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RELINQUISHMENT REPORT ON

PART OF E.L. 10/74

BLACK BLUFF

T.C.R. 83-189

J. PEMBERTON

FEBRUARY, 1983

OPEN FILE

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CONTENTS

		Page
INTRODUCTION		1.
SUMMARY		2.
GEOLOGY		3.
GEOCHEMISTRY		6.
GEOPHYSICS		7.
CONCLUSION		8.
REFERENCES		9.
APPENDIX 1	Dighem II Survey of the Black Bluff Area, Tasmania by D.C. Fraser and Z. Dvorak.	

LIST OF FIGURES

Figure 1	Location Map
Figure 2	E.L. Boundary Map

LIST OF PLANS

		Plan No
Geological Map	Sheet KT 10/74 - 2A	1
	and part of - 3A	2
Drainage Sample Location Map	Sheets KT 10/74 - 1C	3
	- 2C	4
	and part of - 3C (1977)	5A
-80 Mesh Stream Sediment Sample Locations	Part of - 3F (1981)	5B
Drainage Geochemical Results Map		
Cu, Pb, Zn	KT 10/74 - 1B	6
Cu	KT 10/74-2B-1	7
Pb	-2	8
Zn	-3	9
Sn	-4	10
Cu	part of KT 10/74-3B-1	11
Pb	-2	12
Zn	-3	13
Sn	-4	14
Rock Sample Location Map	Sheet KT 10/74-2D	15
Dighem II Survey Results		
Resistivity	Sheet KT 10/74-1	16
Electromagnetics	Sheet KT 10/74-1	17
Enhanced Magnetics	Sheet KT 10/74-1	18
Magnetics	Sheet KT 10/74-1	19
Resistivity	Sheet KT 10/74-2	20
Electromagnetics	Sheet KT 10/74-2	21
Enhanced Magnetics	Sheet KT 10/74-2	22
Magnetics	Sheet KT 10/74-2	23
Resistivity	Sheet KT 10/74-3	24
Electomagnetics		25
Enhanced Magnetics		26
Magnetics		27

INTRODUCTION

The Black Bluff Exploration Licence 10/74 is held in Joint Venture by Geopeko, Aquitane Australia and Union Oil Development Corporation. Prior to this relinquishment the E.L. covered an area of 150sq km but has now been reduced to 52sq km (see Locality Map - Fig 1 and E.L. Boundary Map - Fig 2). The reduction has been established by moving the western boundary to AMG 410 000mE and the northern boundary to AMG 5 408 050mN.

Previous explorers in the area include Pickands Mather (1968), Tasminex (1973-74) and Union Oil (1974-75). Pickands Mather conducted regional and detailed stream sediment geochemistry, whilst Union Oil carried out further stream geochemistry combined with geological mapping and reconnaissance IP. (see McGregor-Dawson, 1975.)

A joint venture agreement between Union Oil and Geopeko was signed in 1977 with Geopeko assuming management. Aquitane Australia joined the joint venture in 1980. This report reviews the work undertaken by Geopeko in the areas to be relinquished.

Previous Geopeko reports on the area include Van den Bogaart and Buckland (1978), Herrmann (1980) and Pemberton (1981).

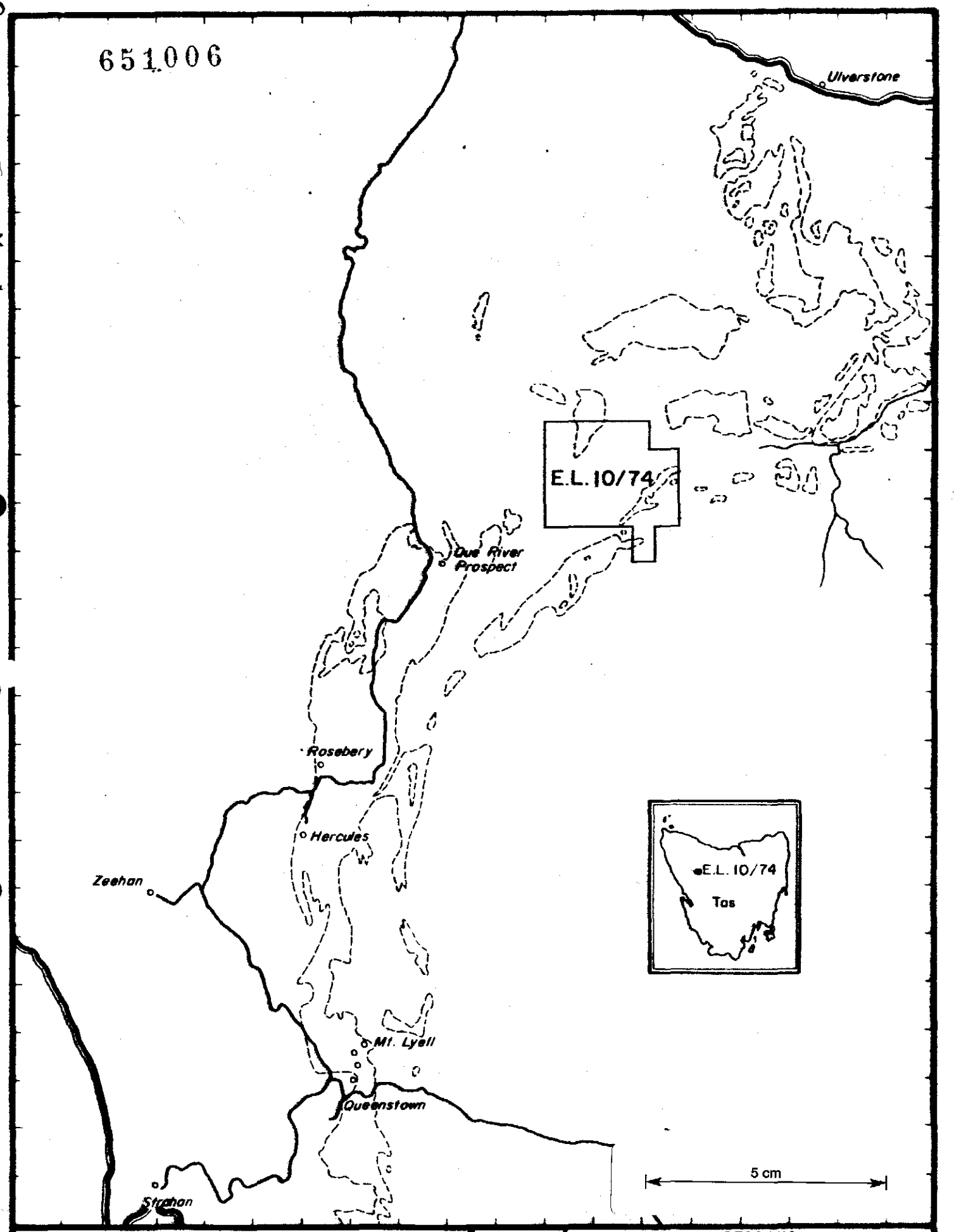
SUMMARY

The area to be relinquished has been explored by Geopeko in the 1977/78 and 1980/81 field seasons. During the first phase of exploration 140 -80mesh stream sediment samples were taken in conjunction with geological mapping.

Early in 1980 a DIGHEM II survey was flown over the area. Follow up of anomalies took place in early 1981. No encouraging results were obtained during this time leading to the decision to relinquish the area.

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LEGEND

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

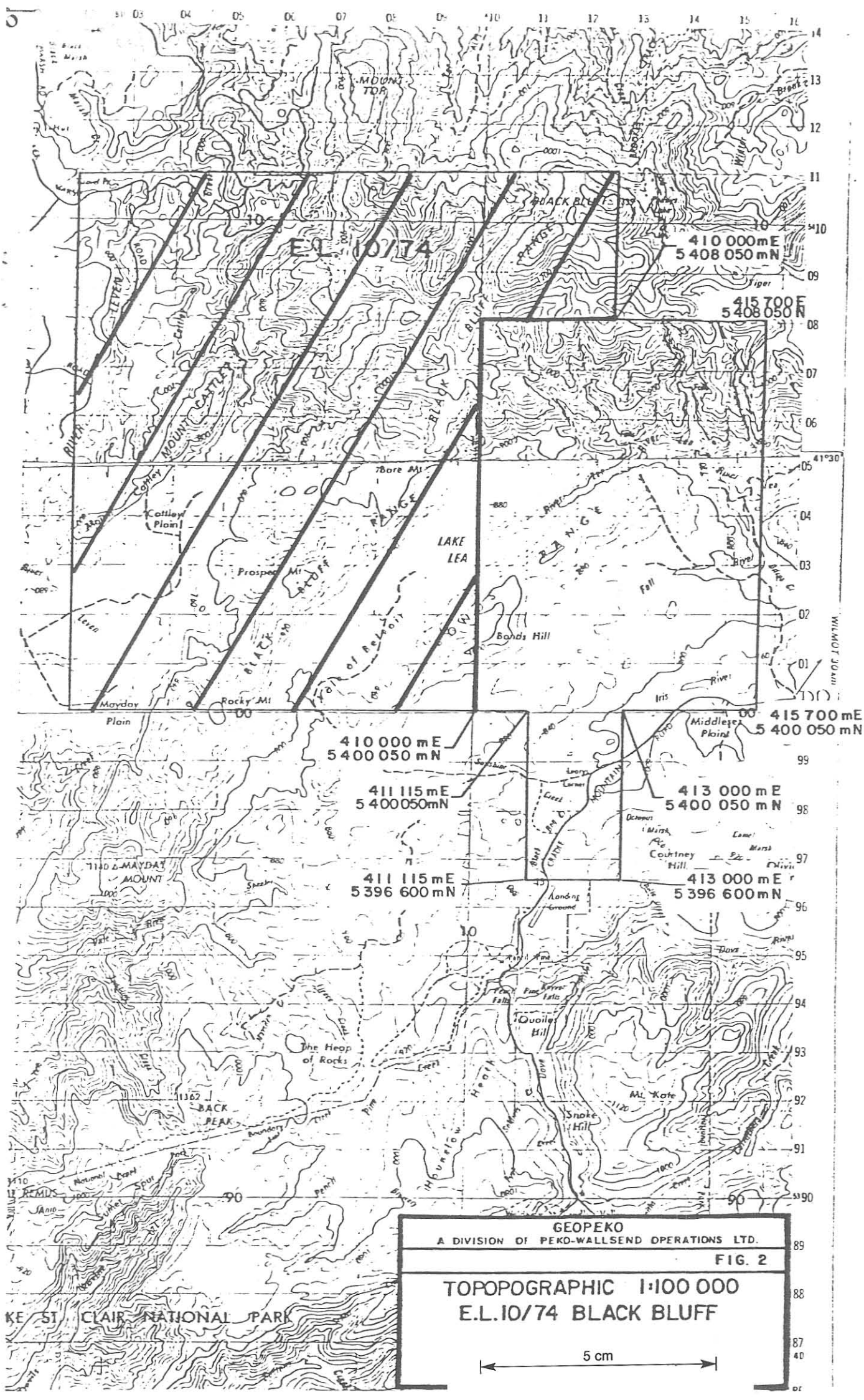
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GEOL
DWN

GEOPEKO
TASMANIA

Scale 1:500 000

Fig No 1

Location Map
E.L.10/74


E.L. 10/74
410 000mE
5 408 050 mN
415 700 E
5 408 050 N
410 000 mE
5 400 050 mN
415 700 mE
5 400 050 mN
411 115 mE
5 400 050mN
413 000 mE
5 400 050 mN
411 115 mE
5 396 600 mN
413 000 mE
5 396 600 mN
MOUNT TOR
BLACK BLUFF RANGE
MOUNT CATTLEY
Cattley Plain
Prospect Mt
LAKE LEA
Bonds Hill
Mayday Plain
Rocky Mt
Middleton Plain
Courtney Hill
MAYDAY MOUNT
The Heap of Rocks
BACK PEAK
Quoiles Hill
Mt Kate
Snake Hill
KE ST CLAIR NATIONAL PARK
GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD.
FIG. 2
TOPOPOGRAPHIC 1:100 000
E.L.10/74 BLACK BLUFF
5 cm

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GEOLOGY

The geology and topography of the area is dominated by the Black Bluff Range. Ordovician Owen Conglomerate and Sandstone folded during the Tabberabberan orogeny into an anticlinal structure forms the backbone of the range. A Cambrian inlier of Mt Read volcanics was mapped in detail on the north western side of the range (see geological plan No 1). For a detailed description of the geology of this inlier the reader is refered to the previous report by Van den Bogaart and Buckland (1978). Descriptions of the principal rock types are repeated below.

Lithic Vitric Tuff-Lava

This rock type outcrops in the Cambrian inlier exposed on the Black Bluff Range approximately 2 kilometers west of Lake Lea.

The lithic vitric tuff-lava overlies (?) the porphyritic plagioclase - quartz rhyolite described below. The unit is brecciated in parts, and is intercalated with rhyodacitic porphyritic plagioclase lava.

The rock is generally dark green in colour, the only recognisable macroscopic mineral is quartz. The rock consists of minor quite discrete fragments of sericite (and/or pyrophyllite) and minor discrete fragments of devitrified glass are scattered. The rock has a groundmass of complex, streaky to contorted, turbid and extremely fine quartz-sericite, with subordinate chlorite including abundant oxidised chloritized biotite and attenuated lenses of altered glass are scattered.

The rock is distinguished from almost all other rock types described, by the almost complete absence of single quartz crystal grains, of either phenocryst or tuff origin. Also its biotite - chlorite content is higher than normal.

Thin section example of this rock type is KR 2664.

Porphyritic Plagioclase Lava

This rock type outcrops in the Cambrian inlier exposed on the Black Bluff Range, approximately 2 kilometers west of Lake Lea.

The porphyritic plagioclase lava interfingers the lithic vitric tuff-lava unit described above. The porphyritic plagioclase lava appears to be transitional to the lithic vitric tuff-lava described above.

Essentially the lava consists of euhedral phenocrysts of plagioclase (up to 3mm) which are evenly disposed, locally in clumps, through a homogeneous microcrystalline groundmass. These plagioclase phenocrysts are stressed and show minor sericite-limonite alteration. Accessory small rounded and embayed quartz phenocrysts are also present. The groundmass consists of fine quartz mosaic, with an intimately intergrown, shredded, extremely fine network of sericite and minor chlorite. The rock has been moderately sheared.

This is a lava with gross rhyo-dacitic composition, but differs from other types described by being abnormally deficient in quartz phenocrysts.

Thin section example of this rock type is KR 2672.

Quartz Crystal Lithic Tuff

This rock type outcrops in the western portion of the Cambrian inlier exposed on the Black Bluff Range, approximately 3.5 kilometers west of Lake Lea.

The quartz crystal lithic tuff contains large (up to 10cm) lithic particles apparently a silicified equivalent of the coarser fraction. The silicified lithic particles probably represent a broken up crystal lithic sequence.

The quartz crystal lithic tuff consists largely of a loosely packed aggregate of quartz crystals, variably euhedral, subrounded, embayed broken and angular, fragments of sericitised rhyolite, also of quartz micro mosaic

representing devitrified glass and/or groundmass, and irregular patches of sericite. These occur in a heterogeneous matrix of sericitic and siliceous glass alteration products.

The lithic particles consist of a mass of cryptocrystalline quartz, densely clouded by clays and ultrafine sericite, with minor disseminated extremely fine tuff quartz fragments. The lithic particles may be classified as a siliceous "tuffite" (i.e. tuffaceous shale particle sized material.)

The rock is sheared, with weak discontinuous foliae cutting through the coarser tuff and finer tuffite. Quartz veins of related volcanogenic origin are continuous through the coarser tuff and finer tuffite.

Thin section examples of the rock type are KR 2646 and 2648.

Porphyritic Plagioclase - Quartz Rhyolite

These lavas outcrop in the Cambrian inlier exposed on Black Bluff Range approximately, 2 kilometers west of Lake Lea.

The lavas are pale yellow or greenish when fresh, with quartz and feldspar phenocrysts being the only macroscopic minerals. Some varieties show well developed primary fluidal texture and rare perlitic cracking textures.

The rock consists of phenocrysts of euhedral plagioclase rounded and embayed quartz phenocrysts which are randomly disposed through a homogeneous, diffuse microcrystalline groundmass. The plagioclase are extensively sericitised, and are generally surrounded by reaction rims. The groundmass consists predominantly of quartz, with minor to subordinate ultra-fine clay-sericite, and extremely fine granular carbonate dispersed throughout. There is no evidence of shearing.

The rhyolite appears to have no affinities with any of the varieties previously described.

Thin section example of this rock type are KR 2684 and 2659.

These authors did not consider the Cambrian inlier to have potential for massive sulphide mineralization because of a lack of hydrothermal alteration. Stream sediment geochemistry supported this observation with no anomalous results.

In the Cattley Creek area Mt Read volcanics outcrop but were not mapped in any detail. Tertiary Basalt covers most of the potential Mt Read volcanics in this locality.

A syncline forms the Vale of Belvoir and Lake Lea between the Black Bluff and Bond Ranges. Gordon Limestone outcrops to the south west of Lake Lea while Tertiary Basalt predominates to the north-east.

GEOCHEMISTRY

Stream sediment sampling was used in this area as a first phase exploration technique over the Cambrian volcanics. In the 1977/78 field season 140 -80mesh stream sediment samples were taken (see drainage sample location maps No's 3-5B). The sampling interval up the creeks was 200 metres and one in ten was duplicated.

Assaying was done by A.L.S. in Adelaide. Digestion was hot concentrated perchloric acid ($HCLO_4$) for one hour of 0.25g sample, diluted and determined by A.A.S. Elements assayed were Cu, Pb, Zn, Fe, Mn, Ag, Cd, Ba, As and Sn. Sn and Ba were assayed by Emission Spectrography and As by modified Gutzeit method. Anomalous Sn samples were reassayed by X.R.F. which showed the Emission Spectrography to be highly unreliable.

Geochemical results for Cu, Pb, Zn and Sn are plotted on Plans No 6-14. The Cambrian volcanic inlier on the Black Bluff Range has no anomalous values for Cu, Pb and Zn. Sn is anomalous according to the Emission Spectrography results but repeat assaying by X.R.F does not duplicate these anomalies.

In the Cattley Creek area Pb, Zn and sometimes Cu are higher in two creeks draining areas of Tertiary Basalt (samples KD 0601-0637 and 0927-0933). Fe and Mn also reflect the contribution of the basalt. No other anomalous samples were recorded in this area.

During the follow up of the Dighem II anomalies 8 stream sediment samples were taken in the vicinity of Lake Lea (see Plan No 5B). Assays for Cu, Pb and Zn were not anomalous (see Pemberton 1981).

GEOPHYSICS

A Dighem II electromagnetic/resistivity/magnetic survey was flown over E.L. 10/74 in February and March, 1980. The report by D.C. Fraser and I. Dvorak on this work is included in the appendix and the relevant Plans are No 16-27.

Three Dighem II anomalies were followed up during 1981:-

1. Mariner 9

A coincident Dighem II and magnetic anomaly to the south west of the southern areas of Lake Lea (407200mE, 5 402 200mN). No outcrops was found but basalt float was present. Two stream sediment samples from the area were not anomalous (KD 7308 and 7309).

2. Mariner 10

A Dighem II anomaly with a magnetic low to the north east. This anomaly is centred on 406 200mE 5 403 400mN. The anomaly is in Ordovician Moina Sandstone and appears to originate as a result of a well developed bog.

3. Mariner 11

A coincident Dighem II and magnetic anomaly in the north west of the E.L. centred on 405 000mE 5 410 200mN.

Mines Department mapping in this area suggested the anomaly was in Cambrian volcanics. A coarse lithic crystal tuff outcropped to the west and south of the anomaly. In the vicinity of the anomaly a steep dipping north east striking Ordovician conglomerate outcrops.

From the position of the anomaly in relation to the geology a possible explanation could be edge effects from the contact of the volcanics and sediments.

CONCLUSION

The disappointing results of the Dighem II survey and stream sediment assays plus the lack of alteration in the volcanics led to the decision to relinquish the area under question.

REFERENCES

Herrmann, W., 1980: Progress Report on E.L. 10/74 Black Bluff - Tasmania.

McGregor- Dawson, J.L., 1975: Union Oil Development Corporation Black Bluff (E.L. 10/74) Annual Report 1974/75 Field Season Unpublished Report

Pemberton, J., 1981: Progress Report on E.L. 10/74 Black Bluff-Tasmania

Van den Bogaart, R and Buckland, G.L., 1978: Progress Report on Exploration Licence 10/74 Black Bluff Area Tasmania

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APPENDIX 1: Frasers Report on DIGHEM II Survey

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DIGHEM^{II} SURVEY

OF

BLACK BLUFF AREA, TASMANIA

FOR

GEOPEKO LIMITED

BY

DIGHEM LIMITED

TORONTO, ONTARIO

AUGUST 12, 1980

D.C. FRASER
PRESIDENT

Z. DVORAK
GEOPHYSICIST

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SUMMARY

DIGHEM^{II} electromagnetic/resistivity/magnetic surveys were flown in February and March, 1980, for Geopeko Limited, over two survey blocks in the Black Bluff area in Tasmania.

The geologic environment within the survey areas varied from resistive to conductive. A few targets of low conductance were located which appear to warrant ground follow-up work.

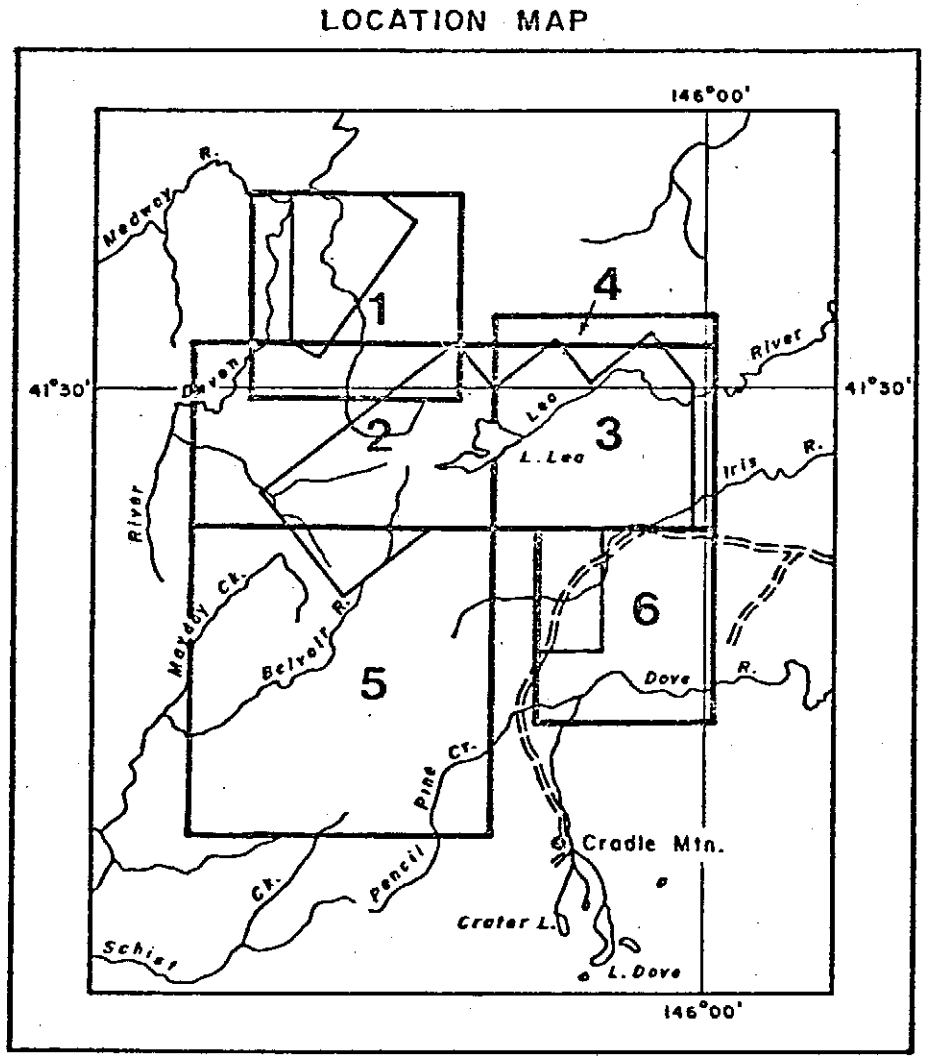


Figure 1. The Survey Area

5 cm

CONTENTS

INTRODUCTION . . . . . - 2

ELECTROMAGNETICS . . . . . - 3

Discrete conductor analysis. . . . . - 4

X-type electromagnetic responses . . . . . -11

The thickness parameter . . . . . -11

Resistivity mapping . . . . . -12

Interpretation in conductive environments . . . -15

Reduction of geologic noise. . . . . -18

EM magnetite mapping . . . . . -19

MAGNETICS . . . . . -22

CONDUCTORS IN THE SURVEY AREA. . . . . -25

Sheet 1 . . . . . -26
Sheet 2 . . . . . -27
Sheet 3 & 4 . . . . . -29
Sheet 5 . . . . . -31
Sheet 6 . . . . . -32

APPENDIX A: The Flight Record and Path Recovery

APPENDIX B: EM Anomaly List

INTRODUCTION

A DIGHEM^{II} surveys of 675 line-km were flown with a 150 m line-spacing for Geopeko Limited from February 27 to March 11, 1980, in the Black Bluff area of Tasmania (Figure 1). The Lama VH-PDU jet helicopter flew with an average airspeed of 100 km/h and EM bird height of 35 m. Ancillary equipment consisted of a Geometrics 803 magnetometer with its bird at an average height of 55 m, a Sperry radio altimeter, Geocam sequence camera, Barrringer 8-channel hot pen analog recorder, and a Geometrics G-714 digital data acquisition system with a Kennedy 9700 9-track 800-bpi magnetic tape recorder. The analog equipment recorded four channels of EM data at approximately 900 Hz, two ambient EM noise channels (for the standard and whaletail recievers), and one channel each of magnetics and radio altitude. The digital equipment recorded the EM data with a sensitivity of 0.25 ppm/bit, and the magnetic field to one gamma/bit.

The Appendix provides details on the data channels, their respective noise levels, and the data reduction procedure. The quoted noise levels are generally valid for wind speeds up to 30 km/h. Higher winds may cause the system to be grounded because excessive bird swinging produces difficulties in flying the helicopter. The

swinging results from the 5 m^2 of area which is presented by the bird to broadside gusts. The DIGHEM system nevertheless can be flown under wind conditions that seriously degrade other AEM systems.

ELECTROMAGNETICS

DIGHEM electromagnetic responses fall into two general classes, discrete and broad. The discrete class consists of sharp, well defined anomalies from discrete conductors such as sulfide lenses and steeply dipping sheets of graphite and sulfides. The broad class consists of wide anomalies from conductors having a large horizontal surface such as flatly dipping graphite or sulfide sheets, saline water-saturated sedimentary formations, conductive overburden and rock, and geothermal zones. A vertical conductive slab with a width of 100 m would straddle these two classes.

The vertical sheet (half plane) is the most common model used for the analysis of discrete conductors. All anomalies plotted on the electromagnetic map are interpreted according to this model. The following section entitled Discrete conductor analysis describes this model in detail, including the effect of using it on anomalies caused by broad conductors such as conductive overburden.

The conductive earth (half space) model is suitable for broad conductors. Resistivity contour maps result from the use of this model. A later section entitled Resistivity mapping describes the method further, including the effect of using it on anomalies caused by discrete conductors such as sulfide bodies.

Discrete conductor analysis

The EM anomalies appearing on the electromagnetic map are interpreted by computer to give the conductance (i.e., conductivity-thickness product) in mhos of a vertical sheet model. DIGHEM anomalies are divided into six grades of conductance, as shown in Table I. The conductance in mhos is the reciprocal of resistance in ohms.

Table I. EM Anomaly Grades

Anomaly Grade	Mho Range
6	greater than 99
5	50 - 99
4	20 - 49
3	10 - 19
2	5 - 9
1	less than 5

The mho value is a geological parameter because it is a characteristic of the conductor alone; it generally is inde-

pendent of frequency, and of flying height or depth of burial apart from the averaging over a greater portion of the conductor as height increases.[1] Small anomalies from deeply buried strong conductors are not confused with small anomalies from shallow weak conductors because the former will have larger mho values.

Conductive overburden generally produces broad EM responses which are not plotted on the EM maps. However, patchy conductive overburden in otherwise resistive areas can yield discrete-like anomalies with a conductance grade (cf. Table I) of 1, or even of 2 for conducting clays which have resistivities as low as 50 ohm-m. In areas where ground resistivities can be as low as 1 ohm-m, anomalies caused by weathering variations and similar causes can have conductance grades as high as 4. The anomaly shapes from the multiple coils often allow such surface conductors to be recognized, and these are indicated by the letter S on the map. The remaining anomalies in such areas could be bedrock conductors. The higher grades indicate increasingly higher conductances. Examples: DIGHEM's New Insco copper

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[1]This statement is an approximation. DIGHEM, with its short coil separation, tends to yield larger and more accurate mho values than airborne systems having a larger coil separation.

discovery (Noranda, Quebec, Canada) yielded a grade 4 anomaly, as did the neighbouring copper-zinc Magusi River ore body; Mattabi (copper-zinc, Sturgeon Lake, Ontario, Canada) and Whistle (nickel, Sudbury, Ontario, Canada) gave grade 5; and DIGHEM's Montcalm nickel-copper discovery (Timmins, Ontario, Canada) yielded a grade 6 anomaly. Graphite and sulfides can span all grades but, in any particular survey area, field work may show that the different grades indicate different types of conductors.

Strong conductors (i.e., grades 5 and 6) are characteristic of massive sulfides or graphite. Moderate conductors (grades 3 and 4) typically reflect sulfides of a less massive character or graphite, while weak bedrock conductors (grades 1 and 2) can signify poorly connected graphite or heavily disseminated sulfides. Grade 1 conductors may not respond to ground EM equipment using frequencies less than 2000 Hz.

The presence of sphalerite or gangue can result in ore deposits having weak to moderate conductances. As an example, the three million ton lead-zinc deposit of Restigouche Mining Corporation near Bathurst, New Brunswick, Canada, yielded a well defined grade 1 conductor. The 10 percent by volume of sphalerite occurs as a coating around

the fine grained massive pyrite, thereby inhibiting electrical conduction.

Faults, fractures and shear zones may produce anomalies which typically have low conductances (e.g., grade 1 and 2). Conductive rock formations can yield anomalies of any conductance grade. The conductive materials in such rock formations can be salt water, weathered products such as clays, original depositional clays, and carbonaceous material.

On the electromagnetic map, the actual mho value and a letter are plotted beside the EM grade symbol. The letter is the anomaly identifier. The horizontal rows of dots, beside each anomaly symbol, indicate the anomaly amplitude on the flight record. The vertical column of dots gives the estimated depth. In areas where anomalies are crowded, the identifiers, dots and mho values may be obliterated. The EM grade symbols, however, will always be discernible, and the obliterated information can be obtained from the anomaly listing appended to this report.

The purpose of indicating the anomaly amplitude by dots is to provide an estimate of the reliability of the conductance calculation. Thus, a conductance value obtained

from a large ppm anomaly (3 or 4 dots) will be accurate whereas one obtained from a small ppm anomaly (no dots) could be inaccurate. The absence of amplitude dots indicates that the anomaly from the standard (maximum-coupled coaxial) coil-pair is 5 ppm or less on both the inphase and quadrature channels. Such small anomalies could reflect a weak conductor at the surface or a stronger conductor at depth. The mho value and depth estimate will illustrate which of these possibilities fits the recorded data best.

Flight line deviations occasionally yield cases where two anomalies, having similar mho values but dramatically different depth estimates, occur close together on the same conductor. Such examples illustrate the reliability of the conductance measurement while showing that the depth estimate can be unreliable. There are a number of factors which can produce an error in the depth estimate, including the averaging of topographic variations by the altimeter, overlying conductive overburden, and the location and attitude of the conductor relative to the flight line. Conductor location and attitude can provide an erroneous depth estimate because the stronger part of the conductor may be deeper or to one side of the flight line, or because it has a shallow dip. A heavy tree cover can also produce

errors in depth estimates. This is because the depth estimate is computed as the distance of bird from conductor, minus the altimeter reading. The altimeter can lock on the top of a dense forest canopy. This situation yields an erroneously large depth estimate but does not affect the conductance estimate.

Dip symbols are used to indicate the direction of dip of conductors. These symbols are used only when the anomaly shapes are unambiguous, which usually requires a fairly resistive environment.

A further interpretation is presented on the EM map by means of the line-to-line correlation of anomalies, which is based on a comparison of anomaly shapes on adjacent lines. This provides conductor axes which may define the geological structure over portions of the survey area. The absence of conductor axes in an area implies that anomalies could not be correlated from line to line with reasonable confidence.

DIGHEM electromagnetic maps are designed to provide a correct impression of conductor quality by means of the conductance grade symbols. The symbols can stand alone with geology when planning a follow-up program. The actual mho values are plotted for those who wish quantitative data.

The anomaly ppm and depth are indicated by inconspicuous dots which should not distract from the conductor patterns, while being helpful to those who wish this information. The map provides an interpretation of conductors in terms of length, strike direction, conductance, depth, thickness (see below), and dip. The accuracy is comparable to an interpretation from a ground EM survey having the same line spacing.

An EM anomaly list attached to each survey report provides a tabulation of anomalies in ppm, and in mhos and estimated depth for the vertical sheet model. The EM anomaly list also shows the conductance in mhos and the depth for a thin horizontal sheet (whole plane) model, but only the vertical sheet parameters appear on the EM map. The horizontal sheet model is suitable for a flatly dipping thin bedrock conductor such as a sulfide sheet having a thickness less than 15 m. The list also shows the resistivity and depth for a conductive earth (half space) model, which is suitable for thicker slabs such as thick conductive overburden. In the EM anomaly list, a depth value of zero for the conductive earth model, in an area of thick cover, warns that the anomaly may be caused by conductive overburden. Since discrete bodies normally are the targets of EM surveys, local base (or zero) levels are

used to compute anomaly amplitudes rather than true zero levels. The use of local base levels may distort the horizontal sheet and conductive earth parameters. True zero levels, however, are used for resistivity mapping, discussed below.

X-type electromagnetic responses

DIGHEM^{II} maps contain x-type EM responses in addition to EM anomalies. An x-type response is below the noise threshold of 2 ppm, and reflects one of the following: a weak conductor near the surface, a strong conductor at depth (e.g., 100 to 120 m below surface) or to one side of a flight line, or aerodynamic noise. Those responses that have the appearance of valid bedrock anomalies on the flight profiles are mentioned in the report. The others should not be followed up unless their locations are of considerable geological interest.

The thickness parameter

DIGHEM^{II} can provide an indication of the thickness of a steeply dipping conductor. The ratio of the anomaly amplitude of channel 24/channel 22 generally increases as the apparent thickness increases, i.e., the thickness in the

horizontal plane. This thickness is equal to the conductor width if the conductor dips at 90 degrees and strikes at right angles to the flight line. This report refers to a conductor as thin when the thickness is likely to be less than 3m, and thick when in excess of 10 m. In base metal exploration applications, thick conductors can be high priority targets because most massive sulfide ore bodies are thick, whereas non-economic bedrock conductors are usually thin. An estimate of thickness cannot be obtained when the strike of the conductor is subparallel to the flight line, when the conductor has a shallow dip, when the anomaly amplitudes are small, or when the resistivity of the environment is below 100 ohm-m.

Resistivity mapping

Areas of widespread conductivity are commonly encountered during surveys. In such areas, anomalies can be generated by decreases of only 5 m in survey altitude as well as by increases in conductivity. The typical flight record in conductive areas is characterized by inphase and quadrature channels which are continuously active; local peaks reflect either increases in conductivity of the earth or decreases in survey altitude. For such conductive areas, apparent resistivity profiles and contour maps are necessary

for the interpretation of the airborne data. The advantage of the resistivity parameter is that anomalies caused by altitude changes are virtually eliminated, so the resistivity data reflect only those anomalies caused by conductivity changes. This helps the interpreter to differentiate between conductive trends in the bedrock and those patterns typical of conductive overburden. Discrete conductors will generally appear as narrow lows on the contour map and broad conductors will appear as wide lows.

Channel 40 (see Appendix) and the resistivity contour map present the apparent resistivity using the so-called pseudo-layer (or buried) half space model defined in Fraser (1978)[2]. This model consists of a resistive layer overlying a conductive half space. Channel 41 gives the apparent depth below surface of the conductive material. The apparent depth therefore is simply the apparent thickness of the overlying resistive layer. The apparent depth (or thickness) parameter will be positive when the upper layer is more resistive than the underlying material,

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[2]Resistivity mapping with an airborne multicoil electromagnetic system: Geophysics, v 43, p. 144-172.

in which case the apparent depth may be quite close to the true depth.

The apparent depth will be negative when the upper layer is more conductive than the underlying material, and will be zero when a homogeneous half space exists. The apparent depth parameter must be interpreted cautiously because it will contain any errors which may exist in the measured altitude of the EM bird (e.g., as caused by a dense tree cover).

The inputs to the resistivity algorithm are the inphase and quadrature components of the whaletail coil-pair. The outputs are the apparent resistivity of the conductive half space (the source) and the sensor-source distance. The flying height is not an input variable, and the output resistivity and sensor-source distance are independent of the flying height. The apparent depth, discussed above, is simply the sensor-source distance minus the measured altitude or flying height. Consequently, errors in the measured altitude will affect the apparent depth parameter but not the apparent resistivity parameter.

The apparent depth parameter is a useful indicator of simple layering in areas lacking a heavy tree cover. The

DIGHEM^{II} system has been flown for the purpose of permafrost mapping, where positive apparent depths were used as a measure of permafrost thickness. However, little quantitative use has been made of negative apparent depths because the absolute value of the negative depth is not a measure of the thickness of the conductive upper layer and, therefore, is not meaningful physically. Qualitatively, a negative apparent depth estimate usually shows that the EM anomaly is caused by conductive overburden. Consequently, the apparent depth channel 41 can be of significant help in distinguishing between overburden and bedrock conductors.

Interpretation in conductive environments

Environments having background resistivities below 30 ohm-m cause all airborne EM systems to yield very large responses from the conductive ground. This usually prohibits the recognition of bedrock conductors. The processing of DIGHEM^{II} data, however, produces four channels which contribute significantly to the recognition of bedrock conductors. These are the inphase and quadrature difference channels (number 33 and 34), and the resistivity and depth channels (40 and 41). The EM difference channels eliminate up to 99% of the response of conductive ground, leaving responses from bedrock conductors, cultural features

(e.g., telephone lines, fences, etc.) and edge effects. An edge effect arises when the conductivity of the ground suddenly changes, and this is a source of geologic noise. While edge effects yield anomalies on the EM difference channels, they do not produce resistivity anomalies. Consequently, the resistivity channel aids in eliminating anomalies due to edge effects. On the other hand, resistivity anomalies will coincide with the most highly conductive sections of conductive ground, and this is another source of geologic noise. The recognition of a bedrock conductor in a highly conductive environment therefore is based on the anomalous responses of the two difference channels (33 and 34) and the resistivity channel (40). The most favourable situation is where anomalies coincide on all 3 channels.

Channel 41, which is the apparent depth to the conductive material, also helps determine whether a conductive response arises from surficial material or from a conductive zone in the bedrock. When this profile rides above the zero level (i.e., it is negative), it implies that the EM and resistivity profiles are responding primarily to a conductive upper layer, i.e., conductive overburden. If channel 41 is below the zero level, it indicates that a resistive upper layer exists, and this usually implies the existence of a bedrock conductor.

Channels 35 and 36 are the anomaly recognition functions. They are used to trigger the conductance channel 37 which identifies discrete conductors. In highly conducting environments, channel 36 may not be generated because it is subject to some corruption by highly conductive earth signals. Some of the automatically selected anomalies (channel 37) are discarded by the human interpreter. The automatic selection algorithm is intentionally oversensitive to assure that no meaningful responses are missed. The interpreter than classifies the anomalies according to their source and eliminates those that are not substantiated by the data, such as those rising from geologic or aerodynamic noise.

The resistivity map often yields more useful information on conductivity distributions than the EM map. In comparing the EM and resistivity maps, keep in mind the following:

(a) The resistivity map portrays the absolute value of the earth's resistivity.

(b) The EM map portrays anomalies in the earth's resistivity. An anomaly by definition is a change from the norm and so the EM map displays

anomalies, (i) over narrow, conductive bodies and (ii) over the boundary zone between two wide formations of differing conductivity.

The resistivity map might be likened to a total field map and the EM map to a horizontal gradient in the direction of flight[3]. Because gradient maps are usually more sensitive than total field maps, the EM map therefore is to be preferred in resistive areas. However, in conductive areas, the absolute character of the resistivity map usually causes it to be mre useful than the EM map.

Reduction of geologic noise

Geologic noise refers to unwanted geophysical responses. For purposes of airborne EM surveying, geologic noise refers to EM responses caused by conductive overburden and magnetic polarization. It was mentioned above that the

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[3]The gradient analogy is only valid with regard to the identification of anomalous locations. The calculation of conductance is based on EM amplitudes relative to a local base level, rather than to an absolute zero level as for the resistivity calculation.

EM difference channels (i.e., channel 33 for inphase and 34 for quadrature) tend to eliminate the response of conductive overburden. This marked a unique development in airborne EM technology, as DIGHEM^{II} is the only EM system which yields channels having an exceptionally high degree of immunity to conductive overburden.

Magnetite produces a form of geological noise on the inphase channels of all EM systems. Rocks containing less than 1% magnetite can yield negative inphase anomalies caused by magnetic polarization. This is described in more detail below. When magnetite is widely distributed throughout a survey area, the inphase EM channels may continuously rise and fall reflecting variations in the magnetite percentage, flying height, and overburden thickness. This can lead to difficulties in recognizing deeply buried bedrock conductors, particularly if conductive overburden also exists. However, the response of broadly distributed magnetite generally vanishes on the inphase difference channel 33. This feature can be a significant aid in the recognition of conductors which occur in rocks containing accessory magnetite.

EM magnetite mapping

The information content of DIGHEM^{II} data consists of

a combination of conductive eddy current response and magnetic polarization response. The secondary field resulting from conductive eddy current flow is frequency-dependent and consists of both inphase and quadrature components, which are positive in sign. On the other hand, the secondary field resulting from magnetic polarization is independent of frequency and consists of only an inphase component, which is negative in sign. When magnetic polarization manifests itself by decreasing the measured amount of positive inphase, its presence may be difficult to recognize. However, when it manifests itself by yielding a negative inphase anomaly (e.g., in the absence of eddy current flow), its presence is assured. In this latter case, the negative component can be used to estimate the percent magnetite content.

A magnetite mapping technique was developed for the whaletail coil-pair of DIGHEM^{II}. The technique yields contours of apparent weight percent magnetite according to a homogeneous half space model. The method can be complementary to magnetometer mapping in certain cases. Compared to magnetometry, it is far less sensitive but is more able to resolve closely spaced magnetite zones, as well as providing an estimate of the amount of magnetite in the rock. The method is sensitive to 1/4% magnetite by weight when the EM

sensor is at a height of 30 m above a magnetitic half space. It can individually resolve steeply dipping narrow magnetite-rich bands which are separated by 60 m.

The EM magnetite mapping technique provides estimates of magnetite content which are usually correct within a factor of 2 when the magnetite is fairly uniformly distributed. EM magnetite maps can be generated when magnetic polarization is evident as indicated by negative inphase responses.

The EM magnetite algorithm is basically quite simple because a linear relationship exists between volume percent magnetite and the negative inphase response in ppm. This linear relationship is true for a fixed survey altitude when demagnetization effects are disregarded and when a fixed susceptibility-volume percent relationship is assumed. The technique in practice involves, first, correcting the actual EM response for variations in flying altitude and, second, calibrating the negative inphase ppms in terms of volume percent magnetite.

EM magnetite mapping provides another method of airborne geologic mapping. It thus joins resistivity mapping, magnetometer mapping, spectrometry, photogeology, etc., as a

possible means by which geologic information can be obtained from airborne techniques. It is not nearly as useful in the general sense as the other airborne mapping techniques, but can be of value in cases where the magnetite content gives an indication of lithology.

Like magnetometry, the EM magnetite method maps only bedrock features, provided that the overburden is characterized by a general lack of magnetite. This contrasts with resistivity mapping which portrays the combined effect of bedrock and overburden.

MAGNETICS

The existence of a magnetic correlation with an EM anomaly is indicated directly on the EM map. An EM anomaly with magnetic correlation has a greater likelihood of being produced by sulfides than one that is non-magnetic. However, sulfide ore bodies may be non-magnetic (e.g., the Kidd Creek deposit near Timmins, Ontario, Canada) as well as magnetic (e.g., the Mattabi deposit near Sturgeon Lake, Ontario).

The magnetometer data are digitally recorded in the aircraft to an accuracy of one gamma. The digital tape is

processed by computer to yield a standard total field magnetic map which is usually contoured at 25 gamma intervals. The magnetic data also are treated mathematically to enhance the magnetic response of the near-surface geology, and an enhanced magnetic map is produced with a 100 gamma contour interval. The response of the enhancement operator in the frequency domain is shown in Figure 2. The 100 gamma contour interval is equivalent to a 5 gamma interval for the passband components of the airborne data. This is because these components are amplified 20 times by the operator of Figure 2.

The enhanced map, which bears a resemblance to a downward continuation map, is produced by digital bandpass filtering the total field data. The enhancement is equivalent to continuing the field downward to a level (above the source) which is 1/20th of the actual sensor-source distance.

Because the enhanced magnetic map bears a resemblance to a ground magnetic map, it simplifies the recognition of trends in the rock strata and the interpretation of geological structure. The contour interval of 100 gammas is suitable for defining the near-surface local geology while de-emphasizing deep-seated regional features.

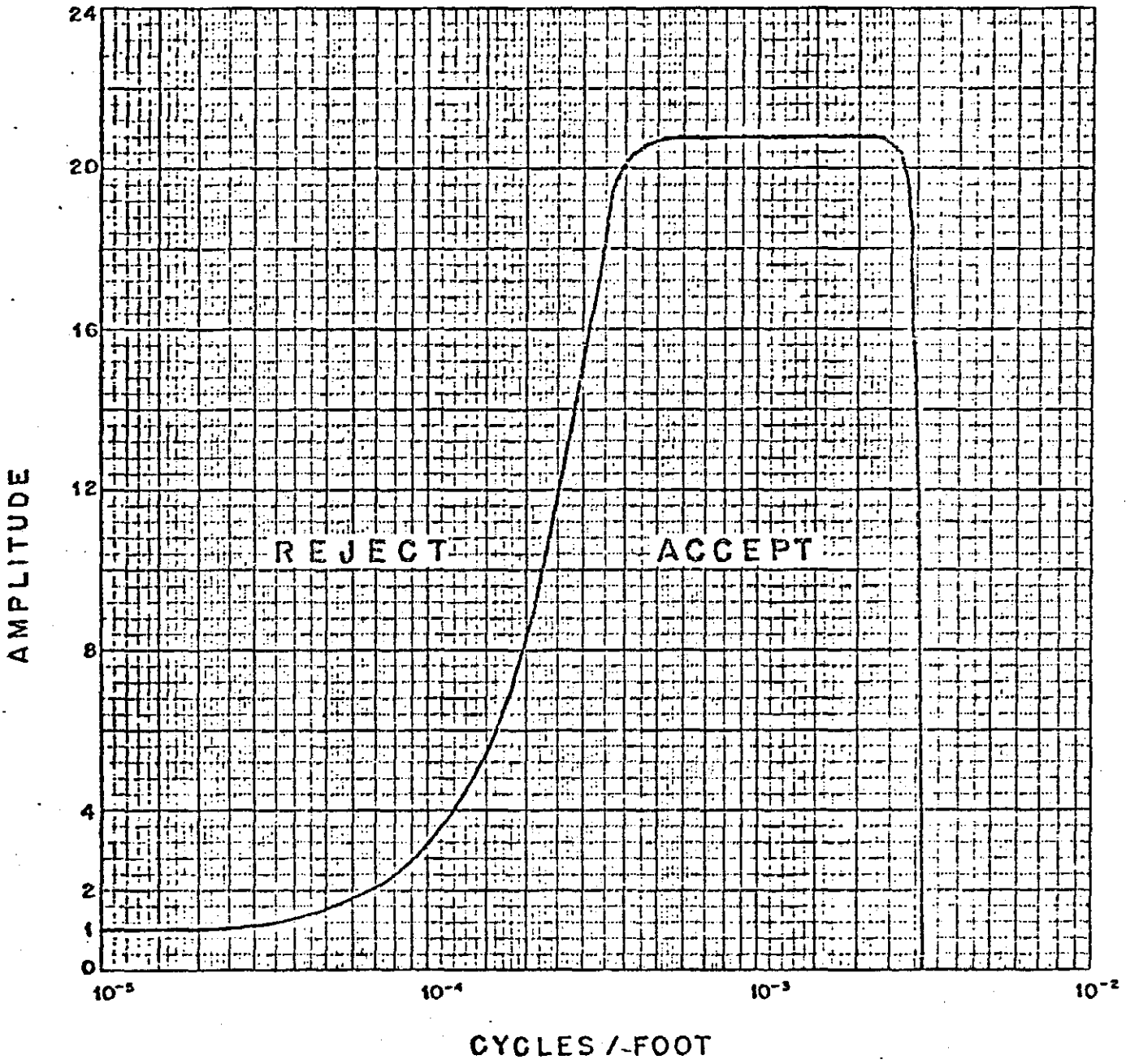


Figure 2 Frequency response of magnetic operator

CONDUCTORS IN THE SURVEY AREA

The electromagnetic maps show the locations of conductors and their interpreted conductance (i.e., conductivity - thickness product) and depth. Their strike direction and length are also shown when anomalies can be correlated from line-to-line. When studying the maps for follow-up planning, consult the anomaly listings appended to this report to ensure that none of the conductors are overlooked.

The survey consisted of two grids flown in a northwesterly direction along lines spaced at 150 m. The amounts flown are indicated below:

Sheet	Line-number	Line-km
1	1-37	87
2 to 6	201-293	588
		675 km

The EM maps indicate which anomalies are believed to be caused by cultural or surficial sources. Generally, such anomalies are not commented on below as the discussions are directed to identifying bedrock features.

Sheet 1

Group 1

The EM anomalies of group 1 have conductance grades of 1 and 2. They represent conductive variations associated with an ellipticaly shaped resistivity low of 50 ohm-m. The apparent depth channel 41 shows that the resistivity low is definitely a subsurface phenomenon, i.e., it is not due to surficial conductivity. The resistivity low is associated with magnetic activity but there is no direct correlation between magnetic and conductive anomalies.

Anomaly 11A

The grade 2 EM anomaly 11A[4] may represent a narrow weak conductor associated with a magnetic anomaly. There is no direct EM-magnetic correlation. The magnetic anomaly appears to represent the same geologic body which produced the magnetic activity described above for group 1.

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[4]This designation refers to anomaly A on line 11.

Anomaly 5xA-6B

The weak grade 1 anomaly 6B, the response 5xA, and the associated resistivity low of 700 ohm-m correlate loosely with a magnetic anomaly. There is a possibility that much of the EM conductivity is caused by surface material.

Response 23xB-24xB

These x-type responses have the appearance, on the profile record, of surface responses. However, the associated resistivity low of 120 ohm-m to the east does not appear to be caused by surficial conductivity. This resistivity low did not generate any EM anomalies although it did result in a number of x-type responses (e.g., 29xA). Consequently, the low does not reflect discrete mineralized sources such as might be characteristic of ore deposits.

Sheet 2

The ground resistivity in the area of sheet 2 ranges from about 40 ohm-m to in excess of 1,000 ohm-m. The

highlands correspond to a high resistivity and the lowlands on either side of Black Buff are typically of high conductivity. The highest conductivities are recorded over a swampy area west of Black Bluff. The magnetic map shows a zone of high activity in the western half of the sheet.

Responses 259xA-260xA

Edge ? basalt

These x-type responses might reflect a broad bedrock conductor which occurs on the flank of a major magnetic high.

Anomaly 265A

basalt

The conductor is evident primarily on the whaletail coil-pair, and produces a resistivity low of 50 ohm-m. The anomaly shapes and resistivity patterns warn that the conductor may simply reflect surface conductivity.

Anomaly 275C

basalt ?

This single-line anomaly may reflect a weak bedrock conductor which occurs within the high conductivity zone west of Black Bluff.

Response 281xA

This x-type response lies among other surficial conductors in the

046

Twenty-four map sheets accompany this report.

Electromagnetics	6 map sheets
Resistivity	6 map sheets
Magnetics	6 map sheets
Enhanced magnetics	6 map sheets

APPENDIX A

THE FLIGHT RECORD AND PATH RECOVERY

Both analog and digital flight records are produced. The analog profiles are recorded on green chart paper in the aircraft during the survey. The digital profiles are generated later by computer and plotted on orange chart paper at a scale identical to the geophysical maps. The digital profiles, which may be displayed, are as follows:

Channel Number	Parameter	Scale units/mm	Noise
20	magnetometer	10 gamma	2 gamma
21	bird height	10 feet	5 feet
22	standard* coil-pair inphase	1 ppm	1-2 ppm
23	standard coil-pair quadrature	1 ppm	1-2 ppm
24	whaletail** coil-pair inphase	1 ppm	1-2 ppm
25	whaletail coil-pair quadrature	1 ppm	1-2 ppm
26	VLF-EM total field	1 %	1-2 %
27	VLF-EM vertical quadrature	1 %	1-2 %
28	ambient noise monitor (standard coil)	1 ppm	1 ppm
29	ambient noise monitor (whaletail coil)	1 ppm	1 ppm
33	difference function inphase	1 ppm	1-2 ppm
34	difference function quadrature	1 ppm	1-2 ppm
35	first anomaly recognition function	1 ppm	1-2 ppm
36	second anomaly recognition function	1 ppm	1-2 ppm
37	conductance	1 mho	
40	log resistivity at main frequency	.03 decade	
41	apparent depth at main frequency	3 m	
45	log resistivity at secondary frequency	.03 decade	
46	apparent depth at secondary frequency	3 m	
50	EM magnetite	0.5%	

* coaxial
** horizontal coplanar

The log resistivity scale of 0.03 decade/mm means that the resistivity changes by an order of magnitude in 33 mm. The resistivities at 0, 33, 67 and 100 mm up from the bottom of the chart are respectively 1, 10, 100 and 1000 ohm-m.

The fiducial marks on the flight records represent points on the ground which were recognized by the aircraft navigator. Continuous photographic coverage allowed accurate photo-path recovery locations for the fiducials, which were then plotted on the geophysical maps to provide the track of the aircraft.

The fiducial locations on both the flight records and flight path maps were examined by a computer for unusual helicopter speed changes. Such changes may denote an error in flight path recovery. The resulting flight path locations therefore reflect a more stringent checking than is provided by standard flight path recovery techniques.

The following brief description of DIGHEM^{II} illustrates the information content of the various profiles*.

*For a detailed description, see D.C. Fraser, Geophysics, v.44, p.1367-1394.

Single-frequency surveying

The DIGHEM^{II} system has two transmitter coils which are mounted at right angles to each other. Both coils transmit at approximately the same frequency. (This frequency is given in the Introduction.) Thus, the system provides two completely independent surveys at one pass. In addition, the digital flight chart profiles (generated by computer) include an inphase channel and a quadrature channel which essentially are free of the response of conductive overburden. Also, the EM channels may indicate whether the conductor is thin (e.g., less than 3 m), or has a substantial width (e.g., greater than 10 m). Further, the EM channels include channels of resistivity, apparent depth and conductance. A minimum of 11 EM channels are provided. The DIGHEM^{II} system therefore gives information in one pass which cannot be obtained by any other airborne or ground EM technique.

Figure A1 shows a DIGHEM^{II} flight profile over the massive pyrrhotite ore body in Montcalm Township, Ontario. It will serve to identify the majority of the available channels.

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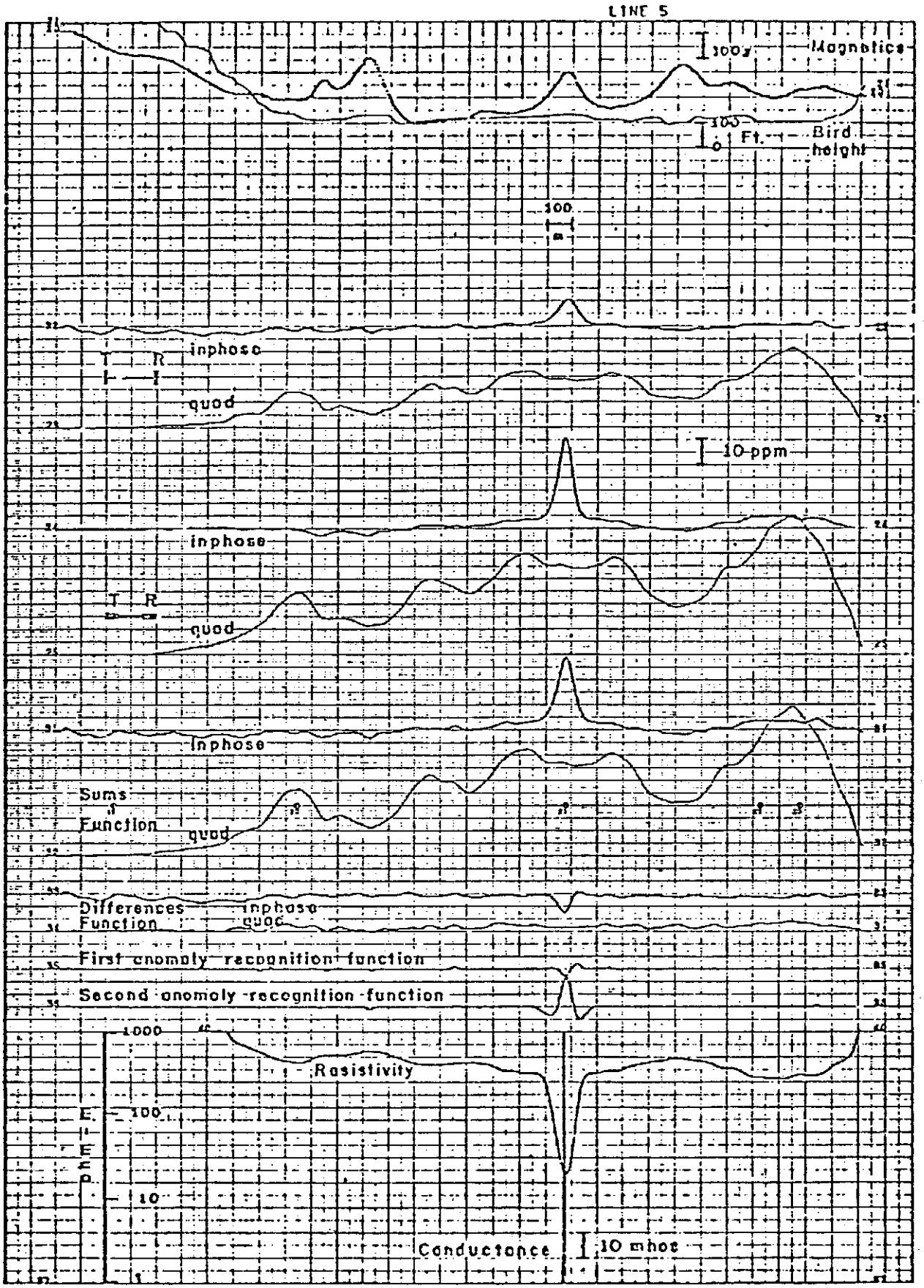


Fig. A1. Flight over Montcalm deposit, with line parallel to strike

The two upper channels (numbered 20 and 21) are respectively the magnetics and the radio altitude. Channels 22 and 23 are respectively the inphase and quadrature of the coaxial coil-pair, which is termed the standard coil-pair. This coil-pair is equivalent to the standard coil-pair of all inphase-quadrature airborne EM systems. Channels 24 and 25 are the inphase and quadrature of the additional coplanar coil-pair which is termed the whaletail coil-pair.

Channels 31 and 32 are inphase and quadrature sum functions of the standard and whaletail channels; they provide a condensed view of the four basic channels 22 to 25. The sum channels normally are not plotted.

Channels 33 and 34 are inphase and quadrature difference functions of the standard and whaletail channels. The difference channels are almost free from the response of conductive overburden. Channel 37 is the conductance. The conductance channel essentially is an automatic anomaly picker calibrated in conductance units of mhos; it is triggered by the anomaly recognition functions shown as channels 35 and 36.

Channel 40 is the resistivity, which is derived from the whaletail channels 24 and 25. The resistivity channel 40 yields data which can be contoured, and so the DIGHEM^{II} system yields a resistivity contour map in addition to an electromagnetic map, a magnetic contour map, and an enhanced magnetic contour map. The enhanced magnetic contour map is similar to the filtered magnetic map discussed by Fraser.*

Figure A2 presents the DIGHEM^{II} results for a line flown perpendicularly to the Montcalm ore body. Channel 20 shows the 175 gamma magnetic anomaly caused by the massive pyrrhotite deposit. For the EM channels, the following points are of interest:

1. On channels 22-25 and 31-34, the ore body essentially yields only an inphase response. The quadrature response is almost completely caused by conductive overburden (which also gives a small inphase response). The hachures show the EM response from the overburden. The overburden response vanishes on the

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*Cdn. Inst. Mng., Bull., April 1974.

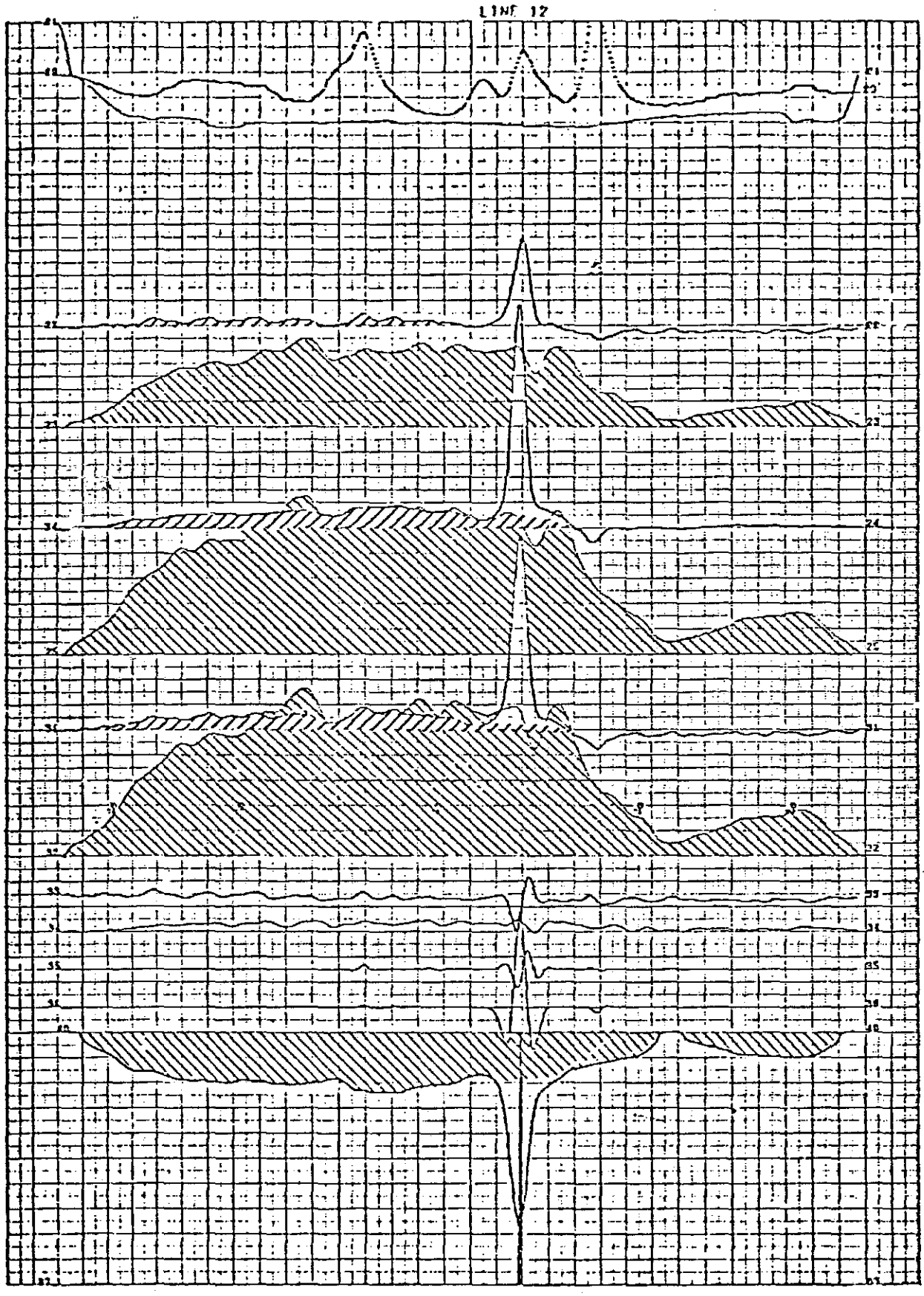


Fig. A2. Flight over Montcalm deposit, with line perpendicular to strike.

difference EM channels, as can be seen by comparing the quadrature channels 25 and 34. This is an important point to note because DIGHEM^{II} is the only EM system which provides an inphase channel and a quadrature channel which are essentially free of conductive overburden response.

2. The whaletail anomaly of channel 24 has a single peak. This shows that the conductor has a substantial width. If the width had been under 3 m, the conductor would have produced a weak m-shaped anomaly on channel 24.

3. The ore body yields a resistivity of 5 ohm-m in a background of about 200 ohm-m (cf. channel 40). A dipole-dipole ground resistivity survey with an a-spacing of 50 m showed a similar background, but the ore body gave a low of only 53 ohm-m because of the averaging effect inherent in the ground technique.

4. The ore body has a conductance of 330 mhos according to its EM response on this particular flight line. The conductance channel 37 saturates at 100 mhos, and so the deposit is indicated by a 100-mho spike.

Figure A1 illustrates the DIGHEM^{II} results for a line flown subparallel to the ore body. The ore body anomaly is small on the standard coil-pair (channel 22) but shows up strongly on the whaletail coil-pair (channel 24).

Dual-frequency surveying

For surveys flown primarily for resistivity mapping, as opposed to EM surveying, the two transmitter coils may be energized at two well-separated frequencies (e.g., 900 and 3600 Hz). Apparent resistivity and apparent depth maps can be made independently for each frequency. The interpretation procedure involves comparing the apparent resistivities and apparent depths at the two frequencies.

The use of two different coil-pair orientations (i.e., standard and whaletail) for dual-frequency resistivity mapping is an unorthodox procedure. However, as long as the current flow patterns are primarily horizontal, the different coil orientations do not influence the results, according to superposed dipole theory. Wire fences and other cultural features will produce local deviations,

because they usually respond preferentially to one or the other of the coil-pairs.

The difference channels 33 and 34 are not produced because the divergent frequencies of the two coil-pairs renders them meaningless. In addition, channels 35 to 37 also are not produced.

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APPENDIX B

EM ANOMALY LIST

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311 GEOPEKO TASMANIA MAY/80

LINE & ANOMALY	STANDARD COIL REAL PPM	STANDARD COIL QUAD PPM	WHALETAIL COIL REAL PPM	WHALETAIL COIL QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* FEET	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH FEET	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPTH FEET
6A	2	5	5	7	3	93	1	361	168	183
6B	1	3	0	2	3	184	1	501	925	105
7A	3	4	6	7	5	178	1	487	75	336
7B	3	4	4	3	6	169	1	517	73	367
8B	3	6	7	18	3	79	1	295	141	146
8C	2	1	1	0	5	235	1	748	82	569
9A	3	2	3	4	8	227	2	623	52	479
10A	4	7	9	12	5	16	1	263	75	123
11A	3	2	0	1	5	222	1	659	103	481

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

LINE & ANOMALY	STANDARD COIL REAL PPM	STANDARD COIL QUAD PPM	WHALETAIL COIL REAL PPM	WHALETAIL COIL QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* FEET	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH FEET	CONDUCTIV EARTH RESIS OHM-M	CONDUCTIV EARTH DEP FE
207B	4	5	7	8	5	30	1	308	71	1
208A	3	2	0	3	6	83	1	460	122	2
219B	2	1	0	0	10	252	1	690	91	5
220B	3	0	0	0	38	259	2	681	44	5
221B	3	4	2	5	3	74	1	373	151	1
221C	5	9	5	13	4	25	1	244	103	1
221D	2	9	7	19	2	0	1	163	202	
222A	3	12	4	18	2	0	1	141	254	
222B	11	42	21	80	3	0	1	69	89	
223A	2	2	0	1	5	232	1	654	173	4
223B	3	1	0	0	16	223	2	670	45	5
223C	2	13	5	22	1	0	1	106	263	
223D	4	10	4	17	2	16	1	200	202	
224A	2	6	2	8	2	7	1	226	327	
225B	2	6	4	10	2	38	1	275	205	1
225C	3	13	8	24	2	0	1	132	200	
226C	2	17	10	32	2	0	1	95	199	
227B	5	19	9	35	2	0	1	100	156	

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

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311 GEOPEKO, TASMANIA MAY/80

LINE & ANOMALY	STANDARD COIL REAL PPM	STANDARD COIL QUAD PPM	WHALETAIL COIL REAL PPM	WHALETAIL COIL QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* FEET	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH FEET	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPTH FEET
231A	2	8	4	14	2	0	1	181	275	23
236A	1	7	0	10	1	0	1	103	617	0
238A	10	37	23	68	3	0	1	115	84	22
238B	2	12	4	21	1	0	1	121	319	0
239A	3	9	4	13	2	26	1	221	221	69
239B	6	19	16	37	3	0	1	151	100	41
239C	5	19	7	30	2	1	1	141	175	20
239E	1	8	4	19	1	0	1	112	368	0
241A	1	9	0	11	1	15	1	164	944	0
241B	2	9	2	17	1	0	1	157	365	-
243A	3	18	4	34	1	0	1	99	282	0
244A	4	5	1	11	2	51	1	291	200	122
244C	5	12	7	28	2	0	1	137	153	9
244D	1	7	5	14	2	0	1	162	289	1
244E	5	5	6	13	4	12	1	262	87	115
245B	7	18	13	36	3	0	1	101	101	0
246A	4	9	10	22	3	0	1	182	104	49
247B	4	11	12	22	3	0	1	175	111	45

.* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

LINE & ANOMALY	STANDARD COIL REAL PPM	STANDARD COIL QUAD PPM	WHALETAIL COIL REAL PPM	WHALETAIL COIL QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* FEET	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH FEET	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPT FEE
249A	5	14	9	25	3	20	1	191	128	6
249B	6	18	8	26	3	23	1	182	135	6
249C	4	16	8	27	2	0	1	119	176	
250A	7	12	11	21	4	53	1	248	74	12
250B	3	7	5	13	3	66	1	293	143	13
250F	4	6	6	10	5	43	1	306	79	16
251A	6	16	7	24	3	33	1	198	139	7
253B	5	29	8	55	2	0	1	83	184	
253C	3	6	5	12	3	86	1	315	163	15
253D	5	7	8	12	5	92	1	338	65	20
253F	5	10	1	11	2	0	1	197	187	4
253G	4	9	2	5	3	15	1	243	199	7
253H	3	11	10	23	3	0	1	142	138	1
254B	8	29	17	59	3	0	1	48	102	
254D	2	8	2	10	1	0	1	123	420	
255A	9	38	11	57	2	0	1	58	120	
255C	3	7	8	14	3	54	1	275	126	12
255D	3	8	7	12	3	67	1	290	132	13
255E	4	17	8	36	2	0	1	125	179	
256B	2	17	2	27	1	0	1	70	486	
257C	1	10	3	17	1	0	1	122	435	

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

U62 311 GEOPEKO, TASMANIA MAY/80

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LINE & ANOMALY	STANDARD COIL REAL PPM	STANDARD COIL QUAD PPM	WHALETAIL COIL REAL PPM	WHALETAIL COIL QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* FEET	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH FEET	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPT FEE
258B	1	10	3	28	1	0	1	28	462	
258D	4	14	5	29	2	0	1	63	220	
258H	3	10	8	22	2	0	1	144	181	
258I	5	9	10	19	4	0	1	196	87	6
259A	3	26	4	44	1	0	1	29	306	
259D	2	43	8	81	1	0	1	14	330	
259K	6	15	8	25	3	0	1	140	127	1
260A	2	13	2	15	1	0	1	124	388	
260B	1	6	3	11	1	17	1	218	381	4
260C	2	12	3	22	1	0	1	85	340	
260E	3	2	1	2	7	114	2	546	58	39
261B	0	48	0	103	1	0	1	0	331	
262B	2	26	6	52	1	0	1	24	368	
262D	2	5	4	0	4	121	1	496	87	33
262F	0	18	0	24	1	0	1	57	740	
263B	0	14	0	24	1	0	1	77	803	
263C	0	32	0	66	1	11	1	0	439	
263E	0	19	0	29	1	0	1	27	681	
263G	0	24	0	32	2	0	1	23	607	
265A	2	2	5	6	4	30	1	360	109	18
265B	0	6	0	10	1	19	1	199	1034	

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

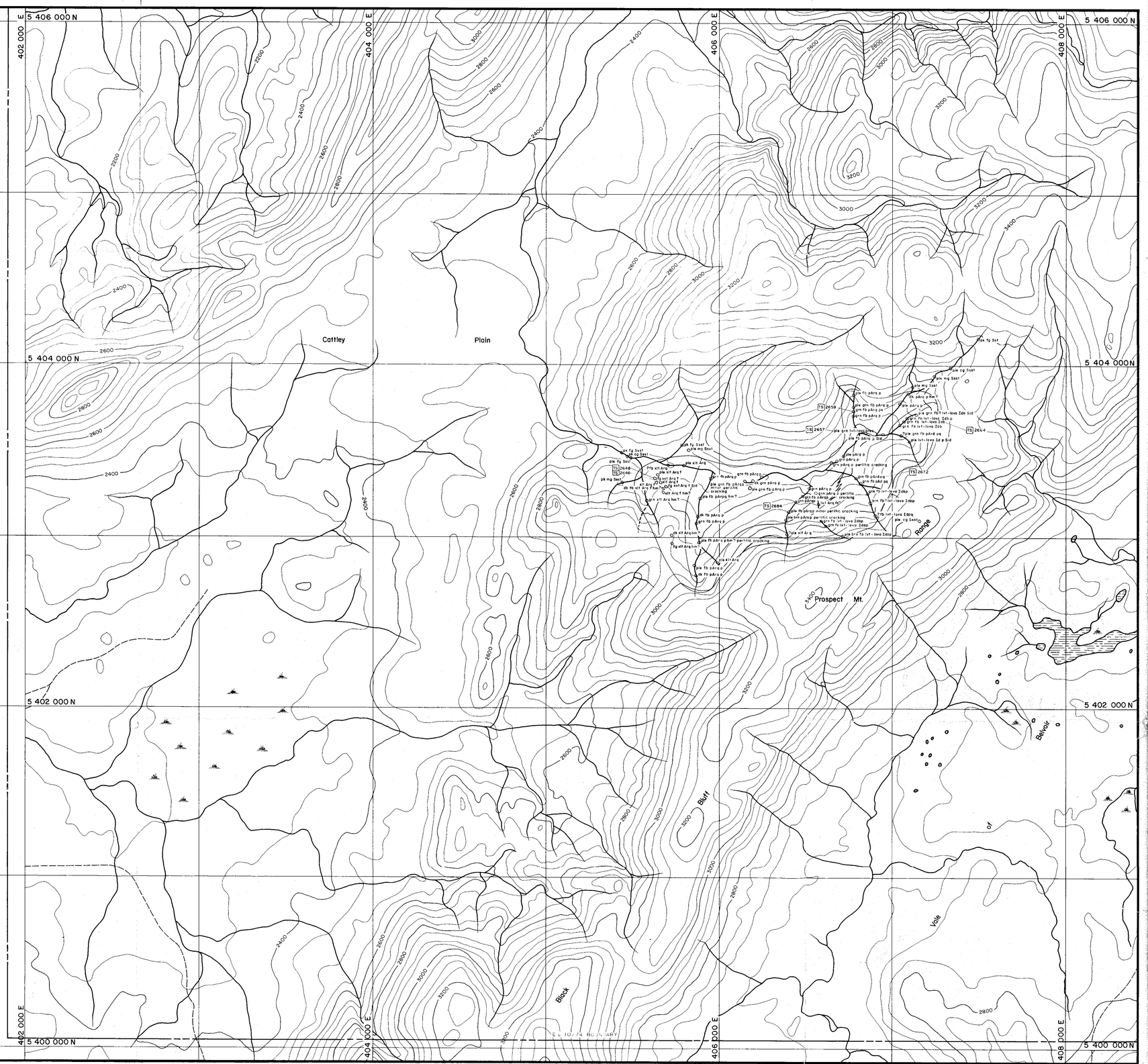
063

651064

311 GEOPEKO TASMANIA MAY/80

LINE & ANOMALY	STANDARD COIL REAL PPM	STANDARD COIL QUAD PPM	WHALETAIL COIL REAL PPM	WHALETAIL COIL QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* FEET	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH FEET	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPTH FEET
269C	1	6	0	9	2	9	1	180	937	0
272B	5	26	12	46	2	0	1	58	146	0
272C	5	11	9	20	3	1	1	195	110	62
273A	4	13	12	25	3	0	1	173	116	47
273B	3	7	8	13	3	0	1	216	115	65
274A	3	4	1	5	3	67	1	353	174	166
274B	3	14	4	23	2	0	1	93	238	0
275A	4	11	11	24	3	0	1	147	107	19
275C	5	7	4	11	3	27	1	267	115	112
276A	7	24	15	46	3	0	1	88	103	0
277A	5	21	9	38	2	0	1	93	157	0
277B	3	22	9	42	2	0	1	82	192	0
277C	4	8	4	12	3	0	1	203	165	50
278B	5	20	12	36	3	0	1	101	130	0
278C	3	11	6	18	2	0	1	167	183	27
278D	6	29	13	50	2	0	1	71	132	0
279A	6	12	8	19	4	9	1	205	93	74
279B	5	18	10	35	2	0	1	94	140	0
280A	4	2	2	5	7	94	2	465	56	326
280B	5	16	8	28	2	0	1	103	153	0
281A	2	5	0	5	2	38	1	253	423	55
282B	3	3	0	4	3	94	1	430	143	236

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.



OPERATION OF LEGEND:

1. Capital letter – indicates primary classification eg. S - sedimentary rock, A - acid rock, M - basic rock
2. Lower case letters – indicate the following:
   (i) Colours - e.g. pk/grn = pink fragments in an acid igneous rock with a green matrix.
   (ii) Textural or structural features - eg. xtA = crystal tuff of acid composition, e.g. pA = porphyric acid rock, eg. unA = unlaised acid rock

b. Ax suffixes in progressive order,
   (i) Categories - e.g. pAr = rhyolite, agZa = intermediate rock of andesitic composition.
   (ii) Mineralogy - e.g. pArf = porphyritic (rhyolite) with feldspar phenocrysts, e.g. lxt f/b = lithic crystal tuff with feldspar (phenocryst component) and biotite (prominent matrix component), e.g. lxt f g = lithic crystal tuff with (major) feldspar crystals and (minor) quartz crystals, e.g. fo lxt - lava Zab = flow banded lithic vitric tuff - lava of intermediate dacitic composition with a biotite rich groundmass.

NOTE:
This map has been compiled from enlargements of the Tasmanian Lands Department's 1:15840 scale topographic machine plots.

SYMBOLS:

IGNEOUS:

A	acid igneous unclassified
Ar	rhyolite
Ard	rhyodacite
I	intermediate igneous unclassified
Ia	andesite
Id	dacite
M	basic igneous unclassified
Mv	basalt
Md	dolerite

SEDIMENTARY:

Sst	Sandstone
Scong	conglomerate
S	volcaniclastic sediment
Sqtz	quartzite

STRUCTURAL and TEXTURAL:

lt	lithic tuff unclassified
xt	crystal tuff
vt	vitric tuff
fb	flow banding
p	porphyritic
vns	veins
ag	acidised
sil	silicified
argd	argillised

STRUCTURAL:

	outcrop limit
	rubble boundary
	approximate contact
	bedding
	joint

GRAIN SIZE:

fg	fine grained - (< 1mm)
mg	medium grained (1mm - 3mm)
cg	coarse grained (3mm - 5cm)

COLOURS:

pk	pink
grn	green
brn	brown
ple	pale
dk	dark

SILICATE MINERALOGY:

q	quartz
f	K feldspar
p	plagioclase
b	biotite
ch	chlorite
c	cordierite
maf	mafics
e	epidote
hb	hornblende

SULPHIDE MINERALOGY:

s°	sulphides
py	pyrite
hm	hematite

MISCELLANEOUS:

TS 2502 Thin Section and rock No.

GEOLOGICAL INTERPRETATION:

Pencil No.					
19-43		HOLOCENE	Alluvium, glacial debris (Md), swamp soils	19-28	Lithic vitric tuff - lava (fb lvt - lava Zds; intercalated with pArdpq)
19-47		TERT.	Olivine basalt (flows, Mv)	19-21	Porphyritic plagioclase - quartz rhyolite (fb pAr qp)
19-38		L. ORDO.	Limestone (Gordon type)	19-3	Fine grained quartzose volcaniclastic sediment (fg S volcaniclastic sed. q s°)
19-71		U. C. ?	Talus - sandstone, conglomerate	19-57	Lithic quartz crystal vitric tuff (lxt Arqf)
19-70		U. C. ?	Sandstone, conglomerate (Owen type, Ssst, Scongl.)	19-55	Lithic quartz crystal tuff (lxtQs qf mf s°)
19-22		C.	Undifferentiated cambrian	19-23	Quartz crystal vitric tuff - lava (xvt - lava Arq)
19-63		C.	Crystal lithic tuff (xlt Ar qf, gradational to tuff - lava)	19-19	Biotite feldspar quartz porphyritic lava (pAre bfq _ pAr btq)

5 cm

GN MN 11° 7°

GEOPEKO LIMITED
KING ISLAND GROUP
651065

SCALE: 1:10,000

No. KT10/74-2A

PLAN 1

E.L. 10/74
BLACK BLUFF, TASMANIA

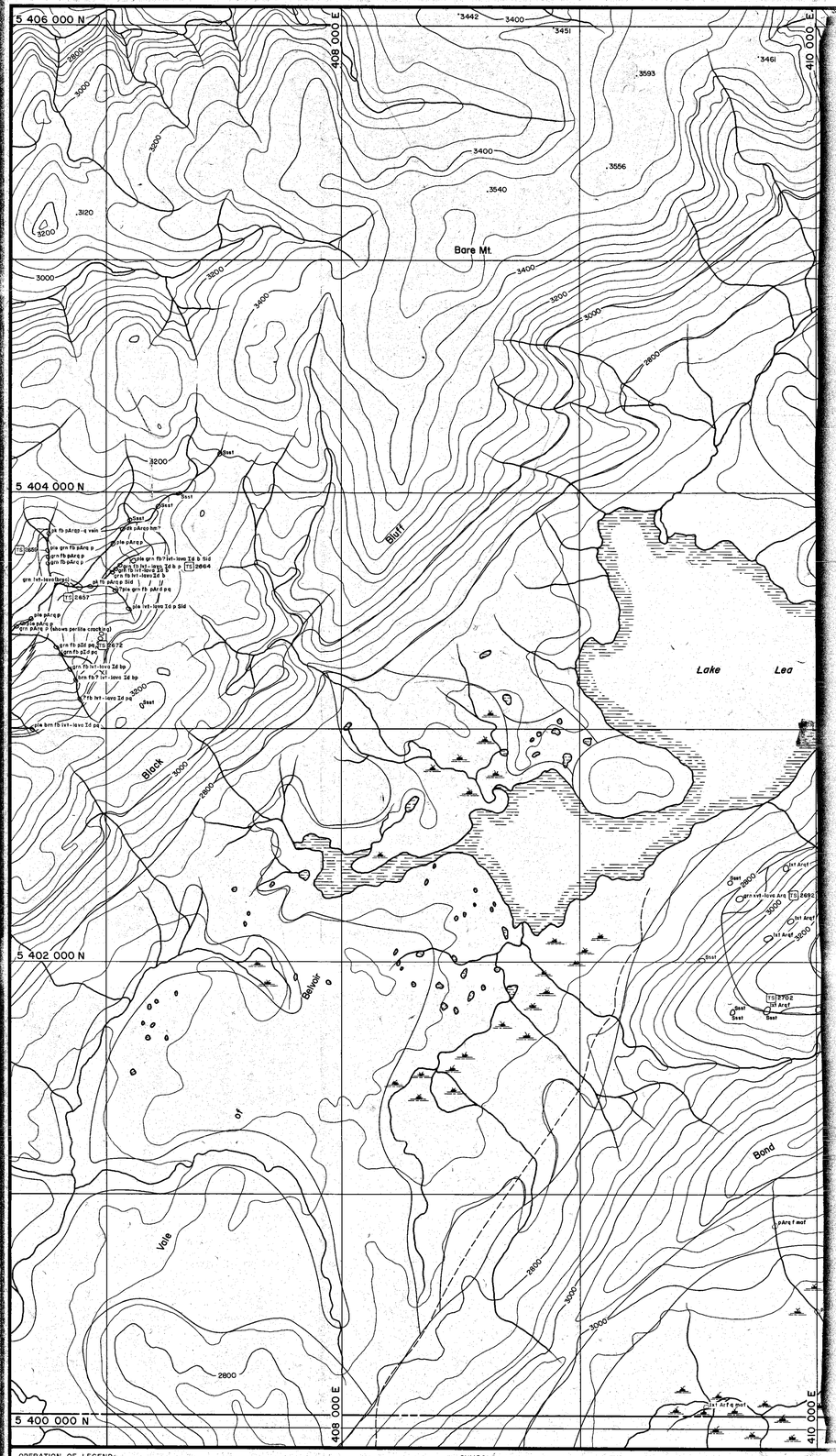
GEOLOGICAL MAP

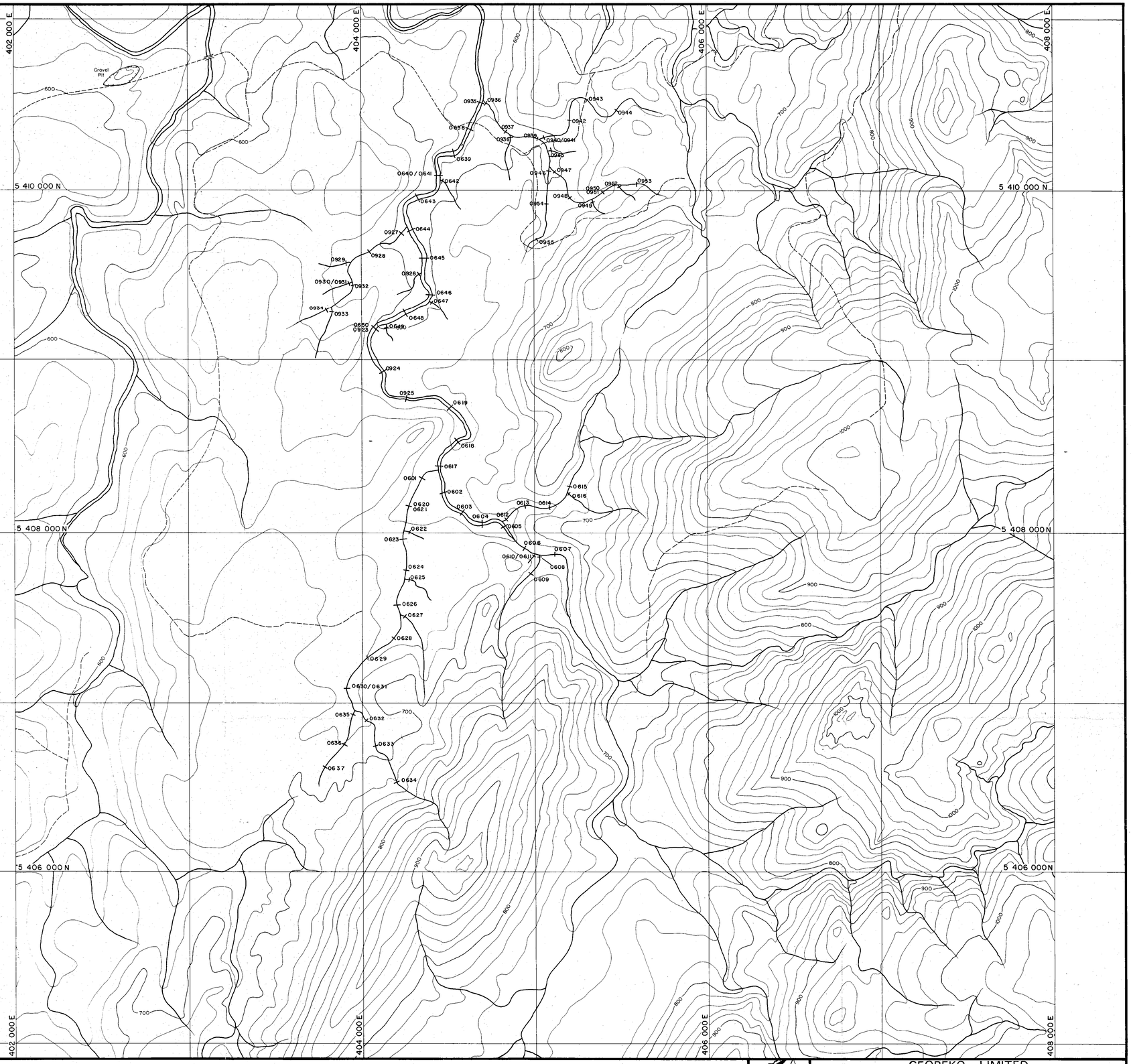
DATE: APRIL '78
GEOLOGIST: R. B.
DRAWN: L. G. B. J. M.
CHECKED: M. C. R.

2397

KT10/74-1	
KT10/74-2	KT10/74-3

83-1895


5 406 000 N
5 404 000 N
5 402 000 N
5 400 000 N
408 000 E
410 000 E
Bare Mt.
Bluff
Lake Lea
Black
Bond
Volo
Belvoir
3442
3400
3451
3461
3593
3556
3540
3120
3200
3000
2800
3600
3400
3200
3000
2800
Sast
Sast
Sast



GEOPEKO LIMITED
KING ISLAND GROUP
651067

SCALE: 1 : 10,000

No. KT10/74-1

PLAN 3

E.L. 10/74
BLACK BLUFF, TASMANIA

DRAINAGE SAMPLE LOCATION MAP

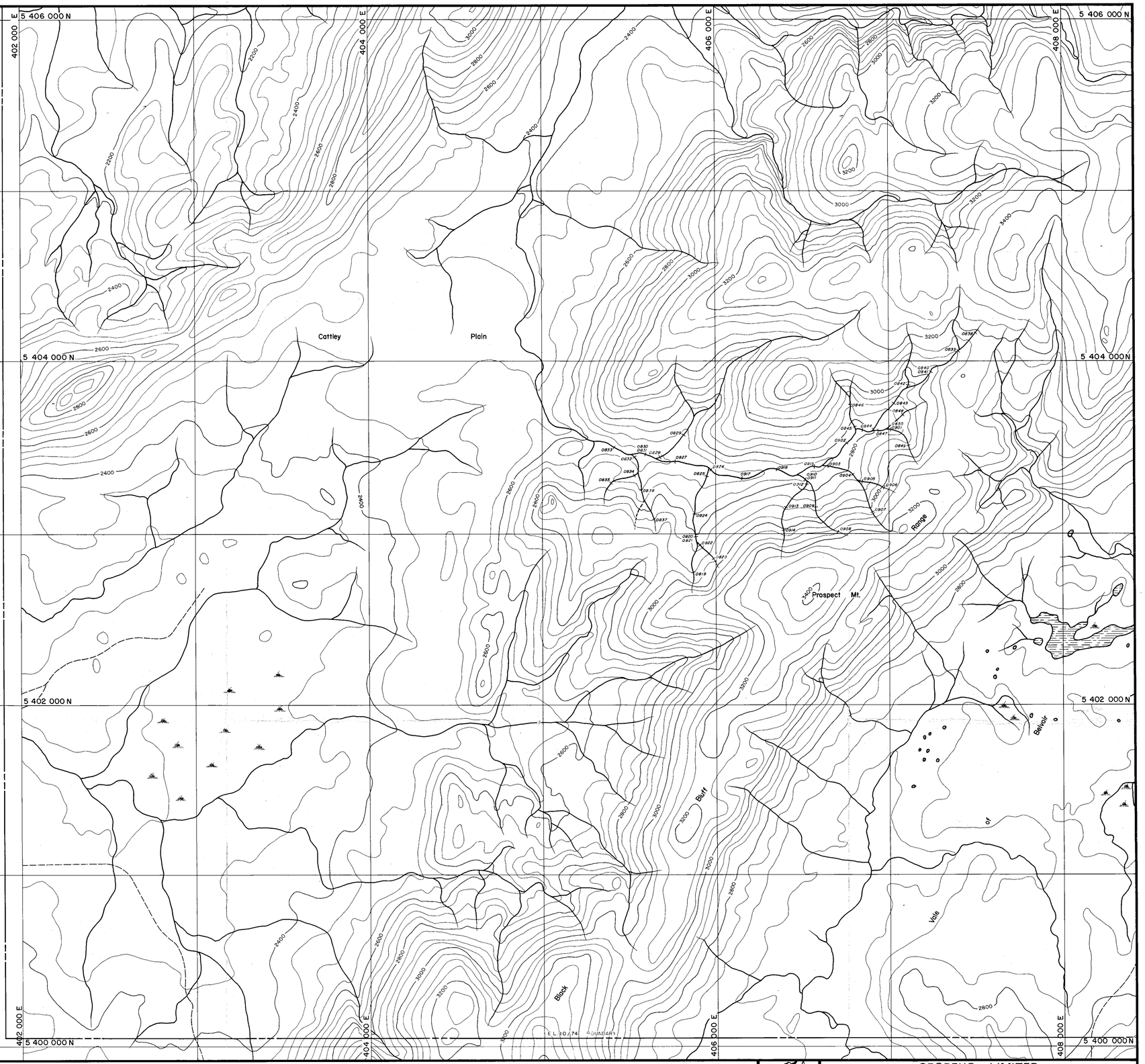
DATE:
GEOLOGIST: G.B./J.P.
DRAWN: J.P.M.
CHECKED:

2399

KT10/74-1	
KT10/74-2	KT10/74-3

5 cm

33-1895



LEGEND:

0820 Drainage sample No. KD 0820

NOTE:
This map has been compiled from enlargements of the Tasmanian Lands Department's 1:15840 scale topographic machine plots.

GEOPEKO LIMITED
KING ISLAND GROUP
651068

SCALE: 1:10,000

No. KT10/74-2C

PLAN 4

E.L. 10/74
BLACK BLUFF, TASMANIA

DRAINAGE SAMPLE LOCATION MAP

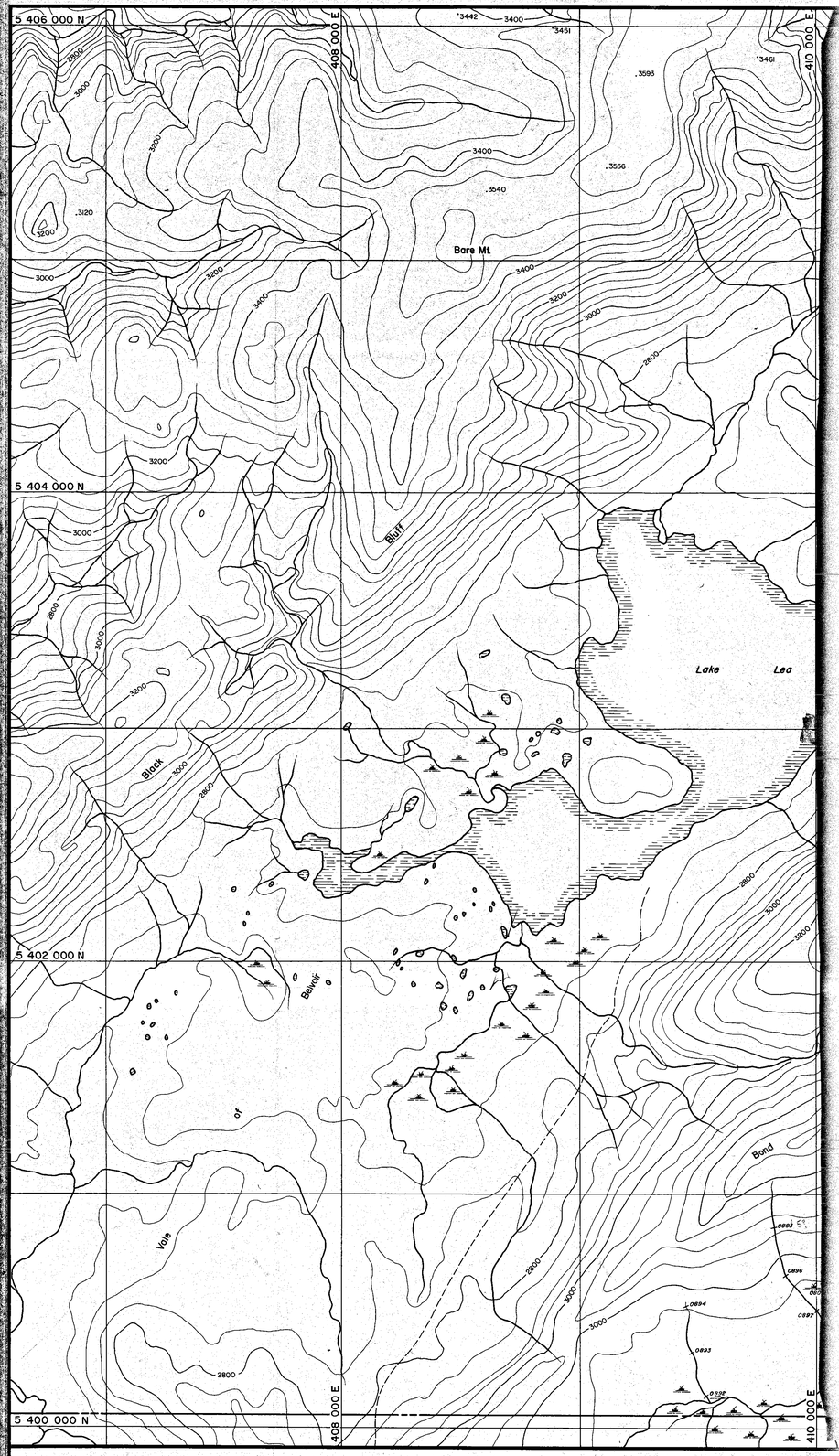
2400

KT10/74-1
KT10/74-2 | KT10/74-3

5 cm

DATE: November 197-
GEOLOGIST: R.B.
DRAWN: L.G. & J.M.
CHECKED: M.C.R.

83-1895



LEGEND:

0812 Drainage sample No. KD 0812

NOTE:
This map has been compiled from enlargements of the Tasmanian Lands Department's 1:15840 scale topographic machine plots.

5 cm

GEOPEKO LIMITED 651069
KING ISLAND GROUP

SCALE 1:10,000

No. KT10/74-3C

PLAN 5A

E.L. 10/74
BLACK BLUFF, TASMANIA

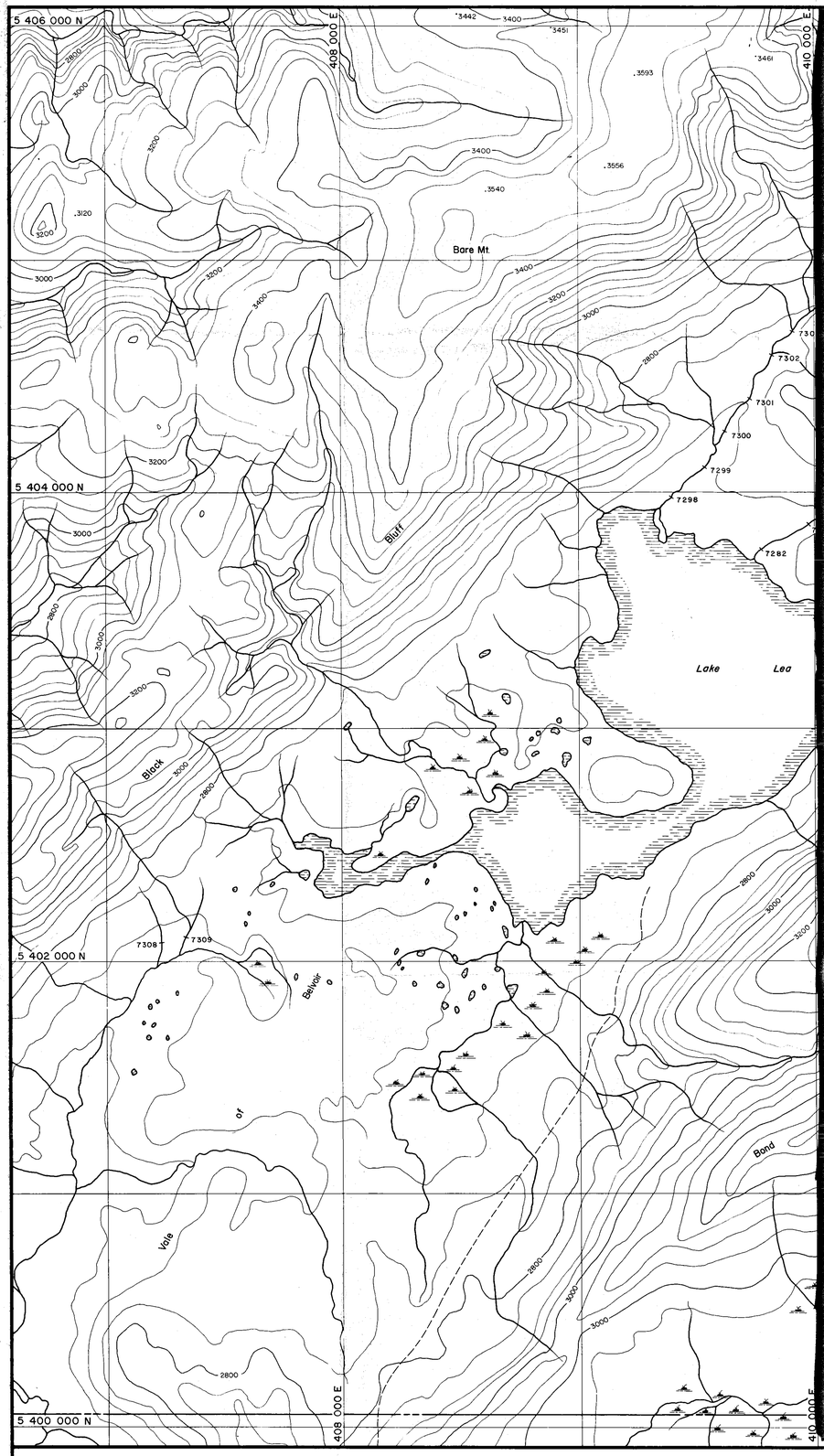
DRAINAGE SAMPLE LOCATION MAP

2401

KT10/74-1
KT10/74-2
KT10/74-3

DATE: November 1977
GEOLOGIST: R.B.
DRAWN: L.G. & J.M.
CHECKED: M.C.R.

83-1895



651070 GEOPEKO
A DIVISION OF PEKO – WALLSEND OPERATIONS LTD

SCALE 1:10,000

No. KT10/74-3 F

DATE MAY 81
GEOLOGIST J.P.
DRAWN J.P.M.
CHECKED

E.L. 10/74 PLAN 5B
BLACK BLUFF, TASMANIA

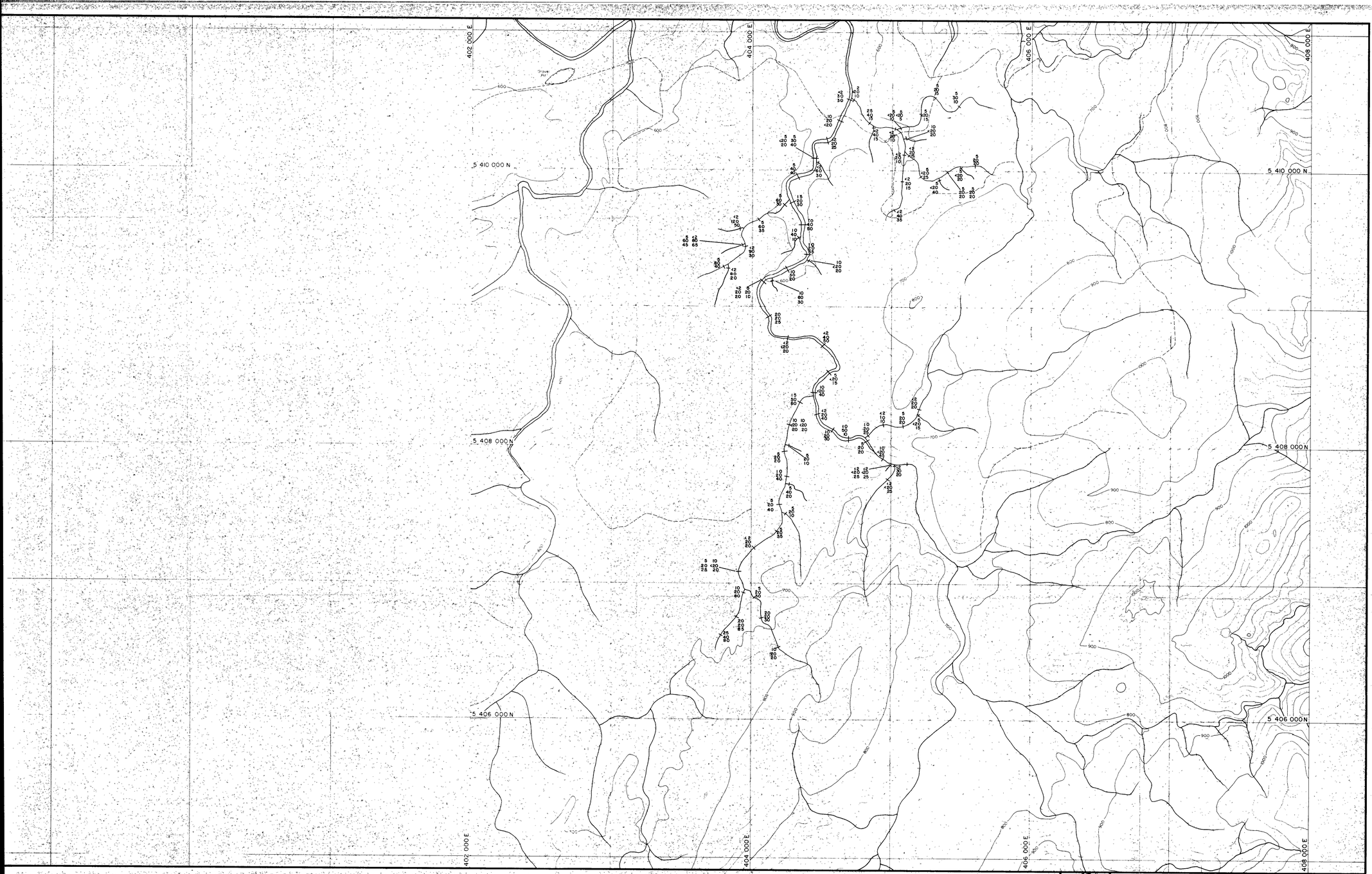
– 80 mesh Stream Sediment Sample Locations

2402

KT10/74-1
KT10/74-2 KT10/74-3

FIGURE 3

83-1895



ORIGINAL SAMPLE
Cu ppm
Pb ppm
Zn ppm
DUPLICATE SAMPLE

GEOPEKO LIMITED
KING ISLAND GROUP
651071

SCALE 1:5,000

No. KTIO/74-1

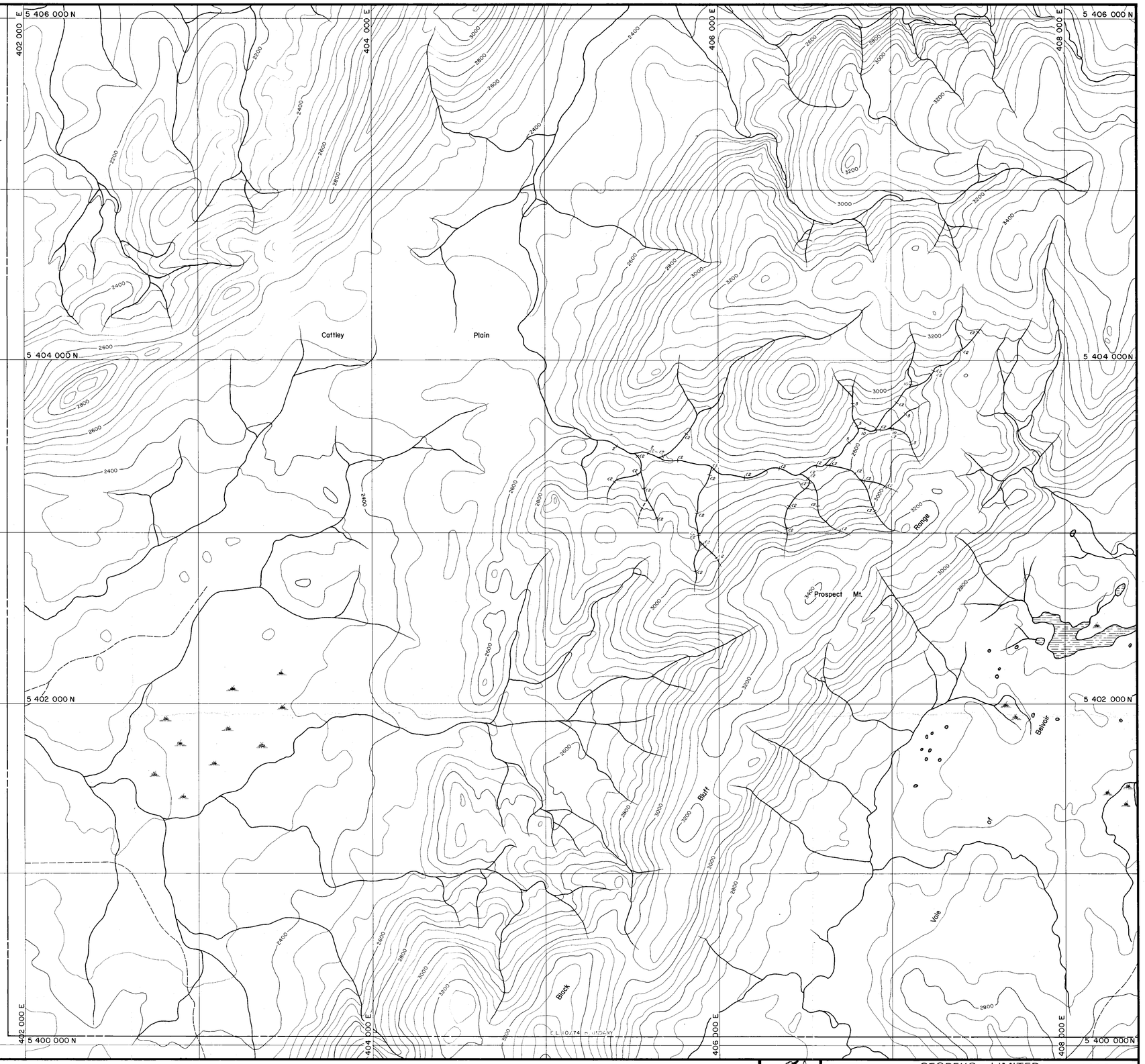
DATE
GEOLOGIST G.B./J.P.
DRAWN J.P.M.
CHECKED

E.L. 10/74 **PLAN 6**
BLACK BLUFF, TASMANIA
DRAINAGE GEOCHEMICAL RESULTS
Cu Pb Zn

2403

KTIO/74-1
KTIO/74-2 KTIO/74-3

5 cm



LEGEND

<2 Cu ppm

ANALYTICAL METHODS: Cu by AAS following conc. HCL leach and HCL/HNO3 leach in latter stages for 1 hour of 0.25g sample

A.C.S. Laboratories Pty LTD

NOTE.
This map has been compiled from enlargements of the Tasmanian Lands Department's 1:15840 scale topographic machine plots.

GEOPEKO LIMITED 651072
KING ISLAND GROUP

SCALE: 1:10,000

No. KT10/74-2B-1

DATE: November 1977
GEOLOGIST: R.B.
DRAWN: L.G. B.J.M.
CHECKED: M.C.R.

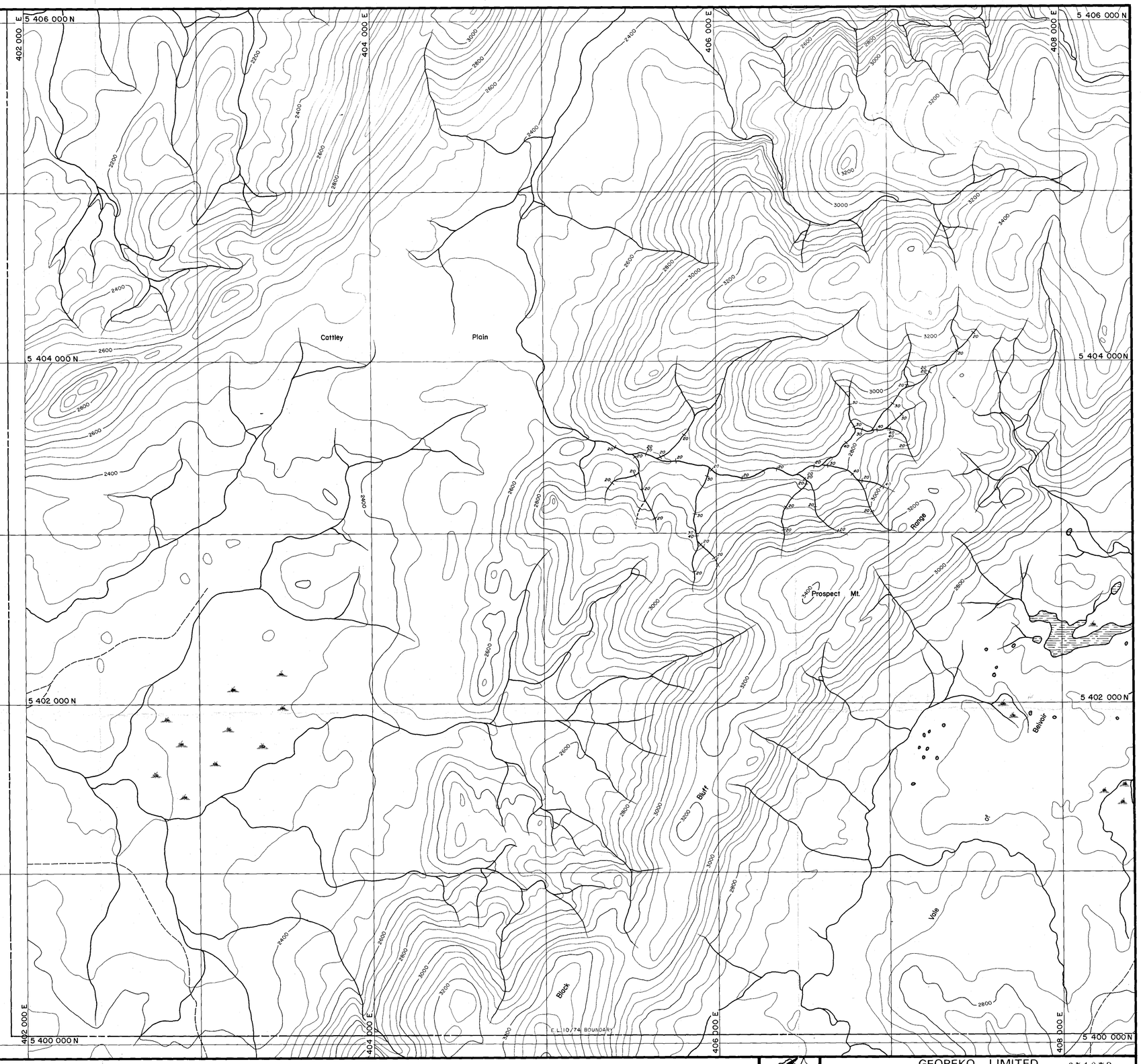
E.L. 10/74 PLAN 7
BLACK BLUFF, TASMANIA
DRAINAGE GEOCHEMICAL RESULTS
COPPER

2404

KT10/74-1	
KT10/74-2	KT10/74-3

5 cm

83-1895



LEGEND:

20 Pb ppm

ANALYTICAL METHODS: Pb by AAS following hot conc. HCL leach and HCL/HNO3 leach in latter stages for 1 hour of 0.25g sample.

A.C.S. Laboratories Pty. LTD

NOTE:
This map has been compiled from enlargements of the Tasmanian Lands Department's 1:15840 scale topographic machine plots.

GEOPEKO LIMITED
KING ISLAND GROUP
651073

SCALE: 1:10,000

No. KTI0/74-2B-2

PLAN 8

E.L. 10/74
BLACK BLUFF, TASMANIA

DRAINAGE GEOCHEMICAL RESULTS
LEAD

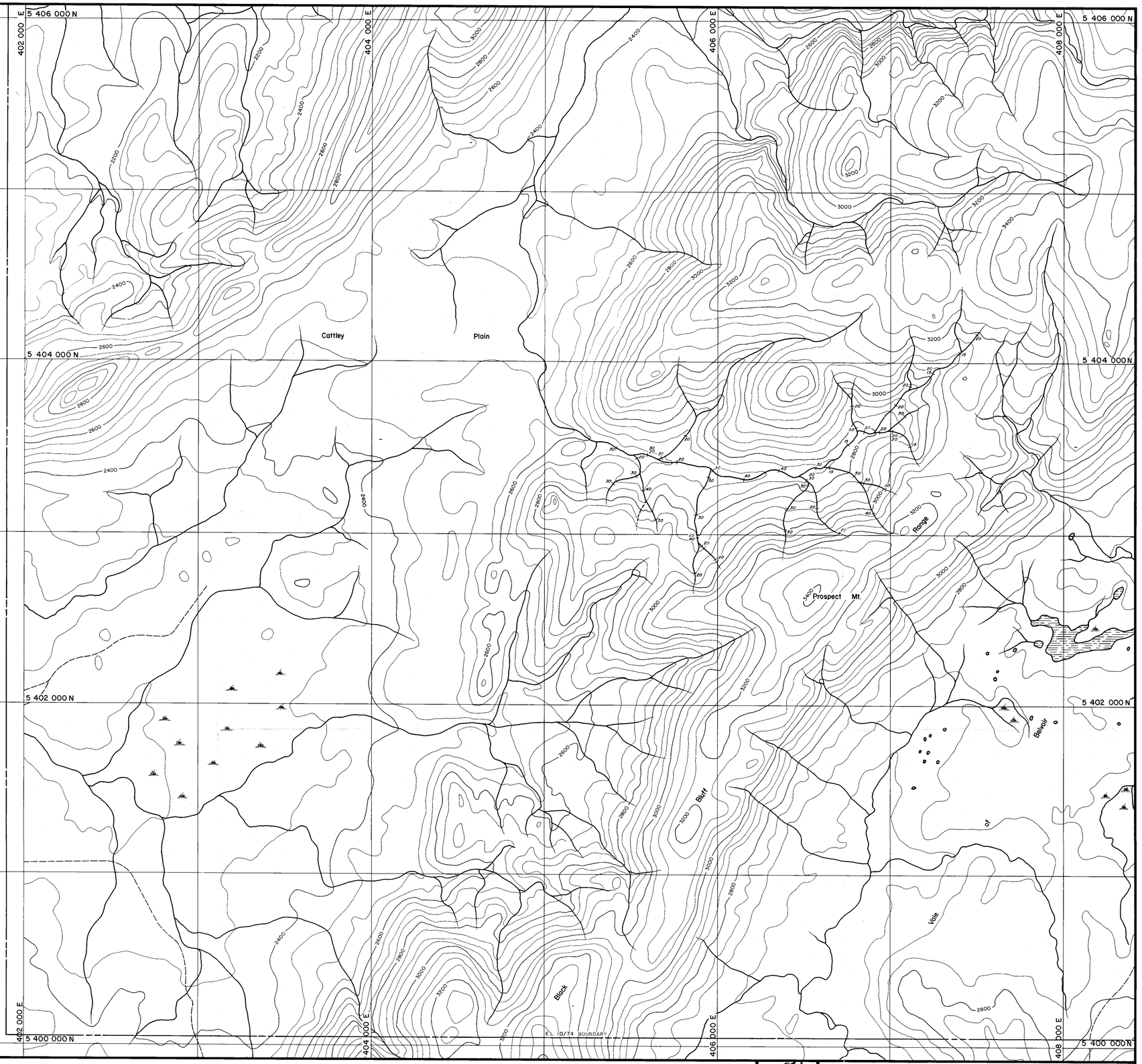
DATE: November 1977
GEOLOGIST: R.B.
DRAWN: L.G. & J.M.
CHECKED: M.C.R.

2405

KTI0/74-1 | KTI0/74-2 | KTI0/74-3

5 cm

93-1895



LEGEND:
40 Zn ppm

ANALYTICAL METHODS: Zn by AAS following hot conc. HCL leach and HCL/HNO_3 leach in latter stages for 1 hour of 0·25g sample.
A.C.S. Laboratories Pty. LTD.

NOTE:
This map has been compiled from enlargements of the Tasmanian Lands Departments 1:15840 scale topographic machine plots.

GEOPEKO LIMITED
KING ISLAND GROUP
651074

SCALE: 1:10,000

No. KT10/74-2B-3

E.L. 10/74 PLAN 9
BLACK BLUFF, TASMANIA
DRAINAGE GEOCHEMICAL RESULTS
ZINC

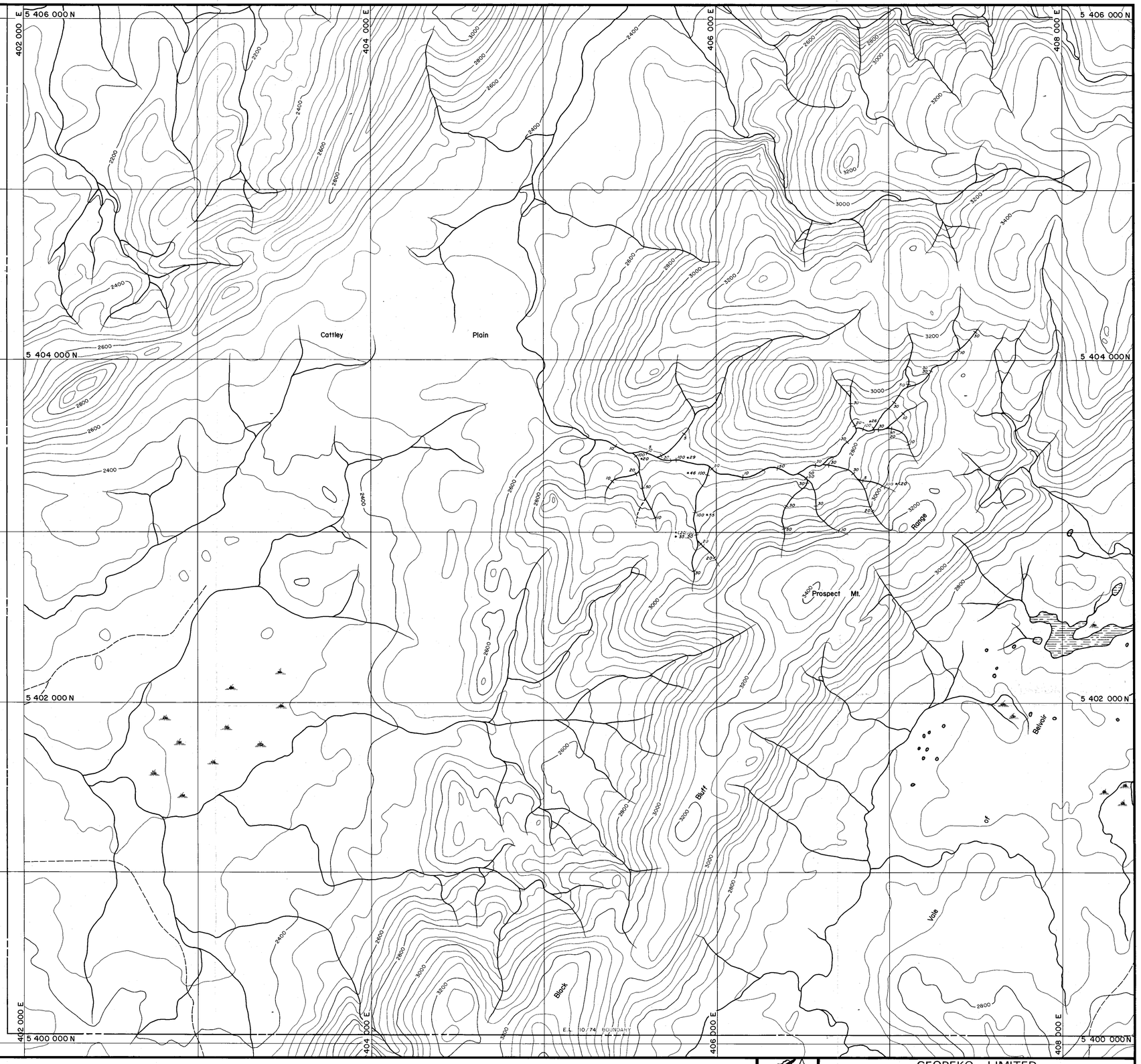
DATE: November 1977
GEOLOGIST: R.B.
DRAWN: L.G. & J.M.
CHECKED: M.C.R.

2406

KT10/74-1	
KT10/74-2	KT10/74-3

5 cm

D. 83-1895



LEGEND:
100 Sn ppm
+33 Sn ppm XRF

ANALYTICAL METHODS: Sn by Emission Spectrography
*Sn by XRF
A.C.S. Laboratories Pty. LTD.

NOTE:
This map has been compiled from enlargements of the Tasmanian Lands Department's 1:15840 scale topographic machine plots.

GEOPEKO LIMITED
651073 KING ISLAND GROUP

SCALE: 1:10,000

No. KT10/74-2B-4

PLAN 10

E.L. 10/74
BLACK BLUFF, TASMANIA

DRAINAGE GEOCHEMICAL RESULTS
TIN

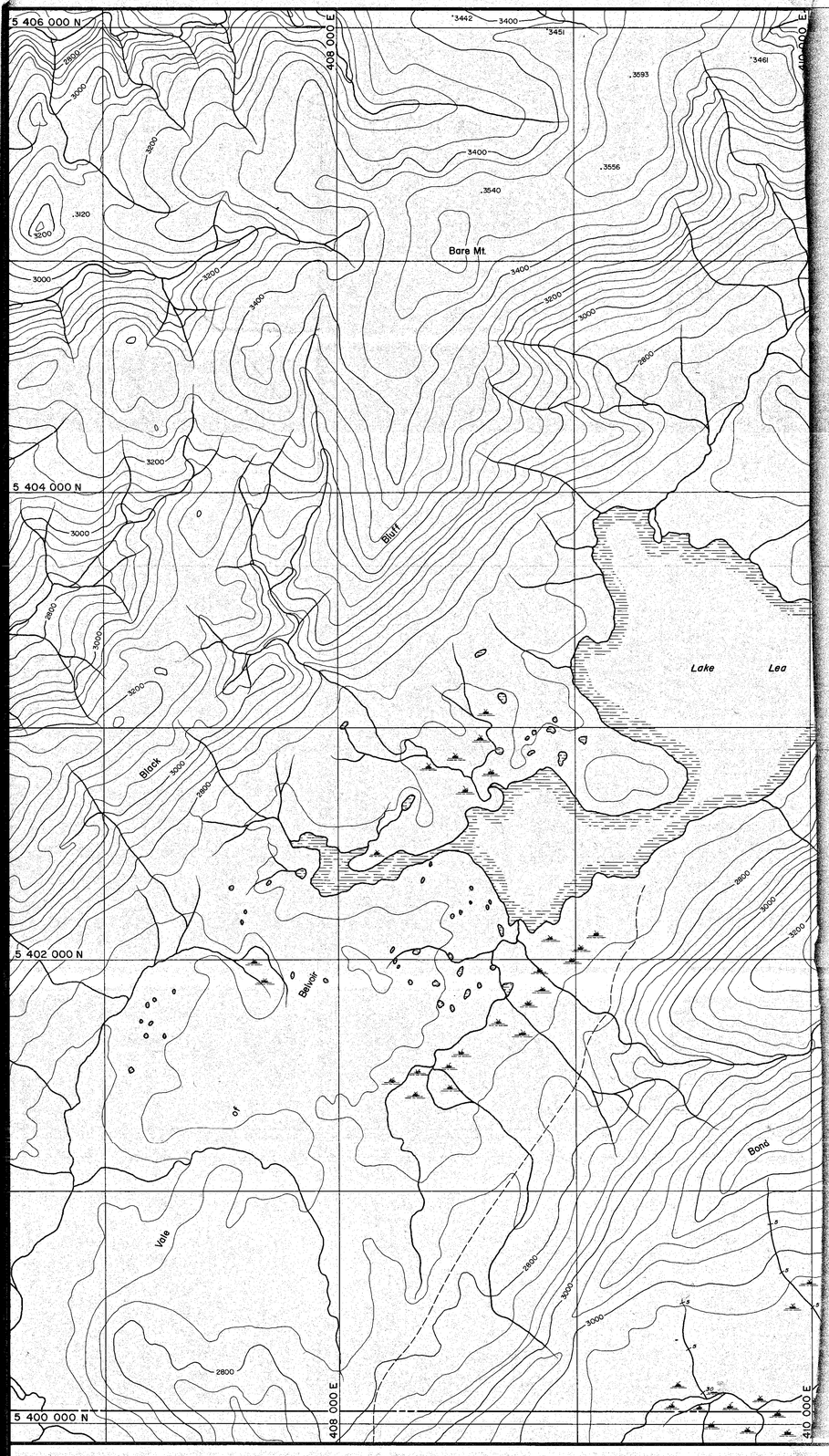
2407

KT10/74-1 | KT10/74-2 | KT10/74-3

5 cm

DATE: November 1977
GEOLOGIST: R.B.
DRAWN: L.G. & J.M.
CHECKED: M.C.R.

83-1895



LEGEND:

50 Cu ppm

ANALYTICAL METHODS: Cu by AAS following hot conc. HCL leach and HCL/HNO3 leach in latter stages for 1 hour of 0·25g sample.

A.C.S. Laboratories Pty. LTD.

NOTE:
This map has been compiled from enlargements of the Tasmanian Lands Department's 1:15840 scale topographic machine plots.

5 cm

GEOPEKO LIMITED
KING ISLAND GROUP
651076

SCALE: 1:10,000

No. KT10/74-3B-1

PLAN 11

E.L. 10/74
BLACK BLUFF, TASMANIA

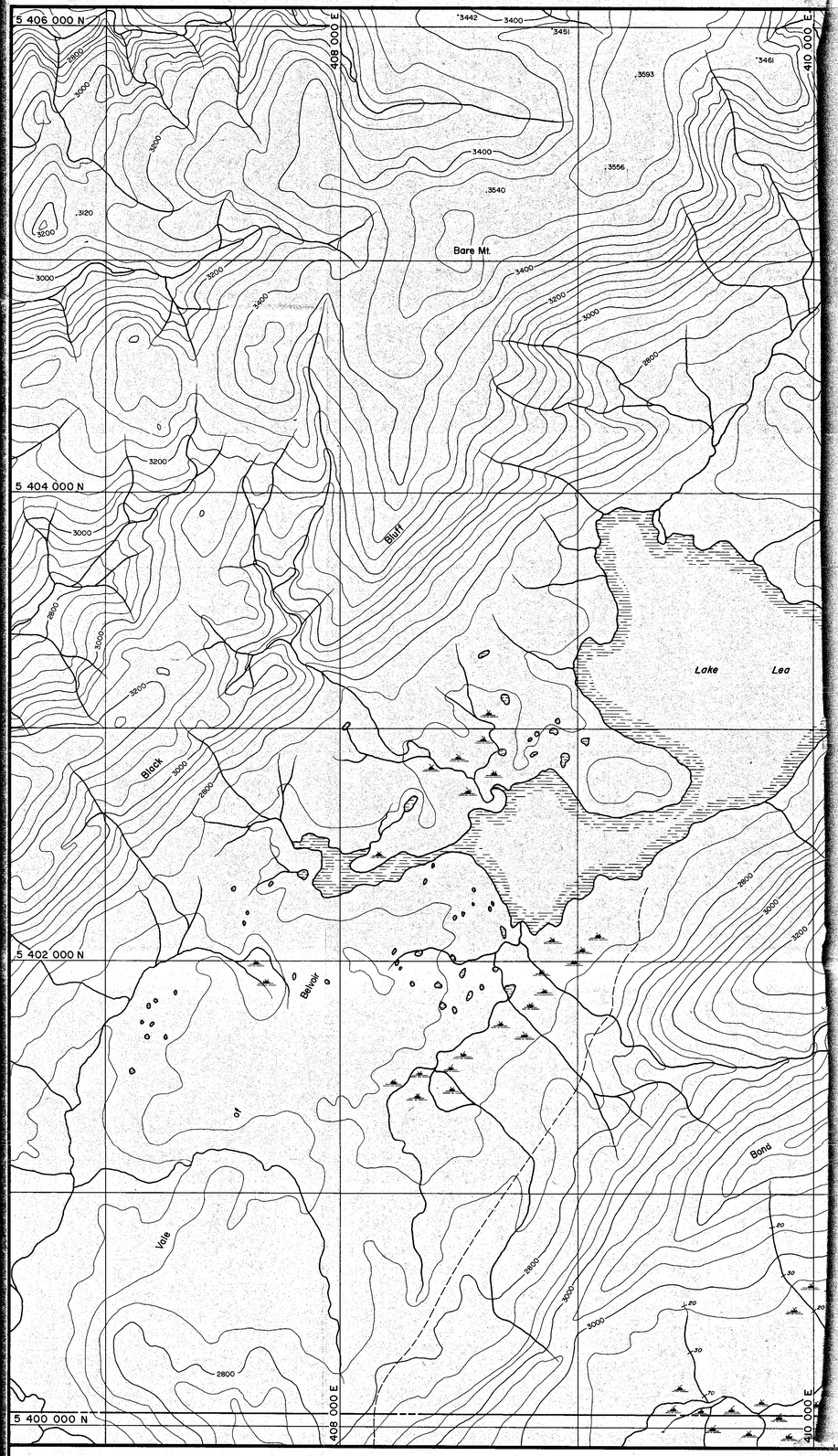
DRAINAGE GEOCHEMICAL RESULTS
COPPER

2408

KT10/74-1 | KT10/74-3
KT10/74-2

DATE: November 1977
GEOLOGIST: R.B.
DRAWN: L.G. & J.M.
CHECKED: M.C.R.

83-1895



LEGEND:

1680 Pb ppm

ANALYTICAL METHODS: Pb by AAS following hot conc. HCL leach and HCL/HNO3 leach in latter stages for 1 hour of 0·25g sample.

A.C.S. Laboratories Pty LTD.

NOTE:
This map has been compiled from enlargements of the Tasmanian Lands Department's 1:15840 scale topographic machine plots.

5 cm

GEOPEKO LIMITED
KING ISLAND GROUP

SCALE: 1:10,000

No. KT10/74-3B-2

PLAN 12

2403

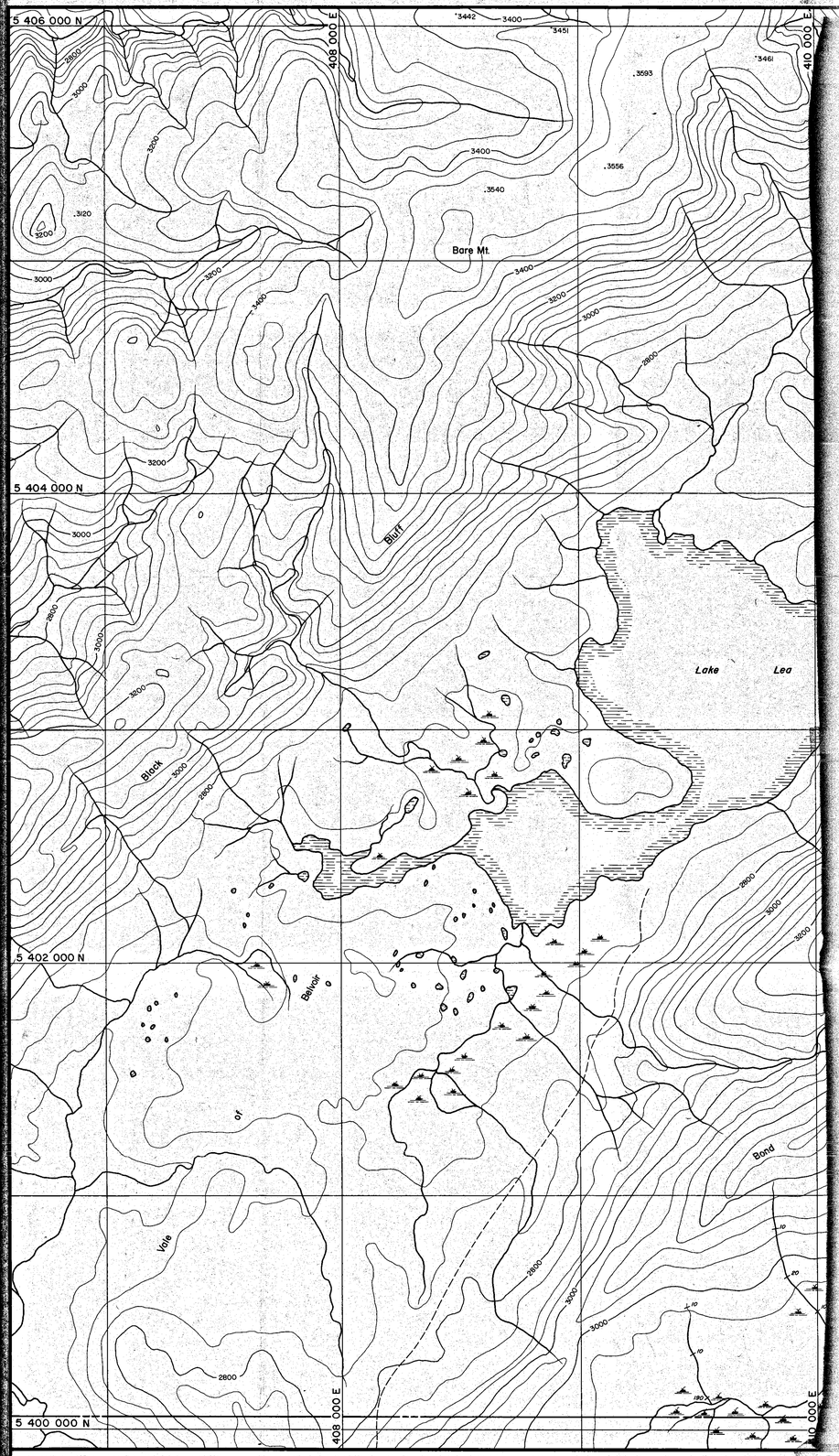
E.L. 10/74
BLACK BLUFF, TASMANIA

DRAINAGE GEOCHEMICAL RESULTS
LEAD

DATE: November 1977
GEOLOGIST: R.B.
DRAWN: L.G. & J.M.
CHECKED: M.C.R.

KT10/74-1	
KT10/74-2	KT10/74-3

83-1895



LEGEND:

620 Zn ppm

ANALYTICAL METHODS: Zn by AAS following hot conc. HCL leach and HCL/HNO3 leach in latter stages for 1 hour of 0·25g sample.

A.C.S. Laboratories Pty. LTD.

NOTE:
This map has been compiled from enlargements of the Tasmanian Lands Departments 1:15840 scale topographic machine plots.

5 cm

651078 GEOPEKO LIMITED
KING ISLAND GROUP

SCALE: 1:10,000

No. KT10/74-3B-3

PLAN 13

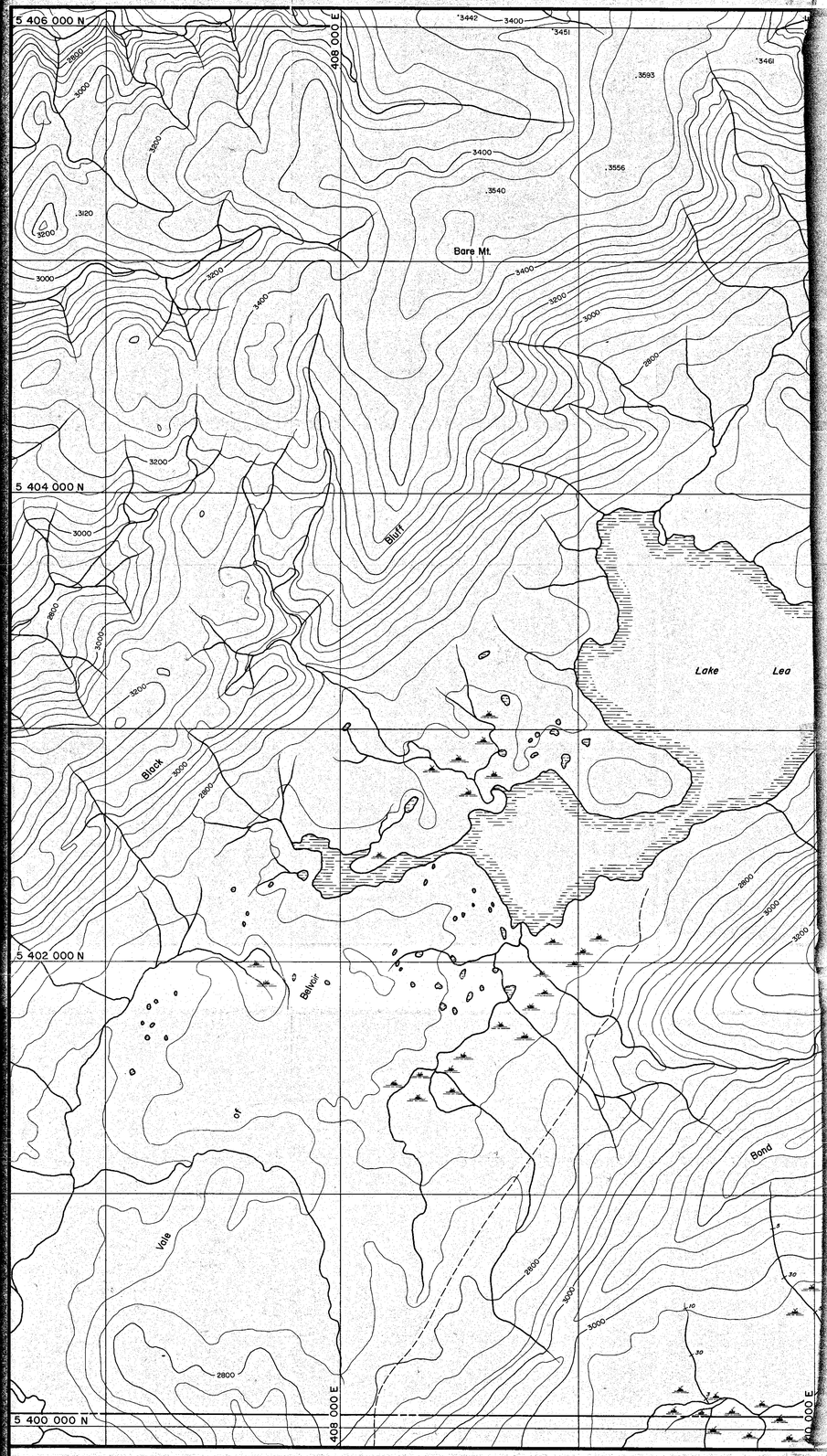
E.L. 10/74
BLACK BLUFF, TASMANIA

DRAINAGE GEOCHEMICAL RESULTS
ZINC

DATE: November 1977
GEOLOGIST: R.B.
DRAWN: L.G. & J.M.
CHECKED: M.C.R.

KT10/74-1 | 2410
KT10/74-2 | KT10/74-3

83-1895



LEGEND:

1000 Sn ppm

*770 Sn ppm by XRF

ANALYTICAL METHODS Sn by Emission Spectrography
Sn by XRF
A.C.S. Laboratories Pty LTD.

NOTE:
This map has been compiled from enlargements of the Tasmanian Lands Departments 1:15840 scale topographic machine plots.

5 cm

GEOPEKO LIMITED
KING ISLAND GROUP
651079

SCALE: 1:10,000

No. KT10/74-3B-4

PLAN 14

E.L. 10/74
BLACK BLUFF, TASMANIA

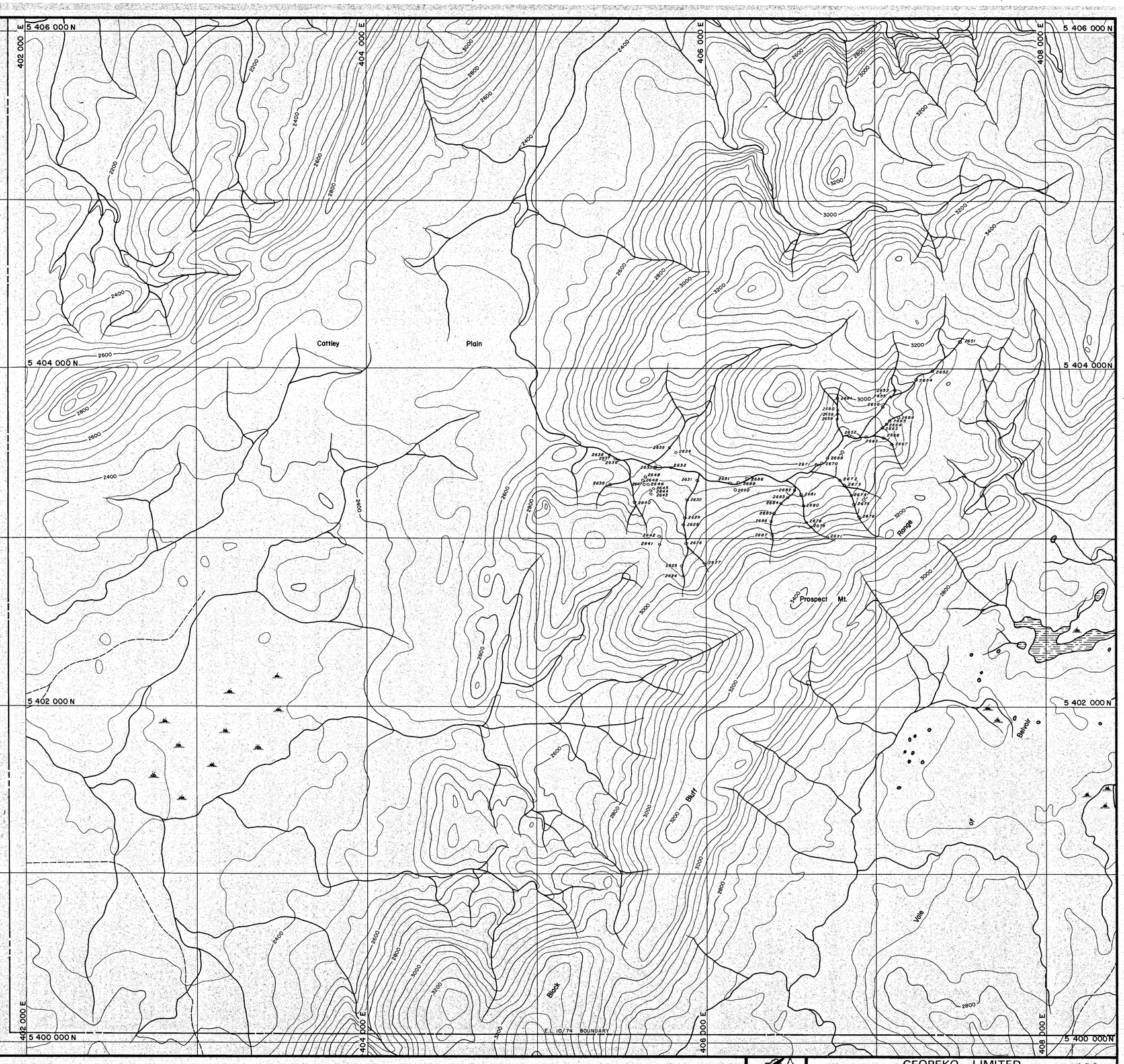
DRAINAGE GEOCHEMICAL RESULTS
TIN

2411

KT10/74-1	
KT10/74-2	KT10/74-3

DATE: November 1977
GEOLOGIST: R.B.
DRAWN: L.G. & J.M.
CHECKED: M.C.R.

83-1895



LEGEND:

o 2624 Outcrop sample No. KR 2624

NOTE:
This map has been compiled from enlargements of the Tasmanian Lands Department's 1:15840 scale topographic machine plots.

DATE: December 1976
GEOLOGIST: R.B.
DRAWN: J.P.M.
CHECKED: M.C.R.

GEOPEKO LIMITED 651080
KING ISLAND GROUP

SCALE: 1:10,000

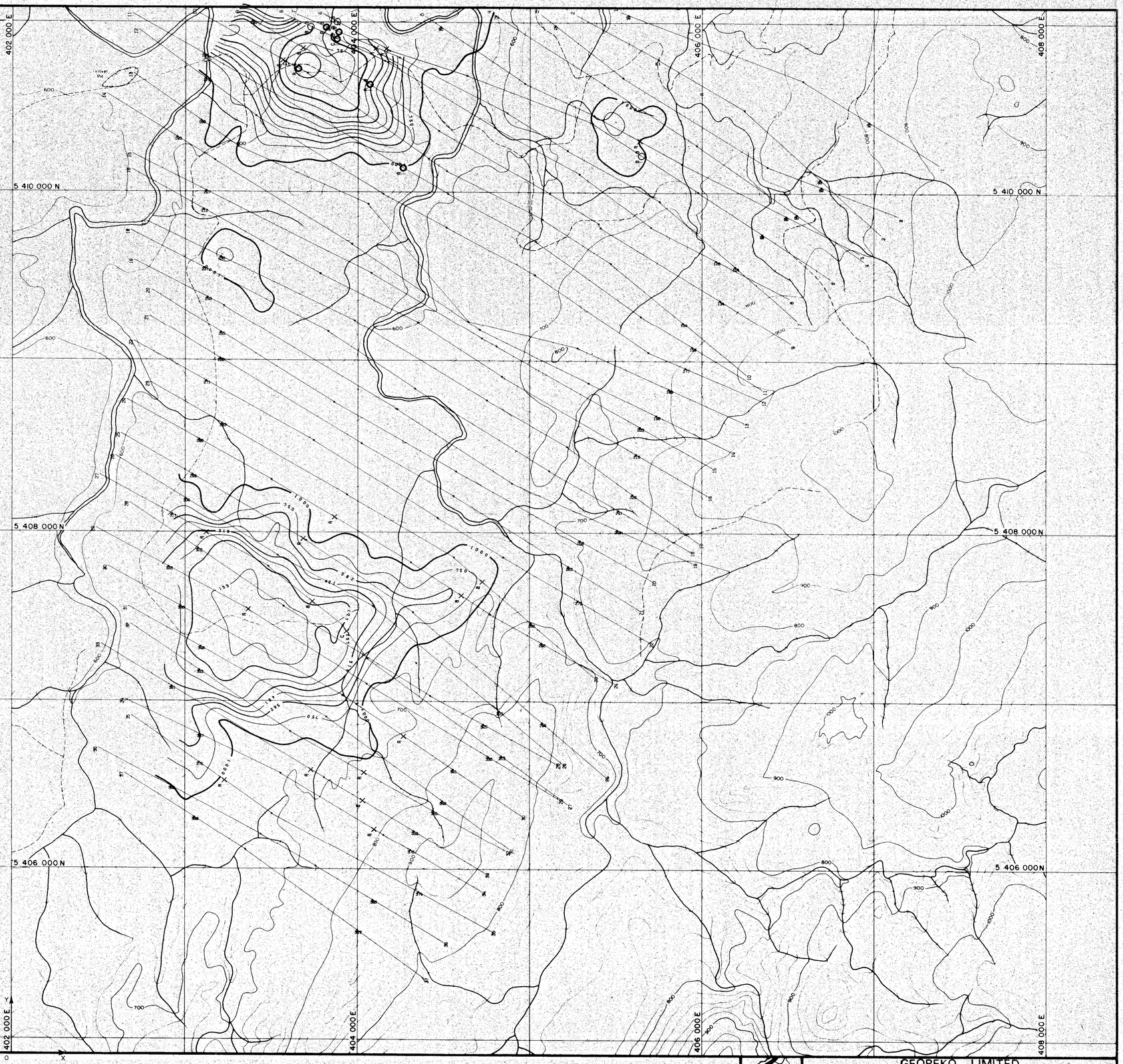
No. KT10/74-2D

E.L. 10/74 PLAN 15
BLACK BLUFF, TASMANIA
ROCK SAMPLE LOCATION MAP

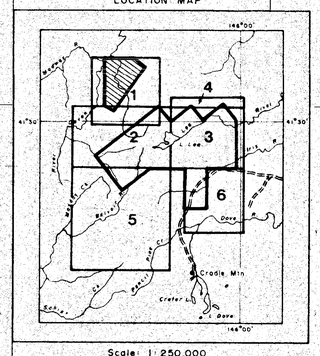
KT10/74-1	2412
KT10/74-2	KT10/74-3

5 cm

33-1895



LOCATION MAP



Scale: 1:250,000

LEGEND

Contours in ohm - m at eight intervals per decade.

100
75
56
42
31
23
17
13
10

Note

The numbers face in the direction of increasing value.

Flight line

Fiducials and numbers

Plan No. 5555 S/B

REGISTERED PROFESSIONAL ENGINEER
D.C. FRASER
PROVINCE OF ONTARIO

DIGHEM^{II} SURVEY

RESISTIVITY

GEOPEKO LIMITED 651081
KING ISLAND GROUP

SCALE: 1:10,000

No. KTIO/74-1

E.L. 10/74
BLACK BLUFF, TASMANIA

PLAN 16

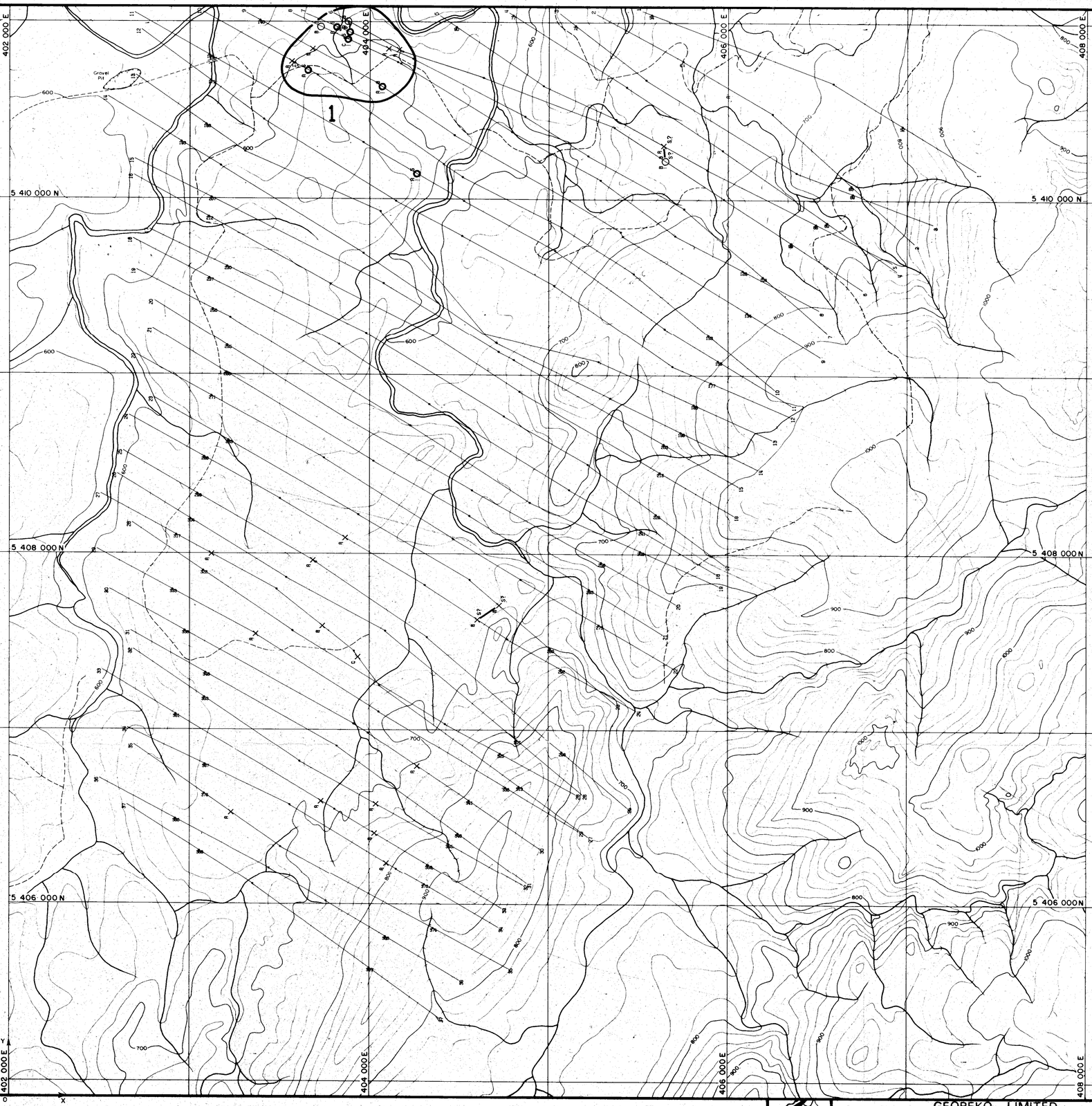
DATE
GEOLOGIST
DRAWN L.G.
CHECKED M.C.R.

2413

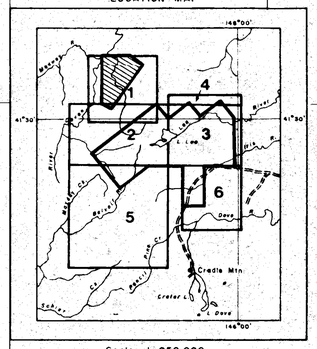
KTIO/74-1 | KTIO/74-2 | KTIO/74-3

5 cm

83-1895



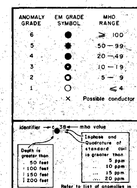
LOCATION MAP



Scale: 1:250,000

ANOMALY GRADE	EM GRADE SYMBOL	MHO RANGE
6	●	≥ 100
5	●	50 — 99
4	●	20 — 49
3	●	10 — 19
2	○	5 — 9
1	○	≤ 4
	×	Possible conductor

DIGHEM anomalies are divided into six grades of conductivity – thickness product. This product in mhos is the reciprocal of resistance in ohms. The mho is a measure of conductance, and is a geologic parameter. Most swamps yield Grade 1 anomalies, but highly conducting clays can give Grade 2 anomalies. The multi-coil anomaly shapes often allow surface conductors to be recognized, and these are indicated by the letter S on this map. The remaining Grade 1 and 2 anomalies could be weak bedrock conductors. The higher grades indicate increasingly higher conductances. Examples: The ore bodies at the Magusi River camp yield Grade 4 anomalies, while Matheson and Wheatle give Grade 5. Graphite and sulphides can span all grades but, in this survey area, field work may show that the different grades indicate different types of conductors.



The actual mho value is plotted beside the EM grade symbol. The letter is the anomaly identifier. The horizontal rows of dots indicate anomaly amplitude on the flight record, and the vertical column gives the estimated depth. This depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or conductive overburden effects.

Refer to text of interpretive survey report for the actual ppm values for all axis, and for conductor depths.

	Conductor axis
S	Probable surface response
S?	Possible surface response
L	Probable line (power, telephone, pipe, or fence)
L?	Possible line
?	Questionable anomaly
	Apparent thickness > 10 m.
Dip	
100%	Direct magnetic correlation of 100 gammas

DIGHEM maps are designed to provide a correct impression of conductor quality by means of the conductance grade symbols. The symbols can stand alone with geology when planning a followup program. The actual mho values are plotted for those who wish quantitative data. The anomaly ppm and depth are indicated by inconspicuous dots which should not distract from the conductor patterns, while being helpful to those who wish this information. The map provides an interpretation of all conductors in terms of length, strike direction, conductance and depth. The accuracy is comparable to an interpretation from a ground EM survey having the same line spacing.

Flight line

Fiducials and numbers

Plan No. 5552 S/B

DIGHEM^{II} SURVEY

ELECTROMAGNETICS

REGISTERED PROFESSIONAL ENGINEER
D. C. FRASER
PROVINCE OF ONTARIO

GEOPEKO LIMITED
KING ISLAND GROUP
651082

SCALE: 1 10,000

No. KT10/74-1

DATE
GEOLOGIST
DRAWN L.G.
CHECKED M.C.R.

E.L. 10/74
BLACK BLUFF, TASMANIA

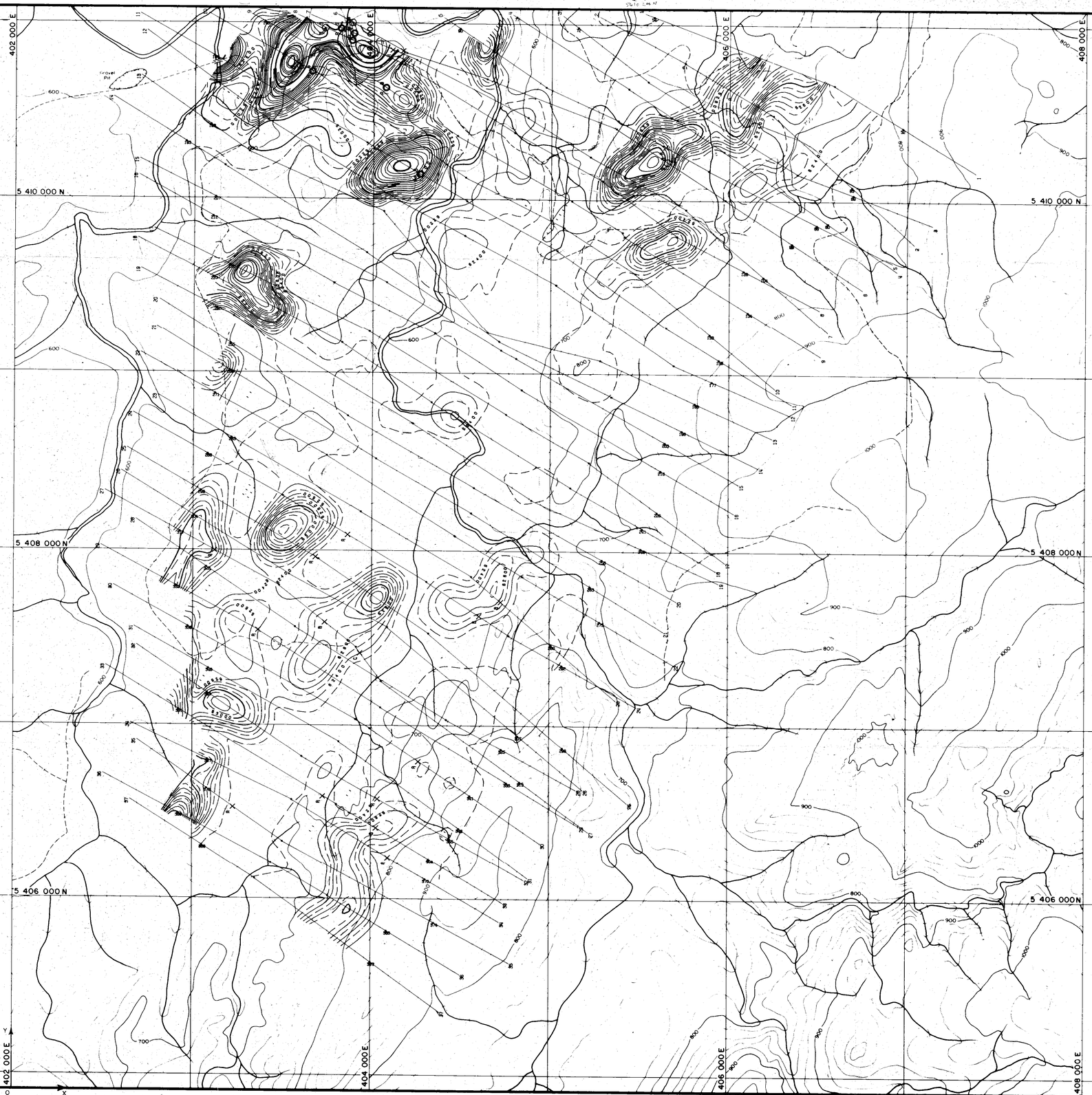
PLAN 17

2414

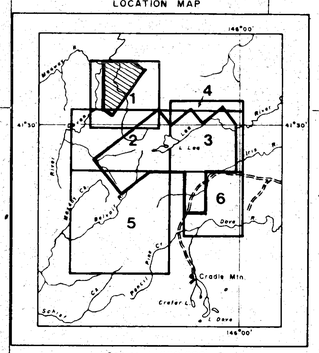
KT10/74-1
KT10/74-2 KT10/74-3

5 cm

83-1895



LOCATION MAP



Scale: 1: 250,000

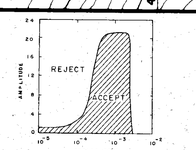
Plan No. 5554 S/B

DIGHEM^{II} SURVEY

ENHANCED MAGNETICS

ISOMAGNETIC LINES
(enhanced field)

- 5000 gammas
- 1000 gammas
- 200 gammas
- 100 gammas
- magnetic depression



Frequency response of magnetic operator

REGISTERED PROFESSIONAL ENGINEER
D. C. FRASER
PROVINCE OF ONTARIO

DATE	
GEOLOGIST	
DRAWN L.G	
CHECKED M.C.R	

GEOPEKO LIMITED
KING ISLAND GROUP
651083

SCALE: 1: 10,000

No. KT10/74-1

E.L. 10/74
BLACK BLUFF, TASMANIA

PLAN 18

2415

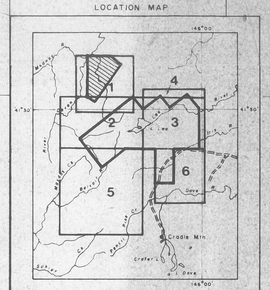
KT10/74-1 | KT10/74-2 | KT10/74-3

5 cm

83-1895

402 000 E
404 000 E
406 000 E
408 000 E
5 410 000 N
5 408 000 N
5 406 000 N

LOCATION MAP



Scale 1:250,000

Flight line

Fiducials and numbers

REGISTERED PROFESSIONAL ENGINEER
D. C. FRASER
PROVINCE OF ONTARIO

DIGHEM^{II} SURVEY

MAGNETICS

ISOMAGNETIC LINES
(total field)

1000 ..... 1000 gammas
200 ..... 200 gammas
..... 50 gammas
..... 25 gammas
..... magnetic depression

Magnetic Inclination within the survey area: 72°

DATE
GEOLOGIST
DRAWN: L.G.
CHECKED: M.C.R.

GEOPEKO LIMITED
KING ISLAND GROUP
651084

SCALE 1:10,000

No. KT10/74-1

E.L. 10/74
BLACK BLUFF, TASMANIA

2416

KT10/74-1
KT10/74-2
KT10/74-3

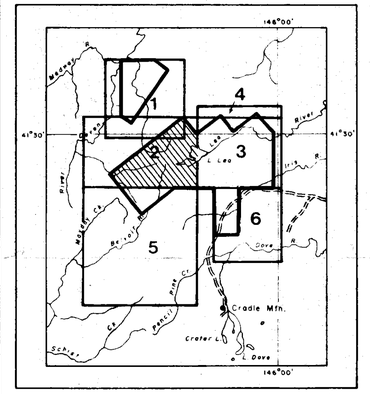
5 cm

Plan No. 5553 S/B

PLAN 19

83-1595

LOCATION MAP



Scale: 1:250,000

LEGEND

Contours in ohm - m
at eight intervals per decade

100
75
56
42
31
23
17
13
10

Note

The numbers face in the direction of increasing value.

Flight line

Fiducials and numbers

Plan No. 5559 S/B

REGISTERED PROFESSIONAL ENGINEER
D. C. FRASER
PROVINCE OF ONTARIO

DIGHEM^{II} SURVEY

RESISTIVITY

GEOPEKO LIMITED
KING ISLAND GROUP

651085

No KT10/74-2

DATE 10/74

GEOLOGIST

DRAWN

CHECKED

BLA BLUFF, TASMANIA

PLAN 20

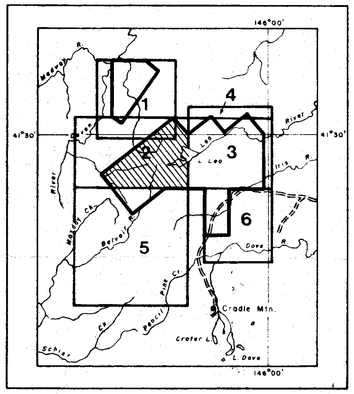
SHEET 2

2417

5 cm

83-1895

LOCATION MAP



Scale: 1:250,000

ANOMALY GRADE	EM GRADE SYMBOL	MHO RANGE
6	●	> 100
5	✱	50 — 99
4	●	20 — 49
3	◐	10 — 19
2	○	5 — 9
1	○	≪ 4
	X	Possible conductor

DIGHEM anomalies are divided into six grades of conductivity – thickness product. This product in mhos is the reciprocal of resistance in ohms. The mho is a measure of conductance, and is a geologic parameter. Most swamps yield Grade 1 anomalies but highly conducting clays can give Grade 2 anomalies. The multi-coil anomaly shapes often allow surface conductors to be recognized, and these are indicated by the letter S on this map. The remaining Grade 1 and 2 anomalies could be weak bedrock conductors. The higher grades indicate increasingly higher conductances. Examples: The ore bodies of the Magusi River camp yield Grade 4 anomalies, while Mattabi and Whistle give Grade 5. Graphite and sulphides can span all grades but, in this survey area, field work may show that the different grades indicate different types of conductors.

Identifier → L 32 ← mho value

Depth is greater than: 50 feet; 100 feet; 150 feet; 200 feet

Thickness and dip/nature of overburden: Shallow soil is greater than ... 5 ppm; ... 10 ppm; ... 15 ppm; ... 20 ppm

Refer to list of anomalies in survey report for the actual ppm values for all coils, and for conductor depths.

The actual mho value is plotted beside the EM grade symbol. The letter is the anomaly identifier. The horizontal rows of dots indicate anomaly amplitude on the flight record, and the vertical column gives the estimated depth. This depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or conductive overburden effects.

	Conductor axis
S	Probable surface response
S?	Possible surface response
L	Probable line (power, telephone, pipe, or fence)
L?	Possible line
?	Questionable anomaly
	Apparent thickness >10m
	Dip
100γ	Direct magnetic correlation of 100 gamma

DIGHEM maps are designed to provide a correct impression of conductor quality by means of the conductance grade symbols. The symbols can stand alone with geology when planning a followup program. The actual mho values are plotted for those who wish quantitative data. The anomaly ppm and depth are indicated by inconspicuous dots which should not distract from the conductor patterns, while being helpful to those who wish this information. The map provides an interpretation of all conductors in terms of length, strike direction, conductance and depth. The accuracy is comparable to an interpretation from a ground EM survey having the same line spacing.

Flight line

Fiducials and numbers

Plan No. 5556 S/B

REGISTERED PROFESSIONAL ENGINEER D.C. FRASER PROVINCE OF ONTARIO

DIGHEM^{II} SURVEY

ELECTROMAGNETICS

GEOPEKO LIMITED
KING ISLAND GROUP
651086

SCALE 1:5000

No. KT10/74-2

DATE
GEOLOGIST
DRAWN L.G.
CHECKED M.C.R.

E.L. 10/74
BLACK BLUFF, TASMANIA

PLAN 21

SHEET 2

2418

KT10/74-1 | KT10/74-2 | KT10/74-3

5 cm

83-1895

5 406 000 N

402 000 E

404 000 E

406 000 E

5 404 000 N

5 402 000 N

5 400 000 N

Cattley

Plain

Prospect Mt

Cradle Mtn.

Crater L.

L. Dove

L. Lea

Barrow Cr.

Dove R.

Forth R.

Scales

Flange

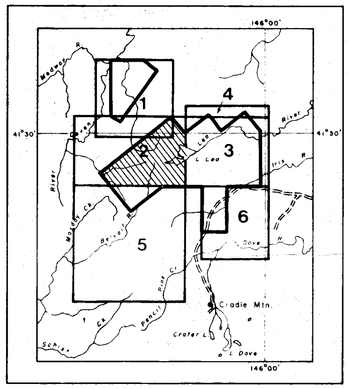
Belvoir

Burt

Black

Vale

LOCATION MAP



Scale: 1:250,000

ISOMAGNETIC LINES

(enhanced field)

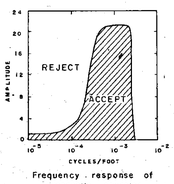
5000 ..... 5000 gammas

1000 ..... 1000 gammas

200 ..... 200 gammas

100 ..... 100 gammas

..... magnetic depression



Frequency - response of magnetic operator

Flight line

Fiducials and numbers

REGISTERED PROFESSIONAL ENGINEER D.C. FRASER PROVINCE OF ONTARIO

DIGHEM^{II} SURVEY

ENHANCED MAGNETICS

Plan No. 5558 S/B

GEOPEKO LIMITED 651087

KING ISLAND GROUP

No KT10/74-2

DATE

GEOLOGIST

DRAWN

CHECKED

E.L. 10/74 PLAN 22

BLACK BLUFF, TASMANIA

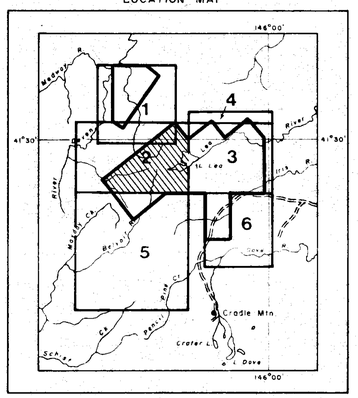
SHEET 2

2419

5 cm

83-1895

LOCATION MAP



Scale: 1:250,000

ISOMAGNETIC LINES

(total field)

- 1000 ..... 1000 gammas
- 200 ..... 200 gammas
- ..... 50 gammas
- ..... 25 gammas
- ..... magnetic depression

Magnetic Inclination within the survey area: 72°

Flight line

Fiducials and numbers

REGISTERED PROFESSIONAL ENGINEER D.C. FRASER PROVINCE OF ONTARIO

DIGHEM^{II} SURVEY

MAGNETICS

Plan No. 5557 S/B

GEOPEKO LIMITED
KING ISLAND GROUP
651088

No. KT10/74-2

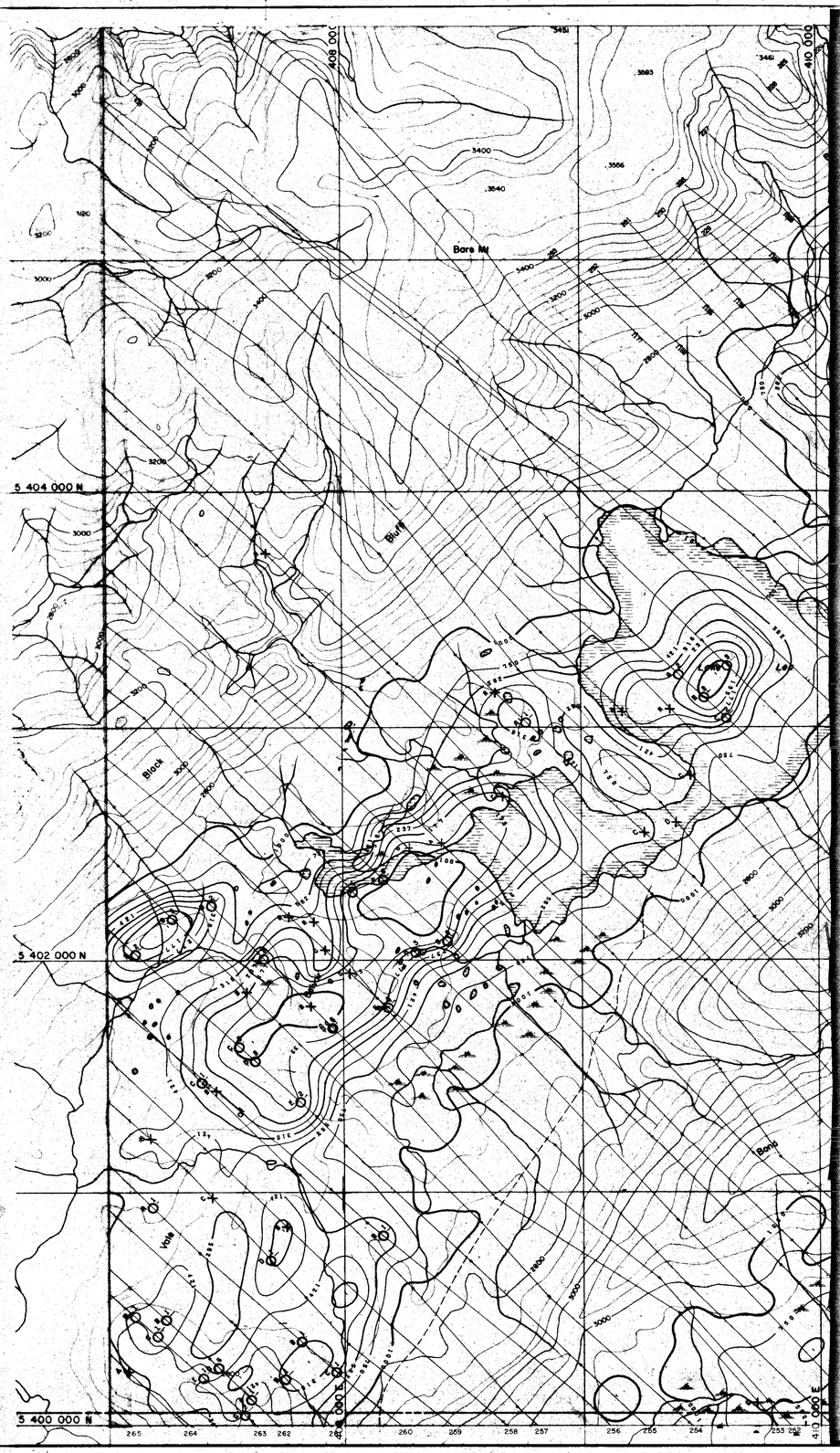
DATE
GEOLOGIST
DRAWN
CHECKED

E.L. 10/74 **PLAN 23**
BLACK BLUFF, TASMANIA

SHEET 2

2420

83-1895



5 cm

Flight line

Fiducials and numbers

DIGHEM^{II} SURVEY

RESISTIVITY

REGISTERED PROFESSIONAL ENGINEER
D. C. FRASER
PROVINCE OF ONTARIO

651089 GEOPEKO LIMITED
KING ISLAND, TAS.

SCALE

No KTIO/74-3

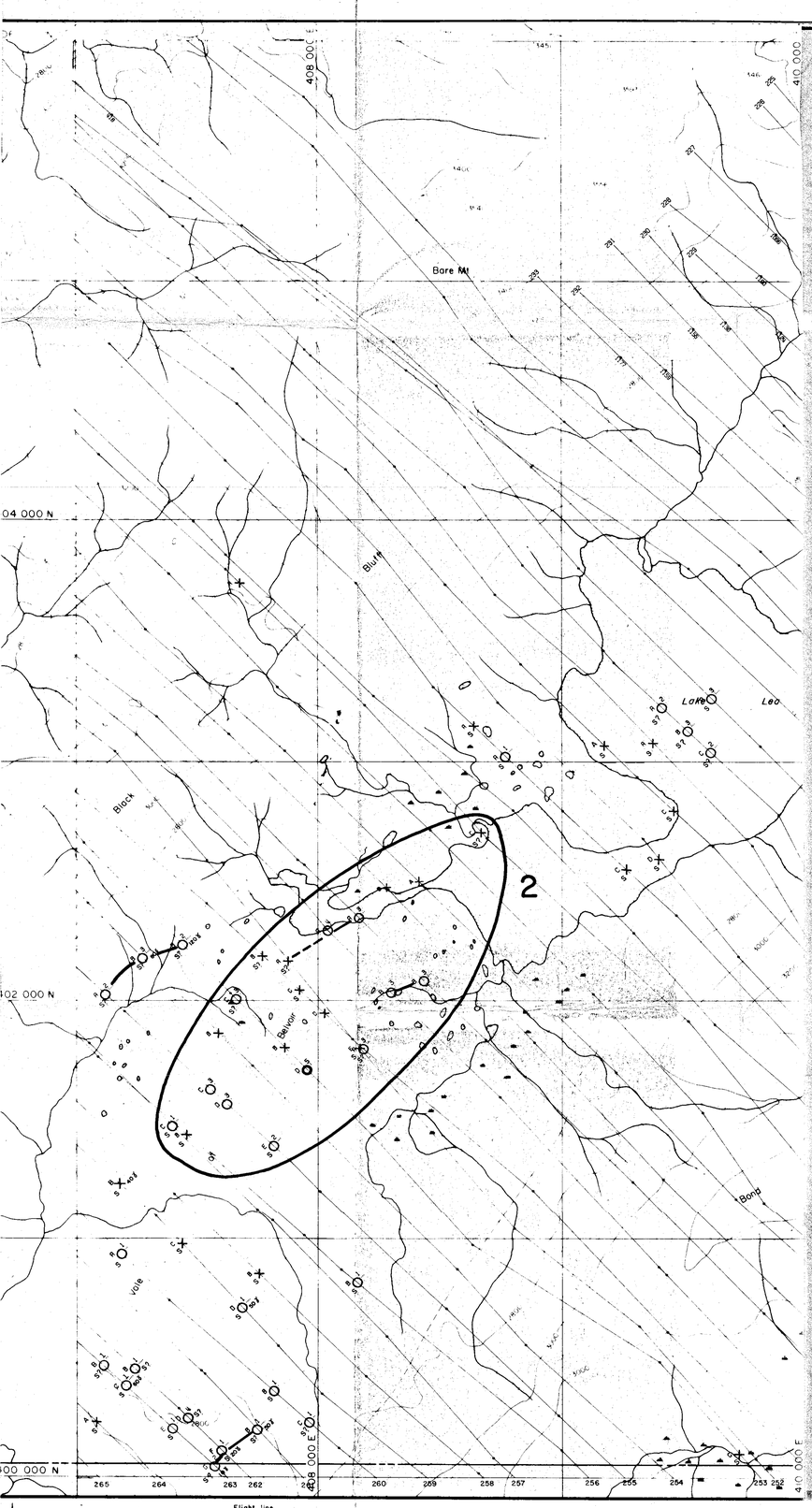
E.L. 10/74
BLACK BLUFF, TASMANIA

SHEET 3 PLAN 24

2421.

DATE
GEOLOGIST
DRAWN
CHECKED

83-1895



Flight line

Fiducials and numbers

REGISTERED PROFESSIONAL ENGINEER
D. C. FRASER
PROVINCE OF ONTARIO

DIGHEM^{II} SURVEY

ELECTROMAGNETICS

5 cm

GEOPEKO LIMITED
KING ISLAND GROUP

651090

SCALE

No KT10/74-3

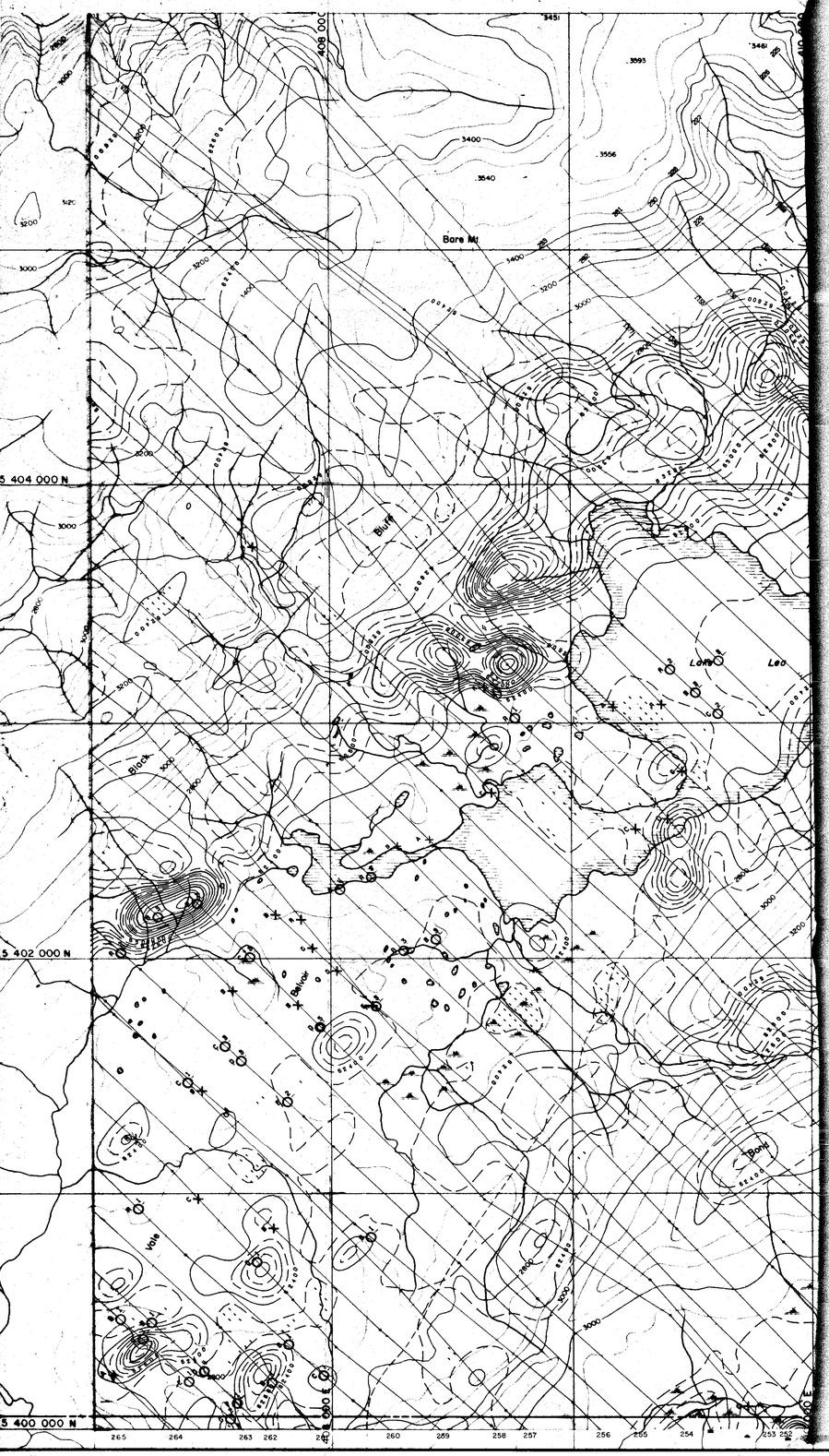
DATE
GEOLOGIST
DRAWN
CHECKED

E.L. 10/74
BLACK BLUFF, TASMANIA

SHEET 3 PLAN 25

2422

83-1895



Flight line

Fiducials and numbers

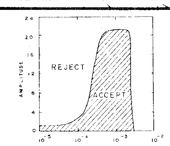
REGISTERED PROFESSIONAL ENGINEER
D. C. FRASER
PROVINCE OF ONTARIO

DIGHEM^{II} SURVEY

ENHANCED MAGNETICS

ISOMAGNETIC LINES
(enhanced field)

5000 gammas
1000 gammas
200 gammas
100 gammas
magnetic depression



Frequency response of magnetic operator

5 cm

DATE
GEOLOGIST
DRAWN
CHECKED

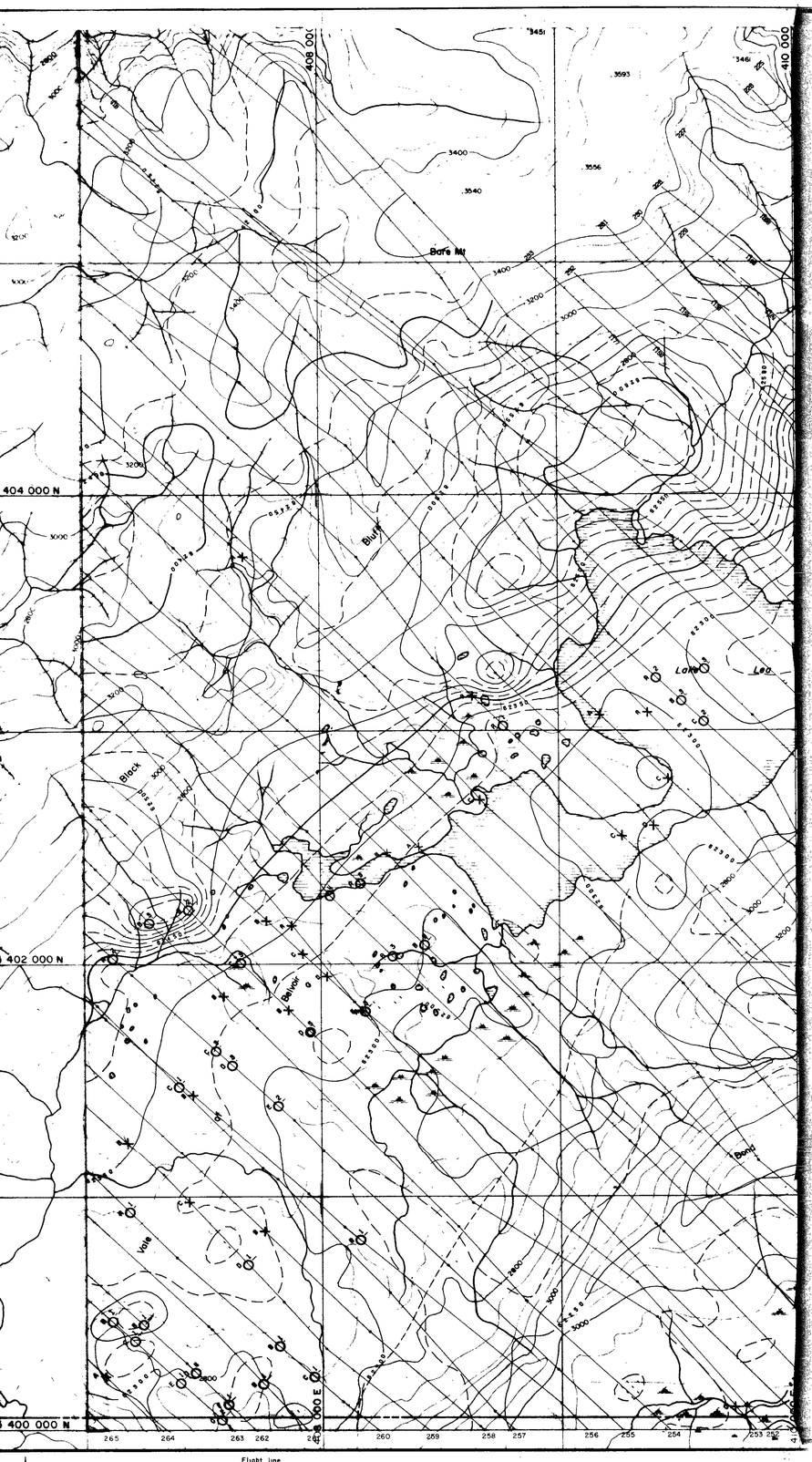
GEOPEKO LIMITED
NEW ONTARIO 651091

SCALE
No KTIO/74 3

E.L. 10/74
BLACK BLUFF, TASMANIA
SHEET 3 PLAN 26

2423

83-1995



Flight line

Fiducials and numbers

DIGHEM[II] SURVEY

MAGNETICS

ISOMAGNETIC LINES

(total field)

- 1000 — 1000 gammas
- 200 — 200 gammas
- 50 gammas
- 25 gammas
- magnetic depression

Magnetic Inclination within the survey area 72°

5 cm

GEOPEKO LIMITED — 651092

SCALE — NO. KTI0/74-3

E.L. 10/74
BLACK BLUFF, TASMANIA

SHEET 3 PLAN 27

2424

DATE
GEOLOGIST
DRAWN
CHECKED

REGISTERED PROFESSIONAL ENGINEER
D. C. FRASER
PROVINCE OF ONTARIO

83-1895