 7814 and 7914 (edition 1) series R.661: Australia 1:100,000 Topographic Survey and from Tasmania 1:250,000 sheet 3 (1st edition).

GRID in metres on Australian metric grid.

LEGEND

- a7 — Aeromagnetic Axis and Reference No.
- Probable contouring of Structure
- Magnetic Discontinuity
- Interpreted Fault Structure
- Mapped Geological Boundaries (between Precambrian elements)

DATE OF COMPILATION	June 1972
COMPILED BY	D.H.BELL
SCALE	1:50,000

5 cm

FIGURE 4 1003

1004

PROJECT PIEMAN

Regional Stream Sediment Geochemistry

753129

72-976

BASE PLAN compiled from sheets 7814 and 7914 (edition 1) series R.661 : Australia 1:100,000 Topographic Survey and from Tasmania 1:250,000 sheet 3 (1 st. edition)

GRID in metres on Australian metric grid.

DISTRIBUTION OF TIN & TUNGSTEN VALUES

- ● 210 PPM. Sn. in minus 85 mesh fraction.
- ● — <10 PPM. Sn. in minus 85 mesh fraction.
- ●(112) PPM. WO_3 in minus 85 mesh fraction.

DATE OF COMPILATION	MAY 1972
COMPILED BY	D.H.BELL
SCALE	1:50,000.

FIGURE 5 1004

42/1

1005

PROJECT PIEMAN

REGIONAL STREAM SEDIMENT GEOCHEMISTRY

E.L. 49/70

E.L. 48/70

753130

72-876

Q42/1

BASE PLAN compiled from sheets 7814 and 7914 (edition 1) series R.661: Australia 1:100,000 Topographic Survey and from Tasmania 1:250,000 sheet 3 (1st edition).

GRID in metres on Australian metric grid.

● 200 PPM. TOTAL COPPER

● 95 PPM. NICKEL

DISTRIBUTION OF SELECTED COPPER AND NICKEL VALUES

NICKEL values from regional sediment sampling by Pickands Mather & Co: Values greater than 20 PPM. only plotted : Sample spacing approx. 1 Km, with a majority of side streams sampled.

COPPER values from regional stream sediment sampling by Pickands Mather & Co., and from Summer 1971-72 programme : Values greater than 20 PPM. Cu., only plotted.

5 cm

DATE OF COMPILATION	JUNE 1972
COMPILED BY	D.H. BELL.
SCALE	1:50,000.

FIGURE 6 1005

PROJECT PIEMAN

REGIONAL STREAM SEDIMENT GEOCHEMISTRY

Distribution of selected Lead & Zinc values

BASE PLAN compiled from sheets 7814 and 7914 (edition 1) series R.661: Australia 1:100,000 Topographic Survey and from Tasmania 1:250,000 sheet 3 (1st edition).

GRID in metres on Australian metric grid.

● 200 PPM. Zinc
● 100 PPM. Lead

Lead & Zinc values from regional stream sediment sampling by Pickands Mather & Co., Sample density approx., 1 Km., with major branches of streams sampled. Values greater than 50 ppm., Zn., & 20 ppm., Pb., plotted.

DATE OF COMPILATION	JUNE 1972
COMPILED BY	D.H. BELL.
SCALE	1:50,000.

FIGURE 7 1006

5 cm

753131

TR-876 042/1

1006

1007

PROJECT PIEMAN

BEACH SANDS EVALUATION

Showing Quaternary Geology and Auger Sample Localities

753132

TR-876

E.L. 49/70

E.L. 48/70

Mt. Hazelton 2200'

Mt. Norfolk 2490'

Mt. Lily

MT SUNDAY

437 MT DONALDSON

Interview Pinnacle

The Longback

Johnston Bay

Kenneth Bay

Bare Rock

Sandy Cape

Rupert Point

Pieman Head

Hardwicke Bay

Conical Rocks Point

Ahberg Bay

Granville Harbour

Delville Saddle

Yarrana Hill 93

Ahrberg Hill

Corinna

Donnellys Lookout Hut

Brookes Ck

Greens Ck

Thornton River

Lindsay River

Pedder River

Lagoon River

Hunt Creek

Chimney Creek

Interview River

Rocky Creek

Donaldson River

Badger Plains Creek

Savage Creek

Foam Ck

PIEMAN RIVER

Ford Creek

Destination Creek

Violet Rivulet

Panel Creek

Huts

Misery Is

Guthrie Ck

Club Foot Ck

Tunnelrace Creek

Timbs Creek

Bracken Creek

Brown Plains Ck

Elizabeth Middleton Creek

Corinna Plateau

Whyte Brothers Ck

Little Hunter Creek

Frenchman Creek

Nancy Creek

Lefroy Ridge

Hades Ridge

Lucy Creek

Owen Meredith River

Hangmans Creek

George Town Packet Creek

Hoyle Creek

Top Falls

Duck Creek

Track

Gourlays Creek

Healy Creek

Rocky Creek

Tikkawoppa Creek

Delville Creek

Bernafai Creek

Newdegate Creek

Sabbath Creek

Savage Ridge

Doodie Creek

Granville Harbour

Qb Beach sand

Qda Active dune sand

Qds Stable & partly vegetated dunes

● Auger sample location

BASE PLAN compiled from sheets 7814 and 7914 (edition 1) series R.661: Australia 1:100,000 Topographic Survey and from Tasmania 1:250,000 sheet 3 (1st. edition)

GRID in metres on Australian metric grid.

DATE OF COMPILATION	JUNE 1972
COMPILED BY	D.H. BELL
SCALE	1:50,000

5 cm

FIGURE 8 1007

120 110 100 90 80 70

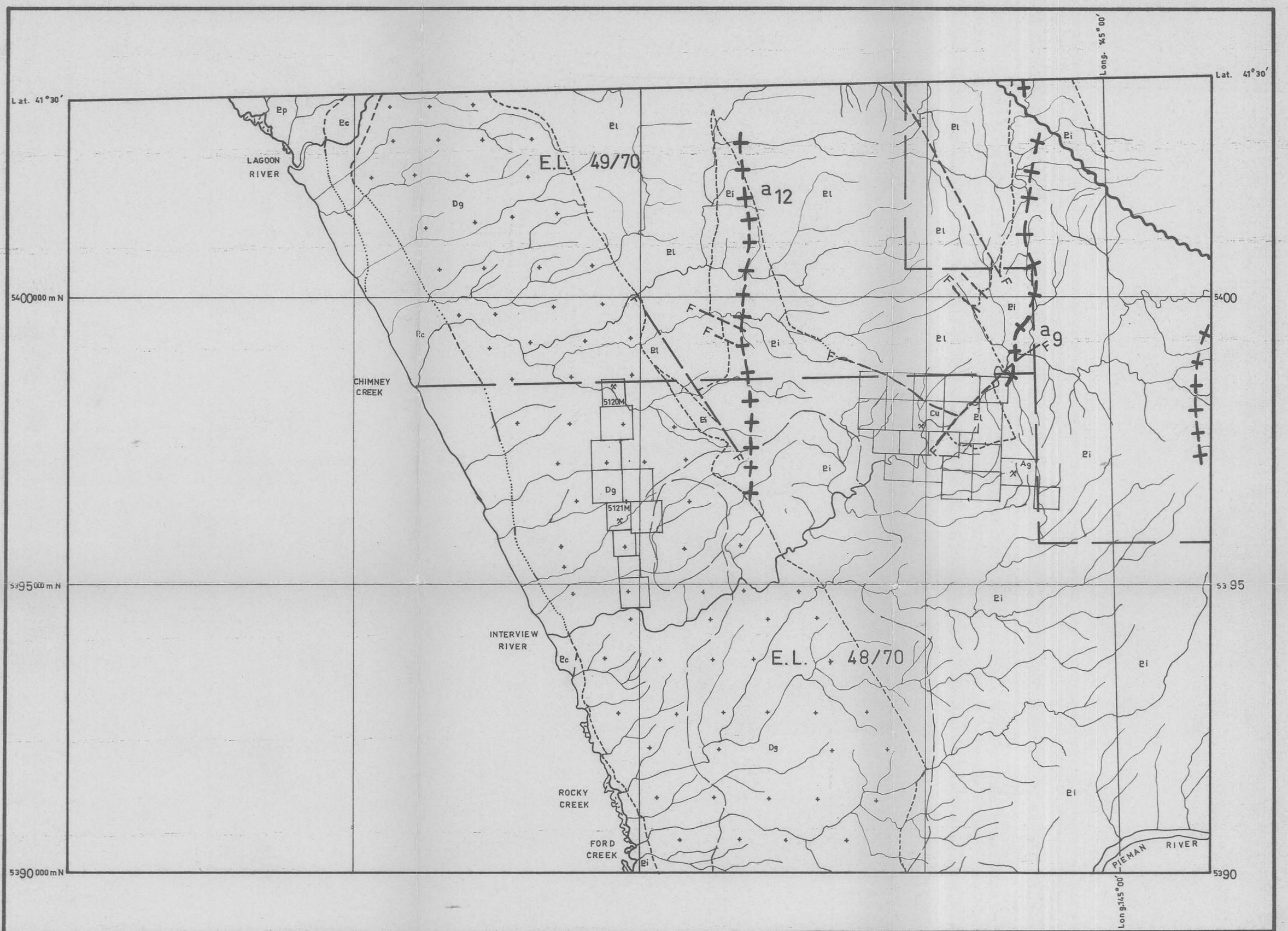
41°30'

145°00'

15 25 35 45

5 370 000 mN

315 000 mE 20



PROJECT PIEMAN 753133

GEOLOGICAL PLAN OF INTERVIEW RIVER AREA

72-876

5 cm

GRID IN METRES on Australian metric grid

Base Plan as for Figs. 1-8

LEGEND

Devonian — Dg Granite

Precambrian — Pi Interview Siltstone

Pl Lagoon River Quartzite

Pc Chimney Creek 'Hornfels'

Pp Pedder River Siltstone

Geological Boundary (Concealed)

Track

Former lease boundaries

Fault

Aeromagnetic Axis

Magnetic Discontinuity

DATE OF SURVEY: Jan. 1972

DATE OF COMPILATION: June, '72

COMPILED BY D.H.BELL

SCALE 1 : 50,000

FIG. 9

1008

753134

72-376

PROJECT PIEMAN

INTERVIEW RIVER TIN - TUNGSTEN WORKINGS — OUTCROP GEOLOGY

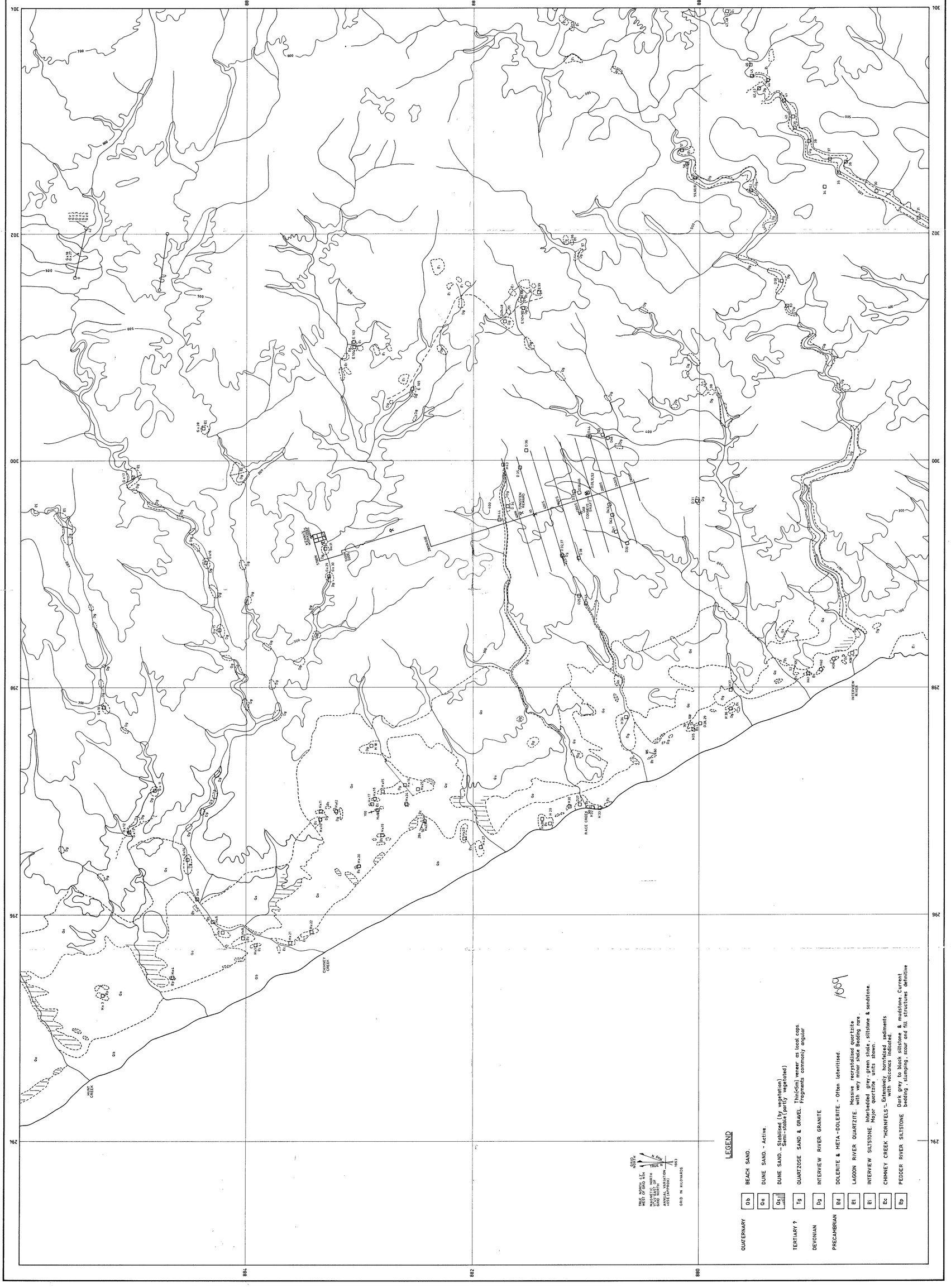
DATE OF SURVEY	JANUARY 1972
DATE OF COMPILATION	MAY 1972
COMPILED BY	D.H BELL
SCALE	1: 10,000 .

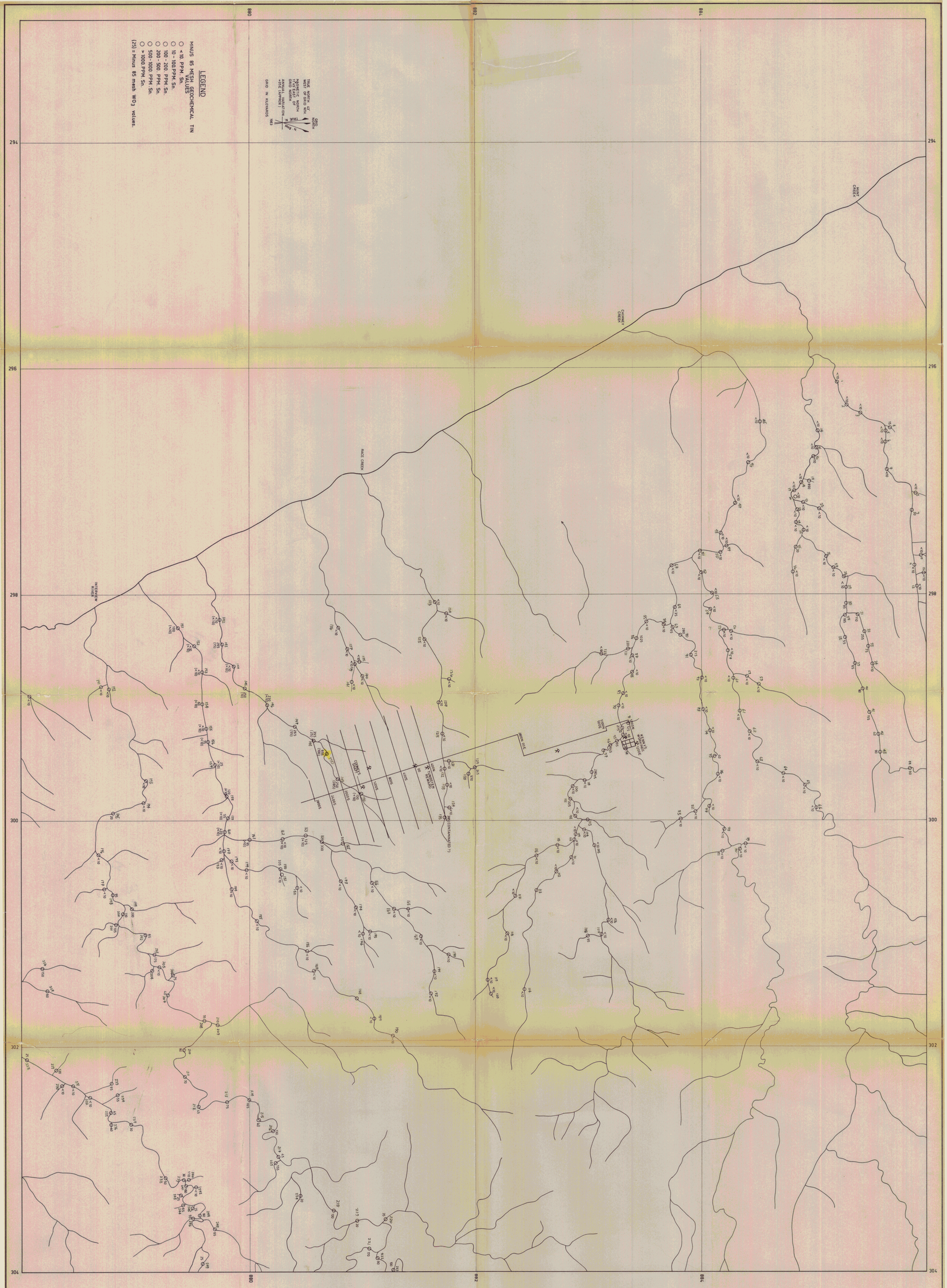
FIGURE 10 1003

5 cm

GRID and CO-ORDINATES (in feet)
shown on this plan are northern extension of Coonerys Shaft Soil Grid which is oriented 330 Mag (1972)

Point 1600S-00E has the co-ordinates 880·95 N 299·70E in terms of KILOYARDS GRID.





753135

72-876

GRID and CO-ORDINATES (in feet) shown on this plan are northern extension of Cooneys Shaft Soil Grid which is oriented 330° Mag. (1972)

Point 1600'S - 00'E has the co-ordinates 880·95 N 299·70 E in terms of KILOYARDS GRID.

PROJECT PIEMAN

INTERVIEW RIVER TIN - TUNGSTEN WORKINGS. - STREAM SEDIMENT GEOCHEMISTRY. P.P.M. TIN & TUNGSTEN.

DATE OF SURVEY	JANUARY 1972
DATE OF COMPILATION	MAY 1972
COMPILED BY	D.H. BELL
SCALE	1: 10,000.

5 cm

1010

FIGURE 11

PROJECT PIEMAN

INTERVIEW RIVER TIN - TUNGSTEN WORKINGS. - STREAM SEDIMENT GEOCHEMISTRY. PPM. ARSENIC & TOTAL COPPER.

GRID and CO-ORDINATES (in feet)
shown on this plan are northern extension of Cooneys Shaft Soil Grid which is oriented 330 Mag. (1972)

Point 1600'S - 00E has the co-ordinates 880-95 N 299-70E in terms of KILOYARDS GRID.

DATE OF SURVEY	JANUARY 1972
DATE OF COMPILATION	MAY 1972
COMPILED BY	D.H. BELL
SCALE	1 : 10,000.

5 cm

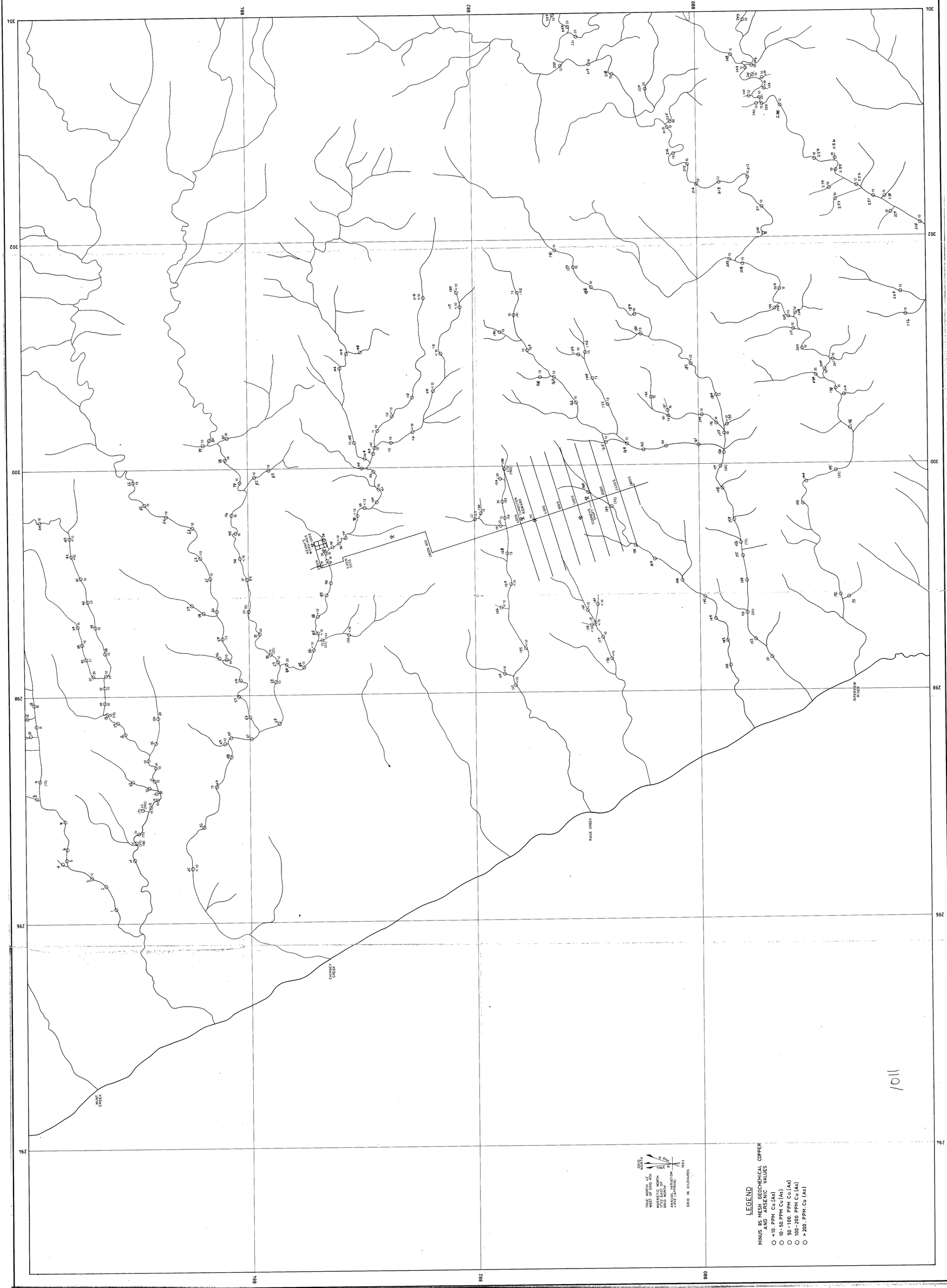
1011

FIGURE 12

753136

72-876

1011



00'N
400'S
800'S
1200'S
1600'S
2000'S
2400'S
2800'S
1600'W
00'E
1600'E

qtz
TUNGSTEN REWARD
qtz-tm-wo
qtz-tm-mu-wo
qtz-tm-mu
py-apy
wo-sch
qtz-tm
COONEY'S WORKINGS

Sn
Cu

LEGEND

100' Sample Interval

Sn 50 — — 75 — parts per million Sn in 'B-C' soil horizon (-85 mesh fraction)

Cu 15 10 — 20 — parts per million TOTAL Copper in 'B-C' soil horizon (-85 mesh fraction)

(— is <10 ppm)

NOTE: Where no 'B-C' soil horizon developed, 'A' horizon data plotted 'A' horizon geochemical assay data given in appendices.

Type of VEIN MINERALIZATION evident from old workings:
qtz - quartz tm - tourmaline
mu - muscovite wo - wolfram
apy - arsenopyrite sch - scheelite
py - pyrite

Mine Shaft (vertical)

Trench

Costean

GRID and CO ORDINATES (in feet) shown on this plan are northern extension of Cooney's Shaft Soil Grid which is oriented 330° Mag. (1972).

Point 1600'S 00'E has co-ordinates 88095 N 29970 E in terms of KILOYARDS GRID.

GRID NORTH

TRUE NORTH 43' west of GRID Nth

MAGNETIC NORTH 11°45 east of GRID NORTH

Annual variation +05 E (appx.) 1963

True N

Mag. N

CONTOURING OF GEOCHEMICAL TIN VALUES. (PPM Sn)
CONTOUR INTERVAL 200 PPM Sn.

CONTOURING OF GEOCHEMICAL TOTAL COPPER VALUES. (PPM Cu)
CONTOUR INTERVAL 50 PPM Cu.

753137

5 cm

72-876

PROJECT

INTERVIEW RIVER TUNGSTEN DEPOSITS

PIEMAN

SOIL GEOCHEMISTRY Cooney's Shaft Soil Grid 1012

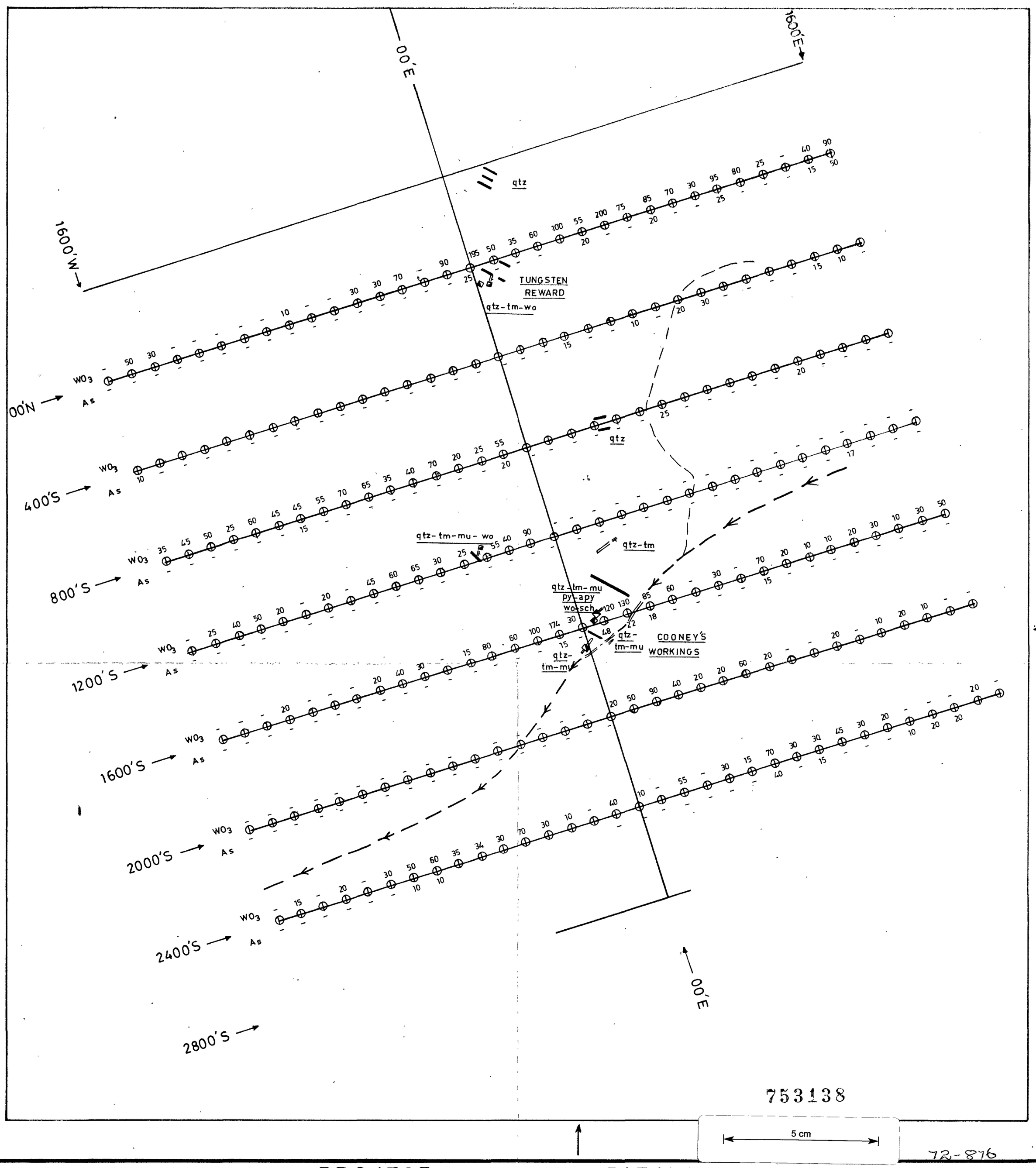
DATE OF SURVEY: January, 1972

DATE OF COMPILATION: May, 1972

COMPILED BY: D. H. BELL

SCALE 1:4,000

FIG 13



PROJECT

INTERVIEW RIVER TUNGSTEN DEPOSITS

PIEMAN

SOIL GEOCHEMISTRY Cooney's Shaft Soil Grid 1013

LEGEND

←100'→ Sample Interval

WO_3 50 — — 75 — parts per million WO_3 in 'B-C' soil horizon (-85 mesh fraction)

As 15 10 — 20 — parts per million TOTAL Arsenic in 'B-C' soil horizon (-85 mesh fraction)

(— is <10 ppm)

NOTE: Where no 'B-C' soil horizon developed, 'A' horizon data plotted. 'A' horizon geochemical assay data given in appendices.

Type of VEIN MINERALIZATION evident from old workings:
qtz - quartz tm - tourmaline
mu - muscovite wo - wolfram
apy - arsenopyrite sch - scheelite
py pyrite

Mine Shaft (vertical)

Trench

Costean

GRID and CO-ORDINATES (in feet) shown on this plan are northern extension of Cooney's Shaft Soil Grid which is oriented 330° Mag. (1972).

Point 1600'S 00'E has co-ordinates 88095 N 29970 E in terms of KILOYARDS GRID.

GRID NORTH

TRUE NORTH 43° west of GRID Nth

MAGNETIC NORTH 11° 45' east of GRID NORTH

Annual variation +05' E (appx.) 1963

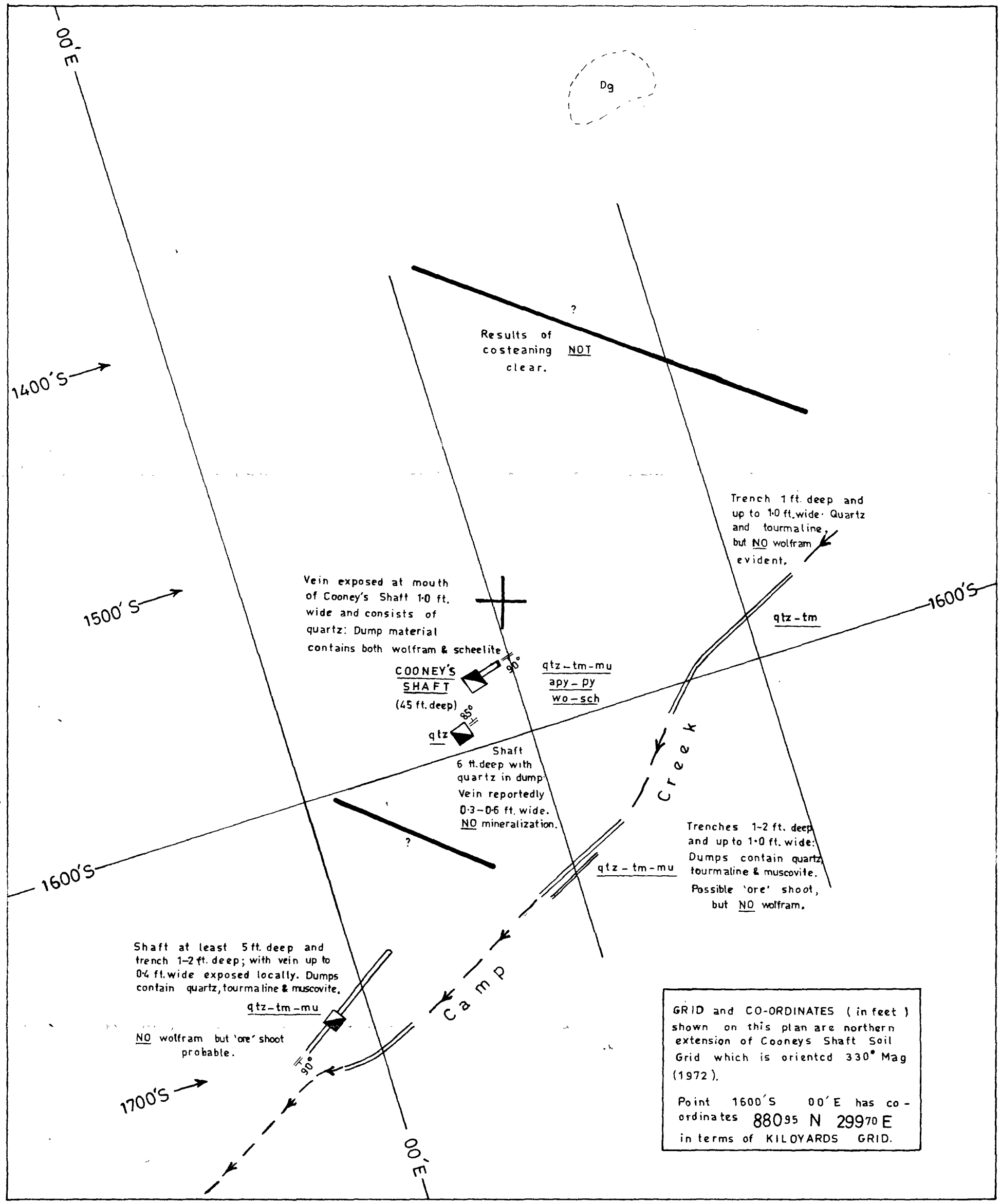
DATE OF SURVEY: January, 1972

DATE OF COMPILATION: May, 1972

COMPILED BY: D. H. BELL

SCALE: 1:4000

FIG. 14



753139 72-876 1014

PROJECT PIEMAN

INTERVIEW RIVER TUNGSTEN DEPOSITS — Geological Sketch Plan, Cooney's Workings

LEGEND

Dg — Extent of outcrops of DEVONIAN GRANITE (mapped as Interview River Granite)

85 — Attitude of quartz vein (possibly mineralized)

Type of VEIN MINERALIZATION evident from old workings:
qtz-quartz tm tourmaline
mu-muscovite py-pyrite
apy-arsenopyrite wo-wolfram
sch-scheelite

Mine Shaft (vertical)

Trench Costean

GRID NORTH

TRUE NORTH 43' west of GRID Nth

MAGNETIC NORTH 11°45' east of GRID NORTH

Annual variation +05 E (appx.) 1963

True N Mag. N

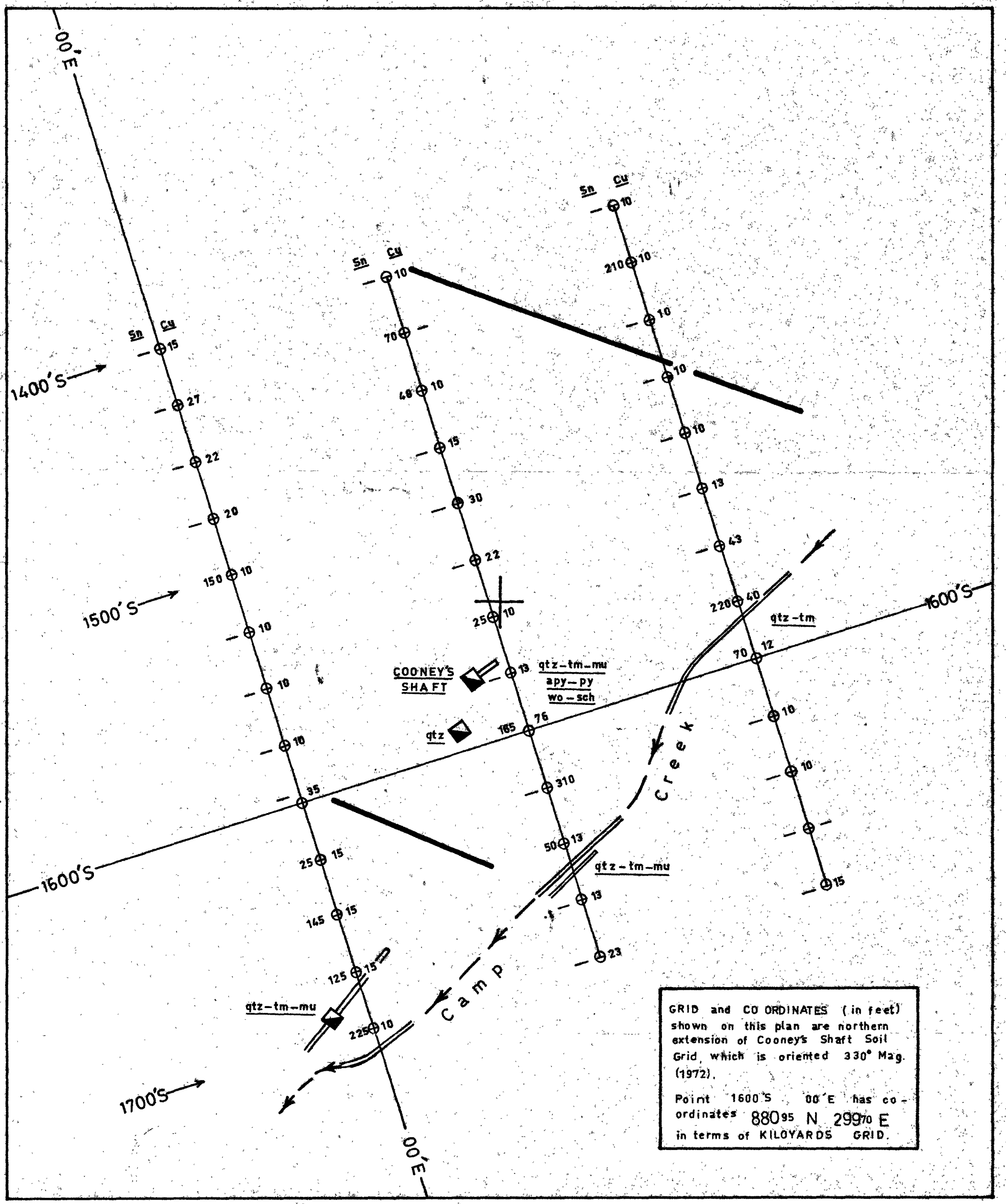
DATE OF SURVEY: January, 1972

DATE OF COMPILATION May, 1972

COMPILED BY D. H. BELL

SCALE: 1:500

FIG. 15



5 cm

753140 72-876

PROJECT PIEMAN

INTERVIEW RIVER TUNGSTEN DEPOSITS — Soil GEOCHEMISTRY Cooney's Workings

LEGEND

|-25'-| Sample Interval

Sn 50 — — 75 — parts per million Sn in 'B-C' soil horizon (-85 mesh fraction)

Cu 15 10 — 20 — parts per million TOTAL Copper in 'B-C' soil horizon (-85 mesh fraction)
(— is < 10 ppm)

NOTE: Where no 'B-C' soil horizon developed, 'A' horizon data plotted. 'A' horizon geochemical assay data given in appendices.

Type of VEIN MINERALIZATION evident from old workings:

qtz-quartz tm-tourmaline
mu-muscovite wo-wolfram
apy-arsenopyrite sch-scheelite
py-pyrite

Mine Shaft (vertical)

Trench Costean

GRID NORTH

TRUE NORTH 43' west of GRID Nth

MAGNETIC NORTH 11°45' east of GRID NORTH

Annual variation +05 E (appx.) 1963

DATE OF SURVEY: January, 1972

DATE OF COMPILATION: May 1972

COMPILED BY: D. H. BELL

SCALE: 1:500

FIG. 16A

1016

CONTOURING OF GEOCHEMICAL TUNGSTEN VALUES (PPM WO_3)
CONTOUR INTERVAL 50 PPM WO_3

00'E

1400'S

1500'S

1600'S

1700'S

00'E

WO3 As
140
175
350
280
200 205 14
75
110
65
30 50
100
45
60
qtz - tm - mu
20 50

WO3 As
40
65
25
05
145
285
185
COONEYS SHAFT
225 190 qtz - tm - mu
apy - py
wo - sch
qtz
120 48
140
20
95
145

WO3 As
125
115
100
80
125
120
150
160 60
210
qtz - tm
200
130 22
75
105
100
55
60

Creek

Camp

GRID and CO-ORDINATES (in feet) shown on this plan are northern extension of Cooneys Shaft Soil Grid which is oriented 330° Mag. (1972).

Point 1600'S 00'E has co-ordinates 880$_{95}$ N 299$_{70}$ E in terms of KILOYARDS GRID.

5 cm

753141 72-876

PROJECT PIEMAN 1015

INTERVIEW RIVER TUNGSTEN DEPOSITS — Soil GEOCHEMISTRY Cooney's Workings

LEGEND

|-25'-| Sample Interval

WO_3 50 — — 75 — parts per million WO_3 in 'B-C' soil horizon (-85 mesh fraction)

As 15 10 — 20 — parts per million TOTAL Arsenic in 'B-C' soil horizon (-85 mesh fraction)
(— is <10 ppm)

NOTE: Where no 'B-C' soil horizon developed, 'A' horizon data plotted. 'A' horizon geochemical assay data given in appendices

Type of VEIN MINERALIZATION evident from old workings:
qtz-quartz tm - tourmaline
mu-muscovite py - pyrite
apy-arsenopyrite wo-wolfram
sch-scheelite
Mine Shaft (vertical)
Trench
Costean

GRID NORTH
TRUE NORTH 43' west of GRID Nth
MAGNETIC NORTH 11°45' east of GRID NORTH
Annual variation +05 E (appx.) 1963

DATE OF SURVEY: January, 1972
DATE OF COMPILATION: May, 1972
COMPILED BY: D H. BELL
SCALE: 1:500

FIG. 16B

1200'E

5700'N

1000'E

Dg

Shaft estimated 20 ft. deep with quartz, tourmaline & muscovite in dump. NO wolfram.

qtz-tm-mu

Dg

Quartz but NO mineralization evident

qtz

5600'N

Dg

1·0 ft. qtz vein at N. end of trench

~85°

Vein material up to 1·5 ft. thick, with quartz, tourmaline, muscovite & wolfram. Suspect "major" 'ore' shoot.

500'E

qtz-tm-mu-wo

Dg

5500'N

Dg

Dg

5400'N

CHIMNEY CREEK (South Branch)

Water Race on South Bank of creek

Dg

Trench 5 ft. deep with 0·5ft vein Quartz and tourmaline.

qtz-tm

Dg

qtz-tm-mu

Vein up to 1·0 ft. thick, with quartz tourmaline & muscovite

~80°

NO wolfram, but extent of workings suggest possible shoot of 'ore'.

NO quartz or mineralization evident

qtz

~90°

Quartz vein apparently outcropped in trench. Attitude uncertain. Less than 1·0 ft thick. NO mineralization evident.

NO quartz or mineralation evident

5100'N

500'E

670'E

600'E

GRID and CO-ORDINATES (in feet) shown on this plan are northern extension of Cooney's Shaft Soil Grid, which is oriented 330° Mag. (1972)

Point 5700'N 1200'E has co-ordinates 88343 N 29935 E in terms of KILOYARDS GRID

5 cm

753142

72-876

PROJECT 'PIEMAN'

INTERVIEW RIVER TUNGSTEN DEPOSITS — GEOLOGICAL Sketch Plan Kenny's Workings

LEGEND

Dg — Extent of outcrops of DEVONIAN GRANITE (mapped as Interview River Granite)

~85° — Attitude of quartz vein (possibly mineralized)

Type of VEIN MINERALIZATION evident from old workings:

qtz - quartz tm - tourmaline
mu - muscovite wo - wolfram

Mine Shaft (vertical)

Trench

Costean

GRID NORTH

TRUE NORTH 43' west of GRID Nth

MAGNETIC NORTH 11°45' east of GRID NORTH

Annual variation +05'E (appx.) 1963

True N. Mag. N.

DATE OF SURVEY: January 1972

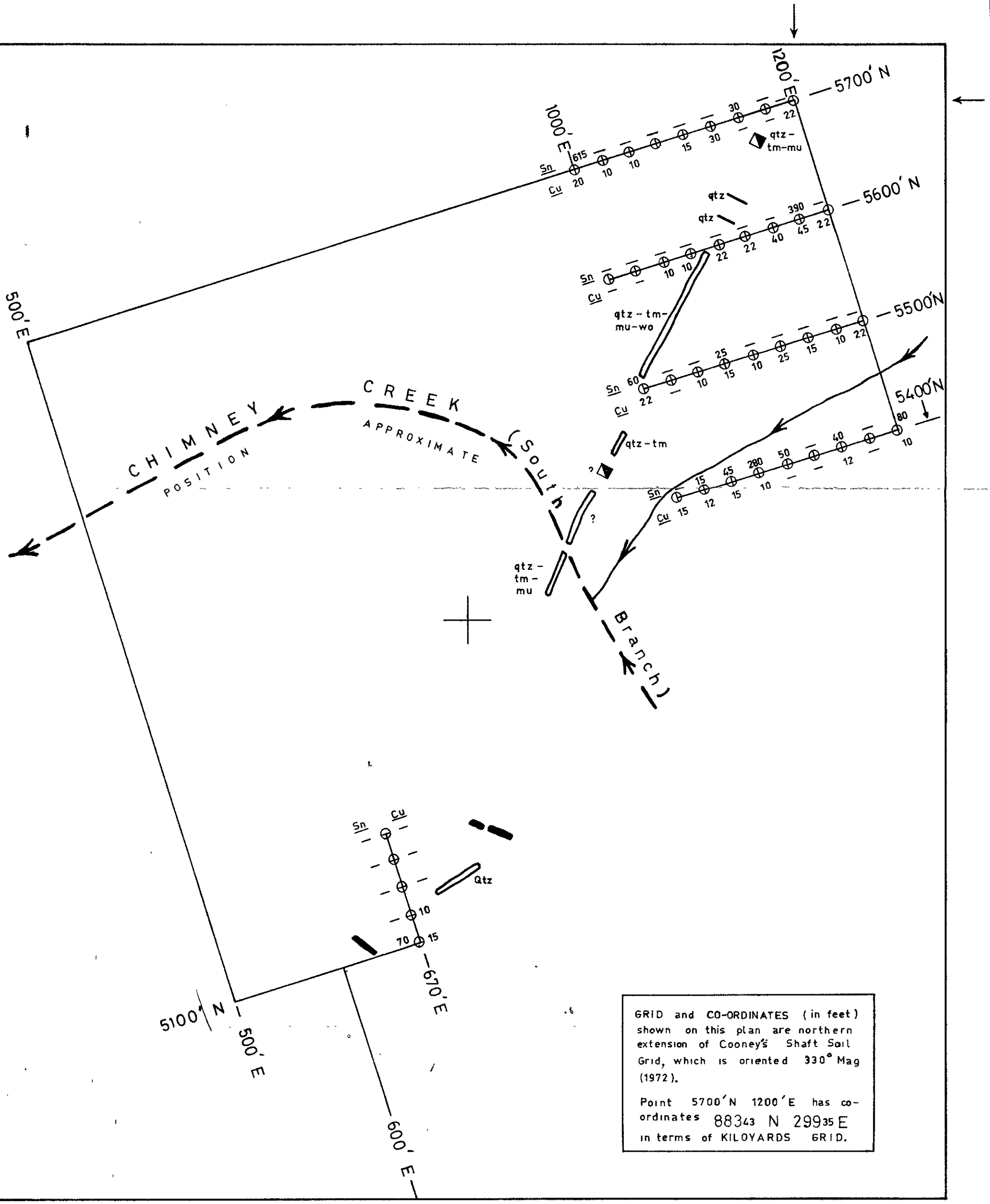
DATE OF COMPILATION: May 1972

COMPILED BY: D. H BELL

SCALE 1:1,000

FIG. 17

1017



GRID and CO-ORDINATES (in feet) shown on this plan are northern extension of Cooney's Shaft Soil Grid, which is oriented 330° Mag (1972).

Point 5700'N 1200'E has co-ordinates 88343 N 29935 E in terms of KILOYARDS GRID.

5 cm

753143

72-876

PROJECT PIEMAN

INTERVIEW RIVER TUNGSTEN DEPOSITS — Soil GEOCHEMISTRY Kenny's Workings

LEGEND

|25'| Sample Interval

Sn 50 — — 75 parts per million Tin in 'B-C' soil horizon (-85 mesh fraction)

Cu 15 10 — 20 parts per million TOTAL Copper in 'B-C' soil horizon (-85 mesh fraction)

(— is < 10 ppm)

NOTE: Where no 'B-C' soil horizon developed, 'A' horizon data plotted. 'A' horizon geochemical assay data given in appendices.

Type of VEIN MINERALIZATION evident from old workings

qtz - quartz tm - tourmaline
mu - muscovite wo - wolfram

Mine Shaft (vertical)

Trench

Costean

GRID NORTH

TRUE NORTH 43' west of GRID Nth.

MAGNETIC NORTH 11°45' east of GRID NORTH

Annual variation +05' E (appx.) 1963

DATE OF SURVEY January 1972

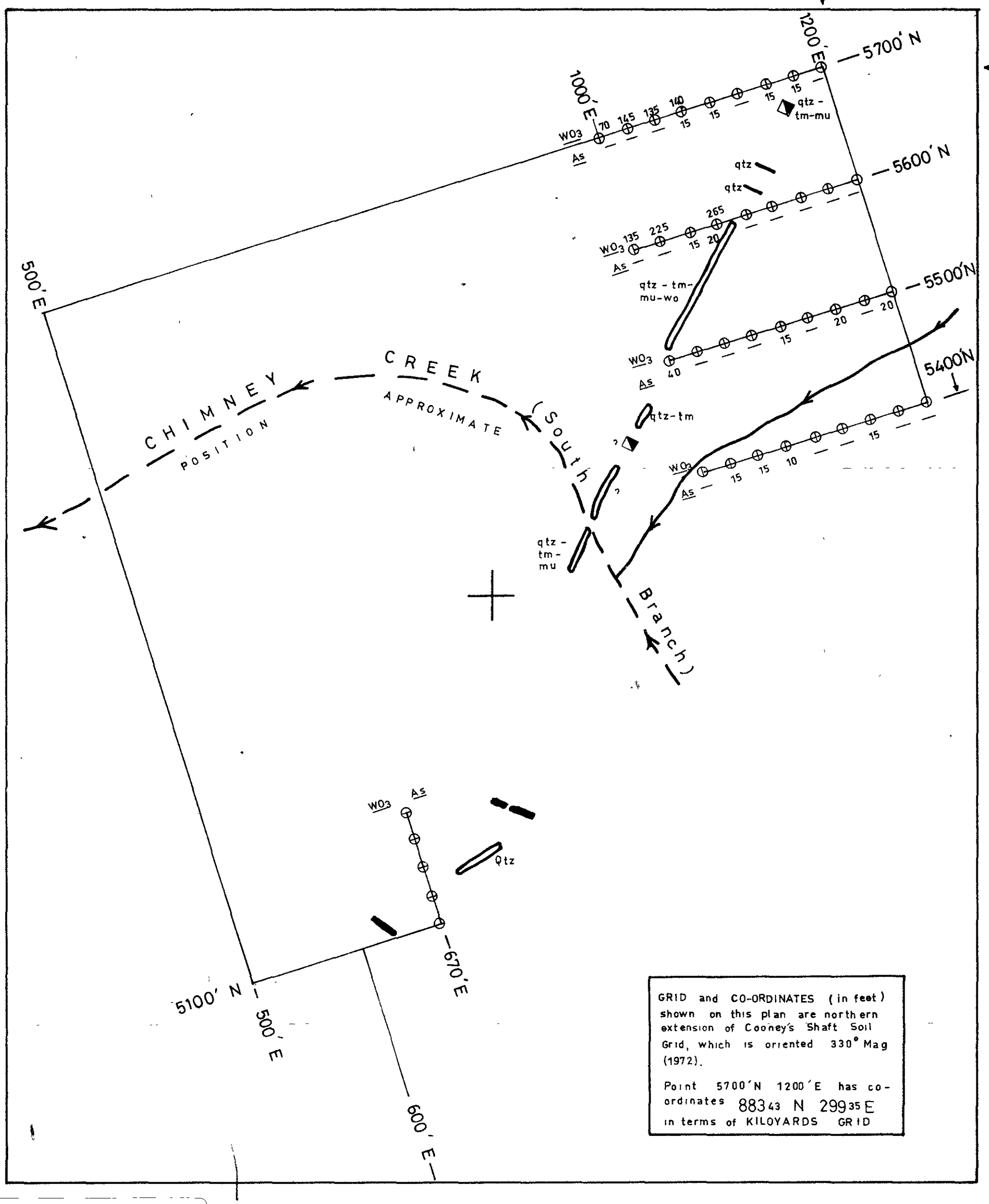
DATE OF COMPILATION May 1972

COMPILED BY D H BELL

SCALE 1:1,000

FIG. 18A

1018



GRID and CO-ORDINATES (in feet) shown on this plan are northern extension of Cooney's Shaft Soil Grid, which is oriented 330° Mag (1972).

Point 5700'N 1200'E has co-ordinates 88343 N 29935 E in terms of KILOYARDS GRID

5 cm

72-876

PROJECT PIEMAN

INTERVIEW RIVER TUNGSTEN DEPOSITS — Soil GEOCHEMISTRY Kenny's Workings

LEGEND

←25'→ Sample interval

WO_3 50 — — 75 parts per million WO_3 in 'B-C' soil horizon (-85 mesh fraction)

As 15 10 — 20 parts per million TOTAL Arsenic in 'B-C' soil horizon (-85 mesh fraction)

(— is <10 ppm)

NOTE: Where no 'B-C' soil horizon developed, 'A' horizon data plotted. 'A' horizon geochemical assay data given in appendices

Type of VEIN MINERALIZATION evident from old workings

qtz - quartz tm - tourmaline
mu - muscovite wo - wolfram

Mine Shaft (vertical)

Trench

Costean

GRID NORTH

TRUE NORTH 43' west of GRID Nth

MAGNETIC NORTH 11°45' east of GRID NORTH.

Annual variation +05' E (appx) 1963

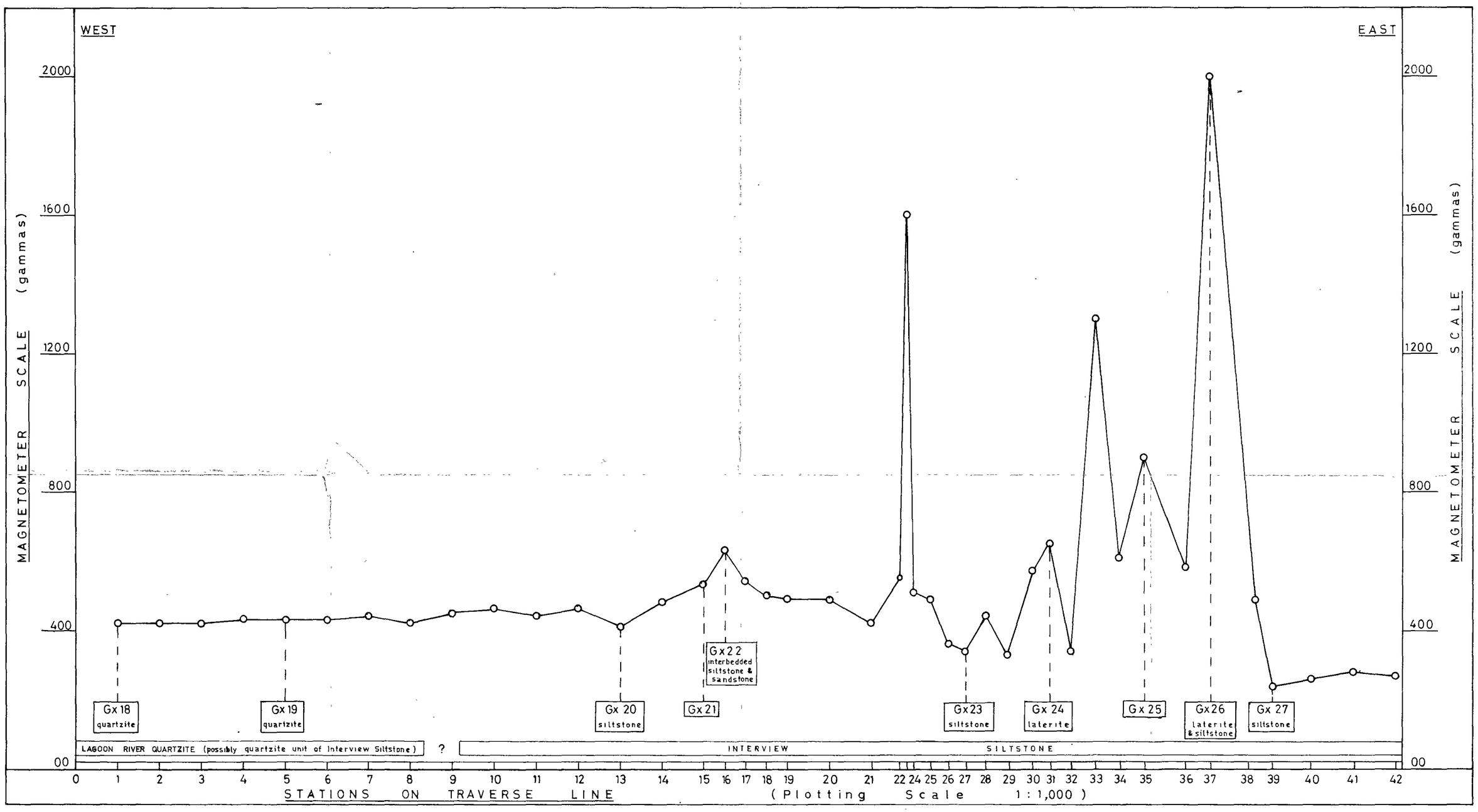
DATE OF SURVEY. January 1972

DATE OF COMPILATION May 1972

COMPILED BY: D H. BELL

SCALE. 1:1,000

FIG. 18B



PROJECT PIEMAN

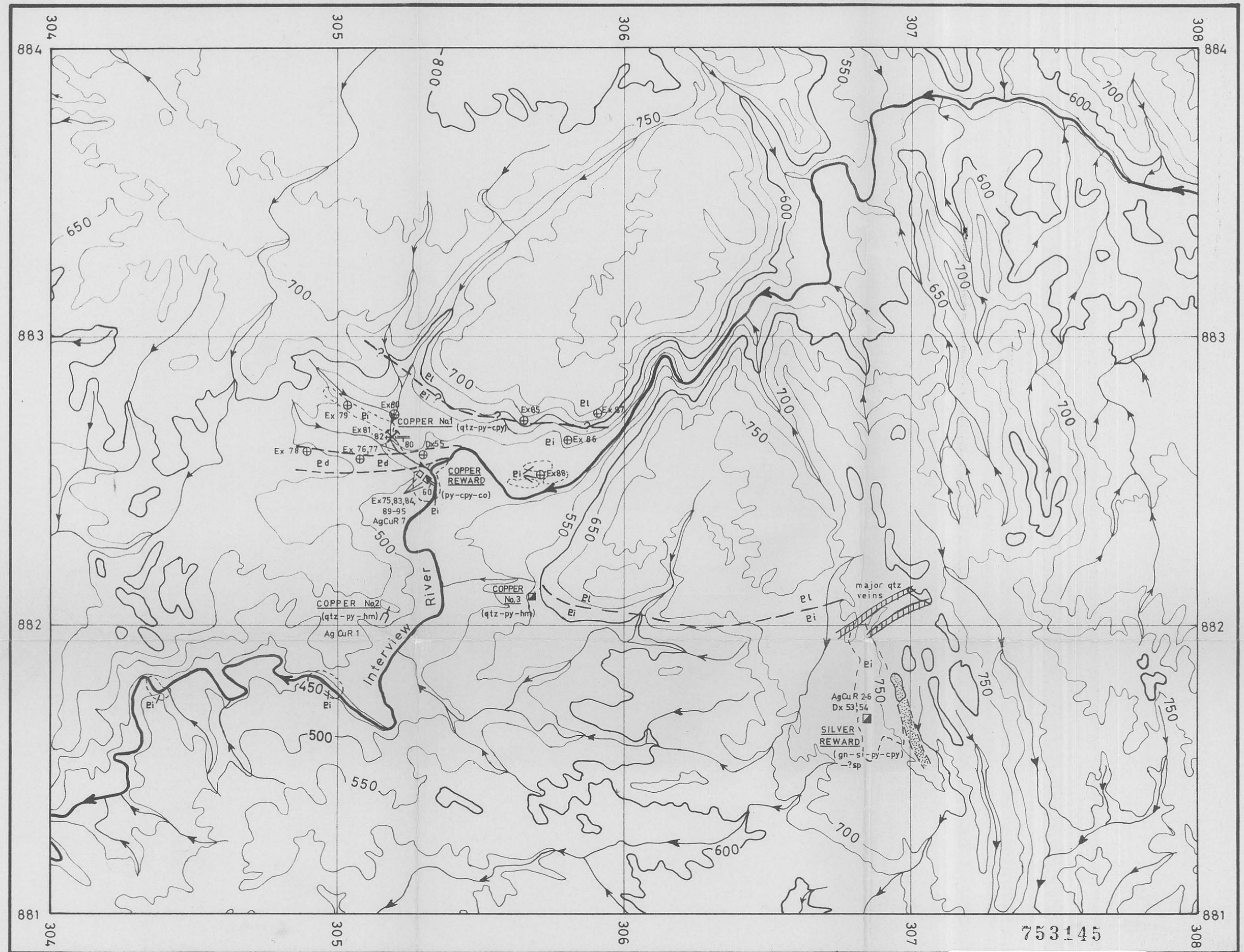
753144

CHIMNEY CREEK AEROMAGNETIC ANOMALY — Ground Magnetometer Profile (Northern Traverse) SHOWING OUTCROP GEOLOGY

72-876

GROUND MAGNETOMETRY DETAILS:			ROCK SPECIMENS:	FIELD SURVEY BY:	DATE:	GEOLOGY BY	COMPILED	
Instrument	Base Station	Note	Hand specimen and thin section petrography discussed in report.	A.G. Stevens G.K. Alexander	January, 1972	D.H. BELL	May, 1972	FIG. 19
McPHAR M 700	SURPRISE CREEK (220 gammas)	Negligible daily fluctuation in scale reading						

1020 42/1



PROJECT PIEMAN

COPPER REWARD and SILVER REWARD Workings — GEOLOGICAL Locality Plan

72-876

5 cm

LEGEND

(?) Tertiary — Tg — Quartzose Sand and Gravel - Thin (< 1m) veneer as local cappings : Fragments commonly angular

Precambrian — Pd — Dolerite and Meta-Dolerite - often laterized

Pl — Lagoon River Quartzite - massive recrystallised quartzite, with very minor shale : Bedding rare.

Pi — Interview Siltstone - interbedded grey-green shale, siltstone and sandstone, with sedimentary features common : Major quartzite units shown

Mine Shaft — Vertical / Inclined

Adit Workings

Surface Workings

Rivers and Natural Watercourses

Contours at 50 feet intervals

Extent of outcrop

Type of mineralization

py pyrite — cpy chalcopyrite
gn galena — sp sphalerite
qtz quartz — hm haematite
co covellite — si - siderite

Strike and dip of mineralized vein 60

Rock Specimen Locality ⊕ Ex 75

Geological boundary — Approx — Pl / Pi — ? Uncertain

NOTE

These values relate to Lat. 41°40' Long. 144°55·5' at mouth of Pieman River

True North 43' West of Grid North

Annual variation in Mag. Declination + 05' E (appx.)

Grid in kilo-yards

GRID NORTH — About 11° 45' — TRUE NORTH — MAGNETIC NORTH — 1963

DATE OF SURVEY :- JANUARY 1972

DATE OF COMPILATION :- MAY 1972

COMPILED BY :- D. H. BELL

SCALE :- 1 : 10,000

FIG. 20

1021

304 305 306 307 308

884 884

883 883

882 882

881 881

Interview River

44 (274) 14 (50 Sn) (275)

COPPER No.1 (qtz-py-cpy) (273)

22 (276) 18 (274) 18 (272)

COPPER REWARD (py-cpy-co) 620

(268) (269) (270) (271) (267) (266) 12 (265) 14 (264) (263) 10

12 277

12 (260) (261) 12 (262)

32 COPPER No. 3 (qtz-py-hm)

COPPER No. 2 (qtz-py-hm)? (259)

(257) (258) (256)

(252) 52 (20 As) (253) (255) 20 (254)

(251)

SILVER REWARD (gn-si-py-cpy) —?sp

305 305 306 305 753146 308

PROJECT PIEMAN

5 cm

COPPER REWARD and SILVER REWARD Workings — Stream Sediment GEOCHEMISTRY

LEGEND

STREAM SEDIMENT SAMPLE LOCALITY ●25 PARTS PER MILLION (ppm) TOTAL COPPER

— LESS THAN 10 ppm Cu

Samples containing TIN (Sn) or ARSENIC (As) in concentrations ⩾ 10 ppm indicated: Remainder contain < 10 ppm Sn and As.

All samples contain < 10 ppm Lead, Zinc & Nickel.

NOTE: ALL GEOCHEMICAL ASSAY DATA apply to minus 85 mesh fraction.

◪ Mine Shaft (vertical)

□ Mine Shaft (inclined)

⊂— Adit Workings

⚒ Surface Workings

Rivers and Natural Watercourses

NOTE

These values relate to Lat. 41°40′ Long. 144°55·5′ at mouth of Pieman River.

True North 43′ West of Grid North

Annual variation in Mag. Declination + 05′ E (appx.)

Grid in kilo-yards

GRID NORTH

About 11° 45′

TRUE NORTH

MAGNETIC NORTH

1963

DATE OF SURVEY:- 72-876 JANUARY 1972

DATE OF COMPILATION:- MAY 1972

COMPILED BY:- D. H. BELL

SCALE:- 1:10,000

FIG. 21

1022

300 302 304

872 870

RUPERT POINT

FOAM CREEK

LINE A9 LINE A8 LINE A7 LINE A6

dolomite

HARDWICKE BAY

PIEMAN RIVER

LEGEND

TERTIARY

Tc — Quartzose sands and gravels, dominantly angular.

DEVONIAN

Dg — Granite.

PRECAMBRIAN

Edol — Dolerite, often lateritised.

Edq — Quartzite, sandstone.

Eds — Siltstone and Mudstone. } DONALDSON GROUP

Edc — Conglomerate.

Dx1 — Sample locality.

F — Fault.

45/5 — Bedding.

Contour interval 100 FEET.

Outcrop boundary.

Track.

NOTE :- Some exposures of siltstone and mudstone mapped as Donaldson Group in southern area may be referable to Interview Siltstone.

LINE A6 — Ground magnetometer traverse line.

GRID NORTH

TRUE NORTH 43' west of GRID NTH

MAGNETIC NORTH 11°45' east of GRID NORTH

ANNUAL VARIATION +05'E (Approx) 1963

GRID IN KILOYARDS.

PROJECT PIEMAN

RUPERT POINT AEROMAGNETIC ANOMALY - OUTCROP GEOLOGICAL MAPPING

5 cm

1023

DATE OF SURVEY	JANUARY 1972
DATE OF COMPILATION	JUNE 1972
COMPILED BY	R.LONG.
SCALE	1:10,000.

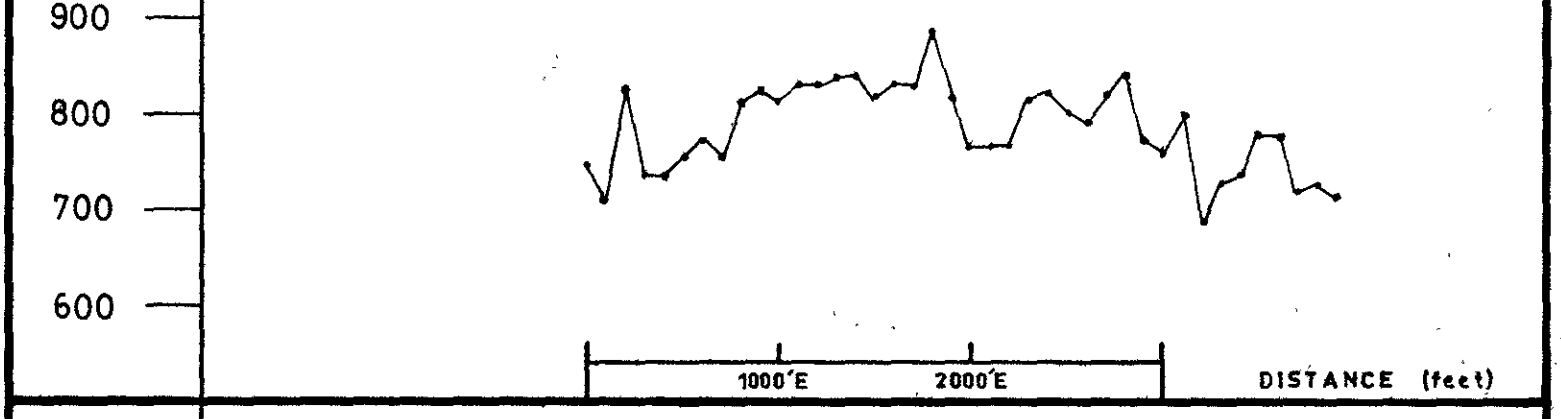
FIGURE 22

72-876

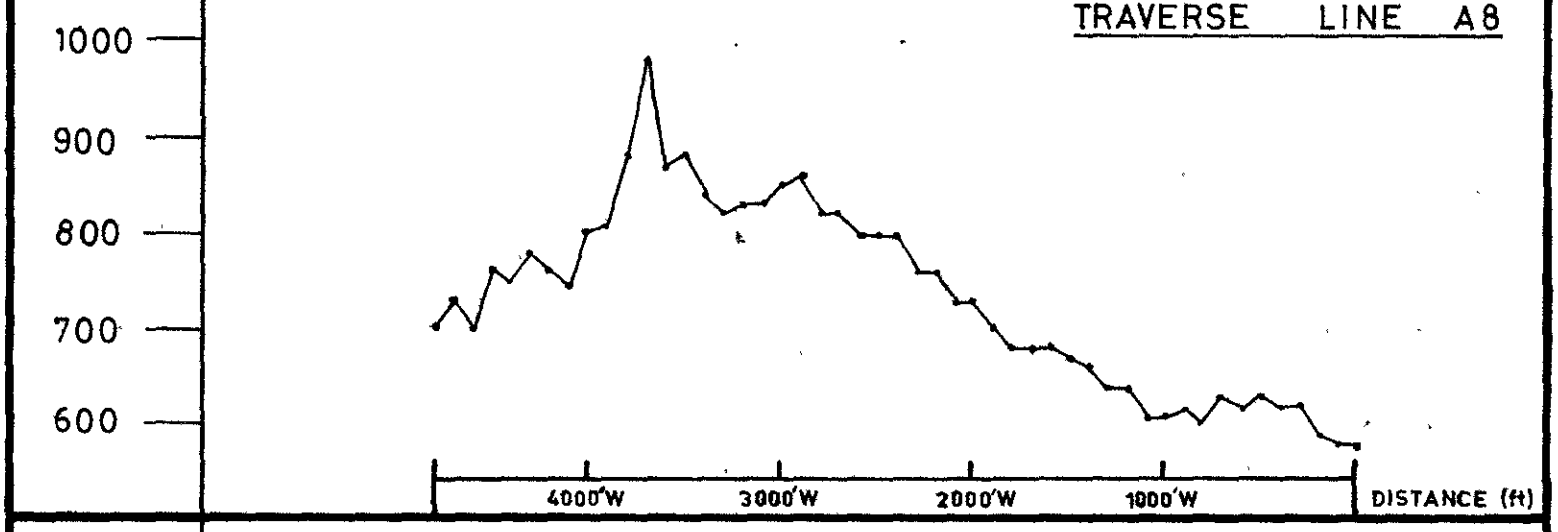
753147

MAGNETOMETER SCALE READING (gammas)

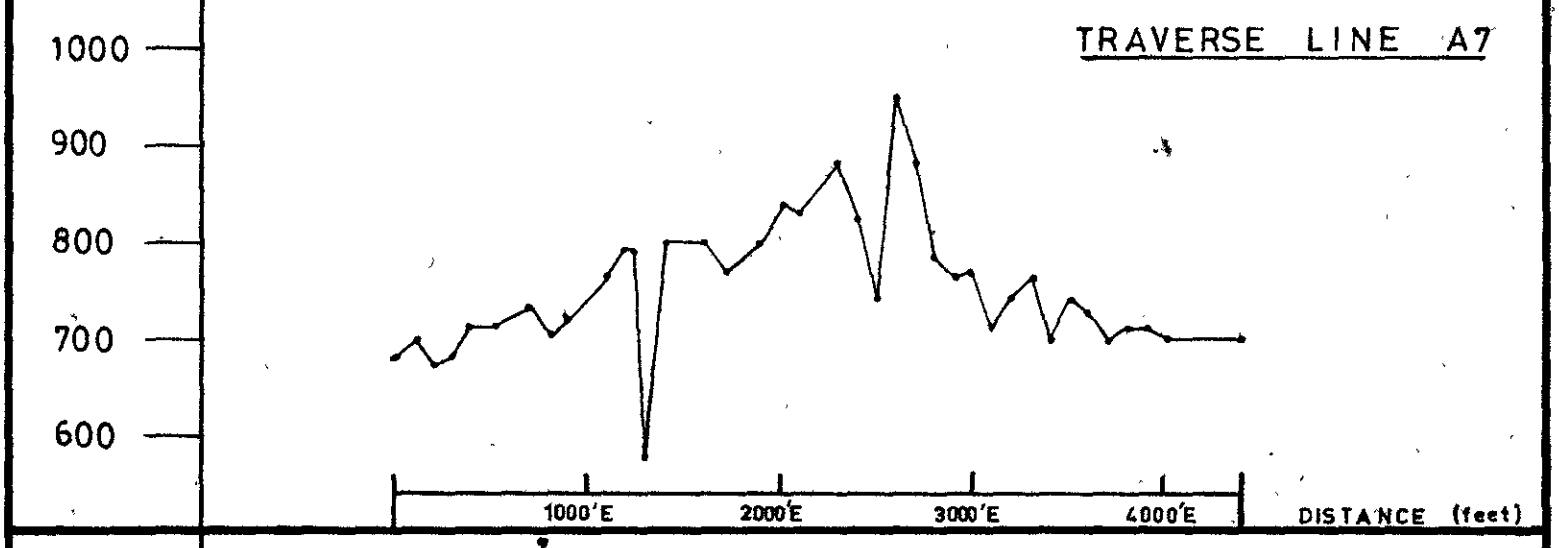
TRAVERSE LINE A9



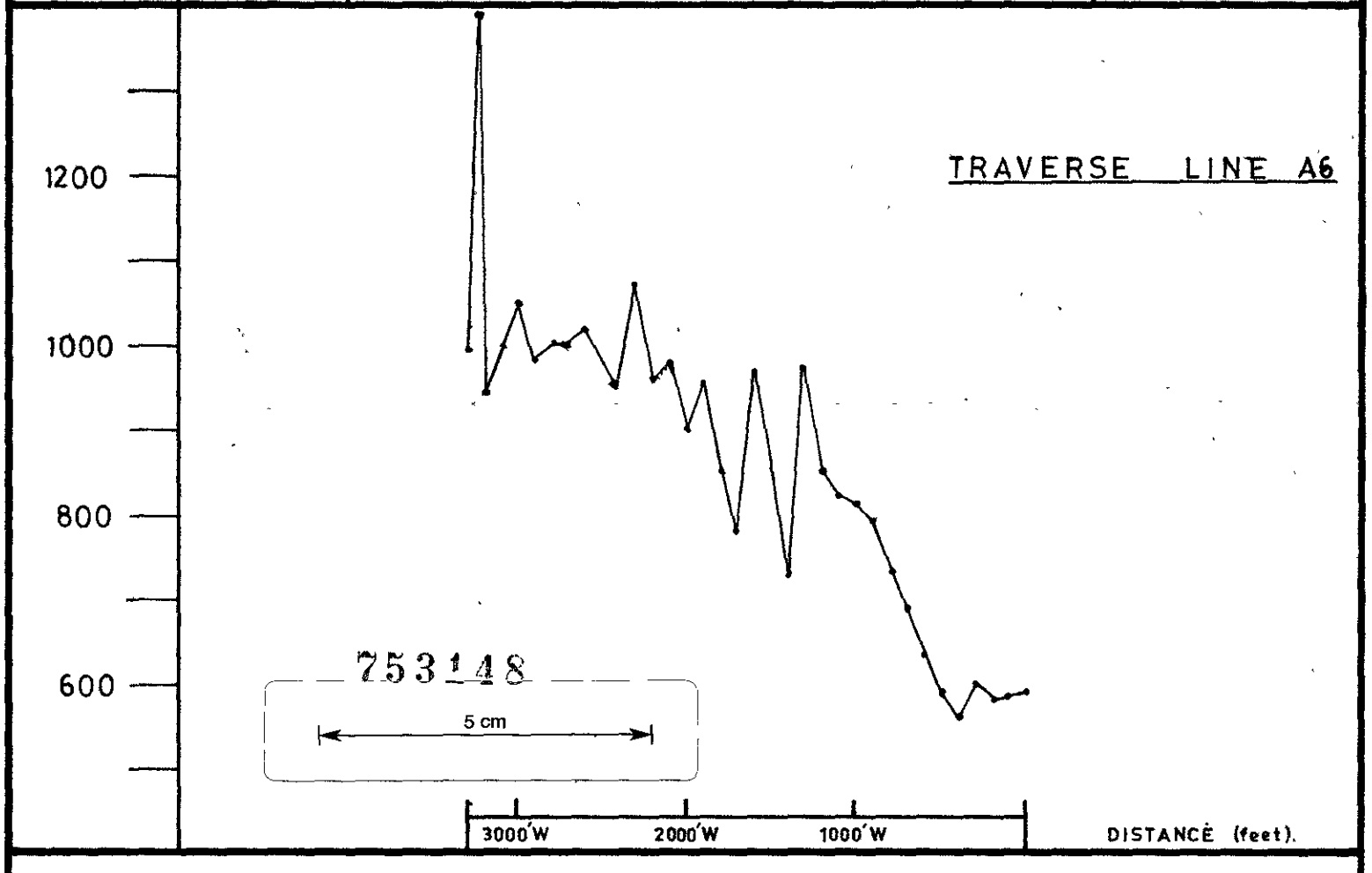
TRAVERSE LINE A8



TRAVERSE LINE A7



TRAVERSE LINE A6



PROJECT PIEMAN

Rupert Point Aeromagnetic Anomaly

INSTRUMENT

Mc Phar M700

BASE READING

220 gammas at Surprise Creek Base Camp Negligible daily fluctuation.

72-876

GROUND MAGNETOMETER PROFILES

FIELD SURVEY BY:

R. G Long

DATE:

January 1972

FIGURE 23

300 302 304

872 872

870 870

RUPERT POINT

FOAM CREEK

HARDWICKE BAY

PIEMAN RIVER

<10/-
<10/-
<10/- <10/- <10/- <10/- <10/- <10/-
<10/- <10/-
40/- 175/- 35/- <10/- 15/- 30/- <10/-
60/- 40/- 45/- <10/- <10/37
100/- 70/- 70/20 75/- <10/- 45/- <10/- 85/- <10/22
455/- As 25
<10/- <10/30
<10/- As. 15
55/- <10/90 150/- 915/- 145/170 30/23 <10/22 150/- 60/- 75/- 105/- <10/- 190/- 600/20 260/- 170/20 375/20 357- 85/23 295/- 460/- 95/- <10/-
<10/20 <10/- <10/40 <10/40
20/- 10/- 90/- <10/- <10/- <10/- 40/20 <10/- 20/- 60/- 75/- 65/- <10/- <10/- <10/- 240/37

TIN VALUES

- ○ < 10 PPM. Sn.
- ○ 10 – 100. PPM. Sn.
- ○ 100 – 200. PPM. Sn.
- ○ 200 – 500. PPM. Sn.
- ○ > 500. PPM. Sn.

All Arsenic values less than 10 ppm.

245/31 :– Tin and Copper values.
/– :– Less than 20 ppm Copper.

300 302 304

TRUE NORTH 43' west of GRID NTH

MAGNETIC NORTH 11°45' east of GRID NORTH

ANNUAL VARIATION +05'E (Approx) 1963

GRID IN KILOYARDS

GRID NORTH

TRUE N

MAG N

PROJECT PIEMAN

RUPERT POINT AEROMAGNETIC ANOMALY – STREAM SEDIMENT GEOCHEMISTRY

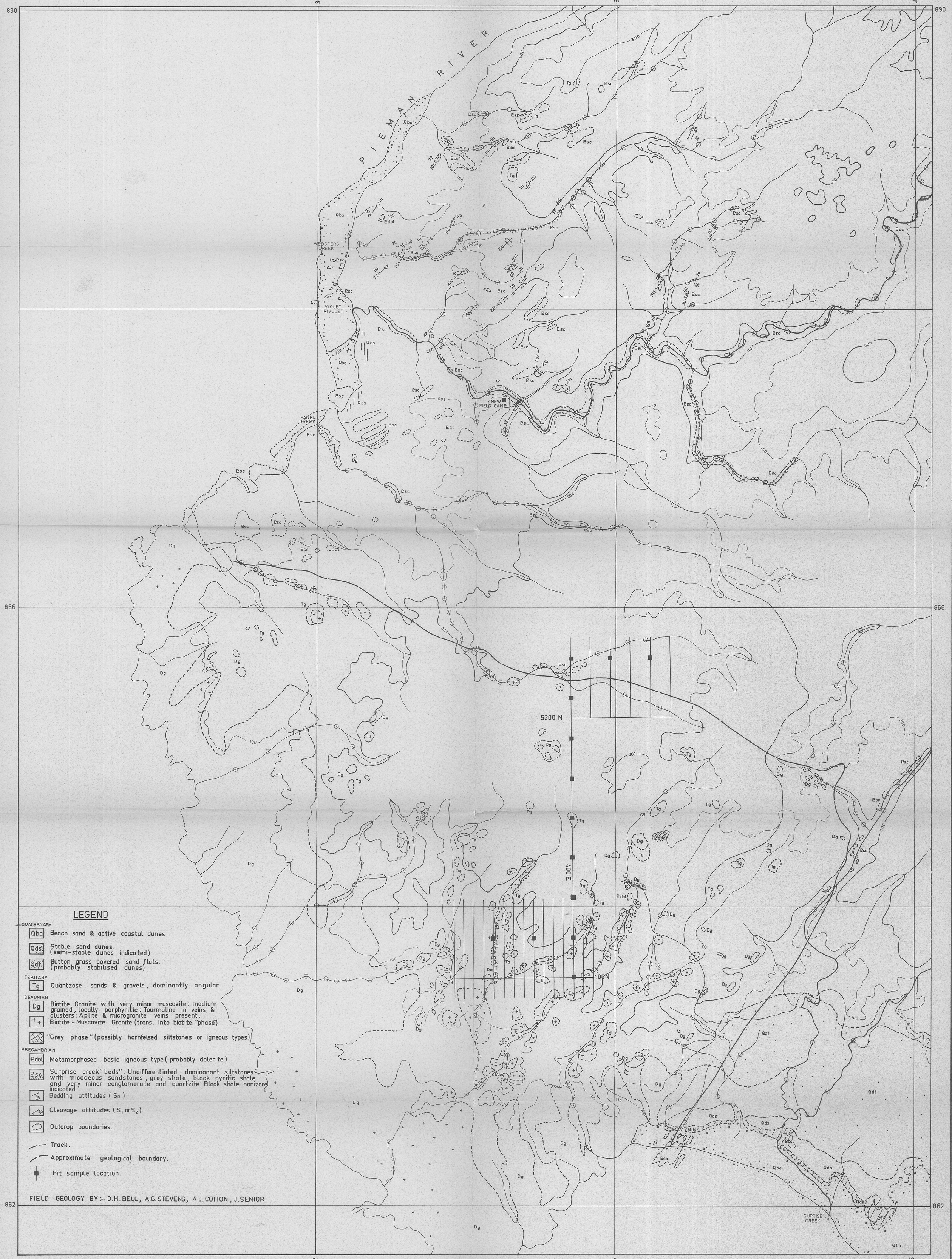
72-876

753149

5 cm

DATE OF SURVEY	JANUARY 1972
DATE OF COMPILATION	JUNE 1972
COMPILED BY	D. BELL.
SCALE	1:10,000.
FIGURE 24	

1025



PROJECT PIEMAN

SOUTH PIEMAN HEAD TIN PROSPECT – OUTCROP GEOLOGICAL MAPPING

TR-876

DATE OF SURVEY	NOV - JAN. 1972.
DATE OF COMPILATION	JUNE 1972
COMPILED BY	D.H. BELL.
SCALE	1: 10,000

FIGURE 25 1026

890

866

862

302

304

306

PIEMAN RIVER

WEBSTERS CREEK

VIOLET RIVULET

PANEL CREEK

SUPRISE CREEK

5200 N

400E

00N

TIN VALUES

- ○ < 10 PPM.
- ○ 10 – 100 PPM.
- ○ 100 – 200 PPM.
- ○ 200 – 500 PPM.
- ○ 500 – 1000 PPM.
- ○ 1000 – 2000 PPM.
- ○ 2000 – 5000 PPM.
- ○ > 5000 PPM.

■ Pit sample location.

PROJECT PIEMAN

SOUTH PIEMAN HEAD TIN PROSPECT – STREAM SEDIMENT GEOCHEMICAL DATA

72-876

GRID NORTH

TRUE NORTH 43' WEST OF GRID NTH.

MAGNETIC NORTH 11° 45' EAST OF GRID NORTH.

ANNUAL VARIATION +05'E (APPROX) 1963

GRID IN KILOYARDS

753151

5 cm

DATE OF SURVEY	NOV – JAN. 1972.
DATE OF COMPILATION	JUNE 1972
COMPILED BY	D.H. BELL.
SCALE	1: 10,000

FIGURE 26 1027

PROJECT PIEMAN

SOUTH PIEMAN HEAD TIN PROSPECT – STREAM SEDIMENT GEOCHEMICAL DATA

72-876

PIEMAN RIVER

WEBSTERS CREEK

VIOLET RIVULET

PANEL CREEK

SUPRISE CREEK

5200 N

400 E

00 N

302 304 306

890 866 862

TOTAL COPPER VALUES

- ○ <10 PPM.
- ○ 10-50 PPM.
- ○ 50-100 PPM.
- ○ 100 – 200 PPM.
- ○ 200 - 500 PPM.
- ○ >500 PPM.
- ┼ Pit sample location.
- – No Copper assay.

GRID NORTH

TRUE NORTH 43' WEST OF GRID NTH.

MAGNETIC NORTH 11°45' EAST OF GRID NORTH.

ANNUAL VARIATION +05'E (APPROX) 1963

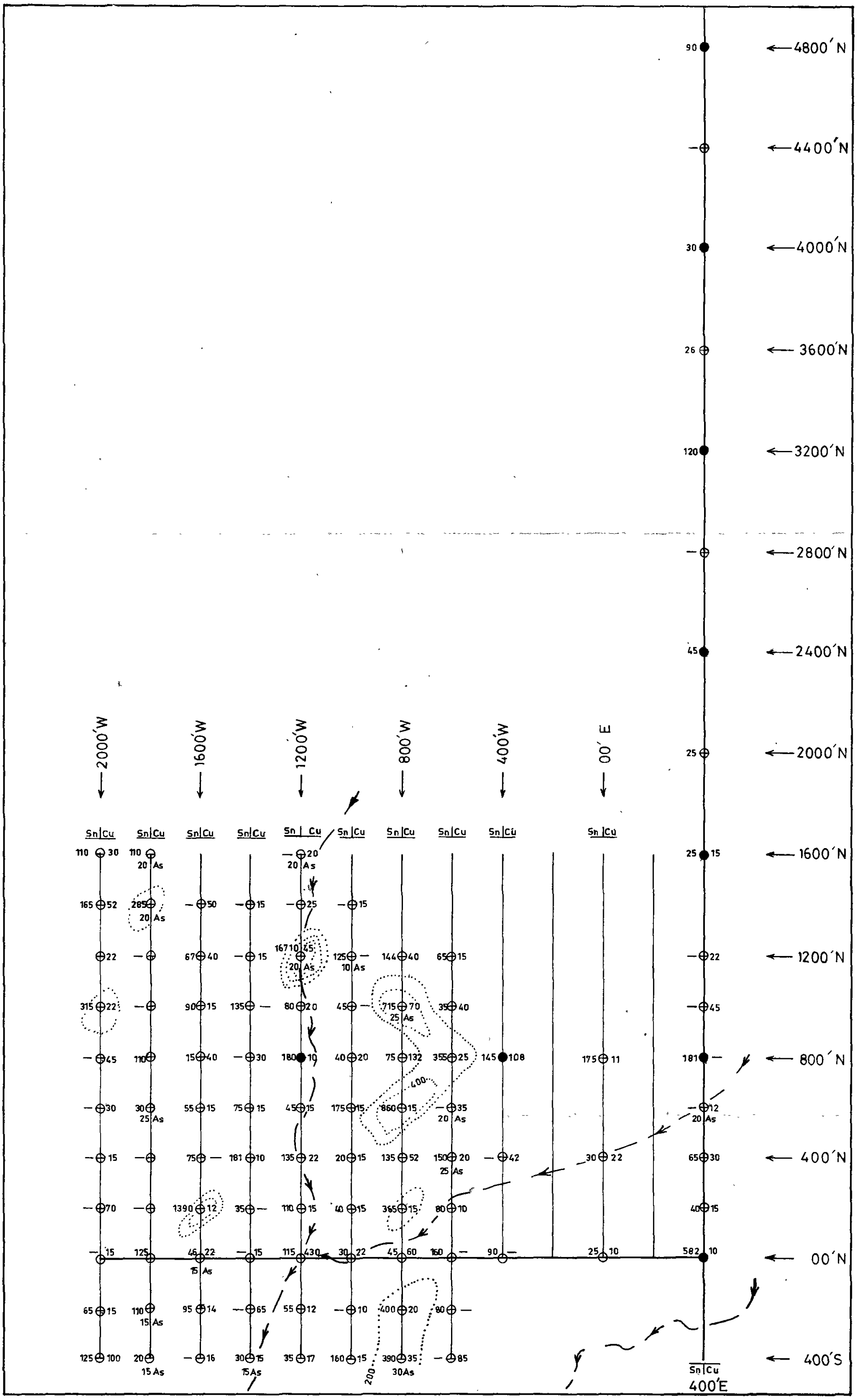
GRID IN KILOYARDS

753152

5 cm

DATE OF SURVEY	NOV-JAN.1972
DATE OF COMPILATION	JUNE 1972
COMPILED BY	D.H. BELL
SCALE	1:10,000

FIGURE 27 1028



5 cm

753153 72-876

PROJECT PIEMAN

SOUTH PIEMAN HEAD TIN PROSPECT — Soil Grid GEOCHEMICAL Assay Data

1029

Sn Cu Sn Cu
100 12 52
95 22 160
10 As

LEGEND

Parts per million Tin and TOTAL Copper in minus 85 mesh fraction of B horizon of Tertiary Gravels.

— less than 10 ppm

200 Contouring of Tin Values (ppm Sn)

Arsenic greater than 10 ppm shown.

SOIL GRID in feet, oriented True North.

Point 400'E 00'N has co-ordinates 30373 E 86353 N in KILOYARDS GRID.

Pit Sample Locality

GRID NORTH

TRUE NORTH 43' west of GRID Nth.

MAGNETIC NORTH 11°45' east of GRID NORTH

Annual variation +05'E (appx) 1963

DATE OF SURVEY
Jan-Feb 1972

DATE OF COMPILATION
June 1972

COMPILED BY
D.H. BELL

SCALE 1:4000

FIG. 28

PROJECT PIEMAN

HOYLE CREEK AEROMAGNETIC ANOMALY – OUTCROP GEOLOGY

DELVILLE SADDLE
NEWDEGATE CRK
FARMHOUSE
GEORGE TOWN PACKET CRK
HOYLE CRK
DUCK CRK
LINE 1 – 142°
LINE 2
LINE 3 – 126°
LINE 4 – 320°
LINE 5 – 90°

LEGEND

QUATERNARY
- Qba — Beach sand & active coastal dunes
- Qds — Stable dunes (semi-stable dunes indicated)
- Qdf — Button grass covered sand flats (probably stabilised dunes)

TERTIARY
- Tb — Tertiary Basalt typical olovine basalt (generally weathered)
- Tg — Quartzose sands & gravels, dominantly angular

ORDOVICIAN
- Os — Ordovician sedimentary rocks (sandstone etc), fossiliferous locally

PRECAMBRIAN
- Pdc — Delville Chert & Savage Dolomite. Outcrops cherty, but possibly silicified dolomite
- Pv — Bernafai Volcanics. Distinctive green fine-grained types, probably sheared volcanics or tuffs
- Pdg — Donaldson Group moderately to highly metamorphosed conglomerate, quartzite, shale, siltstone & sandstone, deformation often intense, quartz extensively recrystallized
- Pcs — Corinna Slate, thinly bedded, weakly cleaved slaty siltstones weathering to a brownish colour, outcrop rare
- Pw — Whyte Schist, Pelitic & psammitic schistose types with sheared amphibolitized bodies, carries minor haematite in mapped area

Ax 22 — Rock sample location
Swamp
Outcrop boundary
LINE 1 — Ground magnetometer traverse lines.
Track
45 — Bedding
F — Fault

FIELD SURVEYS BY : J SENIOR A.COTTON.

GRID NORTH
TRUE NORTH 43' WEST OF GRID NTH
MAGNETIC NORTH 11°45' EAST OF GRID NORTH
ANNUAL VARIATION +05'E (APPROX) 1963
GRID IN KILOYARDS

753154

5 cm

DATE OF SURVEY	DECEMBER 1971
DATE OF COMPILATION	FEBRUARY 1972
COMPILED BY	D. BELL
SCALE	1:10,000

FIGURE 29

72-876

1030

MAGNETOMETER SCALE READING (gammas)

5 cm

W E

2000
1500
1000
500

TRAVERSE LINE A5

1000′ 2000′ 3000′ 4000′ 5000′ 6000′ DISTANCE (feet)

N S

2500
2000
1500
1000
500

TRAVERSE LINE A4

5000 4000 3000 2000 1000 DISTANCE (feet)

N S

4000
3500
3000
2500
2000
1500
1000
500

TRAVERSE LINE A3

2000′ 1000′ DISTANCE (feet)

N 5800 S

3500
3000
2500
2000
1500
1000
500

TRAVERSE LINE A2

DISTANCE 7000 6000 5000 4000 3000 2000 1000 (feet)

N S

3000
2500
2000
1500
1000
500

TRAVERSE LINE A1

753155

1000 2000 3000 4000 5000 6000 DISTANCE (feet)

INSTRUMENT

Mc Phar M700

BASE READING.

550 ɣ Hoyle Creek Camp

Negligible daily fluctuation.

PROJECT PIEMAN

T2-876

Hoyle Creek Aeromagnetic Anomaly

GROUND MAGNETOMETER PROFILES

1031

SURVEY BY

J. Senior
A Stevens

DATE

August & December 1971

FIGURE 30

307 310 313

864 864

60 – <10
15 – <10
<10 – <10
15 – <10
20 – <10
35 – <10
15 – <10
C.R.K.
NEWDEGATE

860 860

20 – 50
ND
10 – <10
30 – 40
<10 – 80
<10 – 110
15-30
10 – 60
<10 – 60
<10 – 15
25 – 250
15 – <10
<10 – <10
25 – <10
GEORGE TOWN PACKET CRK.
HOYLE CRK.
DUCK CRK.

856 856

307 310 313

10-20: Tin & Copper values. (–85 mesh fraction)

ND: No data

All Arsenic values <10 ppm.

FIELD SURVEYS BY: J.SENIOR. A.COTTON.

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PROJECT PIEMAN

HOYLE CREEK AEROMAGNETIC ANOMALY – STREAM SEDIMENT GEOCHEMISTRY

GRID NORTH
TRUE N.
MAG. N.
1963

TRUE NORTH 43' WEST OF GRID NTH.

MAGNETIC NORTH 11° 45' EAST OF GRID NORTH

ANNUAL VARIATION +05'E (APPROX)

GRID IN KILOYARDS

753156

5 cm

DATE OF SURVEY	DECEMBER 1971
DATE OF COMPILATION	FEBRUARY 1972
COMPILED BY	D. BELL
SCALE	1:10,000

FIGURE 311032