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REPORT No. KI/76/5

LOONGANA AREA - TASMANIA,

PROGRESS REPORT EXPLORATION LICENCE 2/76.

JOINT VENTURE, GEOPEKO LIMITED - E.Z. COMPANY OF AUSTRALIA.

by

M. C. ROGERS

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LIST OF MAPS

Exploration Licence 2/76, Loongana, Tasmania:

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SUMMARY

Exploration Licence 2/76 is jointly held by Geopeko Limited and the E. Z. Company of Australia. The area of 195 square kilometres covers three inliers of the Mt. Read volcanic sequence.

In the past only minimal modern exploration techniques have been applied on the area and these were of a reconnaissance nature. Even today there is still no airborne geophysical coverage of this prospective area, a rare situation for the Mt. Read volcanic belt.

This report outlines the nature and results of Phase I of the exploration program, which involved the following exploration methods:

- (a) Geological mapping on a scale of 1:10,000
- (b) Geochemical drainage sampling.

As a result of this work at least three prospects favourable for massive sulphide mineralisation of the Cu, Pb, Zn type have emerged.

- (1) Challenger 1, Mt. Tor area.
- (2) Challenger 2, Native Track Tier.
- (3) Two Hummocks area.

In addition there is potential for at least one further Pb-Zn-Cu prospect and one Sn prospect to emerge.

Recommendations for Phase II of the onward exploration program are given in this report.

INTRODUCTION

Exploration Licence 2/76 termed 'Loongana' is held jointly by Geopeko Limited and the E.Z. Company of Australia. An area of 164 square kilometres was pegged by Geopeko on the 5th November, 1975 and simultaneously an area of 170 square kilometres was pegged by E.Z. Subsequently in accordance with an exchange of letters of intent, it was agreed that the combined area of 195 square kilometres would be held jointly by the two Companies. Geopeko would manage the Loongana Project with assistance from E.Z. from time to time as agreed.

An exploration program constituting the first phase of work was made out in January 1976. On the 23rd February the licence was granted by the Mines Department, and on the 25th February Phase 1 commenced.

Phase 1 of the exploration program consisted of:

- (a) literature review
- (b) preparing base maps
- (c) geological mapping at a scale of 1:10,000
- (d) geochemical drainage sampling
- (e) reporting.

CONCLUSIONS

1. The exploration approach of geological mapping aided by petrographic studies of selected rocks and detailed geochemical drainage sampling has shown that the three inliers of Lower-Middle Cambrian volcanic rocks; Native Track Tier, Mt. Tor and Two Hummocks, are most prospective for massive sulphide Cu, Pb, Zn mineralisation.
  
2. Geological mapping has shown that the Lower-Middle Cambrian rocks within the Exploration Licence consist of acid porphyries of rhyolitic and rhyodacitic composition, pyroclastics having porphyry fragments of varying composition including rhyolitic and andesitic types, and volcanoclastic sediments gradational to felsic greywackes.

These rocks have been intruded in places by basic dykes of microdiorite composition.

The rocks are considered to belong to the Mt. Read volcanic type and not to the Dundas Group. The volcanoclastic sediments mentioned are considered to have a greater proportion of genuine pyroclastic detritus than the Dundas greywackes (K. Corbett 1976 pers. comm.).

3. Geological mapping has indicated an apparent trend in composition of the pyroclastic units at Native Track Tier, from more dominantly andesitic types in the west through a broad zone of dominantly rhyolitic types in the central area to volcanoclastic tuffs or greywackes in the east. The latter sediments contain assorted detritus including fragments of both andesitic and rhyolitic composition. The Challenger 2 prospect is near the eastern margin of the 'rhyolitic belt'.

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4. Geological mapping has shown that there is a great variety of porphyry types. They are felsic in composition being rhyolitic or rhyodacitic. The Mt. Tor area has an abundance of acid porphyries and vitric crystal tuffs, the types ranging from small K feldspars in a fine matrix, to large rounded quartz phenocrysts with smaller feldspars in a fine matrix, to large nodular porphyries containing spherulites of cryptocrystalline silica in a fine matrix of similar material.

At Native Track Tier there is less variety; the porphyry with small K feldspars being dominant. The porphyries here however display flow textures to a greater degree than those at Mt. Tor. The porphyry at Challenger 2 is unique however in that it is vesicular and displays streaks of chlorite and hornblende.

5. It is probable that the Mt. Tor area is in close proximity to an ancient 'volcanic-centre'. Evidence for this rests in the abundance of acid porphyries, the presence of a volcanic agglomerate-breccia containing fragments commonly 10 centimetres in size and the fairly intensive sericitic, chloritic and carbonate alteration of the rocks.
6. In all three prospective areas the rocks generally display a high degree of sericitic, chloritic and carbonate alteration. Some of the porphyries, including that at Challenger 2 have been extensively enriched in deuteric quartz.

It may be possible that at least some of this alteration could be due to the Mt. Husetop Granite which is approximately 4 kilometres to the northwest.

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7. Geological mapping at Native Track Tier has shown the generally close spatial association of coarse pyroclastics or agglomerates to the porphyry belts.
  8. The structural trends of the rocks in the three areas has largely been determined from mapping of the laminated shales which are abundant in the Native Track Tier and Mt. Tor areas. At Mt. Tor the trend is north-northeast with steep dips to the east. At Two Hummocks the trend is southeast with dips to the north? At Native Track Tier the local geology is complex but generally northeast trends are indicated in the eastern area, and east trends in the central area. In the west and central areas the primary foliation in the porphyries varies, being generally north trending with gentle dips west in the central area, and northeast trending with steep dips in the west.  
  
Cross country mapping at Native Track Tier would be necessary to determine the structural trends in more detail.
  9. No definite correlation between the lithologies of Native Track Tier and Mt. Tor has been achieved. The only rocks which are common to both areas is a variety of feldspar porphyry and the 'nodular' porphyry. No occurrences of ashflow tuffs, common to the Mt. Tor and Two Hummocks areas, have been located at Native Track Tier.
  10. Geochemical drainage sampling has been successful in delimiting at least two areas anomalous in Pb, Zn and Cu. These have been termed Challenger 1 (Mt. Tor) and Challenger 2 (Native Track Tier). The approximate areal extent of Challenger 1 is 0.75 square kilometres, and for Challenger 2, 1.2 square kilometres.

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The peak values in stream samples from Challenger 1 are 130 ppm Cu, 200 ppm Pb and 220 ppm Zn. These compare with the average values of the background distributions of <10 ppm Cu, <20 ppm Pb and 30 ppm Zn.

The peak values in stream samples from Challenger 2 are 340 ppm Pb, 430 ppm Zn and 30 ppm Cu. These compare with the average values of the background distributions of 50 ppm Pb, 80 ppm Zn and 5 ppm Cu.

11. Although the original rationale of selecting elements for analysis is considered sound, it is evident that certain elements have either no response in the area or are not useful given the expense of assaying. These include Fe, Sn (generally), Ba, As and Au.
12. Statistical treatment of the drainage sample results has been useful in determination of local threshold values. It is evident from the results that the Mt. Tor area has generally lower backgrounds than the Native Track Tier area which has predominately more pyroclastic rocks to acid porphyries.
13. The Challenger 1 prospect is considered a prime prospect for massive sulphide mineralisation as it is associated with the following 'favourable' factors.
  - an acid porphyry source rock.
  - presence of a volcanic breccia.
  - high degree of argillic and carbonate alteration.
  - proximity to a major time break - the Upper Cambrian? unconformable boundary.

The geological environment at Challenger 1 points to the likelihood of predominately Cu mineralisation being present.

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14. The Challenger 2 prospect is considered a prime prospect for massive sulphide mineralisation as it is associated with the following 'favourable' factors.
- an acid porphyry source rock.
  - proximity of volcanic agglomerates.
  - the intense carbonate, sericite and chlorite alteration of some of the rocks. The porphyry has been extensively enriched in deuteritic quartz.
  - the occurrence of a volcanic chert dyke.
  - the presence of laminated shale horizons indicating quiescent conditions suitable for the formation of stratabound Pb-Zn orebodies.
  - the proximity to a major time break - the Upper Cambrian? unconformable boundary.

The geological environment at Challenger 2 points to the likelihood of predominately Pb-Zn mineralisation being present.

15. The Two Hummocks area is considered a prime prospect for massive sulphide mineralisation as it is associated with the following 'favourable' factors.
- occurrence of barytes in fissures.
  - occurrence of manganese (reportedly) bearing argillaceous shale containing disseminated galena.
  - proximity to the Upper Cambrian? unconformable boundary.
16. The volcanic rocks at Two Hummocks may underlie Black Marsh to the east and may not be everywhere overlain by Tertiary basalt.
17. There is a potential for significant Sn mineralisation, probably in fissure deposits, at Native Track Tier.

RECOMMENDATIONS

The Challenger 1 and 2 prospects are considered prime prospects for massive sulphide mineralisation.

Phase II of the exploration should involve the following exploration steps:

Challenger 1 and 2 Prospects

1. Surveying of lines at 100 metre spacings with pegs at 50 metre intervals at Challenger 1 and 2. This will involve 12,700 line metres of gridding at Challenger 2 and 8,000 line metres at Challenger 1.
2. Handauger soil sampling on the grids with sample intervals of 25 metres. The samples should be taken from as deep as possible. This will total 526 samples for Challenger 2 and 331 samples for Challenger 1.

The samples should be analysed for the following elements; Cu, Pb, Zn, Ag, As, Mn and Cd.

The results should be plotted on a scale of 1:5,000.

3. Assuming a soil anomaly is outlined at both areas then an 'orientation' survey involving one line on each grid should be undertaken to determine:-
  - The correlation of upper and lower B horizon soil sampling. That is between trowel and handauger sampling techniques.
  - The metal values at intervals in the soil profile at key locations on each grid.

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This would involve approximately 150 samples and the results of such work may be of benefit elsewhere on the Exploration Licence.

4. Geological mapping on the grids involving outcrop on the slopes and in the streams and rock chip cuttings from the handauger drilling. Mapping should be recorded at 1:5000 scale.
5. Ground magnetometer survey on the grids with station intervals of 10 metres. This would involve 12,700 line metres of traversing at Challenger 2 and 8,000 line metres at Challenger 1. A magnetometer survey is recommended to aid in geological mapping and to locate any magnetite bearing shales which are often associated with stratabound Pb - Zn deposits.
6. Ground electrical methods probably involving self-potential and induced polarization surveys should be undertaken on a portion of each grid following the results of the soil geochemical sampling.

This work would initially take the form of an orientation survey over key locations on the grids. For instance an I.P. traverse over a key line using varying electrode intervals should provide sufficient information on resistivity background, I.P. effects and general operating conditions to select the most effective procedures to use for the remainder of the survey area.

The final selection of geophysical methods and configurations will depend on the results of the soil geochemical sampling and the orientation geophysical traverses.

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The aim of the electrical ground techniques will be to locate both massive and disseminated sulphide bodies at depth.

### Two Hummocks

1. Reconnaissance magnetometer survey over the Black Marsh area, Two Hummocks, to locate the edge of the Tertiary basalt cover and therefore determine the extent of Cambrian volcanics underlying the Marsh. 10 line kilometres of traversing is envisaged, approximately 5 lines each of 2 kilometres length. The lines need not be accurately surveyed given the reconnaissance nature of the survey.
2. Drainage soil sampling of the Black Marsh Creek with sample intervals of 200 metres.
3. Geological reconnaissance to determine the western limit of the volcanics at Two Hummocks.
4. Surveying of lines at 200 metre spacings, and orientated grid north - south, over the southern slopes of Two Hummocks. Pegs should be placed at 50 metre intervals.

Extending the grid on the flats to the southeast of Two Hummocks with lines at 200 metre spacings, and orientated grid east - west. Pegs should be placed at 50 metre intervals. This will involve 8,600 line metres of gridding.

5. Handauger soil sampling on the grid on the southern slopes of Two Hummocks, the samples being taken at intervals of 25 metres. The bombardier mounted Jacro power auger should be ideal for soil sampling on the flats. Assuming there is little eastward

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extension of the area as defined by the reconnaissance magnetometer survey, then approximately 308 samples would be collected.

The samples should be analysed for the following elements; Cu, Pb, Zn, Ag, As, Mn, Ba, and Cd.

The results should be plotted on a scale of 1:5000.

6. Geological mapping on the grid, mainly involving rock chip cuttings from the auger work. Mapping should be recorded at 1:5000 scale.
7. Ground magnetometer survey on the grid with station intervals of 10 metres. This is recommended to aid in geological mapping and to locate any magnetite bearing shales.
8. An orientation survey involving geophysical ground electrical methods, over selected locations on the grid. This would be undertaken after the soil sampling survey.

#### Tin area

1. Drainage sampling and panning for cassiterite in the stream centring on co-ordinates 5419000 N, 409500 E. Native Track Tier (Sheet 2). Samples should be taken at 200 metre intervals, giving approximately 20 samples, (including panned concentrates).

Other Pb - Zn anomalous areas - (area A of 'Discussion')

1. Ridge soil sampling by handauger along the track at Native Track Tier (Sheet 1) defined by co-ordinates:  
5421250 N, 412350 E  
and  
5420950 N, 412750 E  
Samples should be collected at 50 metre intervals along a 700 metre traverse, giving 15 samples.

Tungsten area

1. Geological reconnaissance of the area of strongly anomalous W drainage anomalies centring on co-ordinates 406800 E and 5422000 N (Sheet 1).

Other geological mapping

1. Geological mapping at 1:10,000 scale in Tor Creek (Sheet 3), to determine whether Lower - Middle Cambrian volcanic rocks are present.

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ACTION SHEET

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PREVIOUS WORK AND MINERAL OCCURRENCES

There appears to be no mention in the literature regarding mineral discoveries in the Licence area during the latter half of the Nineteenth Century. Further north in the Penguin district, and east in the Moina district numerous occurrences of minerals were located. Gold was discovered at Lorinna (1858) and Calder, copper at Barrington and in the Dial Range, iron ore at Penguin, silver-lead at Penguin (1860), and to the west at Mt. Bischoff tin was discovered in 1871.

Besides Mt. Bischoff the only substantial production has been from the low grade iron ore deposits in Penguin Creek.

In the early Twentieth Century exploration was concentrated on non-metallic deposits in the region to the north and east of the Licence area. Economic deposits of limestone were discovered at Eugenana and these are still being mined.

Previous to November 1975 the area was held under Exploration Licence by Tasminex Ltd. The area formed the southern third of Exploration Licence 17/68 and Tasminex's exploration effort was primarily directed toward the occurrence of tungsten around the periphery of the Mt. Husetop Granite. Other than a few prospecting trips by Tasminex there is no record of any serious exploration until the 1970's. Tasminex joint ventured Exploration Licence 17/68 to ANZECO, an offshoot of Union Carbide, who also concentrated on exploration for tungsten. ANZECO did however carry out a regional drainage survey within the Cambrian volcanogenic rocks covering the lower third of Exploration Licence 17/68, (the area now held by Geopeko and E.Z.) and the samples were analysed for Cu, Pb and Zn as well as W. A few anomalous values were located and geological inspection of these areas was carried out. ANZECO reported after the inspection that no further investigation was warranted.

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The drainage samples collected by ANZECO were widely spaced, usually 1 kilometre apart and were generally taken from easily accessible locations. The survey could be considered as 'regional' in character rather than 'detailed'.

Photogeological mapping of the southern portion of Exploration Licence 17/68 was carried out by ANZECO and the three known areas of Cambrian volcanics were outlined fairly accurately. In addition ANZECO outlined a fourth area - a narrow strip of Cambrian in the Tor Creek area, east of Mt. Tor. Whether Cambrian volcanics are present or not in Tor Creek has not been confirmed as yet, however it would appear to be unlikely from photoinspection.

During the drainage sampling program within Exploration Licence 2/76 in April this year, the remains of an old water race was discovered in an eastern tributary of Laurel Creek. At this point the tributary drains Owen type conglomerate. Presumably some gold was won from the vicinity.

Apparently the only recorded mineral occurrence within Exploration Licence 2/76 is the barytes prospect situated immediately southeast of the 'Hummocky Hills'. This prospect was reported on by Burns (1962). High grade barytes outcropped in fault zones within green tuffs. Trenches were cut at intervals across the zone recovering plums of baryte but were not sufficiently deep to define the lode. The baryte veins ranged between 2 - 8 inches in width and most had a strike parallel to the regional trend.

Burns reported that at approximately 60 metres from the baryte lode manganese occurs in places within a fine argillaceous siltstone and in places the siltstone is interbedded with chert.

Inspection and sampling (June 1976) of the argillaceous siltstone has shown that it contains anomalous Pb (galena) in places. One sample recorded 0.14% Pb. No manganese was

reported in the three samples collected from the siltstone unit.

Notwithstanding several airborne geophysical surveys flown by various organisations during the last two decades the area has been repeatedly overlooked. Aeromagnetic coverage of the west coast exists as far east as the Hummocks which are the western margin of our area of interest. To the east of Exploration Licence 2/76 aeromagnetics and airborne E.M. has been flown by C.R.A. on the adjoining Exploration Licence. To the south, Cominco have flown the Que River prospect and surrounding areas using various airborne geophysical techniques. To the north Tasminex has carried out aeromagnetics, and other organisations have flown radiometrics.

In summary, although only minimal sophisticated exploration techniques have been applied to the area it would be surprising indeed if it had not been closely inspected by the diggers of the last Century and more recently by the loggers. Exploration therefore should be sufficiently penetrative to locate any sub-outcropping and hidden mineralisation.

LOCATION AND ACCESS

Exploration Licence 2/76 covers the Lower-Middle Cambrian volcanic and volcano-sedimentary rocks of the Native Track, Mt. Tor and Hummocks inliers which are part of the Mt. Read volcanic belt which to the south contains the Que River, Rosebery, Hercules and Mt. Lyell deposits. The Que River Pb-Zn and Cu deposit is situated 20 kilometres to the southwest, and along regional strike, from the southern boundary of Exploration Licence 2/76. The northern boundary of Exploration Licence 2/76 is situated 30 kilometres to the south of the township of Burnie. (see Figure 1).

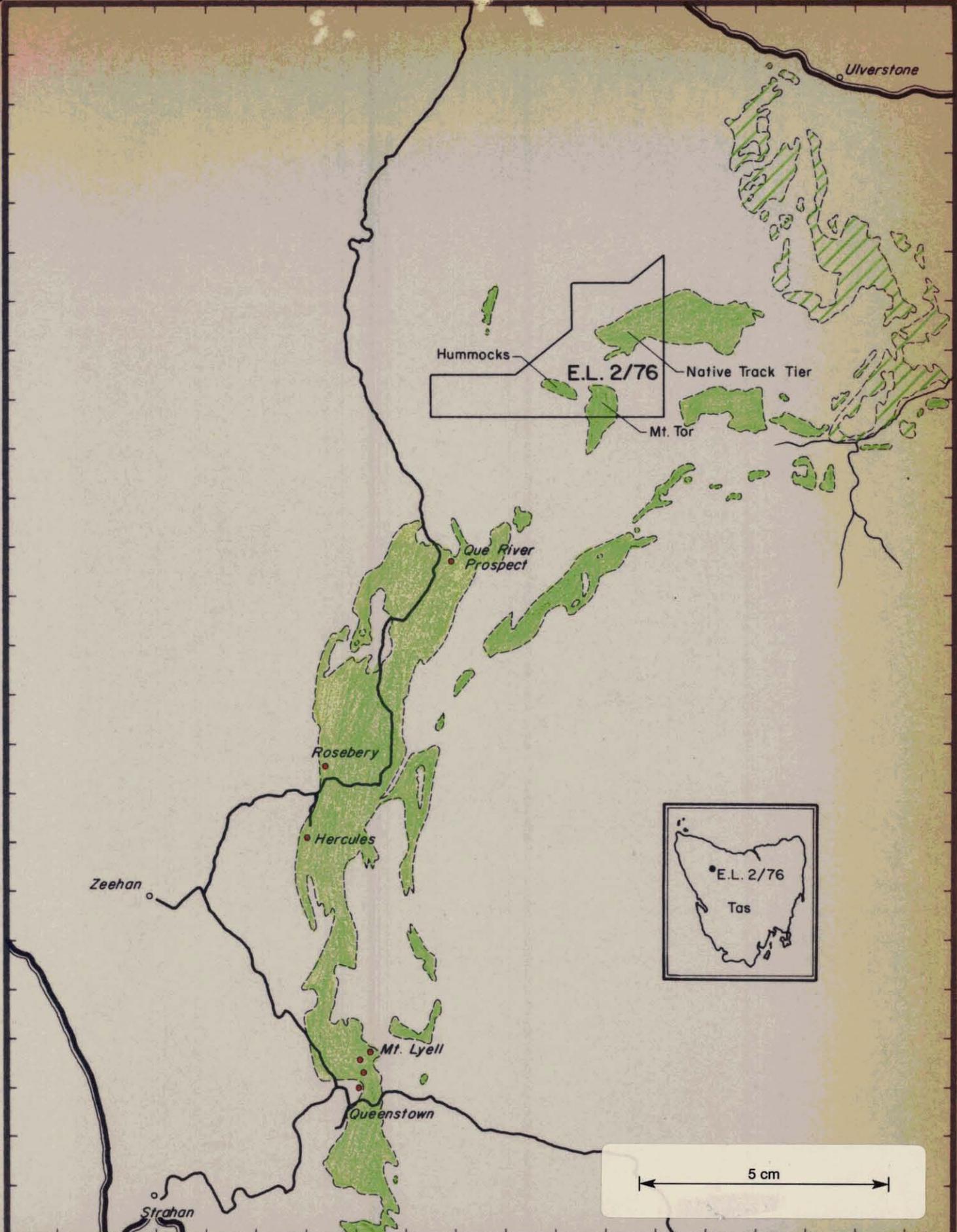
The Native Track Tier and Mt. Tor areas have been subjected to logging operations in the recent past and access to and around the areas is excellent. For the most part the logging tracks have been metalled giving an all weather surface, there are also numerous log skids which give access by foot into the bush. Away from the tracks and skids and in the streams there is considerable low regrowth and much debris left over from logging. The streams are difficult to follow on foot, there being a thick network of debris and occasional horizontal scrub. In the bush, walking is extremely difficult and cut lines would be the only practical method of access.

In the Hummocks area access is good to the quarries (road metal) but there are no other tracks. The bush is thick and difficult to penetrate. There is no stream network and future work will require line cutting for ease of access.

The location and general access to and within Exploration Licence 2/76 can be summed up as excellent. The area, for exploration, must rank as one of the highest in Australia in regards to closeness to a pool of labour (Burnie and Devonport), railway (Hampshire), good roads, sea ports (Burnie and Devonport), and a major Pb-Zn mine (Rosebery).

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**LEGEND:**

- Significant Basemetal Mineralization
- Mt. Read Acid Volcanics
- ▨ Mt. Read Volcanics/Sediments

  
 DATE: Oct 76  
 GEOL: M.C.R.  
 DWN: L.G.  
 CHKD: M.C.R.

GEOPEKO LIMITED  
 KING ISLAND  
 Scale: 1: 500 000  
 Fig. No. 1

**Location Map**  
**E.L. 2/76**

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PHYSIOGRAPHY

The ranges within Exploration Licence 2/76 are the first encountered travelling south from Burnie across the coastal lowlands (see Photo No. 1). The ranges, including Mt. Everett, Native Track Tier, Loongana Range, Mt. Tor and Black Bluff are residuals and all, with the exception of Native Track Tier, are capped by Owen type siliceous conglomerate. Native Track Tier consists of volcanic rocks and forms the core within an east - west striking anticline of younger rocks (see Photo No. 2). The ranges to the north and south stand higher being capped by the siliceous conglomerate, the higher peaks in the ranges include Mt. Everett (approximately) 880 metres, Mt. Tor (approximately) 1,000 metres and Black Bluff 1,339 metres.

Native Track Tier ranges from moderately undulating on its upper parts to steeply undulating on the flanks and is cut by numerous streams, several of which feature large waterfalls. The topography for the most part ranges from 300 - 600 metres in elevation.

Most of the streams in the area drain into tributaries of the Leven River which runs through the area from southwest to east dividing the Loongana and Black Bluff - Mt. Tor ranges.

VEGETATION AND CLIMATE

The higher peaks and crags are rocky and support little vegetation but on the slopes and on Native Track Tier dense cool temperate rain forest vegetation once thrived. Most areas of the forest have been subjected to logging operations and have subsequently been burnt, giving a landscape of blackened trees both standing and fallen with a new forest of young gums and rarer myrtle, wattle etc., along with ferns, blackberry bushes and horizontal scrub. (see Photos No. 3 and 4).

The climate is somewhere inbetween that of the 'west coast' and the 'north coast' with warm to hot fine weather between December - May and wet cool weather with occasional snow falls on the lower areas for the remainder of the year. Given the excellent access that it has, carefully planned exploration of the area could be carried out in all but two or three months of the year.

EXPLORATION PROGRAM - PHASE I

The nature of Phase I of the exploration was finalised on the 15th January 1976. The program consisted of the following exploration steps.

- Aerial photographs at an approximate scale of 1:40,000 and 9" x 9" size were obtained giving stereo coverage of the area. Enlargements to 1:10,000 scale of every second photo were also obtained for field mapping.
  
- Positive transparencies of the machine plots at 1:10,000 scale of the Hellyer 1:100,000 scale topographical map prepared by the Lands Department were obtained for the area. These maps though accurate were not suitable for base maps due to the fact that they were enlargements, each one compiled from two maps - 'topographical' and 'detail'. As it was difficult to differentiate between tracks, contours and streams the machine plots were re-draughted to give five base maps on B1 size sheets covering most of the Exploration Licence
  
- A fully equipped field base was established by Geopeko (at their own expense) near Upper Natone which is half an hour's drive south of Burnie and an equivalent time from the Licence area. The base consists of a farmhouse with double garage and outbuildings. Electricity, telephone and running water are provided.

By mid February the base maps were ready, the Licence was granted on the 23rd February and on the 25th field work commenced.

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- A geological legend was agreed upon during a three day 'orientation' reconnaissance by Geopeko and E.Z.
  
  - Field work, consisting of geological mapping of the tracks, logging skids and streams, and geochemical drainage sampling was carried out in an intensive manner in order to complete the work before the winter rain. Field work was completed by the 23rd April and by the 4th June plotting and map preparation was all but complete.
  
  - During geological mapping representative rock samples were collected to aid in later correlation for map preparation. 960 samples were collected, the location of which are recorded on maps in the folder of this report. The samples are kept at Geopeko. 35 of the samples, selected from throughout the area, were thin sectioned and briefly reported on by I. R. Pontifex & Associates, Adelaide. The samples were of representative rock types, altered rock types, and rocks where the field determination was vague. The location of the thin sectioned rocks is shown on the geological maps in the folder of this report, and Mr. Pontifex's report is enclosed as appendix.
  
  - One rock sample, a fine sandstone containing a portion of a trilobite fossil was forwarded to the Tasmanian Mines Department for identification. Unfortunately they considered it insufficiently preserved to give a reliable date. The location of the sample is recorded on the geological map.
  
  - 560 drainage samples were collected from the streams draining the prospective areas (totalling

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approximately 65 square kilometres). At every tenth location a second sample was taken. The sample location points were measured off from a known starting point and all locations were marked with flagging tape and numbered aluminium tags. The nature of the sample, location number and assay value were recorded in sample books which are kept at Geopeko. The geochemical result sheets in the folder of this report record the sample book number and assay results.

The samples were dried, rebagged if required, and forwarded to A.C.S. Laboratories in Adelaide. The -80 mesh fraction was separated and analysed for Cu, Pb, Zn, Ag, Fe, and Mn by A.A.S. In addition approximately one in six samples were selected on a location basis and analysed for Ba, As, Sn and Au. (Au by special CRA/AAS method, As by modified Gutzeit method, and Sn, Ba by Emission Spectrography.)

The overall sample density over the prospective area was approximately 8 samples per square kilometre. It was argued at the time that oversampling to a degree would be preferred considering the cost of resampling and bearing in mind that the survey would be unlikely to locate an anomaly having as its source an outcropping orebody.

- The expenditure incurred by Geopeko up until the end of the financial year and the detail of men employed are shown as follows.

Summary of Expenditure

Geology	- Salaries	\$ 6,596.00
	- Wages	2,741.00
Geochemistry	- Salaries	430.95
	- Wages	1,811.00
	- Contract Laboratory	2,359.80
Draughting	- Salaries	1,148.00
Base maps, photos		260.00
Field living		1,565.71
Field supplies		65.44
Vehicle expenses & depreciation		1,054.48
Project travel		805.00
Administration & overheads		2,793.00
Administration - Lease negotiations		203.00
		<hr/>
		\$21,833.38
		<hr/>

Summary of Time

Geology:	Supervising Geologist	39.5 days
	Salaries - Technical Staff	63.5 days
	Wages	54.5 days
Geochemistry:	Wages	36.5 days
Draughting:	Draughtsman	26.5 days

GEOLOGY

## REGIONAL SETTING AND TECTONIC HISTORY

Refer to Fig. 4.

The Lower - Middle Cambrian rocks within Exploration Licence 2/76 consist of Mt. Read volcanics - porphyries, pyroclastics and volcanoclastic sediments. These occur as three ~~inliers~~ or spines within Upper Cambrian? (K. Corbett 1976 pers. comm), Owen type sandstones and conglomerates. Further to the east these rocks are termed Roland Conglomerate by Burns (1964) who places them in the Ordovician.

At Mt. Tor the younger rocks form an eroded dome enclosing the volcanics, and at Native Track Tier they form a westerly plunging anticline which has been eroded exposing the volcanic spine.

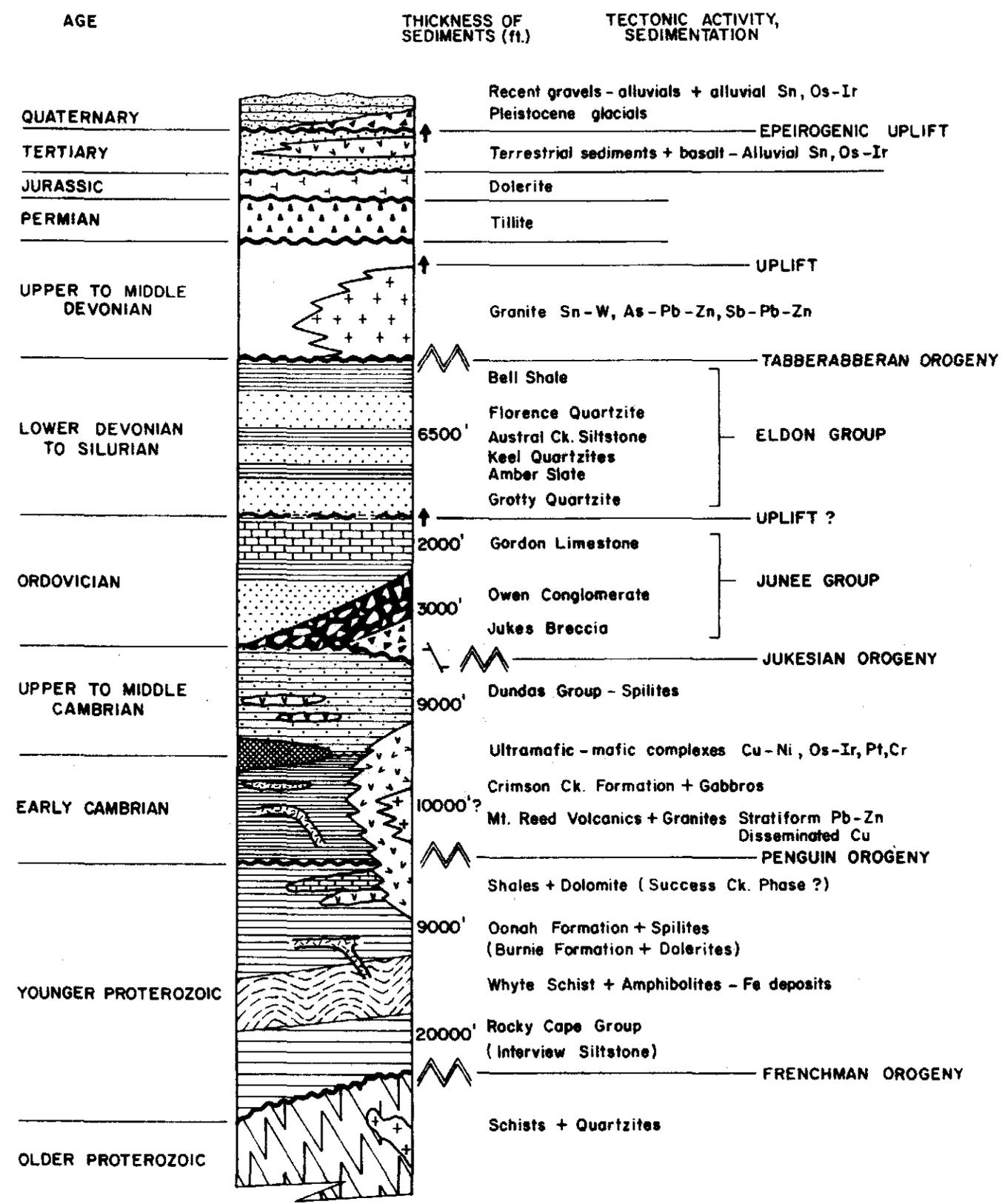
The Native Track Tier volcanic sequence appears to lie on the fork between the Barrington-Dial Range Trough to the northeast and the Fossey Mountain Trough to the east. The latter is the continuation to the east of the main Dundas Trough.

Unconformably underlying the Cambrian rocks away from the area are Proterozoic rocks. To the northwest the Rocky Cape 'Older' Proterozoic rocks consisting of quartzite-phyllite assemblages and schist - quartzite assemblages outcrop. To the northeast 'Younger' Proterozoic unmetamorphosed rocks occur near Devonport, and consist of a turbidite sequence of interbedded mudstones and poorly sorted but graded sandstones. To the south-southeast the Cambrian rocks are underlain by the 'Older' Proterozoic of the Tyennan Nucleus.

The distribution of unmetamorphic Proterozoic indicate that during their deposition the metamorphic Proterozoic rocks formed as geanticline (Tyennan Geanticline) in the Central Highlands. The surrounding basin formed part of a large miogeosyncline (Spry 1962, Solomon 1965).

030

440031



GEOPEKO LIMITED  
KING ISLAND

Scale: None

Fig. No 4

DATE: OCT, 75  
GEOL. M.C.R.  
DWN R.F.  
CHKD: M.C.R.

GEOLOGICAL HISTORY  
of  
WESTERN TASMANIA  
(GROVES, 1968)

031

Gee (1967) suggested that the emergence of the Rocky Cape Geanticline began immediately prior to the Oonah Formation sedimentation and that the major axis of subsidence moved toward the Tyennan Geanticline with accumulation of Oonah Formation in the new basin. The Oonah Formation consists of unfossiliferous and comparatively unmetamorphosed sequences (mainly quartzite with dolomites) and hosts important deposits such as cassiterite-sulphide at Renison Bell, Mt. Bischoff and Cleveland.

In the early Cambrian the Dundas Trough, situated to the west of the Tyennan Nucleus, and the Barrington-Dial Range Trough to the north were initiated in the Tasmanian area of the Lachlan Province of the Tasman Geosyncline. The trough filling reflects marked changes in the depositional environment from that of earlier rocks.

The Cambrian rocks are generally of fossiliferous turbidite-greywacke sequences associated with probable submarine volcanism. The Cambrian sedimentation involved a deepening of the sedimentary basin, the Dundas Trough, toward the Tyennan Geanticline and a change to sedimentation typical of eugeosynclinal development (Solomon 1965) with extrusion of ultramafic and mafic rocks on the sea floor. Solomon (1965) suggested that the development and destruction of local ridges and troughs was a feature of Cambrian development and that this resulted in variable, impersistent accumulation of sediments.

A thick pile of acid volcanics accompanied the sedimentation, this pile is now represented by the arcuate zone known as the Mt. Read Volcanic Arc. The rocks are described by Solomon (1964), and appear to be Cambrian and possibly Upper Proterozoic (Loftus Hills 1969). The stratiform Pb-Zn-pyrite and disseminated Cu ore bodies at Rosebery - Hercules and Mt. Lyell occur within this zone, and a genetic relationship between ore deposition and volcanism is now widely invoked.

The Oonah Formation in the Zeehan - Renison Bell area is overlain conformably by a maximum of 3,000 metres of unfossiliferous purple and green mudstone, greywacke and slate of the Crimson Creek Formation (Blisset and Gulline 1961). Then the fossiliferous Dundas Group ranges from Lower-Middle Cambrian to Upper Cambrian (Banks 1962). The Dundas Group of alternations of greywacke, siltstone, mudstone, and shale with conglomerate and grit has a maximum thickness of 2,900 metres (Blisset and Elliston).

Within the Exploration Licence the Lower-Middle Cambrian rocks consist of massive acid volcanics and pyroclastics of the Mt. Read Volcanic Arc, and tuffaceous greywackes. The latter are considered by a senior Tasmanian Mines Department geologist, K. Corbett (pers. comm.) to have similarities to the Dundas Group but generally contain a greater amount of volcanic detritus. They are probably facies equivalents of the local volcanic rocks and are considered to be part of the Mt. Read volcanic belt.

The Upper Cambrian ? Owen type conglomerates, sandstones, quartzites and siltstones are considered of Upper Cambrian age by Mr. K. Corbett based on a poorly preserved trilobite fossil located in Nielsons Creek during the mapping and from Mr. Corbett's experience of similar rocks in the Zeehan - Queenstown area. They are not in any respect considered prospective for massive sulphide type deposits.

Just to the north of the Licence area, and in Leven River area south of Loongana Range, Ordovician Gordon Limestone is present and is overlain extensively by Tertiary basalt flows.

In the Leven River - Mt. Tor area, and near the southern boundary of the Licence a coarse dark sandstone outcrops and is interpreted to be Silurian, overlying Gordon Limestone.

Elsewhere in the Licence extensive Tertiary basalt flows cover all the lower lying areas.

## LOCAL GEOLOGY

For this section refer to the geological maps Sheets KI2/76-1A to 5A, and to the Mineralogical Report by I. R. Pontifex & Associates, Appendix No. 1.

The geological maps (above) are essentially 'fact maps' but also display a certain amount of 'interpretation'. A close inspection of the mapping along the streams will show that locally the geology is complex, dips and strikes are variable. In order to clarify the interpretation, strike directions which from the field mapping appear to have more 'regional significance' have been coloured in a shade of yellow.

Mr. Pontifex has examined some 'problem' rocks and also a representative suite of rock types from the area. In a few cases (less than 15%) his interpretation as to the nature of the rock has been slanted a little differently as compared with the original field naming. In virtually no cases has Mr. Pontifex's interpretation differed markedly from the original field terms, and bearing in mind the importance of field relationships, it was considered that in the few cases where there is conflict no alteration of the original field terms (as recorded on the geological maps) would be undertaken.

One of the more significant observations from the thin section work was the intensity of alteration of the rocks. Thin section work has enlarged the areas of alteration as recorded in the field mapping. Over 80% of the thin sections from Native Track Tier reported high degrees of sericitic, chloritic and carbonate alteration. A few recorded extensive silicification.

Extensive carbonate alteration, also sericite and chlorite alteration also occur at Mt. Tor and the Hummocks areas.

U34

It is believed that the rock types and alteration within the area is very similar to the setting of the Que River prospect 20 kilometres to the south.

### Porphyries

Seven apparently distinct types of porphyries have been recognised in the field. From primary banding features some are interpreted to be lavas while others could be intrusive. It is likely that a few of the lavas are stratigraphic equivalents.

1. In the Native Track Tier area Sheet 1, the strongly flow banded, feldspar porphyry represented by KR 0695 is interpreted to be a rhyolite lava which has been subjected to extensive silicification.
2. Immediately to the east of this is another porphyry represented by KR 0643 and KR 0308. These two rocks appear different in handspecimen but are interpreted to belong to the same 'belt'. KR 0643 is representative of a massive pink/black porphyry with small K feldspar phenocrysts in a black glassy matrix. No primary layering is evident in field mapping, though columnar jointing has been recorded (indicating a gentle westerly dip) in one location. KR 0308 on the other hand is not unlike the flow banded porphyry first mentioned (KR 0695). The northern portion of this belt (represented by KR 0695), is interpreted to be a K feldspar rhyolite lava which is flow banded, brecciated, and extensively silicified. The brecciation and silicification may be due to a major fault? which cuts across the north of the belt from the southeast. In the south the belt is of rhyodacite composition (KR 0643).

In the Mt. Tor area (Sheet 3) there is a feldspar porphyry represented by KR 0432 of very similar appearance and composition to KR 0643 from the second belt.

- U33
3. Two kilometers to the south of the second belt (Sheet 2) there occurs another strongly flow banded feldspar porphyry which resembles the second belt (KR 0643) except that it is flow banded. This porphyry is represented by KR 0141 and is interpreted to be a plagioclase rhyolite lava with extensive argillic - carbonate alteration. The flow banding is not however in the direction of the second belt but is more aligned towards the first belt.
  4. Approximately 200 metres to the south east of the second belt is a distinct porphyry represented by KR 0647 (Sheet 1 or 2). It is a pink/green vesicular K feldspar porphyry with streaks of chlorite and hornblende. Deuteric quartz and chlorite (minor) are the common infilling of the amygdales. The rock has been extensively enriched in deuteric quartz and is interpreted to be a rhyodacite lava. Trace sulphides have been observed at one locality. Flow banding? as indicated by the chlorite streaks is north - south while the interpreted surface expression of the porphyry is elongated east - west. This porphyry is considered to be closely associated with the anomalous drainage sample geochemical area known as 'Challenger 2'.
  5. In the Mt. Tor area (Sheet 4) there occurs a quartz-feldspar porphyry which is represented by KR 0508. It is the only porphyry located in the Exploration Licence having abundant rounded and embayed quartz phenocrysts. Trace pyrite has been observed in the outcrops in the Leven River and a pyritic 'gossan' was located on the track above the river. The 'gossan' assayed 600 ppm Pb, 0.45% As, 40 ppm Ag, these being the more significant results.

The porphyry is of rhyolitic composition.

- 03
6. In interpreted close spatial association with the above porphyry at Mt. Tor is a very distinct quartzo feldspathic porphyry having a very fine groundmass and containing large 10 - 15 millimetres spherical nodules of 'granular' quartz. This rock is represented by KR 0784 (however the nodule was not represented in the thin section).

This rock type occurs at the Hummocks, in two areas at Mt. Tor, and in three areas at Native Track Tier.

In places the ground mass is so fine and granular (in handspecimen) that the nodules appear to be concretions within a fine grained sedimentary rock. viz: Native Track Tier, just north of the Loongana range.

At the Hummocks the nodules have been developed within the massive homogeneous green coloured vitric crystal tuff or glassy lava? unit.

7. At one locality, Mt. Tor, there occurs a pink coloured vitric porphyritic intrusive? rock having very fine banding. The primary foliation is consistent and cross-cutting the normal north - south trend. This is interpreted to be an 'acid dyke'.

Vitric crystal tuffs - or lava?

This rock type occurs in the Mt. Tor and Hummocks areas. At Mt. Tor it is a uniformly pale whitish-green rock, the matrix being cryptocrystalline silica intimately mixed with carbonate. In handspecimen small fragments (1 - 2 millimetres diameter) of feldspar crystals occur and commonly trace pyrite and galena is disseminated throughout. The sulphides appear to be associated with the carbonate. In thin section it is evident that the rock is fragmental or

autobrecciated (at least in places); the fragments being several centimetres in diameter. Flow texture is evident in cut section. Vitric-crystal tuffs outcrop extensively at the Hummocks and Mt. Tor where the unit is intercalated with zones of ashflow tuffs and agglomerate-breccia consisting largely of large vitric fragments of rhyolitic composition. Thin laminated shale horizons occur in places. The strike of the primary foliation (flow) direction in the Mt. Tor area is grid north - south and in the Hummocks area grid southeast - northwest.

Thin section examples of this rock type are given by KR 0474, KR 0890.

#### Agglomerate-breccia

This rock has been located only at Mt. Tor and is termed agglomerate-breccia to distinguish it from the more obviously pyroclastic type agglomerate occurring at Native Track Tier. The fragments are subangular ranging in size from a few millimetres to 10 centimetres and largely consist of pink coloured vitric porphyry interpreted as glassy rhyolite. Single crystals of quartz and plagioclase are dispersed throughout. The matrix is pale green in colour and consists of cryptocrystalline quartz, sericite, and fine pyroclastic detritus. Streaks of sericite indicate a flow texture.

This unit is interpreted to have a strike in the grid north - south direction although it does not appear to have continuity throughout the Mt. Tor area.

Thin section example of this rock is given by KR 0797.

Ashflow tuffs

This rock type is present at Mt. Tor and the Hummocks but has not been recognised at Native Track Tier. The rock is pale green in colour, appears to be more cleaved than other rock types, and consists of wavy streaks of dark green chloritic clays, crystals of quartz and plagioclase and pyroclastic fragments of vitric porphyry (glassy rhyolite) all dispersed in a matrix of cryptocrystalline silica-clay-sericite. The wavy flow textured chlorite fragments are commonly interpreted in the literature as fiamme or flattened pumice fragments, and the fine grained matrix as altered volcanic glass.

These units are commonly just a few metres in width, the strike of the primary foliation being grid north - south at Mt. Tor, and grid southeast - northwest at the Hummocks.

Thin section examples of this rock type are given by KR 0832, KR 0892 and KR 0437.

Agglomerates and coarse lithic tuffs

This rock type occurs at Native Track Tier. It occurs as massive outcrops and consists of large fragments (up to 5 centimetres in diameter) of altered volcanic rock fragments, minor tuff fragments, and feldspar crystals randomly disposed through a matrix of cryptocrystalline quartz, sericite and chlorite. The volcanic rock fragments are variable in composition. Agglomerates with fragments within the range of trachytic andesite, andesite and (vesicular) andesitic basalt appear more dominant in the central and western? area of Native Track Tier and agglomerates with fragments in the range felsic andesite to rhyolite appear dominant in the eastern portion.

U39

In the generally pinkish coloured rock there occurs mosaics of green due to chlorite and sericite.

Extensive carbonate alteration, the carbonate being ?ankerite, magnesite and siderite, and intensive chloritic and sericitic alteration is predominant in the agglomerates of central Native Track Tier.

The agglomerate units are mainly located in close proximity or marginal to the porphyry belts. In the northeast they may be intercalated with porphyry lavas? Elsewhere they are intercalated with various pyroclastic tuffaceous units.

Thin section examples of this rock type are given by KR 0761, KR 0123 and KR 0734 (a coarse lithic tuff).

#### Lithic tuffs and crystal tuffs

These are the most common rock types within the Native Track Tier area. Because of lateral and vertical grading between various units of crystal tuffs, lithic tuffs and crystal-lithic and lithic-crystal tuffs, it was not possible to differentiate between them for the geological interpretation? However some trends were noted and will be discussed.

- There is a gradational change from west to east in the composition of the pyroclastics in the eastern Native Track Tier area (see Geological Map Sheet 2). This change or trend has been marked on the map as a dotted line. To the east of the line the tuffs are termed volcanoclastic sediments gradational to tuffaceous greywackes, as compared to the tuffs to the west which appear to be genuine volcanic pyroclastics. The volcanoclastic sediments consist of clastic rock fragments, volcanic rock fragments and single quartz (and plagioclase) grains. The abundance of quartz and a certain degree of sorting of fragments were important

*S.P. Constock  
Tuff*

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factors in the differentiation of the tuffs in the field. The matrix consists of fine detritus of similar composition to the coarse grains mixed with variable concentrations of chlorite, clays and sericite.

In the proximity of the eastern boundary of the area the rock contains a significant amount of plagioclase crystals (as well as quartz crystals) and appears pinkish in colour. The rock could be considered either a quartz plagioclase crystal tuff or a felsic greywacke.

The volcanic fragments of the volcanoclastic sediments are variable in composition but predominantly felsic in origin. Rhyolite and andesite type fragments are both present as well as rare basic fragments.

Thin section examples of this rock type are given by KR 0915, KR 0052, KR 0921 and KR 0020.

- In central Native Track Tier and to the west of the 'transition zone' there appears to be a broad zone of the order of  $1\frac{1}{2}$  kilometres wide trending northeast (though the trend may in part be due to the abundance of outcrop in this direction) of pyroclastics of acid derivation.

The rock typically consists of an aggregate of variable amount of feldspar and quartz crystals and volcanic fragments of mainly rhyolitic composition. In handspecimen the rhyolite fragments are dark brown-orange in colour and appear 'cherty'. Pyroclastics of this type have the suffix 'chert' in the field description as shown on Sheets 1 and 2.

Thin section example of this rock type is given by KR 0745.

- In the southwestern extremity of the volcanic sequence of Native Track Tier there occurs a well cleaved pale purple

coloured tuff consisting of crystals of feldspar and flakes of biotite within a fine matrix of sericite, clays and ultrafine quartz.

The purplish colour is probably due to oxidisation and also the proximity of the Upper Cambrian? contact. Elsewhere near this contact the sediments and pyroclastics appear more oxidised.

This section example of this rock type is given by KR 0240.

- Generally elsewhere in the Native Track Tier area and more particularly in the northwestern sector, the pyroclastics are green in colour, are well cleaved and have volcanic fragments of more andesitic composition. This is however a broad generalisation.

This section examples of the above rock type are given by KR 0641, KR 0686.

#### Clastic sedimentary units

Throughout the three areas, but more especially in the Native Track Tier area, there are abundant occurrences of laminated shales, tuffaceous shales, siltstones, and occasional sandstones and conglomerates.

Mapping of the laminated shale beds, which are commonly only a few metres in width, has shown that locally the geology is complex, bedding is often very distorted. There are two cleavage directions within the Lower-Middle Cambrian rocks, 330 - 340° and 010 - 020° (grid).

010 = S2  
150 = S3

Only one of these directions, 330 - 340°, appears to be present in the Upper Cambrian? Owen type siltstones, sandstones and conglomerates.

042

In the Hummocks area there is a fine grained, dark siltstone which is reportedly manganiferous in places (Burns 1962) and contains disseminated (low grade) galena.

Basic intrusives

Basic intrusives have been located at Native Track Tier and Mt. Tor.

At Mt. Tor a large fine to medium grained pyroxene microdiorite intrusive occurs. It is remarkably fresh in appearance but is coarser grained than the Tertiary basalt elsewhere in the area (KR 0786).

Various basic intrusives are present at Native Track Tier. The thin basic dykes are dark coloured, fine grained and appear to be of basaltic composition. The dark green types showing small feldspars are pyroxene microdiorites (KR 0059A).

Other intrusives

A 'silica dyke' occurs to the southeast and adjacent to the Challenger 2 prospect at Native Track Tier. This is interpreted to be volcanogenic chert (KR 0026A).

Upper Cambrian? sediments

In Sheets 1 - 4 of the Geological Map there are extensive areas of siltstones, sandstones, quartzites and conglomerates. The conglomerate is of the Owen or Roland type and the siltstones and sandstones are of the Moina Sandstone type.

043

These rocks are generally considered in the literature to be Ordovician in age but based on recent evidence elsewhere and a poorly preserved Trilobite fossil discovered in Nielson Creek (Native Track Tier), Mr. K. Corbett (Mines Department Geologist) considers (pers. comm.) that the probable age is Upper Cambrian.

The conglomerate consists predominantly of Proterozoic quartzite cobbles in a fine to medium grained (ferruginous) siliceous matrix. A relatively thin (10 metre) fine grained ferruginous shale occurs at the base of the sequence in the northwestern contact area (Sheet 1).

In the Mt. Tor area a bedded sequence of micro-conglomerates, sandstones and shales having much volcanic detritus is interpreted to be part of this Upper Cambrian sequence and would underlie the main (Owen type) conglomerate. In this area (southeastern Mt. Tor) the unconformable relationship between the Upper and Lower-Middle Cambrian sequences is not clear.

Thin section examples of the above rock types are given by KR 0811 and KR 0260.

#### Ordovician

Gordon Limestone overlies the above rocks and is present in the Leven River (Sheet 2). It is possible that it may also occur in contact with the Mt. Husetop Granite stock in the western portion of Sheet 1.

Silurian

A dark sandstone located in the Leven River, Mt. Tor area and near the southern boundary of the Exploration Licence is probably Silurian in age.

Tertiary

Remnants of the widespread Tertiary basalt flows cap the Lower-Middle Cambrian sequence and drape around the Upper Cambrian? outcrops.

Quaternary

Talus which is usually composed of the Owen type conglomerate and sandstones and to a lesser extent Tertiary basalt covers many of the slopes and hill bases in the area. In the Mt. Tor area some of the debris appears to be fluvioglacial in origin.

GEOCHEMISTRYDrainage Sampling

Stream sediment sampling was selected as an appropriate exploration technique for the Loongana area. The sample spacing of 200 metres and the size fraction for analysis, -80 mesh, were selected based on experience of the Joint Venture Partners in Tasmania and elsewhere.

A total of 565 samples were collected from the Native Track and Mt. Tor areas. In addition to samples being taken every 200 metres, one in ten were resampled to serve as checks.

As it was impossible to accurately locate the sample points on aerial photographs film copies of the base maps were used to record the locations, each point being located on the ground by measuring tape. The sample locations were marked by flagging tape and a numbered aluminium tag. Details of location and type of sample were recorded on cards (KD series). The samples were dried and rebagged (as necessary) prior to despatch to A.C.S. Laboratories in Adelaide.

All samples were analysed for Cu, Pb, Zn, Ag, Fe, and Mn and in addition approximately one in six were analysed for Sn, Ba, As and Au.

The method of sample preparation, analysis and the results are recorded on the following maps, located in the folder at the rear of this report,

- 'Drainage Geochemical Results Pb, Zn and Cu'  
Sheets KT2/76 - 1B to 4B
- 'Drainage Sample Location Map with Geochemical Results'  
Sheets KT2/76 - 1C to 4C

Briefly; Cu, Pb, Zn, Ag, Fe and Mn were analysed by A.A.S; Sn and Ba by Emission Spectrography; As by modified Gutzeit method and Au by special low level CRA/AAS.

046

The rationale in selecting the elements other than Cu, Pb and Zn was that the survey should be aimed at locating not only 'obvious' ore occurrences but also geochemically prospective areas in which the ore occurrences are non outcropping or sub-outcropping. Refer to Appendix 2, which is a memo by S. Gatehouse to M. Rogers titled, "Element selection and sampling for Loongana stream sediment survey".

The one in six samples for Sn, Ba, As and Au analyses were selected such that only the volcanic Cambrian areas were sampled, the density of sampling being in most cases one sample per stream, the sample being taken a little upstream of the junction with the main tributary.

#### Statistical Treatment

Perusal of the results of the survey plotted on Sheets KT2/76-1B to 4B and Sheets KT2/76-1C to 4C, show that three main divisions are apparent within the data. Generally speaking (for we are considering all the elements) the samples from the Upper Cambrian areas (conglomerates-sandstones-siltstones) have lower backgrounds than the Lower to Middle Cambrian areas (volcanics and volcanoclastics). Similarly the samples from the Mt. Tor Lower to Middle Cambrian area show lower backgrounds than those from the Native Track Tier Lower to Middle Cambrian rocks.

The Cu, Pb and Zn results of the samples within the Lower to Middle Cambrian areas of Mt. Tor and Native Track Tier have been treated separately for the purpose of determining 'threshold' approximations for the various populations.

Probability density distribution plots or 'cumulative frequency' plots of the  $\log_{10}$  concentrations of Cu, Pb and Zn were made in order to see whether local minimums in the

041

probability density function were present. These minimums represent 'threshold' values or approximate dividing points between overlapping lognormal distributions. The results are shown by Figures 2 and 3.

The method of selection of local minimums or thresholds is subjective as several assumptions are required; the most important being that the accuracy of assaying is as good as the reported figures imply.

In this case most of the cumulative frequency plots approximate to straight lines, especially for the Native Track Tier results and local minimums, points of inflexion, are not so obvious. Because the selection of thresholds by this method was rather subjective no further analysis or refinement was attempted. At times interesting data can be obtained from; separating the overlapping distributions, determining the amount of overlap between distributions and refining the threshold estimate, and plotting the separated distributions on a synoptic diagram displaying all distributions.

The higher threshold values selected from the cumulative frequency plots were used to define anomalous values for Cu, Pb and Zn as shown on Sheets KT2/76-1B to 4B in all but one case. In the case of Pb (Native Track Tier) the upper threshold is interpreted from the distribution function to be 160 ppm, however from 'eyeball' method 130 ppm appears to more naturally outline the anomalous area.

The following are the threshold (approximations) above which the values can be considered anomalous. The number of values above the threshold is expressed as a percentage of the total (in brackets).

Cumulative Frequency Plots - Drainage Geochemistry - Cu, Pb and Zn  
 Lower - Middle Cambrian Area Mt. Tor

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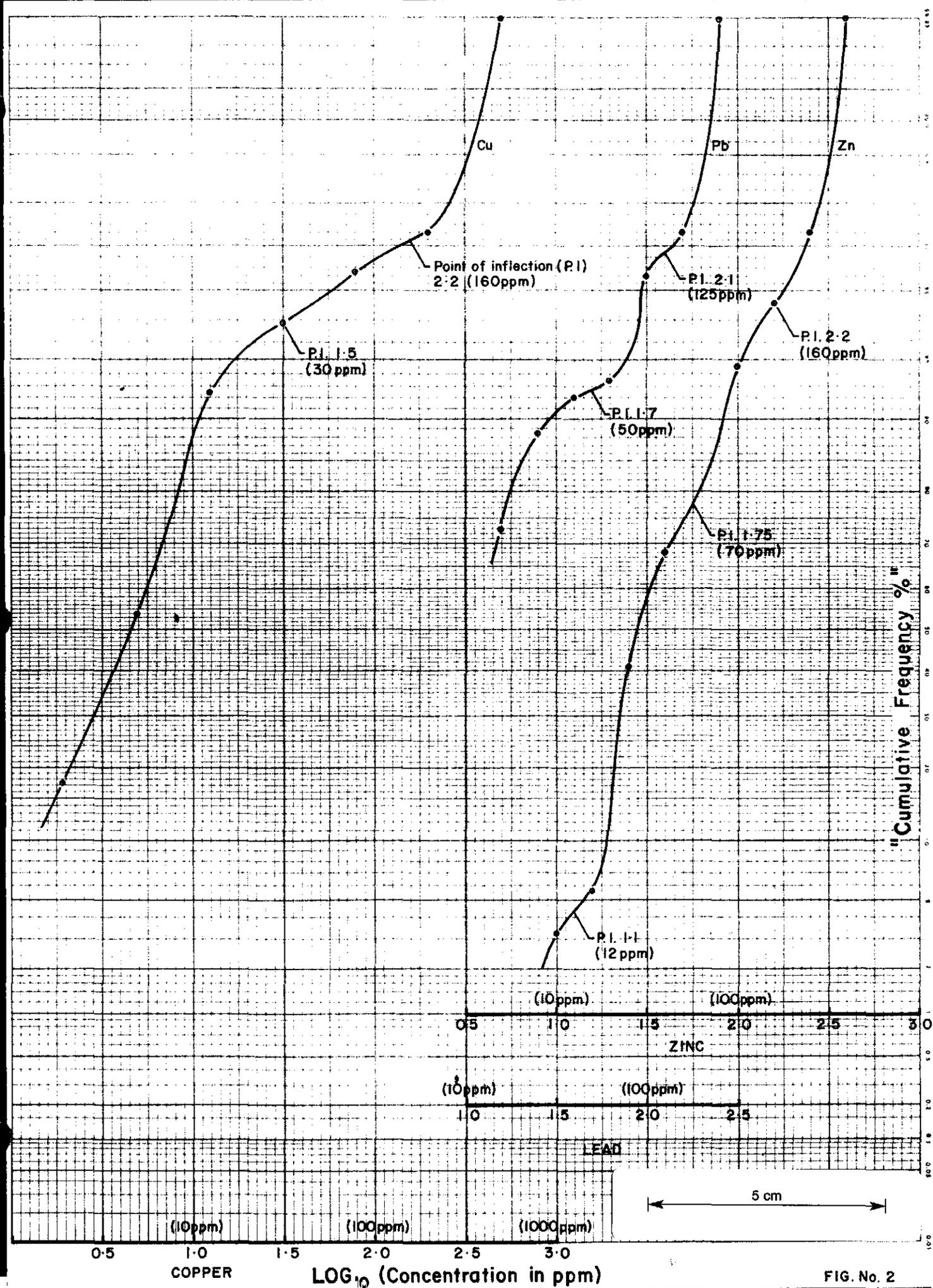


FIG. No. 2

U48

Cumulative Frequency Plots - Drainage Geochemistry - Cu, Pb and Zn  
 Lower - Middle Cambrian Area Native Track Tier

440050

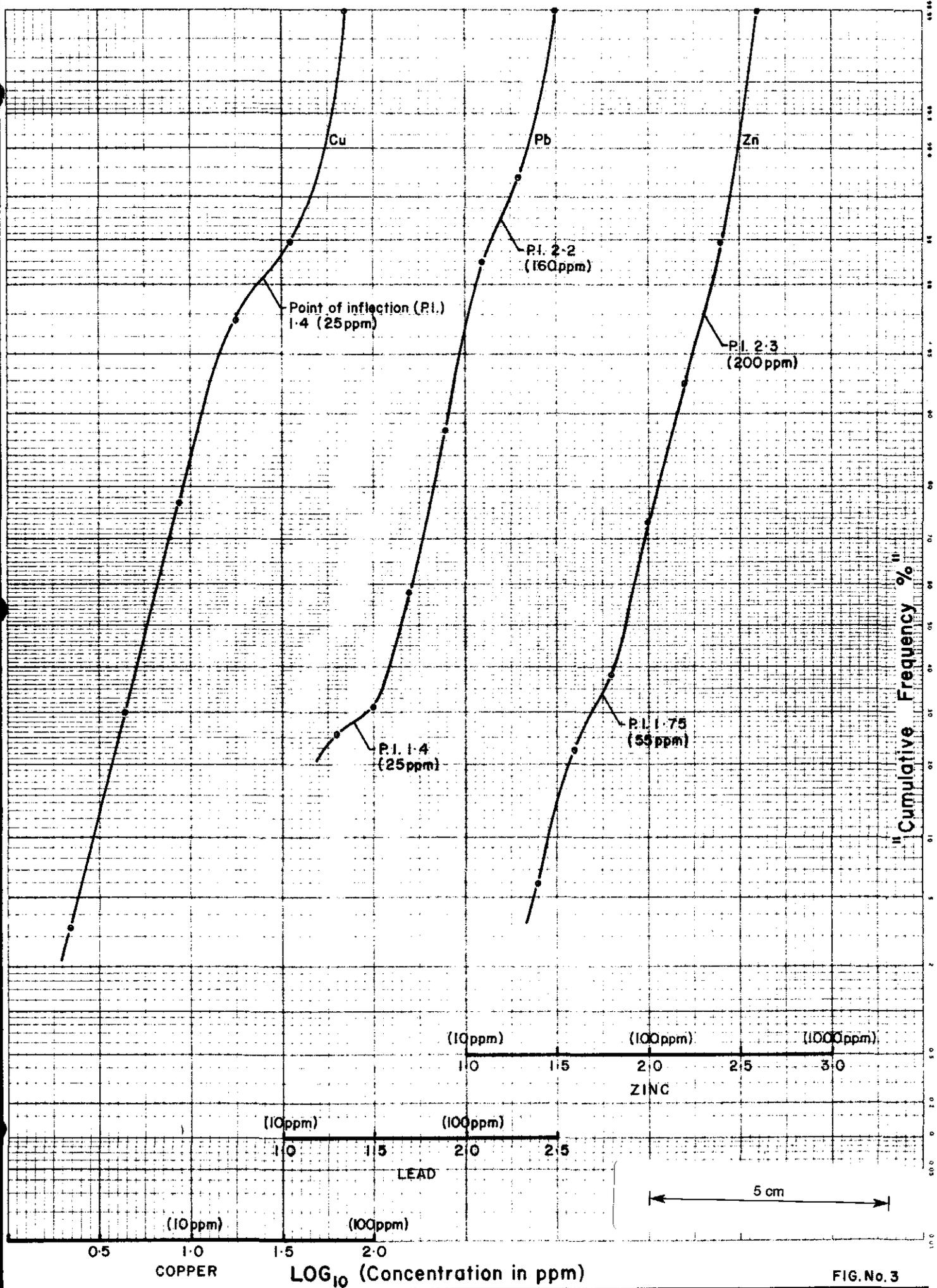


FIG. No. 3

	Cu	Pb	Zn
Mt. Tor	160 ppm (1%) 30 ppm (3%)	125 ppm (1%) 50 ppm (7%)	160 ppm (2%) 70 ppm (20%)
Native Track	25 ppm (2%)	160 ppm (<1%) 130 ppm (1%)	200 ppm (3%)

In all cases in which cumulative frequency plots were made (with the exception of Pb for Native Track Tier), the anomalous areas outlined using the approximate threshold values above corresponded with those obtained by careful trial and error 'eyeball' method.

In summary, the anomalous areas were selected using the 'eyeball' method aided by statistical treatment of data to select approximate threshold values.

Sheets KT2/76-1C to 4C "Drainage sample location maps with geochemical results" display the results for all elements analysed, including Cu, Pb and Zn. 'Interesting' and high values selected by the 'eyeball' method have been underlined in red as have the corresponding sample location numbers.

The reader is referred to Appendix 3 and 4 which are memos by G. Sherrington (Company Geochemist) the subject being:

- Appendix 3 "E.L. 2/76 - Loongana - Stream Sediment Geochemistry"
- Appendix 4 "Correlation Coefficients - Loongana Stream Sediments"

DISCUSSION OF RESULTS

Two main areas anomalous in Pb, Zn and Cu were outlined by the drainage geochemical survey. These have been termed the Challenger 1 prospect (Mt. Tor) and Challenger 2 prospect (Native Track Tier). The areas have been outlined on the Drainage Geochemical Result Sheets 3B and 2B. In addition several interesting areas also requiring follow up work have been outlined.

Challenger 1

See Fig. 5.

The drainage geochemical samples from this prospect area are anomalous in Cu, Pb and Zn. Peak values for Cu, Pb and Zn are 130 ppm, 200 ppm and 220 ppm. The average values of the background distribution are of the order of <10 ppm, <20 ppm and 30 ppm. The area is also anomalous in Mn (see Sheet KT 2/76-3C).

Anomalous drainage values for Cu, Pb and Zn report in four streams, three of which are clustered within an area of 0.5 square kilometres and the fourth is a further 0.6 kilometres to the north. The extent of the anomalous area is approximately 0.75 square kilometres.

There are various rock lithologies within the Challenger 1 area (Geological Map Sheet KT 2/76-3A). The interpreted trend of the rocks is grid north-northeast, and although there are no primary foliation recordings in the immediate vicinity, further afield the dips are generally steep and to the east.

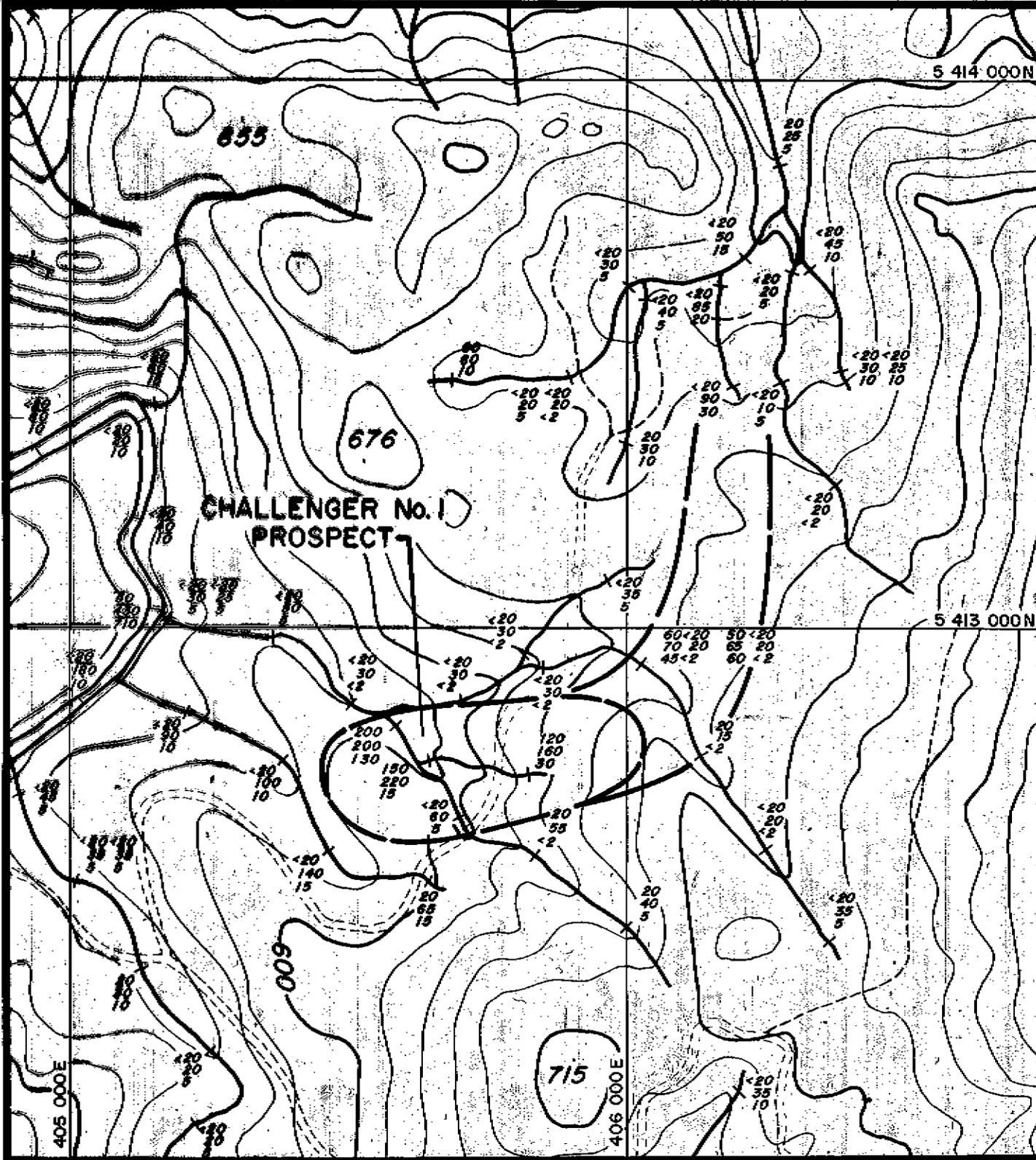
The 1:10,000 scale mapping has not given a detailed geological picture of the area but it is fairly likely that the following rock units are present - generally proceeding up? the sequence from west to east:-

1. Massive pink - black porphyry of rhyodacite composition with small K feldspar phenocrysts in a fine grained (glassy) matrix. This may possibly grade laterally into, or overlie a quartzo feldspathic porphyry containing nodules of 'granular' quartz. It is also likely that it may be an intrusive.
2. Ashflow lithic crystal tuff. The sericitic and chloritic shreds display a flow texture around blocks of rhyolitic porphyry and crystals of plagioclase and quartz. The matrix is cryptocrystalline silica (devitrified glass).
3. Agglomerate - breccia with large blocks (up to 10 centimetres) of pink porphyry (not unlike the underlying rhyodacite) and dispersed single crystals of quartz and plagioclase. The matrix consists of cryptocrystalline quartz with dispersed sericite. The sericitic alteration is intense.
4. Vitric crystal tuff or blocky lava? This rock has been intensively altered giving a matrix of cryptocrystalline silica and carbonate. Disseminated sulphides (mainly pyrite with trace galena) have been observed further to the south.

It is considered likely that the Challenger 1 prospect may be in proximity to a 'volcanic centre'. The main evidence for this is the abundant acid porphyries, the associated volcanic breccia and the fairly intensive sericitic and carbonate alteration. The area is also in close proximity to a major time break - the Upper Cambrian unconformable boundary (the Upper Cambrian? rocks would have covered the area prior to recent erosion). Proximity of this boundary (or a major time break) is a known favourable factor in localisation of massive sulphides (e.g. Mt. Lyell).

440054

5 414 000N



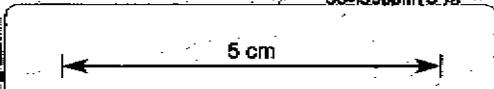
**DRAINAGE GEOCHEMICAL RESULTS:**  
**COPPER, LEAD, and ZINC**

Anomalous Values - Drainage Samples

LEAD: > 125ppm (1% of total population)  
 50-124ppm (7% " " " )

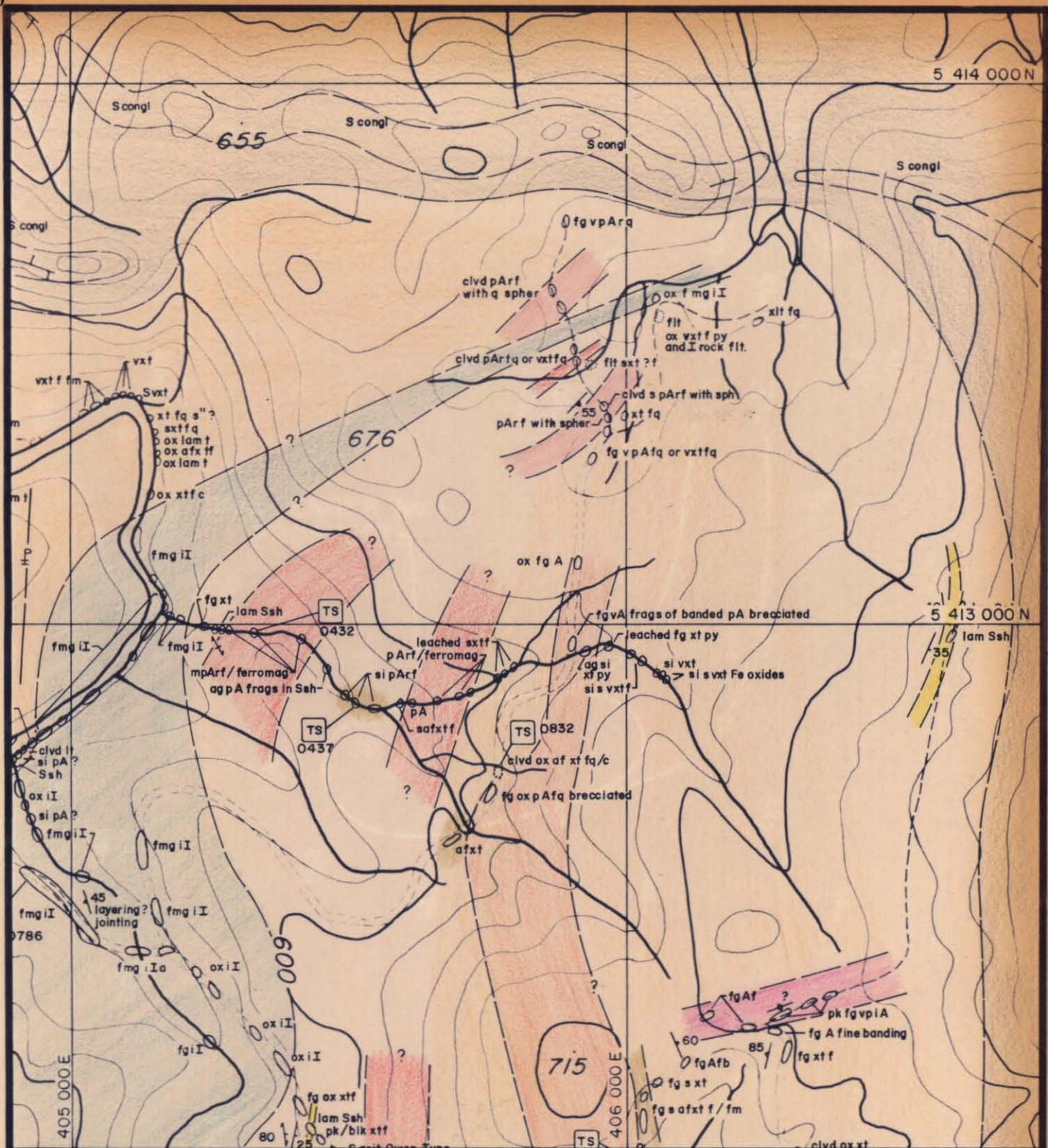
ZINC: > 160ppm (2% " " " )  
 70-159ppm (20% " " " )

COPPER > 180ppm (1% " " " )  
 30-179ppm (3% " " " )



053

5 414 000 N



# CHALLENGER No. 1 PROSPECT

Scale 1:10,000

440055

**GEOLOGICAL INTERPRETATION:**

- € Feldspar-quartz porphyry, felsic lavas, rhyolite, rhyodacite (pArf), (pArfq), (pArf fb)
- € Glassy (fine grained) lava with large silica spheroids (pArf spher)
- € Glassy banded porphyry dyke (vpiA)
- € Vitric, crystal, minor ashflow and brecciated lava. Extensive and penetrative CO<sub>2</sub> alteration. (vxt), (vt), (xt)
- € Volcanic breccia, autobrecciated lava, tuff lava
- € Ashflow tuffs (where more extensive)
- € Shales (Ssh), laminated shale (lam Ssh), siltstone (Ssist)
- U€? Sandstone (Ssst), siltstone (Ssist), conglomerate (Scongl)
- € Basic intrusives - microdiorite (fmgId, iIa)

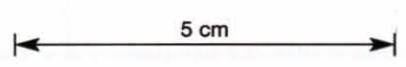
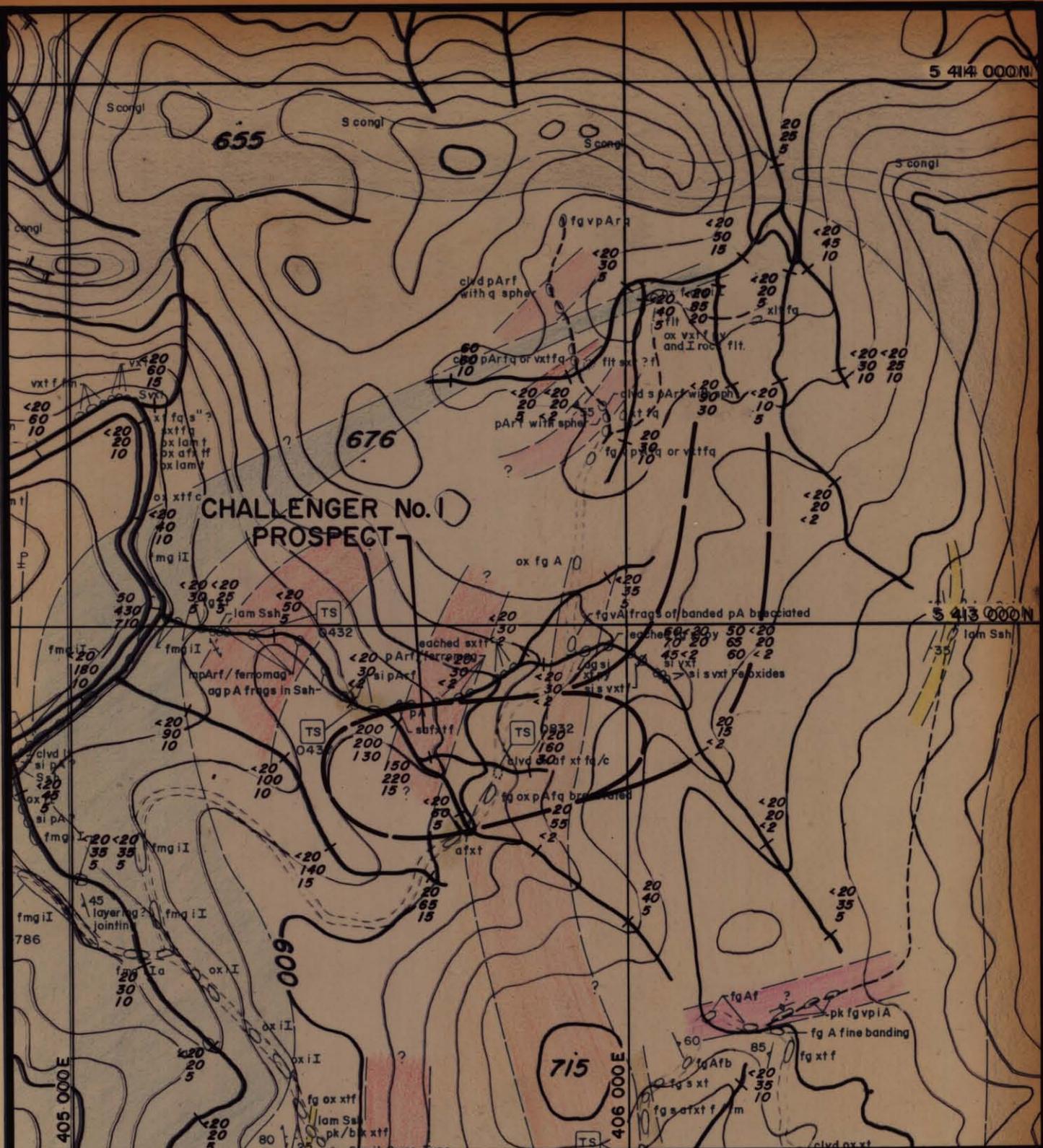


FIG. No. 5

440054

5 414 000N



**CHALLENGER No. 1 PROSPECT**

**CHALLENGER No. 1 PROSPECT**

Scale 1:10,000

**GEOLOGICAL INTERPRETATION:**

- € Feldspar-quartz porphyry, felsic lavas, rhyolite, rhyodacite (pArf), (pArfq), (pArf fb)
- € Glassy (fine grained) lava with large silica spheroids (pArf spher)
- € Glassy banded porphyry dyke (vpiA)
- € Vitric, crystal, minor ashflow and brecciated lava. Extensive and penetrative CO<sub>2</sub> alteration. (vxt), (vt), (xt)
- € Volcanic breccia, autobrecciated lava, tuff lava
- € Ashflow tuffs (where more extensive)
- € Shales (Ssh), laminated shale (lam Ssh), siltstone (Ssist)
- U? Sandstone (Ssst), siltstone (Ssist), conglomerate (Scongl)
- € Basic intrusives - microdiorite (fimgId, iIa)

**DRAINAGE GEOCHEMICAL RESULTS:**  
**COPPER, LEAD and ZINC**

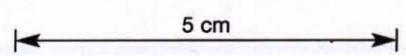
Anomalous Values - Drainage Samples

**LEAD:**    ≥ 125ppm (1% of total population)  
                   50-124ppm (7% " " " )

**ZINC:**     ≥ 160ppm (2% " " " )  
                   70-159ppm (20% " " " )

**COPPER**    ≥ 160ppm (1% " " " )  
                   30-159ppm (3% " " " )

440055



Challenger 2

See Fig. 6.

The drainage geochemical samples from this prospect area are anomalous in Pb, Zn (and Cu). Peak values for Pb, Zn and Cu are 340 ppm, 430 ppm and 30 ppm. The average values of the background distribution are of the order of 50 ppm, 80 ppm and 5 ppm.

Anomalous values are recorded in seven main streams radiating from a ridge trending north-northeast. The extent of the area is approximately 1.2 square kilometres.

The 1:10,000 scale mapping has given only a sketchy geological picture. The following rock types occur within the area.

1. The area is dominated by the (interpreted) presence of a pink / green vesicular K feldspar porphyry of rhyodacite composition. It is characterised by the vesicles and streaks of chlorite and hornblende. The rock has been extensively enriched in deuteritic quartz. If the interpretation as to the distribution of the porphyry is correct then it would appear that the anomalous values may not be due to 'rock type' alone as other streams draining the porphyry are not anomalous in Pb, Zn and Cu.
2. Agglomerates and coarse lithic tuffs which have been subjected to intense carbonate alteration along with sericitic and chloritic alteration occur adjacent to the southern margin of the porphyry.
3. The most abundant rocks in the area are pyroclastics interbedded with laminated shales which strike northeast and dip steeply to the west. The pyroclastics consist of aggregates of variable amounts of feldspar and quartz crystals and volcanic fragments of mainly rhyolitic composition.

4. To the south and east volcanoclastic sediments and conglomerates occur.
5. A 'silica dyke' occurs near the south eastern boundary of the area, and is interpreted to be a volcanogenic chert.

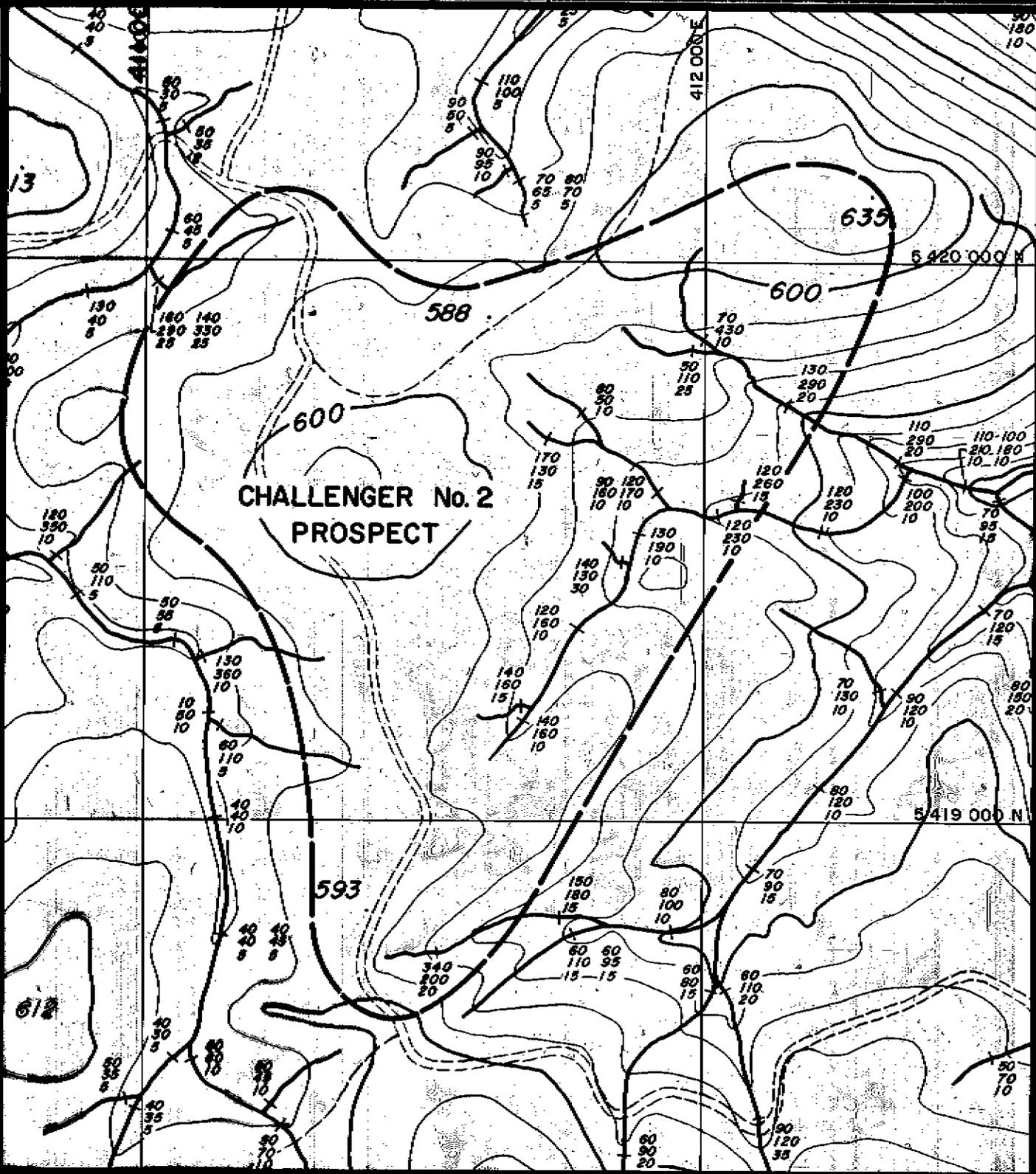
Favourable factors for the occurrence of significant mineralisation in the Challenger 2 area include:

- a. The presence of the acid porphyry; the source rock.
- b. The proximity to the porphyry of coarse pyroclastic units.
- c. The fairly intensive alteration of the rocks including the carbonate, sericitic and chloritic alteration of the pyroclastics and the deuteric silicification of the porphyry.
- d. The presence of volcanogenic chert.
- e. The presence of laminated shales several hundred? metres to the east of the porphyry indicating quiescent conditions favourable for the formation of Pb, Zn mineralisation.
- f. And the proximity of the prospect to the unconformable contact with the Upper Cambrian? rocks.

The reader is also referred to Mr. Sherringtons comment

- Appendix 3.

4440058



CHALLENGER No. 2  
PROSPECT

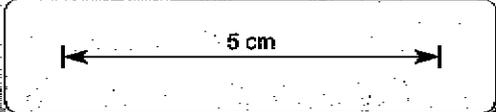
DRAINAGE GEOCHEMICAL RESULTS:  
COPPER, LEAD and ZINC

Anomalous Values - Drainage Samples

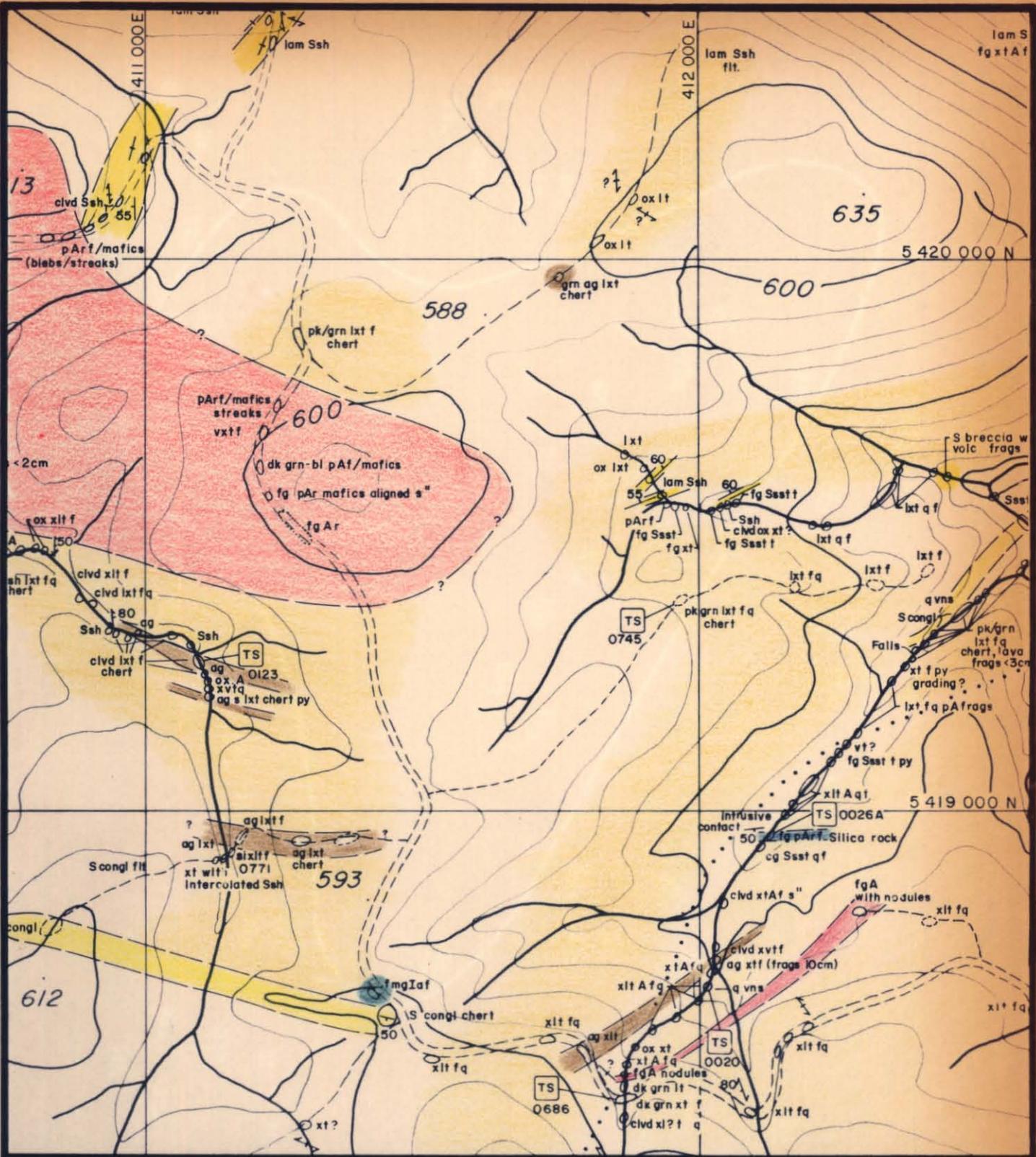
LEAD: > 160ppm (1% of total population)  
130-159ppm (1% " " " )

ZINC: > 200ppm (3% " " " )

COPPER: > 25ppm (2% " " " )



056



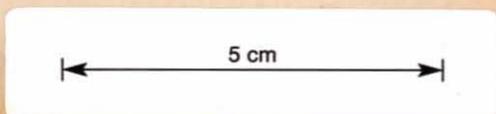
### CHALLENGER No. 2 PROSPECT

Scale 1:10000

**GEOLOGICAL INTERPRETATION:**

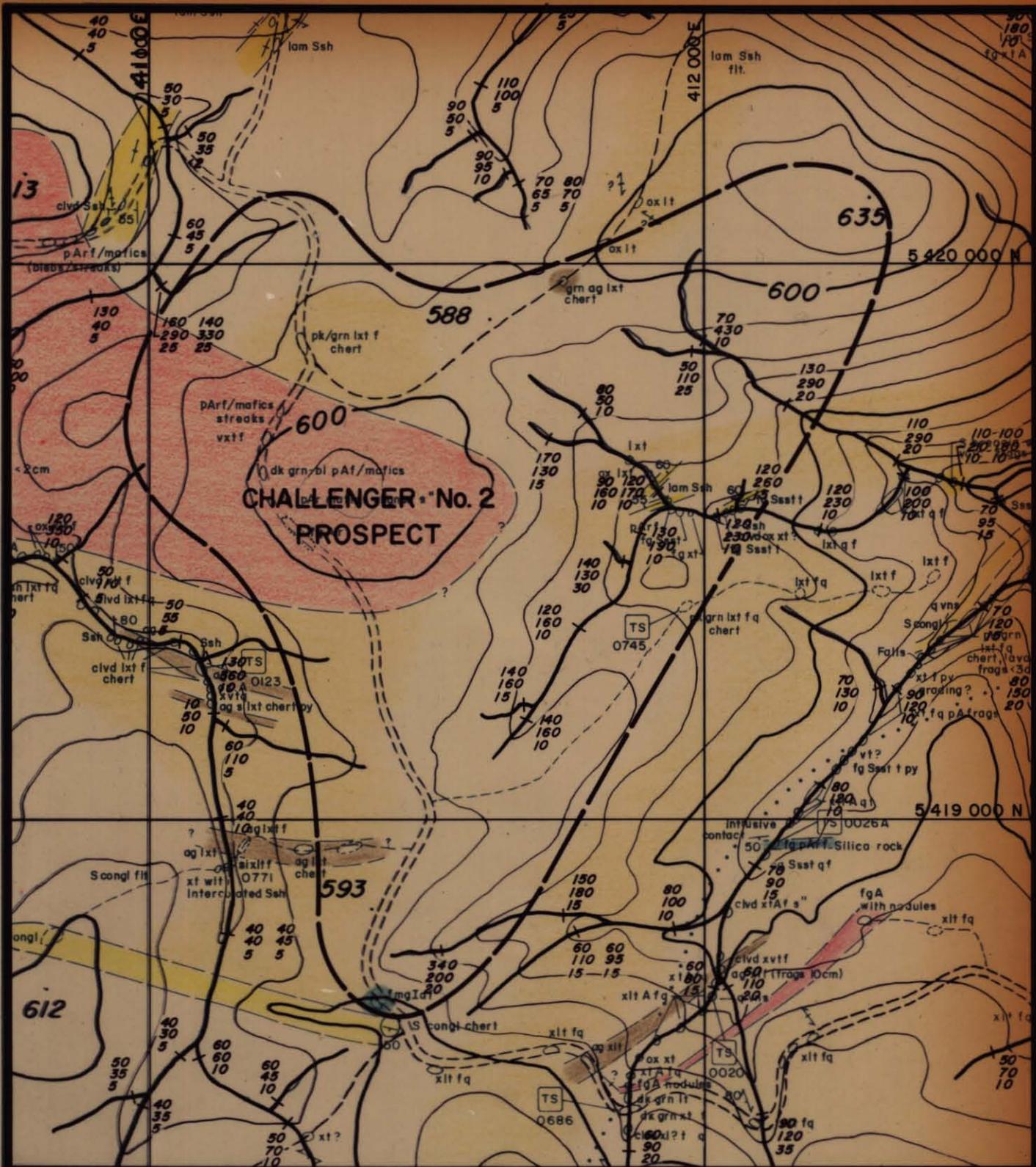
- Feldspar-quartz porphyry, felsic lavas, rhyolite, rhyodacite (pArf), (pArfq), (pArf fb)
- Glassy (fine grained) lava with large silica spheroids (pArf spher)
- Agglomerate and coarse lithic tuffs (aglt), (aglxt)
- Lithic-crystal, crystal-lithic tuffs, minor crystal and lithic tuffs
- Volcaniclastics (lxt fq), (xlt fq), (Sgwk), (Scong)
- Shales (Ssh), laminated shale (lam Ssh), siltstone (Sslst)
- Conglomerate (Scong)
- Silica chert (exhalative)
- Basic intrusives - microdiorite (fmgIId, IId)

440059



056

440058



### CHALLENGER No. 2 PROSPECT

Scale 1:10000

**GEOLOGICAL INTERPRETATION:**

- € Feldspar-quartz porphyry, felsic lavas, rhyolite, rhyodacite (pArf), (pArfq), (pArf fb)
- € Glassy (fine grained) lava with large silica spheroids (pArf spher)
- € Agglomerate and coarse lithic tuffs (agIt), (agIxt)
- € Lithic-crystal, crystal-lithic tuffs, minor crystal and lithic tuffs
- € Volcaniclastics (Ixt fq), (xit fq), (Sgwk), (Scongl)
- € Shales (Ssh), laminated shale (Iam Ssh), siltstone (Ssist)
- € Conglomerate (Scongl)
- € Silica chert (exhalative)
- € Basic intrusives - microdiorite (fimgId, IIA)

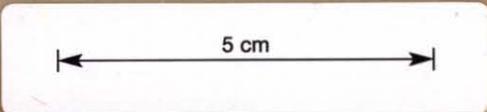
**DRAINAGE GEOCHEMICAL RESULTS:**  
COPPER, LEAD and ZINC

Anomalous Values - Drainage Samples

**LEAD:** ≥ 160ppm (<1% of total population)  
130-159ppm (1% " " " )

**ZINC:** ≥ 200ppm (3% " " " )

**COPPER:** ≥ 25ppm (2% " " " )



057

Two Hummocks

See Fig. 7.

The cumulative frequency plots (drainage geochemical sampling) of Pb and Zn for the Mt. Tor area (Fig. 1) display two upper thresholds. The lower of these thresholds, 50 ppm for Pb and 70 ppm for Zn, appear from inspection of the map to separate two distributions, one being the distribution from streams draining the Mt. Tor area and the other being a distribution from the Leven River. The source of the latter higher valued distribution is not known but may trace back to Black Marsh Creek in the Two Hummocks area. This creek was not sampled during the recent survey and it is recommended that the sampling be carried out in the next program.

The Two Hummocks area has limited outcrop (see Geological Map Sheet 4). The dominant rock type is a pale green massive vitric crystal tuff or glassy lava? The rock has been altered such that the matrix is now cryptocrystalline silica and clays. In the northern quarry at the Hummocks, near the argillaceous siltstone, nodules of silica (10 - 15mm) in diameter are present within the unit. This is the 'nodular' porphyry similar to those at Mt. Tor and Native Track Tier.

Intercalated with the vitric crystal tuff unit are thin bands of ashflow tuffs. The flow texture is indicated by wisps of chlorite, and the matrix has been altered to ultrafine silica and chloritic and sericitic clays.

In the northern quarry a dark argillaceous siltstone is present. Burns (1962) reports that the siltstone is manganiferous in places, however the two samples collected during the recent mapping assayed low in manganese. The siltstone does however contain disseminated galena (0.14% Pb in one sample).

058



**TWO HUMMOCKS PROSPECT**

Scale 1:10000

- GEOLOGICAL INTERPRETATION:**
- E Glassy (fine grained) lava with large silica spheroids (pArf spher)
  - E Vitric, crystal, minor ashflow and brecciated lava. Extensive and penetrative CO<sub>2</sub> alteration. (vxt), (vt), (xt).
  - E Ashflow tuffs (where more extensive)
  - E Shales (Ssh), laminated shale (lam Ssh), siltstone (Ssst)
  - U&? Sandstone (Ssst), siltstone (Ssst), conglomerate (Scongl)
  - TERT. Basalt (flows), (Mv)



440061

In the vicinity of the southern quarry there are numerous pits dug across the strike of various barytes lodes which have been reported on by Burns (1962). The barytes is evidently present in fissures which crosscut the local strike trend of southeast - northwest. Virtually nothing of the geology can be seen today without digging new pits.

East of the barytes pits outcrop is hidden by Black Marsh. It is possible that the volcanics continue to the east and southeast under the marsh and are not everywhere covered by Tertiary basalt. If this is the case then the prospective area of the volcanics will have been significantly increased.

#### Tin areas

The reader is referred to Mr. Sherringtons memo, Appendix 3.

Approximately one in six samples were assayed for Sn, and the initial results indicated a significantly anomalous area bounded by co-ordinates:

409 000 E - 410 000 E  
5418200 N - 5420000 N

Most of the values were recorded in one stream adjacent to the southern margin of a porphyry mass. The values were as follows:

KD 0189 2000 ppm Sn.  
0186 3000 ppm Sn.  
0178 500 ppm Sn.  
0182 300 ppm Sn.

060

Eighteen samples from this area and elsewhere in Native Track Tier were reassayed for Sn by X.R.F. method, the results are displayed on Sheet KT2/76-2C.

Four samples reported anomalous values three of which were from the first area mentioned:

KD 0189 2300 ppm Sn.  
0186 3300 ppm Sn.  
0178 770 ppm Sn.  
and 0012 300 ppm Sn.

The last sample is immediately adjacent to the highest Pb drainage value at Challenger 2 prospect.

A.C.S.Laboratories were asked to determine the size fraction containing the majority of tin in sample KD 0186 but were unsuccessful due to the lack of suitable sample. Other samples could not be used for the same reason.

It is disappointing that none of the 'in-between' values from the first area mentioned reported anomalous values and so further follow-up action will be restricted. Resampling and panning of samples from the one stream will be recommended.

The source of the tin is probably related to the Mt. Husetop granite which outcrops 3 kilometres to the north. Numerous faults of Tabberabberan origin would be expected to cut through the area and the tin may be associated with such faulting. Possibly the tin may be associated with the porphyry body immediately to the north of the stream carrying the anomalous values.

Other Pb - Zn anomalous areas

- A. The apparently most significant of the lesser anomalous areas is a ridge centring on 5421000 N 412500 E at Native Track Tier. Streams to the north and south of this ridge are anomalous. In one stream to the north **black** mineral sands were noted in the stream bed, however a concentrate of this sand did not report significant base metal content. (See Geological Map Sheet 1A).

Feldspar porphyry and altered (chloritic) agglomerates are in close proximity.

- B. The Pb - Zn anomalous values reporting in two streams at Native Track Tier and trending north along co-ordinate 409 800 E between 541 980 N and 5422000 N appear to be related to the porphyry belts. Due to the extent of this anomalous zone and apparent association with the porphyry, it is designated as low priority warranting no follow up at this stage.
- C. In the south-eastern corner of the Native Track Tier area there is a spread of higher copper values. As this is in the area of volcanoclastic sediments it is **probable** that a higher background exists here.

No follow up work is recommended.

It is **interesting** to note however that C.R.A. has drilled several diamond drill holes into similar rocks just 1 kilometre to the east of the boundary (in the area centring on co-ordinates 5419500 N, 414000 E).

062

- D. It is interesting to note that the majority of the other (Pb, Zn and Cu) anomalous values are situated very near to the unconformable contact with the Upper Cambrian? rocks, and that commonly high manganese is also present.
  
- E. Some high anomalous values are present in the Leven River, Mt. Tor area. These are not considered significant in themselves as it would be expected that concentrations of elements would occur at stream junctions and at acute bends in the river.

Tungsten drainage anomaly

Australia and New Zealand Exploration Company carried out drainage sampling throughout the Exploration Licence mainly for tungsten.

Most samples recorded 5 - 30 ppm W, however values of 2300, 60, 120, 50, 110 and 80 ppm were obtained from a small area of 0.1 square kilometres at Native Track Tier centring on co-ordinates:

406 800 E and 5422000 N (Sheet KT2/76-1A)

This is immediately adjacent to the Mt. Housetop Granite. The geology in the area would appear to be Moina Sandstone and it is unlikely that the overlying Gordon Limestone host rock will be present. It is considered however that the occurrence should warrant further inspection.

GEOPEKO LIMITED



M. C. ROGERS  
SUPERVISING GEOLOGIST,

REFERENCES

- Burns, K. L., 1964: Geological Survey Explanatory Report.  
One mile geological map series,  
Devonport. K/55-6-29. Tasmania  
Department of Mines.
- \_\_\_\_\_, 1962: Barytes and Manganese near Guildford.  
Annual Report, 1962. Tasmania  
Department of Mines.
- Rogers, M. C., 1975: Initial report - base metal exploration  
by Geopeko Ltd. on mainland Tasmania.  
Unpublished Geopeko report.
- Various reports and maps by A.N.Z.E.C.O.  
and Tasminex N.L.

APPENDIX 1MINERALOGICAL REPORT NO. 2017

By

IAN R. PONTIFEX & ASSOCIATES PTY. LTD.

TO: Mr. M. C. Rogers,  
Supervising Geologist,  
Geopeko Limited,  
Grassy,  
King Island, Tasmania, 7256.

YOUR REFERENCE: Your letter dated 19/7/76  
Order No. KP 1279

MATERIAL: Rock samples

IDENTIFICATION: Area 1 to Area 3  
KR 0123 to 0890 (not consecutive)

WORK REQUESTED: Petrological report, mainly to  
confirm field name.

SAMPLES & SECTIONS: Returned.

COMMENTS

Each sample is given a fairly objective description, resulting in a rock name. Comments on alteration, comparisons between samples and comparison with field identification are given where appropriate. The following brief comments refer to nomenclature, (which largely follows Joplin "A Petrography of Australian Igneous Rocks" and Pettijohn Potter Siever, in their section on volcanoclastics in "Sand and Sandstone").

For "relatively simple" lithic pyroclastics terminology is based largely on the size of fragments:

>32 mm : bombs, aggregated to form agglomerate

>4 mm < 32 mm : lapilli, aggregated to volcanic breccia

<4 mm: ash, aggregated to tuff

In this report coarse tuff, or coarse (lapilli) tuff is used instead of volcanic breccia to avoid confusion with possible volcanic breccia of not true pyroclastic origin.

Where individual crystals contribute to the pyroclastic aggregate the term crystal tuff applies. It is noted that in hand specimen it is virtually impossible to differentiate between free pyroclastic crystals and phenocrysts, in-situ, within porphyritic lithic fragments, since these fragments commonly grade imperceptibly into the matrix.

The use of the word vitric is somewhat confusing in the nomenclature. In this report pyroclastics which have a devitrified glassy matrix without diagnostic ignimbritic texture are termed vitric. Also if lithic fragments are largely pumiceous or glassy lava "vitric" may be used together with "lithic". If there is evidence of shards, or eutaxitic texture, then "ignimbrite" may be employed.

These terms qualifying a genuine pyroclastic are listed in order of increasing abundance.

In some rocks there is evidence of lava flow characteristics in the matrix, incorporating abundant pyroclastic debris. This combined lava and tuff is termed tuff-lava.

Where flow is evident in a glass with only minor fine tuffaceous crystals and/or fragments, the term ash-flow tuff may be used.

The above comments refer to genuine pyroclastics, however several samples contain "normal" clastic detritus, such as fragments of shale, metaquartzite etc., as well as volcanic crystals and lithic fragments. These may form an ordered aggregate, indicating submarine deposition. Commonly they contain 15-20% matrix. Such facies are essentially "wackes", a term which may be qualified by "tuffaceous", "lithic", "felspathic", or simply the term greywacke.

These rocks are volcanic sediments (volcaniclastics), and represent facies variations of genuine pyroclastics.

The distribution and abundance of potash feldspar was determined by staining the slide offcuts with sodium cobalt-nitrite. The identification of carbonate species in these rocks is identified by optical properties only, but could be confirmed by staining and selective chemical analysis if necessary.

AREA 1

## NATIVE TRACK TIER

KR 0123 very coarse (lapilli) crystal lithic vitric tuff of largely andesitic composition, extensive carbonate alteration, and devitrification of glassy matrix

Field comment: (agglomerate) sericitic lithic crystal tuff, felspar

This is a massive rock composed of altered volcanic rock fragments up to 6 mm (40%) also felspar crystals (10-15%), randomly disposed through a matrix of cryptocrystalline quartz, intimately mixed with shredded sericite and lesser chlorite.

The rock fragments have a variable composition within the range of trachytic andesite, andesite and (vesicular) andesitic basalt, with a variable proportion of groundmass to phenocryst in each. They are fairly extensively replaced by carbonate which varies in composition from ?ankerite, magnesite and probable minor siderite. Minor fragments of pumice, largely resorbed by the siliceous matrix are also present.

The siliceous matrix is interpreted as devitrified glass, thus rendering this pyroclastic "vitric".

KE 0915 (quartz) plagioclase crystal tuff; altered matrix, shear planes extensively sericitised + minor chlorite and carbonate.  
(alternatively a felsic-wacke)

Field comment: crystal lithic tuff, felspar quartz

This rock consists of an aggregate of andesine-plagioclase crystals and minor (10%) quartz crystals ranging in size from 0.1 to 1.5 mm, and trace fragments of sericitised intermediate volcanic groundmass material. The plagioclase is clouded but not significantly altered.

These are randomly and fairly tightly packed with a matrix (20%) of ultrafine chlorite-quartz-sericite-clay mixture. Variably continuous streaky foliae and/or shear planes are extensively sericitised + minor chlorite, also carbonate which is largely replaced by limonite.

This is a volcanoclastic facies, derived from a somewhat more acid and felsic rock than the abundant andesitic facies in Area 1. It may be a genuine pyroclastic, i.e., a (quartz) plagioclase crystal tuff. However, the degree of order in the aggregate suggests subaqueous deposition, conceivably with some sorting. The rock may therefore be considered as a felsic-wacke.

KR0921 lithic, plagioclase crystal tuff; extensive pervasive argillic and chloritic alteration, disseminated magnetite

Field comment: crystal tuff, felspar

This rock consists mainly of a heterogeneous aggregate of completely argillised plagioclase crystals, subordinate, generally chloritised, mafic crystals and/or rock fragments; and minor, quartzose crystals and/or fragments. These are randomly packed with an ubiquitous matrix (20%) of chlorite, chloritic clays and accessory sericite.

Some rock fragments have an andesitic composition others consist of chloritised and/or sericitised glass and pumice. Other fragments consist of sericitic silt stone, shale, tuffaceous silt stone and tuff.

The quartzose components consist variably of single quartz crystals, fine metaquartzite, and impure chert. Accessory fine grains of partly oxidised magnetite (3-5%) are scattered, thus the rock is weakly magnetic.

The chloritic matrix may be largely after glass or altered detritus of unspecified origin.

The composition of this rock, in the context of this suite indicates that it is a lithic plagioclase crystal tuff of mainly intermediate composition. In view of the considerable abundance of "normal" clastic components, it may be transitional to tuffaceous greywacke. The components have a fairly uniform size, suggesting some ? subaqueous sorting during deposition.

KR0666 lithic crystal tuff of gross andesitic composition; extensive pervasive chloritic alteration; disseminated magnetite

Field comment: crystal lithic tuff (? waterlaid).

Subhedral to euhedral plagioclase crystals, and completely chloriticised mafic (? hornblende) crystals, average and fairly consistent size of about 1 mm constitute the majority of this rock.

They form a fairly tightly packed, random aggregate, with a matrix (15-20%) of chloritic clays. Minor crystals of oxidised magnetite (3-5%) and fragments of chloritised andesitic groundmass material (7-10%) are evenly scattered.

The rock is a lithic crystal tuff of andesitic composition which has been pervasively chloritised by hydrothermal agencies. The generally overall even texture and grain size indicates probable subaqueous deposition.

It is similar to KR 0921, but with negligible contamination by clastic detritus, and negligible argillic alteration of plagioclase crystals.

KR0647 vesicular and porphyritic, potassic felsic lava; probable rhyodacite, possible trachyandesite with vesicles extensively enriched in deuteric quartz

Field comment: pink/green porphyry, rhyolitic, feldspar, quartz, siliceous augens, chlorite streaks

This is a porphyritic and vesicular lava. The groundmass consists of randomly oriented extremely fine plagioclase microlites in cryptocrystalline potash feldspar (largely indicated by staining). Lenticular and streaky bands rich in chlorite, vaguely define ?flow structures through the groundmass.

Phenocrysts consist of euhedral plagioclase (andesine) crystals and groups of these, they are fissured and flecked with sericite. Accessory chloritised hornblende accompanies some. There are no quartz phenocrysts.

Amygdales vary from single and groups of spheroidal gas bubbleholes, 0.1 mm, to irregular cavities up to 20 mm across. Almost invariably these are rimmed by chlorite and filled by deuteritic (drusy) quartz. Trace magnetite is disseminated.

This is a highly porphyritic, vesicular, and largely felsic lava in which the groundmass is chloritic-potassic, and vesicles extensively enriched in quartz. It may be classified as a rhyodacite, (or possibly a trachyandesite with extensive deuteritic quartz enrichment).

KR0643 glassy, potassic, felsic lava of  
rhyodacite or possible dellinite composition

Field comment: porphyry, rhyolitic, felspar

This is a porphyritic rock in which the groundmass consists of a clouded, ill defined cryptocrystalline mass of potash felspar, plagioclase microlites and fine chlorite. Apparently largely an altered potassic-mafic glass. Vague streaky layering provides poorly defined evidence of flow, characterised by fluxion structure.

Scattered phenocrysts (35%) consist of commonly zoned plagioclase, as individuals and groups of these (together with minor chloritised, amphibole and deuteritic quartz).

Accessory primary magnetite crystals are disseminated.

The rock is porphyritic, glassy, largely felsic lava. In the absence of quartz phenocrysts, and with calcic plagioclase, it is not considered as a "normal" rhyolite, but more likely a rhyodacite or dellinite.

KR0641 (lithic) plagioclase crystal vitric tuff;  
extensive chlorite-carbonate alteration  
(in view of the eutaxitic matrix, it may  
also be considered as an andesitic-ignimbrite)

Field comment: pink/green cleaved crystal lithic tuff

This rock consists of a fairly loosely packed aggregate of (pyroclastic) plagioclase crystals (35%), and lesser completely chloritised mafic crystals (15%), most likely chlorite and biotite. The plagioclase is extensively replaced by magnesite. Minor chloritised fragments of andesite (7-10%) and subhedral magnetite crystals (5%) are also present.

These are all evenly distributed through a matrix of basic volcanic glass, altered to a clay, chlorite, sericite mixture, with ignimbritic shard textures preserved. These textures have been deformed by moderate shearing through this altered matrix.

The eutaxitic texture, altered glassy matrix, indicates ignimbrite affinities.

KR0686 plagioclase crystal vitric tuff-lava,  
of gross andesitic composition; extensive  
chlorite-carbonate alteration

Field comment: dark green crystal tuff, felspar

This rock is similar to KR0641. Euhedral (pyroclastic) crystals of andesine plagioclase (40%) form a vaguely orientad aggregate, together with minor, smaller crystals of chloritised hornblende (10%) within a partly sheared out matrix of altered glass. The matrix consists of the same clouded chlorite, clay admixture as in 0641, with abundant discontinuous streaks almost certainly a relict eutaxitic texture.

The plagioclase crystals are very extensively altered to the fine granular carbonate (magnesite) + clay sericite and chlorite. Their common orientation suggests that the glassy matrix flowed prior to final crystallisation, thus this rock seems to be more correctly identified as an ash flow tuff or tuff lava rather than the ignimbritic tuff of 0641.

A carbonate vein cuts the rock.

072

KR0695 porphyritic glassy rhyolite breccia;  
extensively silicified by late volcanogenic  
(?epithermal) quartz.

Field comments: silicified rhyolitic porphyry.

The streaky layering seen in hand specimen is primary, flow banded rhyolitic glass, composed of cryptocrystalline clouded potash feldspar intimately mixed with quartz.

Euhedral plagioclase phenocrysts ranging from 0.1 mm to 4 mm are scattered through this glass, commonly oriented in the direction of flow. The rock is therefore essentially a porphyritic (glassy) rhyolite.

Late stage volcanogenic (?epithermal) quartz occurs in random patchy domains through the rhyolite, more or less connected by irregular veins, apparently invading and filling breccia voids. This quartz also partly replaces some plagioclase crystals, and lines some drusy cavities.

Accessory oxidised magnetite is disseminated.

FR 0734 coarse (lapilli) lithic tuff; of  
predominantly glassy andesite composition;  
extensive chlorite clay and carbonate  
alteration

Field comment: green (agglomerate) lithic tuff, feldspar  
quartz and cherty fragments

Angular volcanic rock fragments up to 20 mm form a random fairly tightly packed aggregate within a slightly schistose, green, matrix composed largely of chloritic alteration products after glass. There are no "free" crystals in this matrix, although many fragments contain quite coarse plagioclase phenocrysts.

Most fragments have a porphyritic glassy andesite lava composition in which the groundmass is chloritised and argillised, and plagioclase phenocrysts are carbonated.

The "cherty fragments" referred to in field comment are "rhyolitic" lava fragments similar in texture to samples 0643 and 0647, but not as potassic (i.e. no reaction to stain test). Fragments of andesitic glass, altered to a cloudy mass of chloritic clays, are also common, and it is this type of material which forms the rock matrix.

KR0745 lithic, quartz felspar crystal tuff;  
of gross "rhyolitic" composition

Field comment: pink/green lithic crystal tuff, felspar  
quartz and cherty fragments

This rock consists of a fairly tightly packed, aggregate of pyroclastic felspar crystals, subordinate quartz crystals and volcanic rock fragments. The aggregate is generally random but very vaguely bedded with grain size ranging from 0.1 to 2.5 mm; average and fairly consistent size of about 1 mm.

The plagioclase crystals are andesine, and essentially unaltered. Volcanic fragments are mainly rhyolitic. Quartz crystals are embayed and together with minor potash felspar crystals, (highlighted by staining), have an acid volcanic origin. Minor chloritised biotite and/or hornblende is present. The matrix (15%) consists of chloritic clays.

This rock has a relatively more acid derivation than the abundant andesitic tuffs above. It also includes more quartz (and orthoclase) phenocrysts than in the rhyolitic lavas above.

074

KR0761 coarse lithic (lapilli) tuff; of heterogeneous rhyolitic to andesitic composition and largely chloritic matrix

Field comment: pink/green (agglomerate), lithic tuff with porphyry fragments.

This rock consists of a random, fairly loosely packed aggregate of volcanic rock fragments up to 20 mm across, and of particularly heterogeneous composition, probably more so than most other rocks in the suite.

Staining (and petrography) indicates about 35% rhyolitic fragments, which includes most "porphyry fragments" noted in field comments. Felsic andesites, quite strongly porphyritic in plagioclase are also present. Dark coloured fragments are (porphyritic) andesite with a groundmass crowded by fine oxidised magnetite.

Greenish domains consist of chloritised (potassic) andesitic to dacitic fragments, also fairly extensive patches of chlorite matrix. Tuff fragments of the type seen in 0915 and 0745 are also present.

KR0020 crystal lithic tuff; of mainly acid composition, subordinate clastic fragments (transitional to greywacke)

Field comment: crystal lithic tuff, felspar, quartz

This rock consists of a fairly tightly packed aggregate of lithic fragments of variable clastic to volcanic composition, and of relatively independent pyroclastic quartz crystals (30 %), lesser plagioclase crystals (7 - 10%). Size of these components varies from 0.1 to 5 mm, albeit the aggregate is fairly well sorted, and locally is vaguely bedded.

About 40 of the fragments consist of rhyolite, and rhyolitic glass, weakly porphyritic in quartz. These are variably sericitised and silicified. Clastic fragments include shale, metaquartzite and sericitic-siliceous silt-stone, the latter being difficult to differentiate from acid volcanic groundmass. There are no intermediate or basic rock fragments.

Chloritic and sericitic clays of undertain origin form most of the matrix (15-20%).

The inclusion of minor clastic fragments suggests that this facies is transitional to a tuffaceous greywacke.

KR0026A           volcanogenic chert; possibly ignimbritic or  
                  high level volcanic exhalative

Field comment:   porphyry, intrusive dyke

This rock consists essentially of a mass of cryptocrystalline silica (chert), which grades imperceptibly into fairly abundant scattered patches of diffuse microcrystalline chalcedonic quartz which may give rise to a pseudo porphyritic texture noted in field comment.

This siliceous mass is cut by an extensive random network of fine fractures variably mineralised by clouded magnesite and/or siderite. Small (0.1 mm) fairly discreet grains of quartz, magnesite, sericite and feldspar are scattered in accessory abundance.

Vague shard-like textures are poorly preserved.

Objectively this rock is interpreted to consist essentially of devitrified siliceous glass, and in view of relict textures, may be classified as an ignimbritic chert. Considering the apparent intrusive dyke field occurrence however, it may be considered as volcanic exhalative silica, of siliceous sinter type, in a high level aphophyse.

KR0052 Tuffaceous lithic greywacke

Field comment: cleaved crystal tuff; felspar, grey mineral? rock with strong foliation possibly indicative of a fault

This rock consists of a random aggregate of mainly clastic rock fragments, minor single quartz grains of indefinite origin and minor volcanic rock fragments. The matrix (15-20%) consists of extremely fine detritus of similar composition to the coarser grains mixed with variable concentrations of chlorite, clays and sericite.

The most abundant fragments consist of metaquartzite, then sericitic siltstone and shale. Minor fragments of "chert" may be compared with 0026A. Volcanic rock fragments consist mainly of silicified rhyolite, and chloritic-felsic groundmass of intermediate (andesitic) composition.

Fine grains of magnetite are scattered, and the rock is weakly magnetic.

This rock is composed partly of pyroclastic detritus, however, the dominance of clastic lithic components, and quartz grains of not specifically volcanic origin, together with 15-20% matrix, suggest that the rock is best classified as a tuffaceous lithic greywacke, rather than a tuff. Although some individual fragments are sheared and stressed, there is no gross foliation or deformation indicative of proximity to a fault.

KR0059A highly porphyritic pyroxene microdiorite (intrusive) with a chilled margin of potassic, virtually non-porphyritic "andesite"

Field comment: green fine-medium intrusive intermediate rock, grey mineral?

This rock consists of a highly porphyritic pyroxene micro-diorite gradational into a relatively potassic equivalent of the groundmass phase of that rock type.

077

In the porphyritic domains, euhedral crystals of andesine and subordinate clinopyroxene are crowded with vague common flow orientation within a relatively very minor groundmass of argillised plagioclase microlites and interstitial chlorite. The fine crystalline domain, conceivably a chilled margin, consists of plagioclase microlites within an interstitial poorly defined matrix of chlorite mixed with ? potassic glass (largely indicated by staining).

The rock appears to represent a small probably high level, dyke-like intermediate intrusive.

KR0141 rhyolite porphyritic in plagioclase;  
extensive argillic-carbonate alteration

Field comment: massive pink porphyry, rhyolitic

Macroscopically this is very similar to 0643, in thin section it is also similar although plagioclase phenocrysts are smaller, fewer, and tend to be aligned along a flow direction clearly manifest in the groundmass.

Euhedral phenocrysts of plagioclase (20%) and minor fairly coarse single flakes of biotite (5%) are virtually completely replaced by clays and minor carbonate (?magnesite). They are scattered with similar orientation through a cryptocrystalline groundmass of altered potassic-siliceous glass, and ghost-like relicts of plagioclase microlites replaced by clays and carbonate. Accessory crystals of magnetite are scattered. There are no quartz phenocrysts.

078

KR0152 sheared, tuffaceous (lithic), carbonate-shale facies?

Field comment: cleaved, sericitic, lithic crystal tuff

About 40% of this rock consists of a cleaved-out matrix of clays crowded with abundant streaky foliae of sericite.

Abundant grains, attenuated and/or lenticular patches of carbonate micromosaic (25-30%) of ? sericitic shale (25%) and minor fragments of fine tuff, chert and andesite are scattered, more or less along the foliation. There are virtually no free crystals.

The carbonate appears to be ankerite and some siderite, possibly minor magnesite. There is no clear evidence that it replaces a former mineral or rock, but rather seems to be crystalline carbonates in its own right; possibly a volcanogenic exhalative product, possibly a chemical sediment.

The volcanic rock fragments constitute the only real evidence of a tuff component, however the sheared matrix may have originally been glass.

A tentative interpretation is that this rock is a sheared and silicified tuffaceous, carbonate-shale facies.

KR 0240 (biotite plagioclase) crystal ash tuff;  
or possibly a tuffaceous sericitic siltstone;  
sheared and sericitised.

Field comment: lithic crystal tuff, feldspar and biotite

This rock is dominated by a sheared and altered extremely fine matrix composed of abundant shredded streaks of sericite through a mixture of clays and ultrafine quartz. Some cuticular streaks of relatively concentrated sericite are present.

Coarse flakes of oxidised biotite (10-15%), and completely argillised feldspar crystals (10%), measuring up to 0.1 x 1.5 mm, are evenly scattered with generally similar orientation to the "schistosity". Accessory euhedral crystals of magnetite (5-7%) are disseminated. Minor lithic fragments of shale (5-7%) and fine quartz sand grains are also evenly distributed.

The precise genesis of this rock is not absolutely clear. It seems most likely to be a very fine (ash fall) tuff, sheared and sericitised. Alternatively, it may be a highly tuffaceous sericite siltstone.

KR0260 lithic (tuffaceous) quartz greywacke

Field comment: sandstone with shale fragments

This is a fairly homogeneous massive aggregate of subrounded to subangular single crystal quartz grains (40%), lithic fragments (30-40%), average and fairly consistent size about 0.6 mm.

Most quartz grains have relict "phenocryst" subrounding and embayments. Most fragments consist of variable proportions of chert, clays, sericite, microcrystalline quartz mosaic. These may be variably interpreted as shale, sericitic siltstone, sericitised acid volcanic groundmass, or sericitised feldspar crystals.

The matrix (20%) has a similar composition to the fragments, and grades imperceptibly into them.

KR0308 extensively brecciated glassy rhyolite, invaded and partly replaced by epithermal silica

Field comment: siliceous, porphyry, rhyolitic, feldspar shows perlitic texture. Near a fault?

This rock, (and its history) is essentially the same as 0695. It is a fairly extensively brecciated, flow textured glassy rhyolite, weakly porphyritic in small euhedral plagioclase crystals and accessory coarse biotite. Staining indicates the strongly potassic composition of the glass.

The abundant random fractures are filled by microcrystalline to cryptocrystalline quartz of epithermal,, probably volcanic exhalative origin. This quartz also replaces most phenocrysts.

KR0339 andesite lava, porphyritic in (altered)  
plagioclase; complete chlorite-clay  
alteration of groundmass

Field comment: pink/green crystal tuff

This is a lava rather than a tuff. Phenocrysts of euhedral plagioclase (30-35%) ranging in size from 0.5 to 3 mm, and some clumps of these, are evenly disposed through a clouded microcrystalline groundmass. They are extensively replaced by extremely fine clay, sericite and chlorite; also by voids suspected of being secondary carbonate now removed by leaching.

The groundmass is fairly homogeneous and vaguely flow textured. It consists of minute plagioclase and mafic microlites completely replaced by an admixture of clays and chlorite.

Accessory remnants of magnetite and hornblende are present.

KR0675 lithic tuff, composed essentially  
of fragments of sericitised and  
argillised felsic glassy lava

Field comment: pink/green sericitic crystal tuff

A loosely packed random aggregate of lithic fragments up to 12 mm across from about 60% of this rock. They consist of variable amounts of ultrafine clay, sericite, silica, leucoxanitic and/or carbonate alteration products almost certainly after felsic-siliceous glassy lava. (similar in fact to sample 0784 from Area 2).

081

Very small (0.2 mm) quartz and completely altered plagioclase phenocrysts, and small fragments of one groundmass variant in another confirms their volcanic rather than fine clastic genesis.

Several fragments of sericitic siltstone are present however.

The rock matrix consists of extremely fine volcanoclastic detritus of similar composition. There are insufficient single crystals to justify the term crystal tuff as suggested in field comment.

AREA 2

MT. TOR

KR0784 altered, non potassic, quartzo felspathic  
glassy lava

Field comment: porphyry with silica nodules

This rock consists of a homogeneous, diffuse, microcrystalline to cryptocrystalline mass of quartz intimately mixed with ultrafine clay-sericite. Minute, dustlike granules of ? secondary titania minerals are disseminated. A relict ultrafine texture of felted microlite is vaguely discernible, indicating the primary fluidal-lava nature of the pre-crystallisation melt, which appears to have been largely a quartzo-felspathic (but non-potassic) glass.

Sparse phenocrysts of quartz (<1 mm) and of argillised plagioclase (1-2 mm) are scattered.

KR0786 Heterogeneous, fine to medium grained  
pyroxene microdiorite, gradational to  
weakly potassic micro-dolerite.

Field comment: fine-medium grained intrusive basic  
or intermediate rock

This rock has patchy medium grained, crystalline domains grading into irregular fine grained areas of similar composition. Locally the texture is subophitic. The coarser patches consist of randomly interlocking plagioclase laths, in vaguely spherulitic arrangement, with minor clino-pyroxene, brown biotite and interstitial chlorite. Accessory cloudy potash feldspar is also more or less interstitial (apparently as a late enrichment phase) Laths of titaniferous magnetite have a random skeletal distribution.

The finer grained areas are essentially andesite, composed essentially of randomly interlocking plagioclase and interstitial chlorite, disseminated leucogenised magnetite.

083

KR0797 coarse (lapilli) vitric lithic tuff  
lava; composed largely of glassy rhyolite  
fragments.

Field comment: (agglomerate) ash flow crystal tuff,  
felspar, fiamme, porphyry fragments.  
An ignimbritic breccia

The petrography supports the heterogeneous  
pyroclastic character of this rock, which in a gross sense  
may be termed a coarse (lapilli) tuff.

Subangular fragments of rhyolitic, weakly  
porphyritic glassy lava, (some showing classical (micro)  
perlitic textures), measure up to 15 mm. These are randomly  
disposed through a matrix of diffuse cryptocrystalline quartz  
mosaic, crowded with shredded sericite, and very fine pyroclastic  
detritus, similar in composition to the coarser fragments.

Accessory single crystals, i.e., apart  
from enclosed phenocrysts, of quartz and plagioclase are randomly  
scattered, but not sufficient to justify the term "crystal"  
tuff.

The matrix is largely devitrified glass, but  
there are no shards or eutaxitic texture to justify the term  
ignimbrite. It does render the rock vitric, however, and the  
streaks of sericite indicate some flow. This lava characteristic  
combined with the fragmental composition indicates a tuff lava.

KR0811 quartz crystal lithic tuff, transitional to  
tuffaceous greywacke

Field comment: fine grained conglomerate

Field evidence suggests a clastic sedimentary facies,  
and certainly in some respects petrography indicates some similarities  
with the (finer) greywacke facies in Area 1 (0052 and 0260). However,  
it also has a similar texture and composition to some crystal lithic  
tuffs in Area 1, e.g., 0745, 0020.

It consists of an apparently bedded fairly tightly packed aggregate of single crystal quartz grains (ex phenocrysts), about 25% of the rock, together with larger (3 mm) lithic fragments of variably ultrafine siliceous, argillaceous, sericitic composition. Many of these are micro-porphyrific in quartz and are silicified glassy rhyolite. Others have the same composition as 0784. Minor shale and/or siltstone clasts are present.

The matrix is clay-sericite-chlorite but not quite sufficient (10-12%) to classify the rock as a wacke. Accessory grains of magnetite are scattered.

KR0832 (ash flow) lithic crystal vitric tuff

Field comment: cleaved ash flow crystal tuff

Irregular shredded patches of altered pumiceous glass, lesser weakly porphyritic glassy rhyolite, single pyroclastic plagioclase and lesser quartz crystals, are all randomly disposed through a matrix of cryptocrystalline silica. This silica also contains fine shredded streaks of chlorite clay-sericite.

It is essentially devitrified glass, and commonly grades imperceptibly into the fragments.

There is no genuine tectonic cleavage, although a vague foliation probably reflects primary flow. Otherwise the field identification is confirmed correct.

KR0432 felsic lava of rhyodacite or possible dellenite composition; minor amygdalae filled with deuteric chlorite

Field comment: massive porphyry, rhyolite

This has essentially the same micro texture, and very similar composition to 0643 in Area 1.

Small, pinkish phenocrysts of euhedral plagioclase (25-30%) and some clumps of these are evenly distributed through a cloudy, diffuse microcrystalline quartzo-felspathic groundmass.

Minor bright green chlorite pseudomorphs after small hornblende crystals, and minor small irregular amygdalae filled with the same chlorite are present. Accessory fine magnetite is scattered. Phenocrysts of quartz and potash feldspar are absent.

085

KR0437 (ash flow) lithic crystal vitric tuff

Field comment: siliceous porphyry, rhyolitic

This is a tuff almost identical in texture and composition to 0832.

It consists of poorly defined shredded (pumiceous) and perlitic textured glassy "fragments", minor plagioclase and trace potash felspar crystals, randomly disposed through devitrified glass matrix of cryptocrystalline silica.

KR 0538 vaguely layered vitric crystal lithic tuff

Field comment: lithic crystal tuff

This rock is very similar in texture and composition to 0641 from Area 1. It consists of a more or less bedded aggregate of volcanic rock fragments and subordinate single plagioclase crystals, within a discontinuously foliated matrix of clouded chloritic clays largely comprised of altered glass.

The fragments consist mainly of weakly porphyritic glassy rhyolite, their potassic nature which is highlighted by staining.

Accessory magnetite and titaniferous granules are disseminated. Some pumiceous fragments are indistinguishable from the altered glass matrix. Quartz crystals are very sparse, accessory possible oxidised siderite occurs locally.

KR 0474 breccia or blocky tuff, \* composed entirely of carbonated siliceous glass; disseminated pyrite

Field comment: vitric crystal tuff, felspar, sulphides

In this section a large block of altered glass 30 mm across with relict streaky wavy flow textures occurs within a mass of similar material, i.e., altered glass, but without such pronounced texture.

Both domains consist essentially of cryptocrystalline silica intimately mixed with carbonate, mainly ankerite or magnesite, locally enriched in iron to produce siderite. The carbonate occurs in diffuse patches and streaks, commonly following inherent flow textures.

Accessory fine pyrite is disseminated, and locally occurs in clusters. It tends to be associated with the carbonate.

NOTE: (\*Mr. Pontifex agrees that 'tuff' should read 'Lava').

KR0508 porphyritic rhyolite, with abundant quartz phenocrysts; all felspar completely argillised

Field comment: porphyry, rhyolitic, quartz, felspar

This rock contains more quartz phenocrysts (approx 15%) than any other sample in the suite - since in spite of the rhyolitic composition of many samples quartz phenocrysts are abnormally rare. Conceivably this facies is related to the provenance of the quartz greywacke and similar rocks.

These phenocrysts, typically rounded and embayed, measure up to 4 mm, and together with completely argillised felspar phenocrysts (10%), are randomly disposed through a microcrystalline quartzo felspathic groundmass. The felspar in this groundmass is also completely altered to clays.

087

AREA 3

Two Hummocks

KR0890 extensively altered ? glassy lava or extremely fine vitric tuff

Field comment: sericitic vitric crystal tuff

This is a massive virtually structureless, extremely fine grained rock, in thin section it is seen to consist largely of clays clouded by ? secondary titaniferous material. This contains abundant spicules and/or microlites of cryptocrystalline silica, which are variably disseminated and packed into a felted mass with similar flow alignment. There are no clear shard textures.

The rock is a volcanic, but there is insufficient objective petrographic evidence to classify it as a glassy lava or extremely fine vitric tuff.

KR0892 crystal, vitric ash flow tuff; vitric component typically altered to sericitic and chloritic clays

Field comment: sericitic ash flow crystal tuff

Poorly defined patches of fine shredded clay-sericite-cryptocrystalline silica and flame of chloritic-clays are scattered with similar orientation through a matrix of cryptocrystalline silica intimately mixed with ultrafine chloritic and sericitic clays. All of these components represent altered glass, the textures indicate a vitric ash flow.

Small euhedral plagioclase crystals (10-15%) completely altered to clay-sericite indicate a "crystal" contribution. Accessory titaniferous granules and small pockets of chalcedony are scattered. There is no ignimbritic texture.

APPENDIX 2

25th March, 1976.

FROM: S. GATEHOUSE

TO: M. ROGERS

ELEMENT SELECTION AND SAMPLING  
FOR LOONGANA STREAM SEDIMENT SURVEY

1. Cu, Pb, Zn only may be the most suitable technique when one expects "obvious" orebodies. We are also attempting to define prospective areas.
2. Other elements often associated with massive sulphides are As, Ba, Ag, Au and sometimes Sn.
3. Some elements associated with favourable horizons are Mn, (Fe), As, Zn, Ba.
4. These elements have different mobilities. Use of their mobilities allows better focussing onto targets.
5. Analysis of Fe allows some metals (Cu, Zn in particular) to be ratioed to iron. This can smooth the data (for example by removing some of the variable effect of SiO<sub>2</sub> dilution of samples).
6. High Mn levels in sediments allow the possibility of base metal scavenging and high base metals with high Mn should be interpreted with caution. Large areas of high Mn may reflect favourable chemical horizons.
7. Some elements (Cu, Zn, As) will be predominantly dispersed ionically. Others (Au, Sn, perhaps Ba) are likely to have a large clastic component. Use can be made of this difference in seeking the source.
8. The 1:5 analysis for Ba, Sn, Au is mainly based on cost of analysis. For Ba, Sn, As, Au a 1 in 5 sample should be sufficient for detection of anomalous sources. Their dispersion is principally clastic and thus they are less susceptible to flushing from the stream system, as may be the case with ionic type dispersion.
9. The limits of detection now available for metals such as Au and Sn are lower than prospectors panning techniques. If the area has been prospected by panning before they may have overlooked fine low level gold or tin trails.
10. Emission spec. analyses for Ba and Sn eliminates costly fusion digestions prior to an analysis by A.A.S. Ba detection limits for A.A.S. and Emission are comparable. Emission does not have any problems regarding the insolubility of Ba in solution. Bearing these factors in mind we consider the imprecision of this method can be tolerated.

The limit of detection for tin using emission spec. is 1 ppm versus XRF 20 ppm and A.A.S. 50 ppm. We regard this low detection as useful.

S. GATEHOUSE.

G.H. SHERRINGTON

c.c. K. WRIGHT

M.C. ROGERS

R.L. RICHARDSON

E.L. 2/76 - LOONGANA - STREAM SEDIMENT GEOCHEMISTRY

I have perused map sheets KT2/76, 1-4 inclusive, with sample locations, result tabulations for Cu, Pb, Zn, Ag, Au, Sn, As and Ba, plots of Pb, Zn, Cu and preliminary geology.

Tin

Spot values in the thousands of ppm in the -80 mesh fraction signify some tin potential. Although 1 in 10 only of the samples have been analysed for tin, it is possible to define an anomalous area (above 100 ppm tin, arbitrary cut-off) roughly bounded by the lines.

409,000E and 413,000E

5,418,200 N and 5,420,400 E

This area of about 10 square kilometers contains all tin values above 100 ppm and 8 values below 100 ppm which cluster into two lows. One of the lows, centered around 412,000 E, 5,419,500 N with a diameter of about 1 kilometer, contains the best lead expression (below).

On the basis of the geology given, and considering that stream sediment values are integrals over a drained area, no good correlation is possible between high tin and any particular rock type.

Action is understood to be in progress to close in with further tin analyses around the higher values. Assuming that these define more closely an anomalous zone, I would recommend a closer geological inspection combined with some panning to try to locate coarse cassiterite and a possible source. The tin geochemistry does not appear to correlate with any other element so pathfinders seem out.

Lead

You will probably have defined yourself the main anomalous areas for lead. A cumulative frequency plot of most of the analyses, done without regard to geology, gives a break at 110 ppm Pb which value ties in acceptably with past experience and mean + standard deviation criteria (mean 63, s.d. 33 for 297 samples).

The area considered most interesting is that cluster which has most anomalous values and this is centered around

412,000 E, 5,419,500 N

The ridge to the west of this drainage system, and the system itself, are considered to warrant more work.

A grid of roughly 1 km square is proposed, with lines cleared E-W at 100m intervals. The cost of this I understand to be about \$4,000.

Mr. Richardson should be asked to nominate which, if any, geophysical methods are appropriate. I would prefer some reconnaissance S.P. work before proceeding with geochemistry

090

The next geochemical step would involve taking soil samples at 50 metre intervals along each line with a hand auger (200 samples). These would be analysed for Cu, Pb, Zn, Ag, As. Any extra geological mapping input would assist on this grid.

This work should lead to the definition of a drilling target, if one emerges.

Zinc

One expects the dispersion of zinc to be greater than that of lead and hence it is less useful for a fine focus. A cumulative frequency plot of most of the samples did not give a classical pattern; there was some indication of a break at 100 ppm zinc. A mean of 84 and a standard deviation of 53 would tend to push the threshold up to about 140 ppm. There are about 50 samples above this value. Many occur with the lead anomaly above, and downstream from it. This can only reinforce the importance of this area as the first candidate for follow-up work.

Copper

I have no comment to make on copper levels apart from noting that although they are very low, the higher values may be shown in follow-up work to be significant.

Silver, Arsenic, Gold

There are no obvious anomalies. Two rock chip samples gave arsenic of about 0.5%; the arsenic might be dispersing in solution.

Barium

Virtually all values are reported as 1000, 2000 or 3000 ppm, probably reflecting an inappropriate analysis method. Barite is known to occur in the area. The results are not useful.

Iron, Manganese

Some correlation analysis of iron and manganese with base metals will be undertaken to see if they are secondary causes of enrichment. This will be reported shortly.

General

The so-called manganiferous shale from the Two Hummocks area shows very little manganese and some electrical conductivity. It is probably carbonaceous, and might serve as a marker for electrical methods of geophysics. It also contains visible galena (about 0.1%).

I feel that we should concentrate on the single area defined above to calibrate responses and obtain a feel for the country, rather than attempting follow-up of all anomalies at this time.

The stream sediment survey has been rewarding. I would be surprised if we did not develop some worthwhile targets.

GHS:ps

G.H. SHERRINGTON

091

APPENDIX 4

26th July, 1976.

G.H. SHERRINGTON

M.C. ROGERS

CORRELATION COEFFICIENTS - LOONGANA STREAM SEDIMENTS

All of the results were lumped together with no attempt to sort locations by geology. Correlation coefficients were taken between all pairs of elements.

All correlations were very low to insignificant. These were the four highest values:

Zn x Fe	+ 0.6080
Zn x Pb	+ 0.5520
Pb x Fe	+ 0.4135
Ba x As	- 0.3760

I would draw no definite conclusions from these data.

GHS:ps

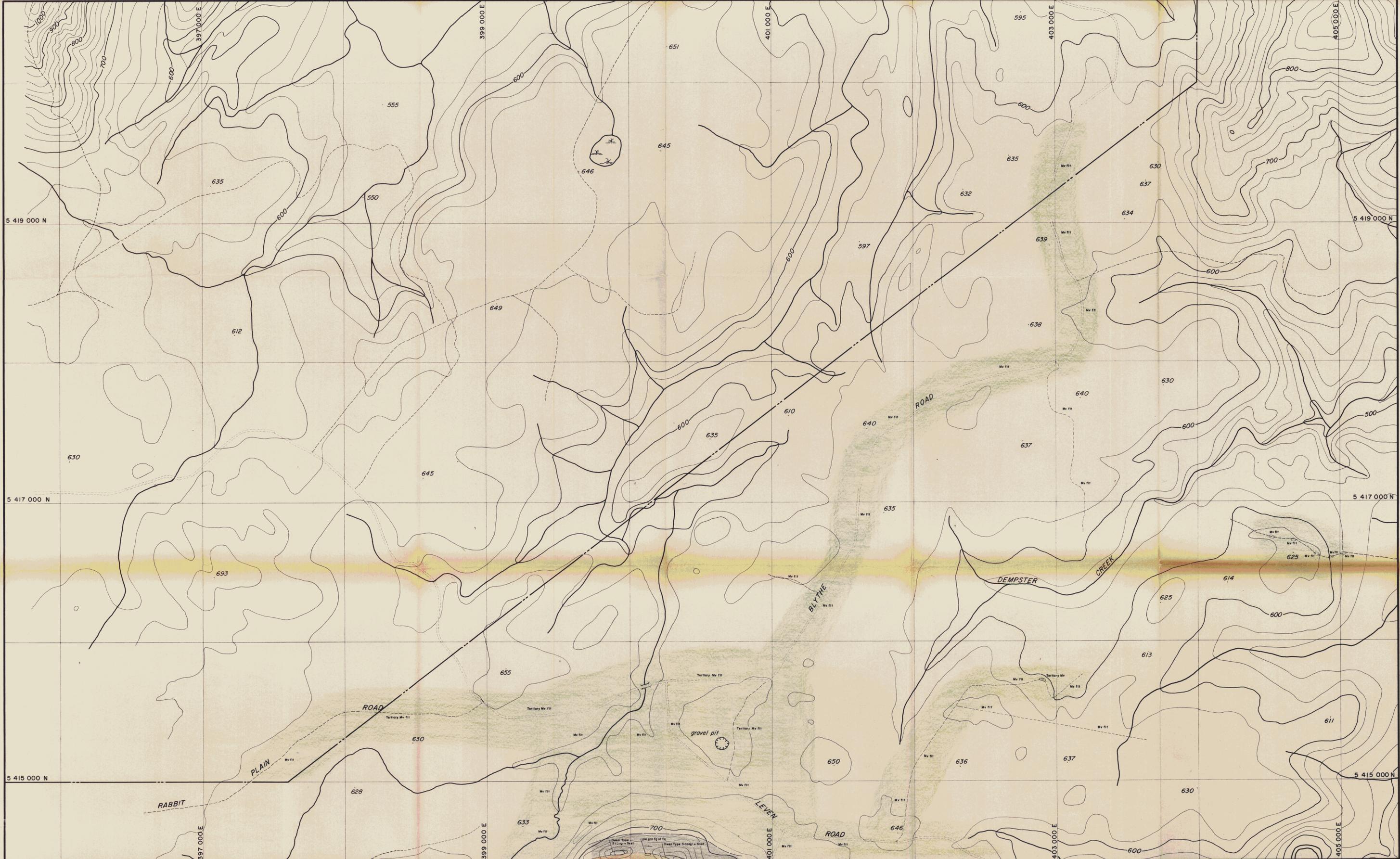
G.H. SHERRINGTON











**OPERATION OF LEGEND:** (following the Legend compiled by "E.Z. Co of ASIA Ltd.", dated 1975)

1. Capital letter - indicates primary classification eg. S - sedimentary rock, A - acid rock, M - basic rock

2. Lower case letters - indicate the following:

(i) Colour - eg. pa/pgr = pink feldspar in an acid igneous rock with a green matrix

(ii) Textural or structural features - eg. stA = crystal tuff of acid composition, eg. pA = porphyric acid rock, eg. oA = oxidized acid rock, eg. clvA = cleaved shale

3. As suffixes in progressive order:

(i) Category - eg. pA = rhyolite, eg. SAs = shale, eg. SAs = Intermediate rock of andesitic composition

(ii) Mineralogy - eg. pArl = porphyritic (rhyolite) with feldspar phenocrysts, eg. lat f/b = lithic crystal tuff with feldspar (phenocryst component) and biotite (prominent matrix component), eg. lat fA = lithic crystal tuff with (minor) feldspar crystals and (minor) quartz crystals.

**NOTE:**

Due to inexperience with the "Legend" some important deviations from the above system occurred in the mapping

(1) as first suffix - penetrative alteration eg. stA = sericitic lithic tuff, eg. stA = silicified crystal tuff

- major textural feature eg. og lat = conglomerate consisting of lithic fragments (major) and crystals (minor)

(2) as text suffix - textural features within the matrix eg. fA = flow banded (pArl fA)

- characteristic feature in matrix eg. chert, magnetite, sulphides and chlorite

**SYMBOLS:**

**IGNEOUS:**

A acid igneous unclassified

Ar rhyolite

Z intermediate igneous unclassified

IZ intrusive intermediate rock

mda dike

IZa diorite

M basic igneous unclassified

Mv basalt

Gr granite

**SEDIMENTARY:**

Ss shale

Sslt siltstone

Ssnt sandstone

Sqz quartzite

Sgk gneiss

Scong conglomerate

Slsk slate

Sgl glacial material

**STRUCTURAL AND TEXTURAL:**

l luff unclassified

lt lithic tuff

at crystal tuff

vt vitric tuff

ag agglomerate >32mm

fla flow

pm pumice

of ash flow

rs flow banding

pp porphyritic

wa waste

m massive

clv cleaved

ox oxidized

bed bedded

thb thin bedded

lms laminated

aph aphanitic

chert chert

frg fragments

chrt chert

int interbedded

flot float

**STRUCTURAL:**

oq outcrop limit

rb rubble boundary

me medium contact

da dike

u unconformity

ba basin

clv cleaved

f primary foliation

ma major schistosity

ap approx. boundary or trend

l line between pyroclastic and volcanoclastic (rich in clastic material, quartz)

**GRAIN SIZE:**

cg coarse grained

mg medium grained

fg fine grained

sp spherulitic

ch chert

fr fragments

hm hornblende

gn gneiss

pk pink

gr green

gy grey

**BLACK:**

blk black

pur purple

pie pale

dk dark

**SILICATE MINERALOGY:**

10-18 G Feldspar-quartz porphyry, felsic lavas, rhyolite, rhyodacite (pArlf), (pArlfa), (pArlff)

34 G Quartz porphyry, rhyolite (pArlg)

32 G Glassy (fine grained) lava with large siliceous spheroids (pArlf spher)

19-22 G Glassy banded porphyry dyke (pArla)

37 G Vitric crystal minor ashflow and brecciated lava. Extensive and penetrative CO<sub>2</sub> alteration (vst), (vt), (st)

48 G Volcanic breccia, subvolcanic lava, tuff lava

56 G Agglomerate and coarse lithic tuff (oglt), (oglat)

51 G Ashflow tuff (where more extensive)

41 G Lithic-crystal, crystal-lithic tuff, minor crystal and lithic tuff

40 G Volcanoclastic (lat fg), (lat fa), (Sgwk), (Scong)

**SULPHIDE MINERALOGY:**

sp pyrite

mag magnetite

hm hornblende

gn gneiss

**MISCELLANEOUS:**

1023 Thin Section and rock No.

**SEMI-QUANTITATIVE ROCK GEOCHEMISTRY (ppm)**

8 G Shale (Ssh), laminated shale (low Ssh), siltstone (Ssilt)

3 G Conglomerate (Scong)

57 UG ? Sandstone (Ssant), siltstone (Ssilt), conglomerate (Scong)

19-28 G Sandstone (Ssant)

23 G Limestone (Sslst)

19-35 G Siliceous chert (estabiolite)

19 G Basic intrusives - microdiorite (fmjD), (I2a)

16 TERT. Basalt (flow), (Mv)

106-2 DEV Granite - Mt. House (Gr)

**RESULTS:**

Kr

Cu

Pb

Zn

Mn

Sb

Ag

As (ppm)

As %

Sr

Ba (ppm)

Ba %

**SCALE:** 1:10,000

**DATE:** AUG. 1976

**GEOLOGIST:** M.C.R.

**DRAWN:** R.F.

**CHECKED:** M.C.R.

**E.L. 2/76**

**LOONGANA, TASMANIA**

**GEOLOGICAL MAP**

**1712**

**440099**

**90° 11' 40"**

**5 cm**

**KT2/76-1**

**KT2/76-2**

**KT2/76-4**

**KT2/76-3**

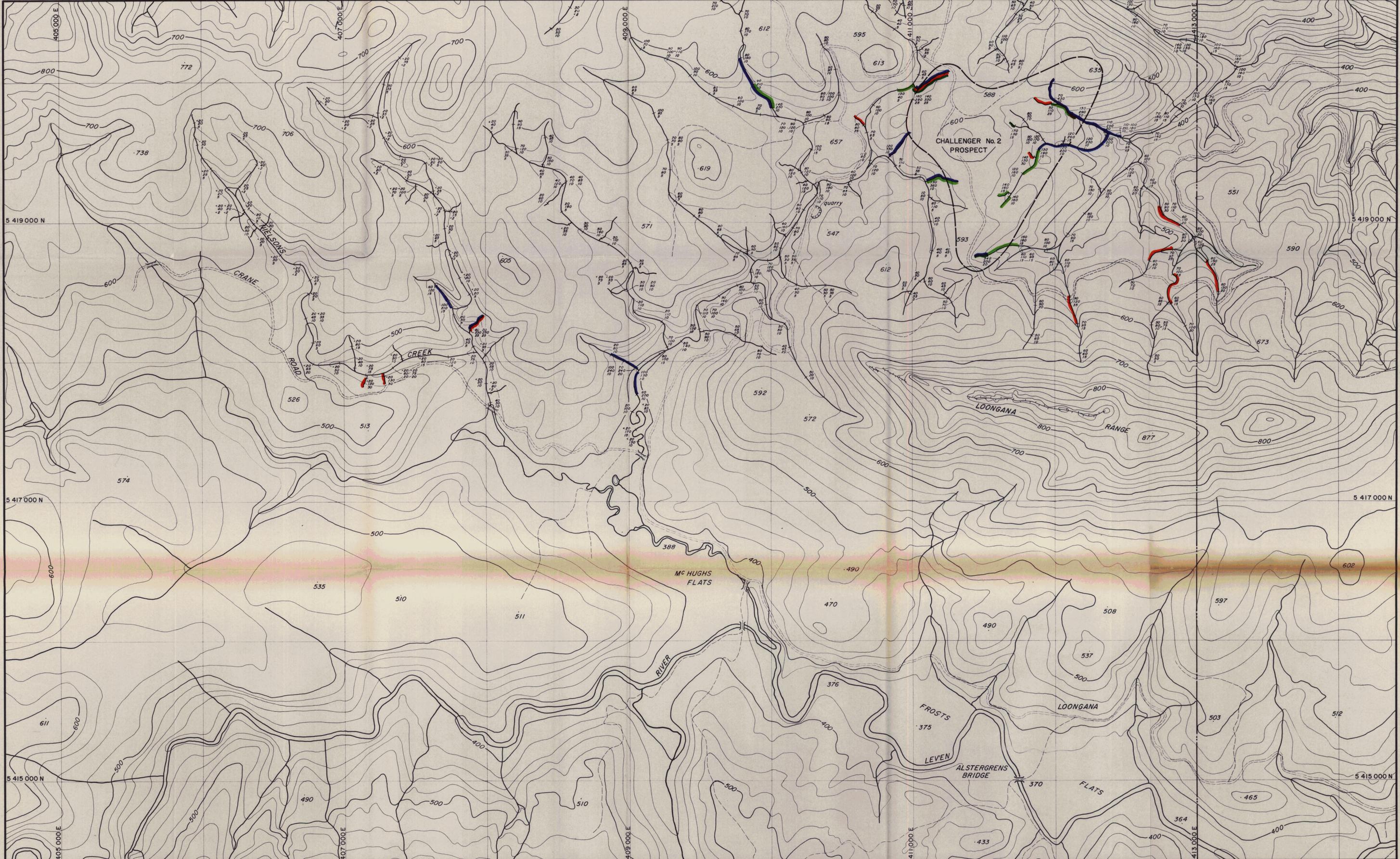
**90° 11' 40"**

**5 cm**

**1712**

**440099**





**LEGEND:**

**ANALYTICAL METHOD:** Pb, Zn, and Cu by AAS following hot conc. HClO<sub>4</sub> leach for 1 hour of 0.25g sample.

**Anomalous Values - Drainage Samples**  
(colour marked from sample location upstream to next location)

Lead > 150ppm (1% of total population)  
 150-199ppm (1% " " " " )  
 200-249ppm (1% " " " " )  
 250-299ppm (1% " " " " )  
 300-349ppm (1% " " " " )  
 350-399ppm (1% " " " " )  
 400-449ppm (1% " " " " )  
 450-499ppm (1% " " " " )  
 500-549ppm (1% " " " " )  
 550-599ppm (1% " " " " )  
 600-649ppm (1% " " " " )  
 650-699ppm (1% " " " " )  
 700-749ppm (1% " " " " )  
 750-799ppm (1% " " " " )  
 800-849ppm (1% " " " " )  
 850-899ppm (1% " " " " )  
 900-949ppm (1% " " " " )  
 950-999ppm (1% " " " " )  
 > 1000ppm (1% " " " " )

Zinc > 200ppm (3% " " " " )  
 200-249ppm (3% " " " " )  
 250-299ppm (3% " " " " )  
 300-349ppm (3% " " " " )  
 350-399ppm (3% " " " " )  
 400-449ppm (3% " " " " )  
 450-499ppm (3% " " " " )  
 500-549ppm (3% " " " " )  
 550-599ppm (3% " " " " )  
 600-649ppm (3% " " " " )  
 650-699ppm (3% " " " " )  
 700-749ppm (3% " " " " )  
 750-799ppm (3% " " " " )  
 800-849ppm (3% " " " " )  
 850-899ppm (3% " " " " )  
 900-949ppm (3% " " " " )  
 950-999ppm (3% " " " " )  
 > 1000ppm (3% " " " " )

Copper > 25ppm (2% " " " " )  
 25-49ppm (2% " " " " )  
 50-74ppm (2% " " " " )  
 75-99ppm (2% " " " " )  
 100-124ppm (2% " " " " )  
 125-149ppm (2% " " " " )  
 150-174ppm (2% " " " " )  
 175-199ppm (2% " " " " )  
 200-224ppm (2% " " " " )  
 225-249ppm (2% " " " " )  
 250-274ppm (2% " " " " )  
 275-299ppm (2% " " " " )  
 300-324ppm (2% " " " " )  
 325-349ppm (2% " " " " )  
 350-374ppm (2% " " " " )  
 375-399ppm (2% " " " " )  
 400-424ppm (2% " " " " )  
 425-449ppm (2% " " " " )  
 450-474ppm (2% " " " " )  
 475-499ppm (2% " " " " )  
 500-524ppm (2% " " " " )  
 525-549ppm (2% " " " " )  
 550-574ppm (2% " " " " )  
 575-599ppm (2% " " " " )  
 600-624ppm (2% " " " " )  
 625-649ppm (2% " " " " )  
 650-674ppm (2% " " " " )  
 675-699ppm (2% " " " " )  
 700-724ppm (2% " " " " )  
 725-749ppm (2% " " " " )  
 750-774ppm (2% " " " " )  
 775-799ppm (2% " " " " )  
 800-824ppm (2% " " " " )  
 825-849ppm (2% " " " " )  
 850-874ppm (2% " " " " )  
 875-899ppm (2% " " " " )  
 900-924ppm (2% " " " " )  
 925-949ppm (2% " " " " )  
 950-974ppm (2% " " " " )  
 975-999ppm (2% " " " " )  
 > 1000ppm (2% " " " " )

**Note:** The above assay subdivisions apply to only sheets 1B and 2B.

**NOTE:**  
This map has been compiled from enlargements of the Tasmanian Lands Department's aerial photo overlays.

DATE: AUG, 1976  
 GEOLOGIST: M.C.R.  
 DRAWN: R.F.  
 CHECKED: M.C.R.

**GEOPEKO LIMITED**  
 KING ISLAND GROUP 76-11 SL4

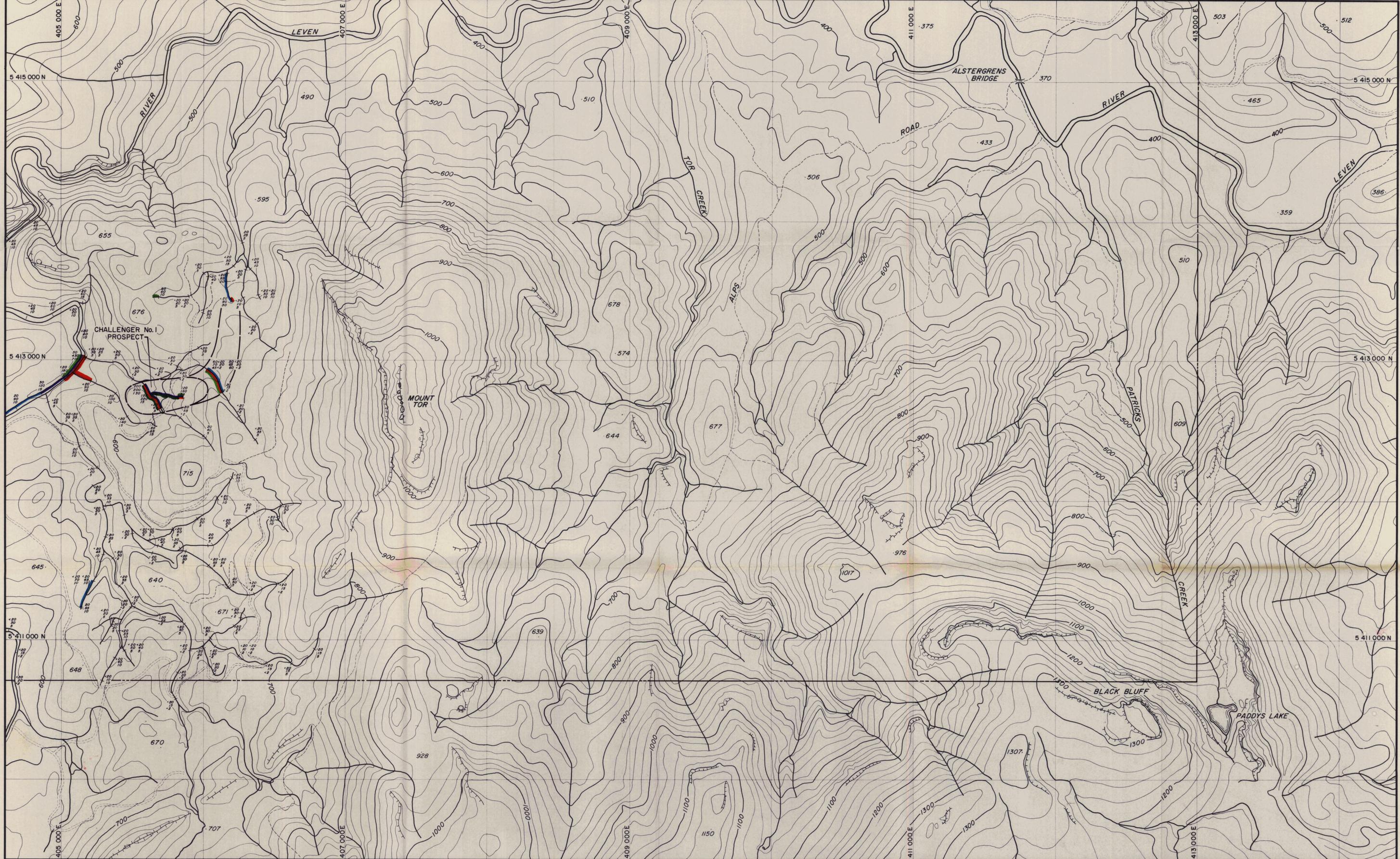
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No. KT2/76-2B

**E.L. 2/76**  
**LOONGANA, TASMANIA**  
**DRAINAGE GEOCHEMICAL RESULTS**  
**LEAD, ZINC and COPPER** 1714

KT2/76-1	KT2/76-2
KT2/76-3	KT2/76-4

440101



**LEGEND:**

ANALYTICAL METHOD: Pb, Zn, and Cu by AAS following hot conc. HClO4 leach for 1 hour of 0.25g sample.

Anomalous Values - Drainage Samples (colour marked from sample location upstream to next location)

Lead > 125ppm (1% of total population)  
50-124ppm (7% " " " )

Zinc > 160ppm (2% " " " )  
70-159ppm (20% " " " )

Copper > 160ppm (1% " " " )  
30-159ppm (3% " " " )

Note: The above assay subdivisions apply only to sheets 3B and 4B.

**NOTE:**  
This map has been compiled from enlargements of the Tasmanian Lands Department's aerial photo overlays.

DATE: AUG, 1976  
GEOLOGIST: M.C.R.  
DRAWN: R.F.  
CHECKED: M.C.R.

**GEOPEKO LIMITED** 76-11814  
KING ISLAND GROUP

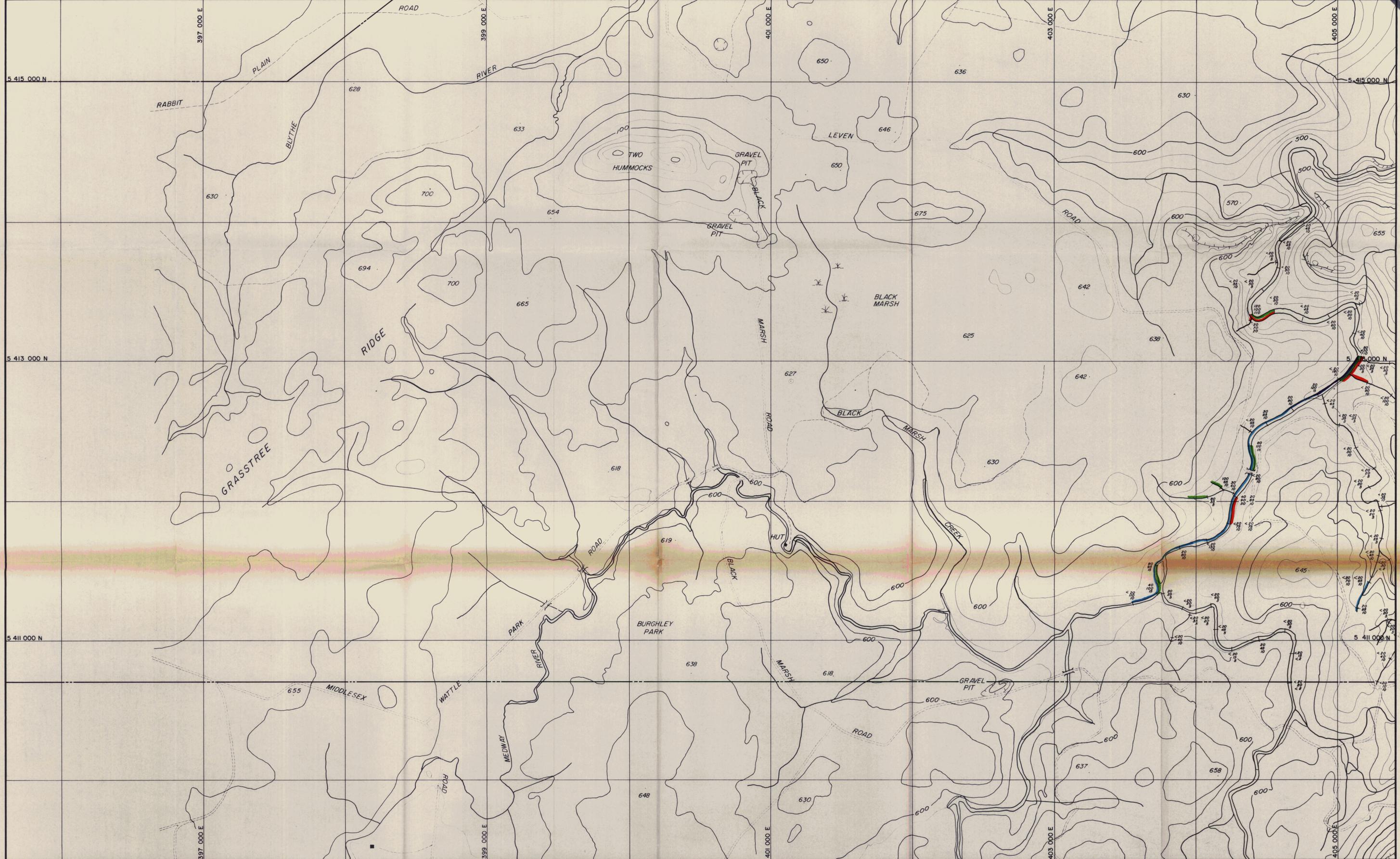
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**No. KT2/76-3B**

**E.L. 2/76**  
**LOONGANA, TASMANIA**  
**DRAINAGE GEOCHEMICAL RESULTS**  
**LEAD, ZINC and COPPER 1715**

KT2/76-1	KT2/76-2
KT2/76-3	KT2/76-4





**LEGEND:**

**ANALYTICAL METHOD:** Pb, Zn, and Cu by AAS following hot conc. HClO<sub>4</sub> leach for 1 hour of 0.25 g. sample.

**Anomalous Values - Drainage Samples**  
(colour marked from sample location upstream to next location)

Lead	> 125ppm	Green	(1% of total population)
	50-124ppm	Light Green	(7% " " " )
Zinc	> 160ppm	Blue	(2% " " " )
	70-159ppm	Light Blue	(20% " " " )
Copper	> 160ppm	Red	(1% " " " )
	30-159ppm	Light Red	(5% " " " )

*Note: The above assay subdivisions apply to sheets 3B and 4B.*

**NOTE:**  
This map has been compiled from enlargements of the Tasmanian Lands Department's aerial photo overlays.

**GEOPEKO LIMITED** 76-1184  
KING ISLAND GROUP

No. KT2/76-4B

SCALE: 1:10,000

**EL. 2/76**  
**LOONGANA, TASMANIA**  
**DRAINAGE GEOCHEMICAL RESULTS**  
**LEAD, ZINC and COPPER** 1716

KT2/76-1
KT2/76-2
KT2/76-3

DATE: AUG., 1976

GEOLOGIST: M.C.R.

DRAWN: L.G.

CHECKED: M.C.R.

SAMPLE NUMBER	GEOCHEMICAL RESULTS									
	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Fe %	Mn ppm	Au ppb	As ppm	Sr ppm	Ba ppm
0048	35	145	130	2	4.8	850				
0049	10	90	160	2	3.2	430				
0050	10	80	150	2	2.2	480				
0051	10	120	130	2	3.8	480				
0052	10	120	240	2	3.2	700				
0053	10	120	250	2	2.9	850				
0054	10	120	730	2	2.7	850				
0055	20	130	730	2	3.5	1600				
0056	10	70	530	2	2.8	1400				
0057	20	110	110	2	3.4	1300				
0058	15	70	150	2	3.1	900				
0059	10	70	170	2	2.5	1400				
0060	10	100	170	2	3.3	1400				
0061	15	70	160	2	2.8	1300				
0062	15	80	170	2	3.0	900				
0063	10	100	140	2	2.8	770				
0064	10	100	160	2	3.2	1000				
0065	15	100	160	2	3.2	1200				
0066	10	70	180	2	2.8	1100				
0067	10	140	130	2	2.2	800				
0068	10	70	180	2	2.6	700				
0069	10	100	120	2	1.6	1000				
0070	5	90	110	2	2.4	700				
0071	5	90	100	2	2.6	680				
0072	10	130	280	2	6.7	3300				
0073	10	100	70	2	2.7	1200				
0074	10	100	120	2	2.8	1100				
0075	10	140	140	2	2.4	450				
0076	10	140	130	2	2.2	800				
0077	5	80	120	2	2.6	1000				
0078	5	50	40	2	2.0	300				
0079	5	50	40	2	2.0	300				
0080	10	120	170	2	3.0	440				
0081	10	110	110	2	2.4	540				
0082	10	100	130	2	1.6	1700				
0083	10	120	120	2	6.3	3400				
0084	50	50	40	2	1.4	430				
0085	5	40	30	2	2.200	20				

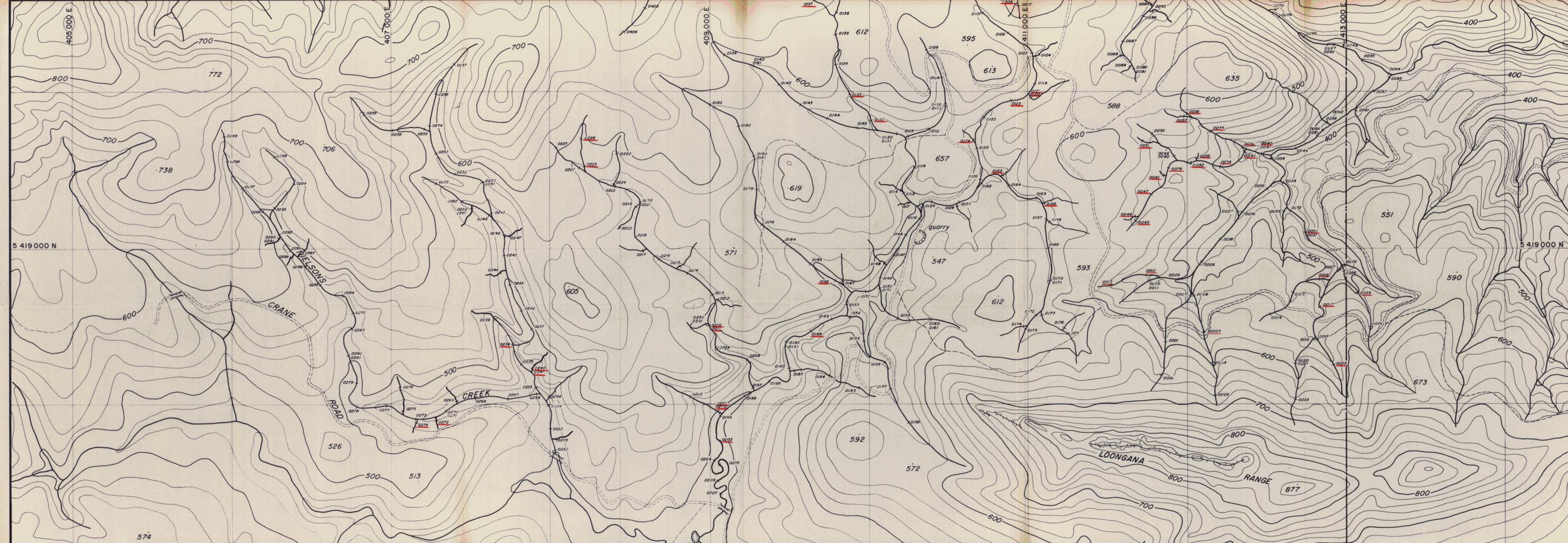
SAMPLE NUMBER	GEOCHEMICAL RESULTS									
	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Fe %	Mn ppm	Au ppb	As ppm	Sr ppm	Ba ppm
0086	5	50	25	2	2.600	170				
0087	5	110	100	2	2.1	1700				
0088	5	90	50	2	2.4	1270				
0089	10	80	90	2	1.8	850				
0090	5	70	85	2	2.400	230				
0091	5	80	70	2	1.9	330				
0092	10	80	50	2	2.8	580				
0093	2	80	20	2	1.900	10				
0094	5	60	40	2	1.32	180				
0095	10	80	20	2	2.7	750				
0096	10	80	120	2	3.0	1400				
0097	10	80	180	2	4.3	720				
0098	5	100	130	2	2.0	450				
0099	10	80	130	2	2.0	450				
0100	10	80	90	2	1.4	470				
0101	10	40	100	2	1.3	420				
0102	10	80	180	2	2.4	850				
0103	10	50	160	2	2.3	1150				
0104	5	70	150	2	1.1	1900				
0105	5	50	30	2	1.6500	130				
0106	5	40	40	2	1.5500	100				
0107	2	50	35	2	2.800	100				
0108	10	80	80	2	1.6	1300				
0109	10	80	95	2	2.1	1000				
0110	10	80	90	2	1.8	1100				
0111	10	80	100	2	2.0	1400				
0112	15	80	90	2	1.9	520				
0113	10	80	100	2	1.9	800				
0114	15	100	170	2	2.4	1100				
0115	5	60	45	2	1.3	200				
0116	5	120	220	2	2.4	2000				
0117	5	120	220	2	2.4	2000				
0118	5	130	40	2	1.6	1700				
0119	5	130	40	2	1.6	1700				
0120	5	130	40	2	1.6	1700				
0121	5	130	40	2	1.6	1700				
0122	5	130	40	2	1.6	1700				
0123	5	130	40	2	1.6	1700				
0124	5	130	40	2	1.6	1700				
0125	5	130	40	2	1.6	1700				
0126	5	130	40	2	1.6	1700				
0127	5	130	40	2	1.6	1700				
0128	5	130	40	2	1.6	1700				
0129	5	130	40	2	1.6	1700				

SAMPLE NUMBER	GEOCHEMICAL RESULTS									
	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Fe %	Mn ppm	Au ppb	As ppm	Sr ppm	Ba ppm
0130	10	40	100	2	1.5	340				
0131	10	90	180	2	2.4	1270				
0132	10	70	120	2	1.5	700				
0133	10	90	120	2	1.5	650				
0134	10	40	250	2	1.1	800				
0135	10	90	200	2	1.6	720				
0136	10	80	100	2	1.8	880				
0137	10	70	170	2	1.7	450				
0138	10	70	170	2	1.7	450				
0139	5	100	70	2	1.2	1250				
0140	10	90	100	2	1.6	480				
0141	10	90	110	2	1.4	400				
0142	10	100	90	2	1.4	1040				
0143	5	80	95	2	1.4	500				
0144	10	60	100	2	1.9	720				
0145	5	70	150	2	1.9000	210				
0146	10	120	150	2	2.2	900				
0147	5	80	80	2	1.1	520				
0148	5	80	80	2	1.1	520				
0149	5	80	80	2	1.1	520				
0150	5	80	80	2	1.1	520				
0151	5	80	80	2	1.1	520				
0152	5	80	80	2	1.1	520				
0153	5	80	80	2	1.1	520				
0154	5	80	80	2	1.1	520				
0155	5	80	80	2	1.1	520				
0156	5	80	80	2	1.1	520				
0157	5	80	80	2	1.1	520				
0158	5	80	80	2	1.1	520				
0159	5	80	80	2	1.1	520				
0160	5	80	80	2	1.1	520				

SAMPLE NUMBER	GEOCHEMICAL RESULTS									
	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Fe %	Mn ppm	Au ppb	As ppm	Sr ppm	Ba ppm
0161	5	20	25	2	1.5	340				
0162	5	20	30	2	1.5	340				
0163	5	20	30	2	1.5	340				
0164	5	20	30	2	1.5	340				
0165	5	20	30	2	1.5	340				
0166	5	20	30	2	1.5	340				
0167	5	20	30	2	1.5	340				
0168	5	20	30	2	1.5	340				
0169	5	20	30	2	1.5	340				
0170	5	20	30	2	1.5	340				
0171	5	20	30	2	1.5	340				
0172	5	20	30	2	1.5	340				
0173	5	20	30	2	1.5	340				
0174	5	20	30	2	1.5	340				
0175	5	20	30	2	1.5	340				
0176	5	20	30	2	1.5	340				
0177	5	20	30	2	1.5	340				
0178	5	20	30	2	1.5	340				
0179	5	20	30	2	1.5	340				
0180	5	20	30	2	1.5	340				

SAMPLE NUMBER	GEOCHEMICAL RESULTS									
	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Fe %	Mn ppm	Au ppb	As ppm	Sr ppm	Ba ppm
0181	10	20	120	2	1.85	420				
0182	10	20	90	2	1.58	360				
0183	10	20	90	2	1.58	360				
0184	10	20	90	2	1.58	360				
0185	10	20	120	2	1.55	420				
0186	10	20	70	2	1.55	420				
0187	10	20	70	2	1.55	420				
0188	10	20	70	2	1.55	420				
0189	5	20	65	2	1.6800	80				
0190	5	20	50	2	1.9000	150				
0191	5	20	100	2	1.24	440				
0192	5	20	20	2	2.900	25				
0193	5	20	20	2	2.900	25				
0194	5	20	20	2	2.900	25				
0195	5	20	20	2	2.900	25				
0196	5	20	20	2	2.900	25				
0197	5	20	20	2	2.900	25				
0198	5	20	20	2	2.900	25				
0199	5	20	20	2	2.900	25				
0200	5	20	20	2	2.900	25				

SAMPLE NUMBER	GEOCHEMICAL RESULTS									
	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Fe %	Mn ppm	Au ppb	As ppm	Sr ppm	Ba ppm
0201	5	20	50	2	1.12	620		</		



GEOCHEMICAL RESULTS										
SAMPLE NUMBER	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Fe %	Mn ppm	Au ppb	As ppm	Sr ppm	Ba ppm
0001	10	80	90	<2	1.95	900	<30	80	300	2000
0002	10	90	60	<2	1.56	1900				
0003	15	80	60	<2	2.4	1700				
0004	15	70	95	<2	2.4	1600				
0005	10	120	110	<2	3.9	1700				
0006	15	80	110	<2	3.3	1200				
0007	15	60	80	<2	1.95	600				
0008	15	70	90	<2	2.3	850				
0009	10	80	100	<2	1.80	900				
0010	15	60	110	<2	2.5	900				
0011	15	320	180	<2	2.3	900	<30	<5	1000	2000
0012	20	330	200	<2	2.6	1200				
0013	10	50	70	<2	2.1	500				
0014	10	60	80	<2	2.3	850				
0015	10	70	95	<2	2.2	800				
0016	10	70	100	<2	3.9	1400				
0017	15	30	85	<2	3.2	1400				
0018	15	40	95	<2	2.7	1000				
0019	10	50	80	<2	3.1	800	<20	10	100	3000
0020	10	50	75	<2	3.3	800				
0021	5	50	50	<2	1.60	600				
0022	10	70	100	<2	3.0	1200				
0023	20	60	130	<2	2.6	1800				
0024	15	80	150	<2	2.6	2300	<30	<5	300	3000
0025	20	80	120	<2	2.6	1300				
0026	20	80	95	<2	2.7	900	<20	<5	300	3000
0027	20	80	110	<2	2.6	1100				
0028	20	80	100	<2	1.80	1000				
0029	15	70	110	<2	2.5	950				
0030	15	60	130	<2	3.1	1200	<20	<5	300	3000
0031	10	60	120	<2	2.1	500				
0032	20	80	150	<2	2.9	1900				
0033	10	60	100	<2	2.1	500				
0034	15	70	120	<2	2.5	900				
0035	10	60	120	<2	2.5	700				
0036	10	70	130	<2	1.75	900	<20	<5	300	3000
0037	10	80	120	<2	2.4	600				
0038	15	70	95	<2	2.3	800	<20	<5	50	1000
0039	10	110	210	<2	2.5	800				
0040	10	100	180	<2	2.3	800				
0041	10	100	180	<2	2.3	800				
0042	10	110	210	<2	2.8	1800				
0043	10	100	210	<2	2.7	1700				
0044	15	70	140	<2	3.1	750				
0045	15	70	140	<2	2.7	750				
0046	15	140	160	<2	3.9	1300				
0047	10	120	160	<2	2.7	800	<20	30	30	2000
0048	10	140	160	<2	3.4	850				
0049	10	90	160	<2	3.2	430				
0050	10	80	95	<2	2.2	800	<20	20	10	1000
0051	15	120	130	<2	3.8	480				
0052	10	120	230	<2	3.2	700				
0053	15	120	230	<2	2.9	950	<20	<5	100	2000
0054	10	120	230	<2	2.7	800				
0055	20	130	230	<2	3.5	1600	<20	<5	300	3000
0056	10	70	130	<2	2.8	1400				
0057	15	70	110	<2	3.4	1300				
0058	15	70	150	<2	3.1	900	<20	<5	300	3000
0059	10	70	170	<2	2.5	1600	<40	<5	300	3000
0060	10	100	170	<2	3.3	950				
0061	15	70	160	<2	2.8	1200				
CHECK 0070	5	95	120	<2	1.65	1000				
CHECK 0071	10	100	160	<2	2.4	800				
CHECK 0072	10	100	160	<2	1.8	1000				

**GEOPEKO LIMITED** 76-1184  
KING ISLAND GROUP

NOTE:  
This map has been compiled from enlargements of the Tasmanian Land Department's aerial photo overlays.

ANALYTICAL METHOD:  
Cu, Pb, Zn, Ag, Fe and Mn by AAS following hot conc. HClO<sub>4</sub> leach for 1 hour of 0.25g sample.  
Au by Special low level GRAAS.  
As by modified Gutzait method.  
Sn and Ba by Emission Spectrography Schemes, ES 2 and 5.

A.C.S. Laboratories Pty. Ltd.

DATE: AUG., 1976  
GEOLOGIST: M.C.R.  
DRAWN: R.F.  
CHECKED: M.C.R.

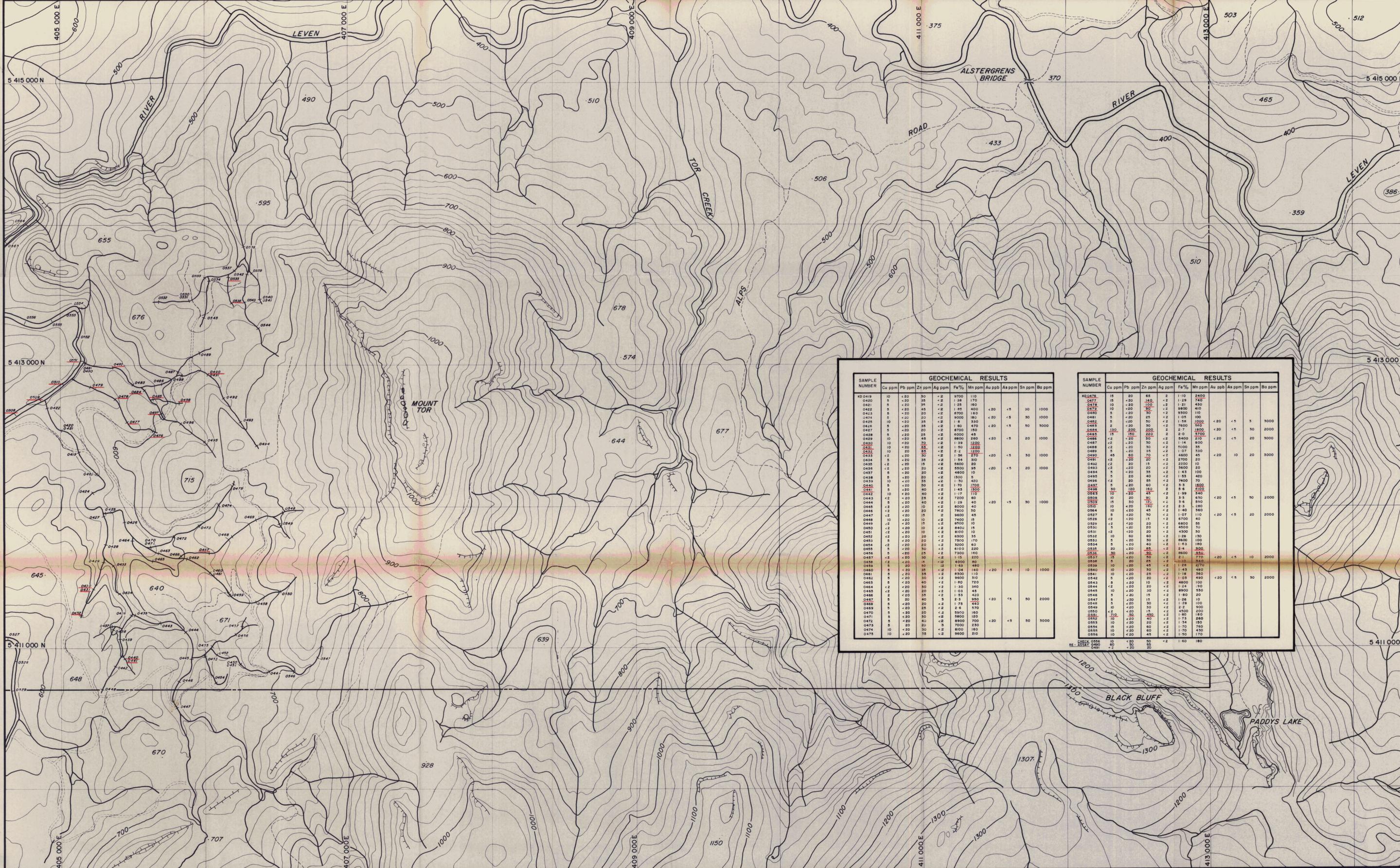
SCALE: 1:10,000

5 cm

**EL. 2/76**  
**LOONGANA, TASMANIA**  
**DRAINAGE SAMPLE LOCATION MAP**  
**WITH GEOCHEMICAL RESULTS**

1718  
KT2/76-1  
KT2/76-5  
KT2/76-4  
KT2/76-3

440105



SAMPLE NUMBER	GEOCHEMICAL RESULTS									
	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Fa %	Mn ppm	Au ppb	As ppm	Sn ppm	Bi ppm
KD 0419	10	<20	30	<2	9700	110				
0420	5	<20	35	<2	138	170				
0421	5	<20	35	<2	125	160				
0422	5	<20	45	<2	185	400	<20	<5	30	1000
0423	5	<20	20	<2	9700	160			30	1000
0424	5	<20	20	<2	9700	180				
0425	5	<20	35	<2	18	330				
0426	5	<20	35	<2	180	470	<20	<5	30	3000
0427	5	<20	20	<2	8700	350				
0428	5	<20	25	<2	6000	45				
0429	10	<20	45	<2	8700	350				
0430	10	<20	70	<2	139	1200	<20	<5	20	1000
0431	10	<20	85	<2	190	1200				
0432	10	<20	85	<2	190	1200				
0433	<2	<20	30	<2	156	370	<20	<5	30	1000
0434	5	<20	35	<2	154	30				
0435	<2	<20	15	<2	5600	30				
0436	<2	<20	20	<2	8500	35	<20	<5	20	1000
0437	5	<20	20	<2	4800	10				
0438	5	<20	20	<2	1200	5				
0439	10	<20	35	<2	130	420				
0440	5	<20	30	<2	170	2700				
0441	5	<20	40	<2	143	1300				
0442	10	<20	40	<2	117	110				
0443	5	<20	25	<2	7200	40				
0444	5	<20	40	<2	129	40	<20	<5	30	1000
0445	<2	<20	10	<2	8000	40				
0446	<2	<20	20	<2	7800	30				
0447	<2	<20	15	<2	9600	45				
0448	10	<20	10	<2	7400	15				
0449	<2	<20	15	<2	8100	10				
0450	<2	<20	10	<2	8400	15				
0451	<2	<20	15	<2	8100	10				
0452	<2	<20	10	<2	8300	35				
0453	5	<20	20	<2	7800	170				
0454	<2	<20	20	<2	3100	40				
0455	5	<20	30	<2	6100	220				
0456	5	<20	25	<2	7300	160				
0457	<2	<20	30	<2	115	220				
0458	<2	<20	15	<2	6900	80				
0459	5	<20	50	<2	183	480				
0460	5	<20	35	<2	104	140	<20	<5	10	1000
0461	5	<20	35	<2	8300	110				
0462	5	<20	30	<2	8900	30				
0463	5	<20	40	<2	180	720				
0464	<2	<20	30	<2	130	360				
0465	<2	<20	20	<2	103	45				
0466	2	<20	35	<2	153	420				
0467	5	<20	40	<2	213	350				
0468	5	<20	20	<2	175	440	<20	<5	30	2000
0469	5	<20	25	<2	216	570				
0470	5	<20	20	<2	5900	160				
0471	5	<20	30	<2	8900	20				
0472	5	<20	40	<2	8900	700	<20	<5	30	3000
0473	10	<20	20	<2	7000	150				
0474	10	<20	30	<2	8100	180				
0475	10	<20	35	<2	9600	210				

SAMPLE NUMBER	GEOCHEMICAL RESULTS									
	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Fa %	Mn ppm	Au ppb	As ppm	Sn ppm	Bi ppm
KD 0476	15	<20	65	<2	110	2400				
0477	15	<20	140	<2	128	740				
0478	10	<20	100	<2	121	430				
0479	10	<20	30	<2	8000	410				
0480	5	<20	30	<2	9500	110				
0481	5	<20	25	<2	105	100				
0482	5	<20	30	<2	158	1000	<20	<5	3	3000
0483	2	<20	30	<2	7600	560				
0484	130	200	200	<2	217	1800	<20	<5	30	2000
0485	15	150	220	<2	20	5700				
0486	<2	<20	30	<2	2400	210	<20	<5	20	3000
0487	<2	<20	30	<2	114	800				
0488	<2	<20	30	<2	7000	35				
0489	5	<20	35	<2	107	330				
0490	55	60	70	<2	600	45	<20	10	20	3000
0491	<2	<20	20	<2	4700	20				
0492	<2	<20	15	<2	2200	10				
0493	<2	<20	20	<2	3600	20				
0494	5	<20	35	<2	143	100				
0495	5	<20	40	<2	105	480				
0496	<2	<20	55	<2	7400	70				
0497	5	<20	60	<2	33	1800				
0498	30	120	160	<2	56	6100				
0499	10	<20	45	<2	199	340				
0500	10	<20	80	<2	33	430	<20	<5	50	2000
0501	15	30	120	<2	36	590				
0502	10	<20	45	<2	23	380				
0503	10	<20	45	<2	140	360				
0504	5	<20	10	<2	107	110	<20	<5	20	2000
0505	<2	<20	15	<2	6700	40				
0506	<2	<20	20	<2	4800	35				
0507	5	<20	20	<2	4900	30				
0508	<2	<20	10	<2	107	110				
0509	5	<20	30	<2	128	130				
0510	5	<20	30	<2	8600	100				
0511	5	<20	40	<2	153	160				
0512	10	<20	60	<2	128	130				
0513	5	<20	30	<2	8600	100				
0514	5	<20	40	<2	153	160				
0515	20	<20	85	<2	24	300				
0516	30	<20	25	<2	8900	250	<20	<5	10	2000
0517	15	<20	50	<2	21	770				
0518	5	<20	85	<2	110	350				
0519	10	<20	45	<2	128	270				
0520	10	<20	25	<2	43	480				
0521	10	<20	20	<2	118	360	<20	<5	30	2000
0522	10	<20	20	<2	103	490				
0523	5	<20	10	<2	4800	100				
0524	5	<20	20	<2	136	10				
0525	5	<20	15	<2	180	20				
0526	5	<20	15	<2	136	10				
0527	5	<20	30	<2	128	100				
0528	10	<20	30	<2	22	900				
0529	<2	<20	15	<2	4500	200				
0530	<2	<20	30	<2	80	430				
0531	10	<20	40	<2	173	280				
0532	10	<20	20	<2	134	180				
0533	15	<20	60	<2	170	760				
0534	10	<20	60	<2	170	830				
0535	10	<20	45	<2	150	170				

**GEOPEKO LIMITED** 76-1184  
KING ISLAND GROUP

NOTE: This map has been compiled from enlargements of the Tasmanian Lands Department's aerial photo overlays.

ANALYTICAL METHOD: Cu, Pb, Zn, Ag, Fe and Mn by AAS following hot conc. HClO<sub>4</sub> leach for 1 hour at 0-25g sample. Au by Special low level CRA/AAS. As by modified Gutzell method. Sn and Bi by Emission Spectrography Schemes, ES 2 and 3. A.C.S. Laboratories Pty. Ltd.

DATE: AUG., 1976  
GEOLOGIST: M.C.R.  
DRAWN: R.F.  
CHECKED: M.C.R.

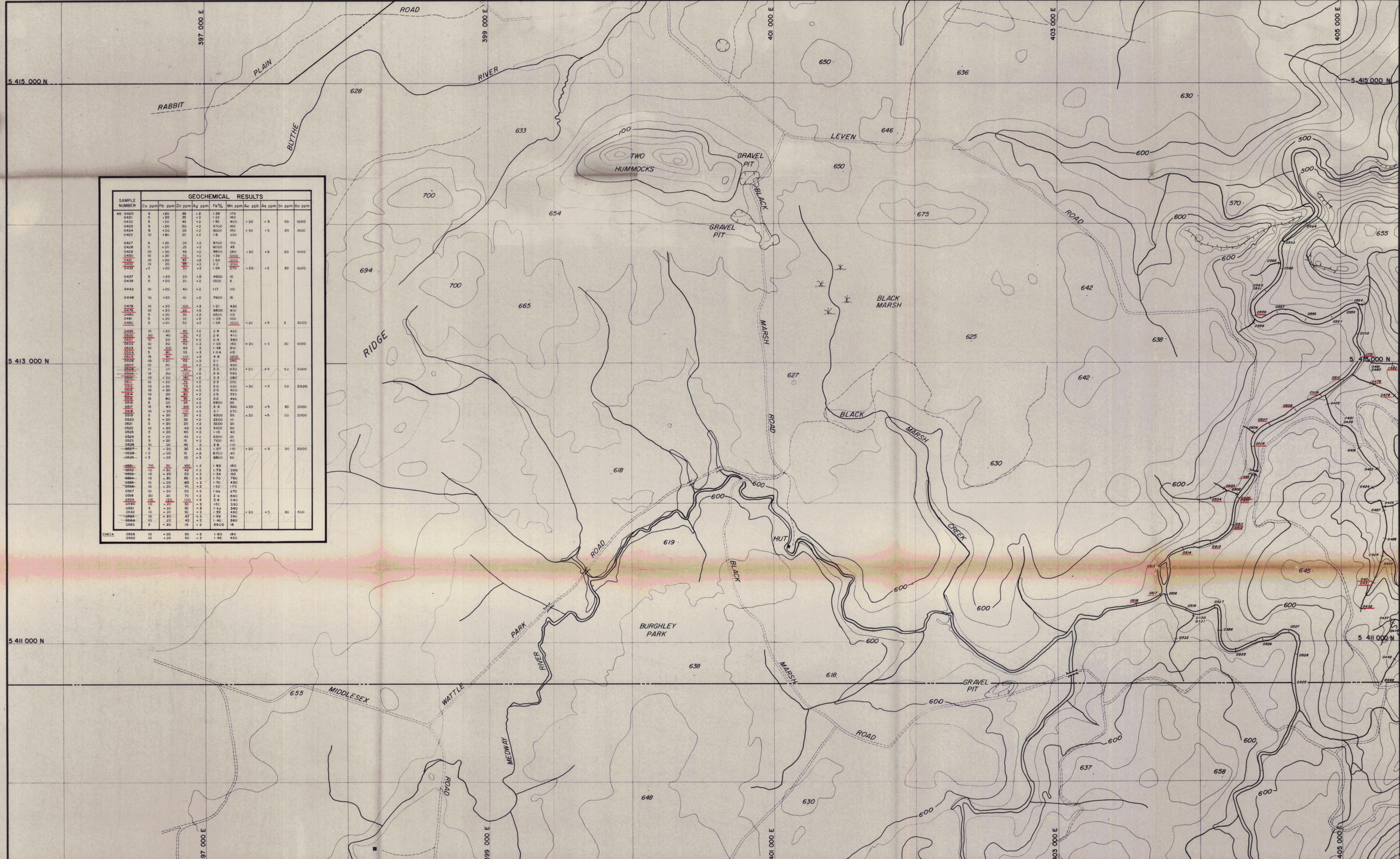
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EL. 2/76  
LOONGANA, TASMANIA  
DRAINAGE SAMPLE LOCATION MAP WITH GEOCHEMICAL RESULTS

No. KT2/76-3C  
1719  
KT2/76-1  
KT2/76-2  
KT2/76-3  
KT2/76-4

5 cm

440106



GEOCHEMICAL RESULTS											
SAMPLE NUMBER	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Fe%	Mn ppm	Au ppb	As ppm	Sn ppm	Bi ppm	
0420	5	<20	35	<2	1.38	170					
0421	5	<20	35	<2	1.23	160					
0422	5	<20	45	<2	1.80	400	<20	<5	30	1000	
0423	5	<20	20	<2	8700	190					
0424	5	<20	20	<2	1.8	330					
0425	10	<20	35	<2	1.8	330					
0427	5	<20	20	<2	8700	150					
0428	5	<20	25	<2	6000	45					
0429	10	<20	45	<2	8800	260	<20	<5	20	1000	
0430	10	<20	75	<2	1.39	2300					
0431	10	<20	65	<2	1.50	1300					
0432	10	<20	30	<2	2.2	1300					
0433	<2	<20	30	<2	1.56	270	<20	<5	30	1000	
0437	5	<20	20	<2	4600	10					
0438	5	<20	20	<2	1300	5					
0442	10	<20	40	<2	117	110					
0448	10	<20	10	<2	7400	15					
0479	10	<20	100	<2	1.21	430					
0479	10	<20	35	<2	9800	410					
0480	5	<20	30	<2	9300	110					
0481	5	<20	25	<2	1.08	100					
0482	5	<20	50	<2	1.38	1000	<20	<5	3	3000	
0499	10	<20	80	<2	2.8	420					
0500	10	<20	40	<2	2.6	410					
0501	10	<20	30	<2	2.0	380					
0502	10	<20	60	<2	1.08	160	<20	<5	20	1000	
0503	10	<20	60	<2	1.48	60					
0504	5	<20	55	<2	1.04	110					
0505	15	<20	110	<2	4.6	1000					
0506	10	<20	65	<2	2.1	390					
0507	10	<20	30	<2	3.0	490					
0508	10	<20	30	<2	3.3	630	<20	<5	50	2000	
0509	15	<20	120	<2	3.8	590					
0510	10	<20	180	<2	2.3	280					
0511	10	<20	75	<2	2.3	250					
0512	10	<20	75	<2	2.0	220	<20	<5	50	2000	
0513	10	<20	100	<2	2.0	400					
0514	10	<20	20	<2	2.5	330					
0515	15	<20	80	<2	3.2	490					
0516	5	<20	35	<2	6800	55					
0517	15	<20	100	<2	3.9	390	<20	<5	30	2000	
0518	10	<20	110	<2	3.1	270					
0519	5	<20	20	<2	8900	55	<20	<5	50	2000	
0520	5	<20	25	<2	2200	10					
0521	5	<20	20	<2	3500	20					
0522	10	<20	40	<2	5100	30					
0523	5	<20	60	<2	1.10	40					
0524	5	<20	45	<2	6300	35					
0525	5	<20	15	<2	700	110					
0526	10	<20	45	<2	2.8	110					
0527	5	<20	30	<2	1.07	110	<20	<5	20	2000	
0528	<2	<20	15	<2	6700	40					
0529	<2	<20	20	<2	6800	50					
0530	70	30	400	<2	1.80	160					
0531	10	<20	40	<2	1.73	260					
0532	10	<20	20	<2	1.34	80					
0533	15	<20	60	<2	1.70	760					
0534	10	<20	60	<2	1.70	430					
0535	10	<20	45	<2	1.50	170					
0537	10	<20	50	<2	1.99	270					
0538	20	<20	70	<2	2.4	440					
0539	10	<20	100	<2	2.8	540					
0540	10	<20	50	<2	1.50	330					
0541	5	<20	50	<2	1.32	240					
0542	10	<20	45	<2	1.59	460	<20	<5	30	500	
0543	10	<20	45	<2	1.99	240					
0544	10	<20	45	<2	1.40	380					
0545	5	<20	10	<2	3800	15					
CHECK	0546	10	<20	50	<2	1.80	180				
	0547	10	<20	50	<2	1.45	430				

NOTE:  
This map has been compiled from enlargements of the Tasmanian Lands Department's aerial photo overlays.

ANALYTICAL METHOD:  
Cu, Pb, Zn, Ag, Fe and Mn by AAS following hot conc. HClO<sub>4</sub> leach for 1 hour of 0.25g sample. Au by Special low level GRA/AAS. As by modified Gutzwiller method. Sn and Bi by Emission Spectrography Schemes, ES 2 and 3.

A.C.S. Laboratories Pty. Ltd.

GEOPEKO LIMITED  
KING ISLAND GROUP 76-1184

No. KT2/76-4C

SCALE: 1:10,000

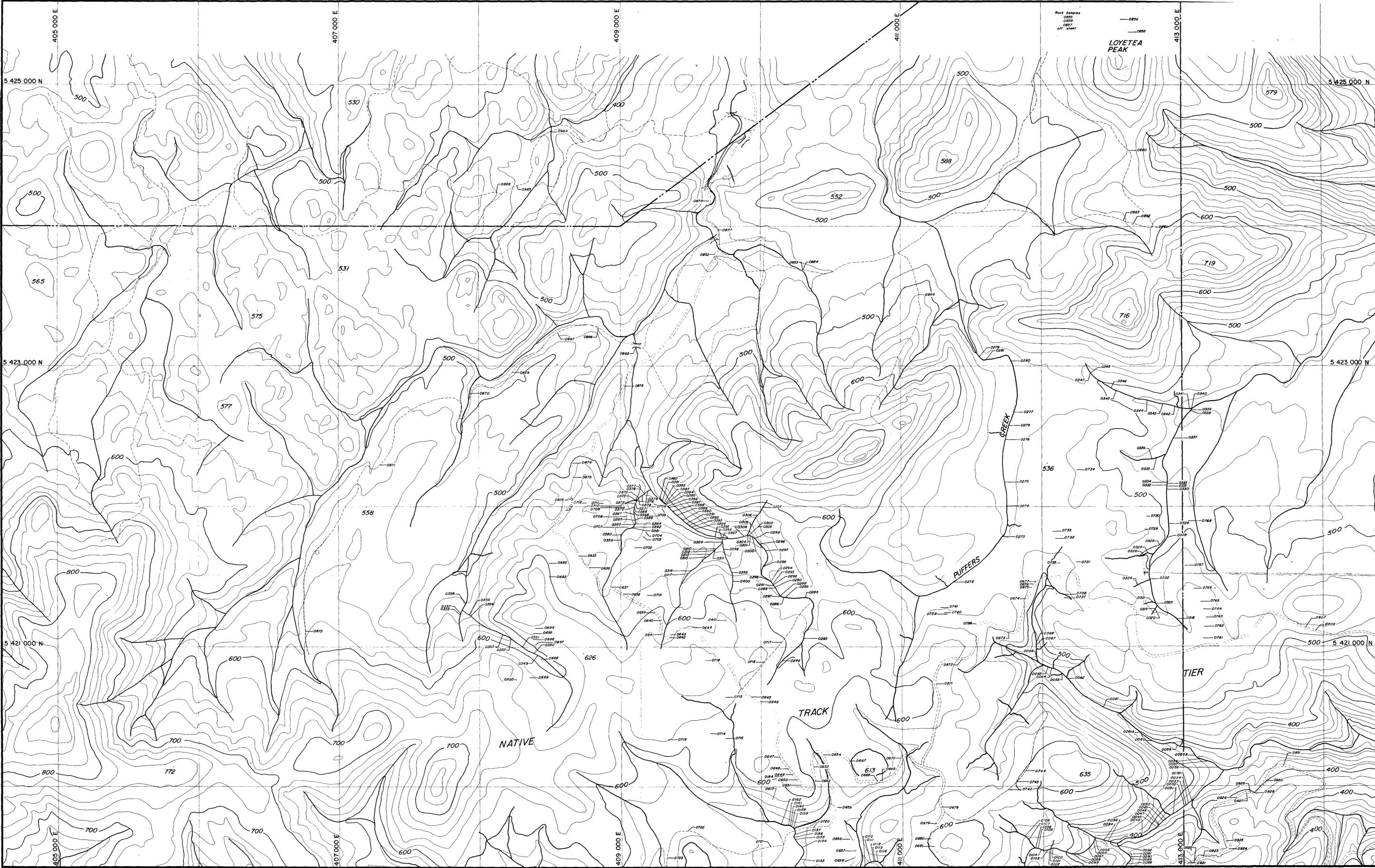
EL. 2/76  
LOONGANA, TASMANIA  
DRAINAGE SAMPLE LOCATION MAP  
WITH GEOCHEMICAL RESULTS

1720

KT2/76-1  
KT2/76-5  
KT2/76-2  
KT2/76-3

DATE: AUG., 1976  
GEOLOGIST: M.C.R.  
DRAWN: L.G.  
CHECKED: M.C.R.





Rock Samples  
0855  
0856  
0857  
off sheet

NOTE  
This map has been compiled from enlargements  
of the Tasmanian Lands Department's  
aerial photo overlays

DATE: AUG, 1976  
GEOLOGIST: M.C.R.  
DRAWN: L.G.  
CHECKED: M.C.R.

**GEOPEKO LIMITED**  
KING ISLAND GROUP

76-1184

No. KT2 / 76-1D

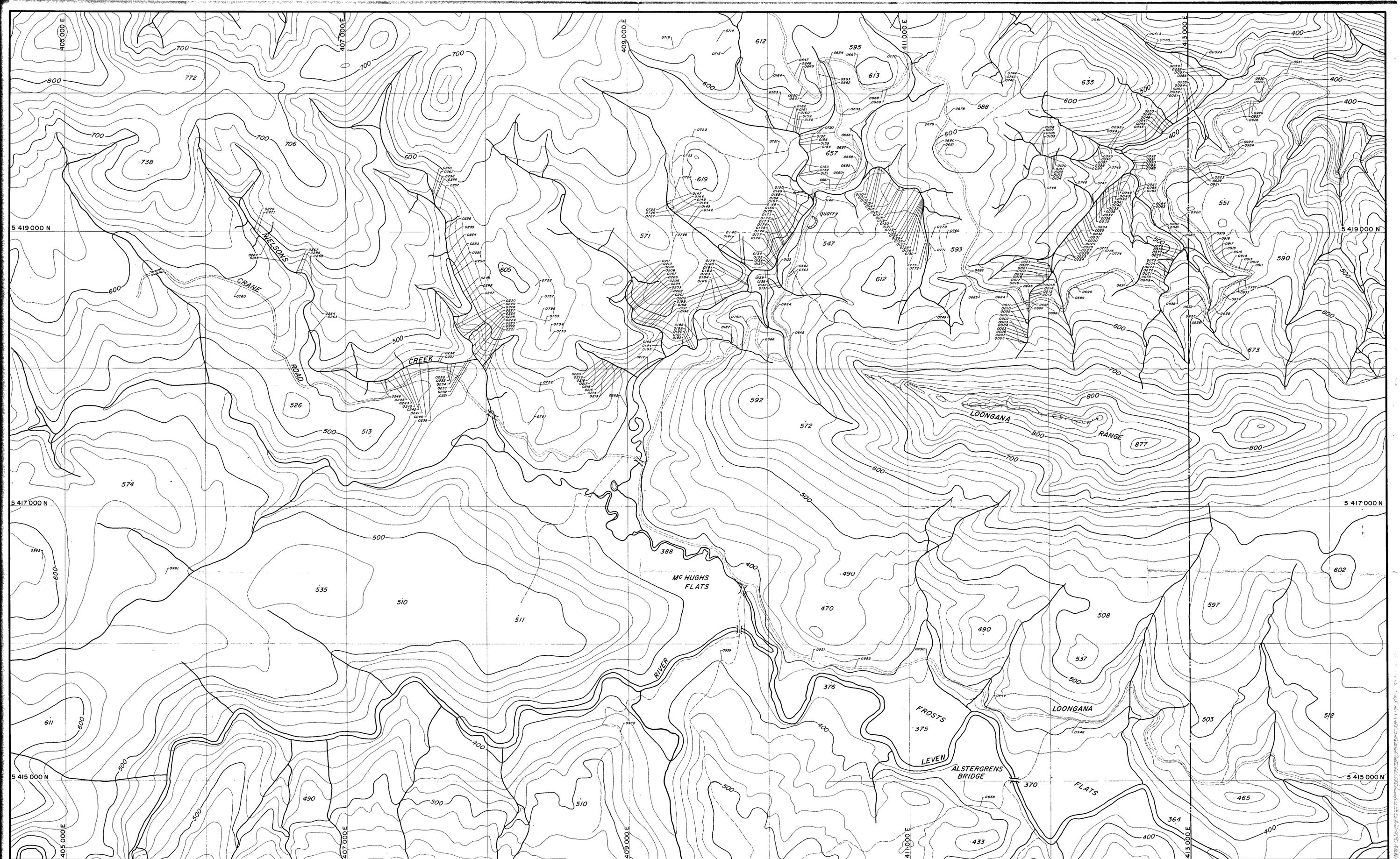
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E.L. 2/76  
LOONGANA, TASMANIA  
ROCK SAMPLE LOCATION MAP

1721

KT2/76-1	KT2/76-2
KT2/76-3	KT2/76-4

5 cm



NOTE  
 This map has been compiled from enlargements  
 of the Tasmania Land's Department's  
 aerial photo overlays

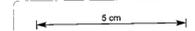


GEOPEKO LIMITED 76-1154  
 KING ISLAND GROUP

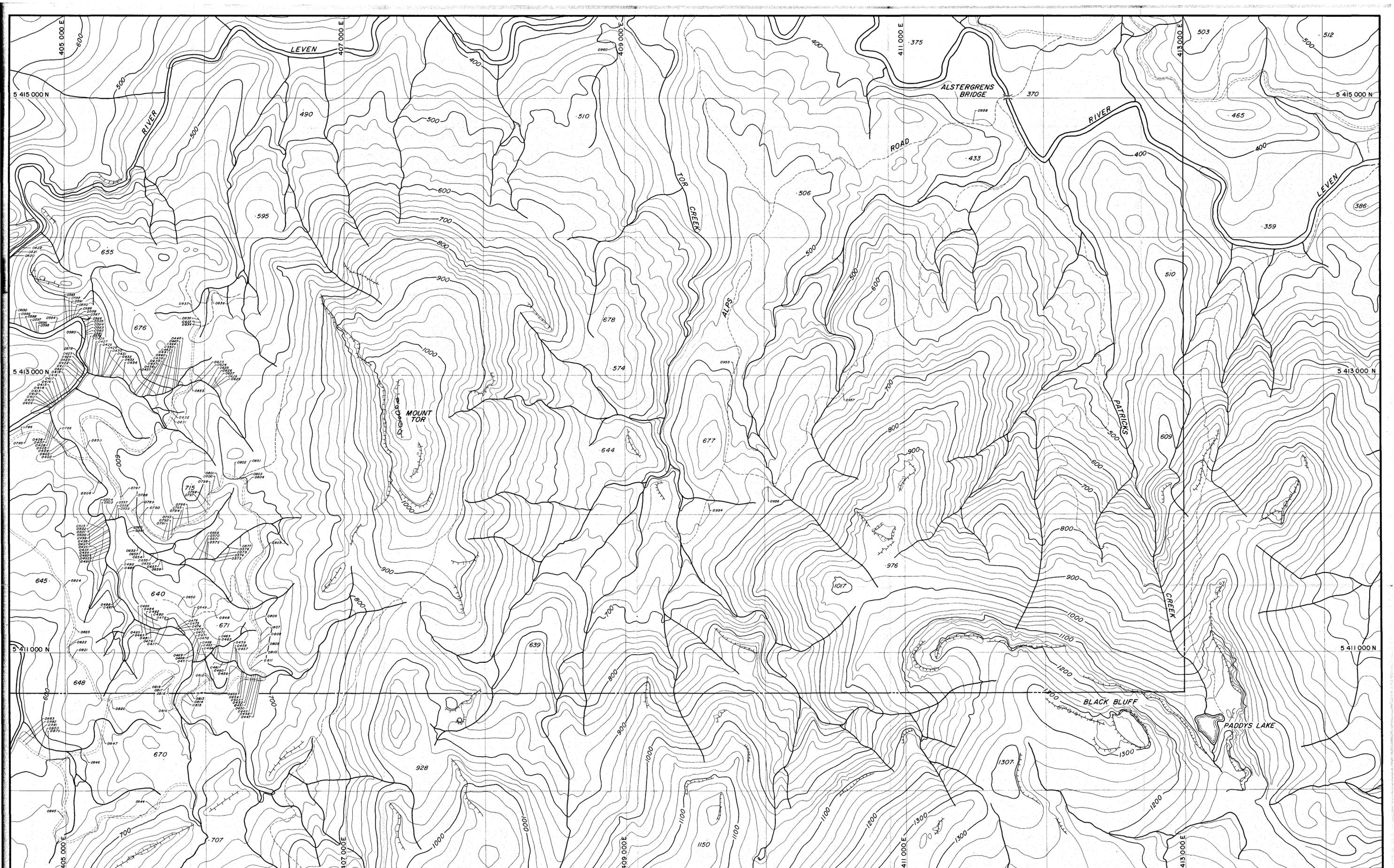
SCALE: 1:10,000 No. KT2/76-2D

DATE: AUG., 1976  
 GEOLOGIST: MCR  
 DRAWN: R.F.  
 CHECKED: MCR.

EL. 2/76  
 LOONGANA, TASMANIA  
 ROCK SAMPLE LOCATION MAP



1722  
 KT2/76-1  
 KT2/76-2  
 KT2/76-3  
 KT2/76-4  
 KT2/76-5



NOTE:  
This map has been compiled from enlargements  
of the Tasmanian Lands Department's  
aerial photo overlays.



DATE: AUG, 1976  
GEOLOGIST: M.C.R.  
DRAWN: R.F.  
CHECKED: M.C.R.

GEOPEKO LIMITED 76-1184  
KING ISLAND GROUP

No. KT2/76-3D

SCALE: 1:10,000

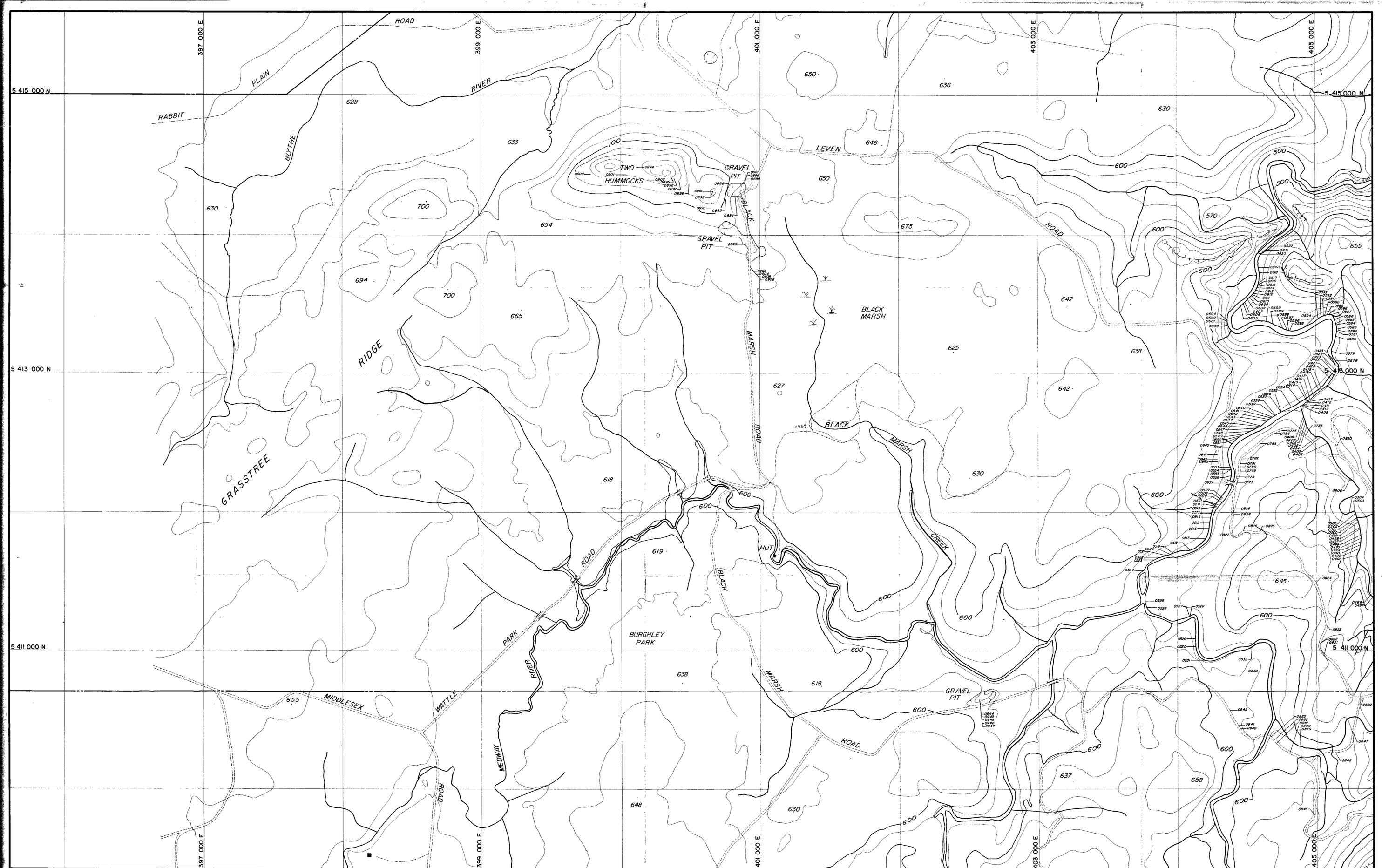
E.L. 2/76  
LOONGANA, TASMANIA  
ROCK SAMPLE LOCATION MAP

5 cm

1723

KT2/76-1	KT2/76-2
KT2/76-3	KT2/76-4

140110



NOTE  
This map has been compiled from enlargements  
of the Tasmanian Lands Department's  
aerial photo overlays



DATE: AUG, 1976  
GEOLOGIST: MCR  
DRAWN: LG  
CHECKED: MCR

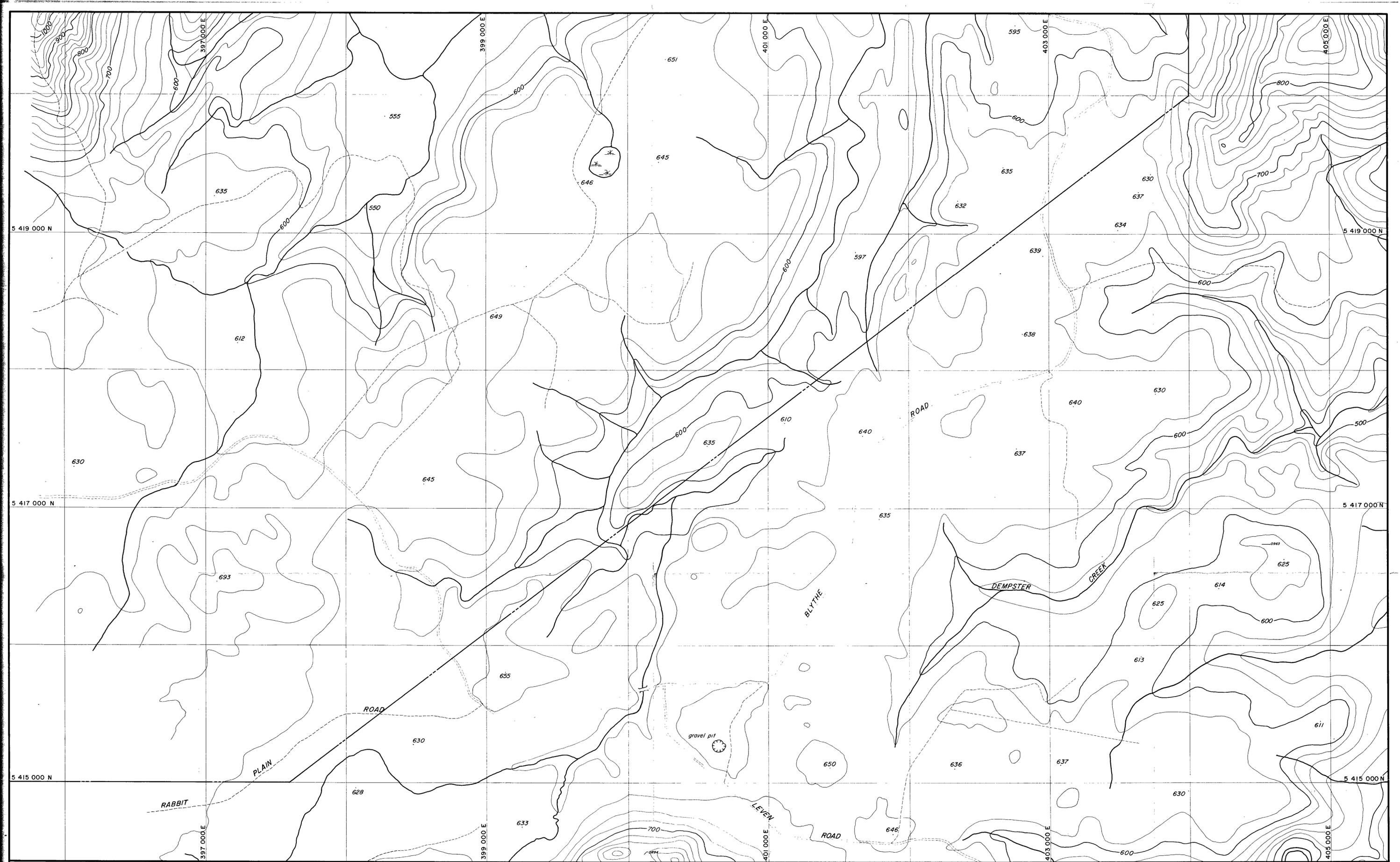
GEOPEKO LIMITED  
KING ISLAND GROUP 76-1184

SCALE: 1:10,000  
No. KT2/76-4D

E.L. 2/76  
LOONGANA, TASMANIA  
ROCK SAMPLE LOCATION MAP

1724  
KT2/76-1  
KT2/76-2  
KT2/76-3

5 cm



NOTE  
 This map has been compiled from enlargements  
 of the Tasmanian Lands Department's  
 aerial photo overlays



DATE AUG 1976  
 GEOLOGIST MCR  
 DRAWN: R F  
 CHECKED: MCR

GEOPEKO LIMITED  
 KING ISLAND GROUP 76-1182

SCALE: 1:10,000  
 No. KT2/76-5D

E.L. 2/76  
 LOONGANA, TASMANIA  
 ROCK SAMPLE LOCATION MAP

5 cm 1725

KT2/76-1	KT2/76-2
KT2/76-3	KT2/76-4