

669001

**DOUGLAS McKENNA & PARTNERS PTY. LTD.**

**Consulting Exploration & Mining Geologists**

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A.B.N. 98 004 774 761

**ANNUAL REPORT TO 3 APRIL 2001**  
**ON**  
**DOLCOATH EL 37/97**  
**TASMANIA**  
**FOR**  
**JERVOIS MINING N.L.**

**MICROFILMED**  
**FICHE No.015525-**

<b>MINERAL RESOURCES</b>		
FILE REF: <b>EL37/97</b>		
14 MAR 2001		
DOC. REF:		
OFFICER	FOR ACTION	FOR INFO
<i>See fol 02</i>		
RESUBMIT TO	DATE	

**March 2001**

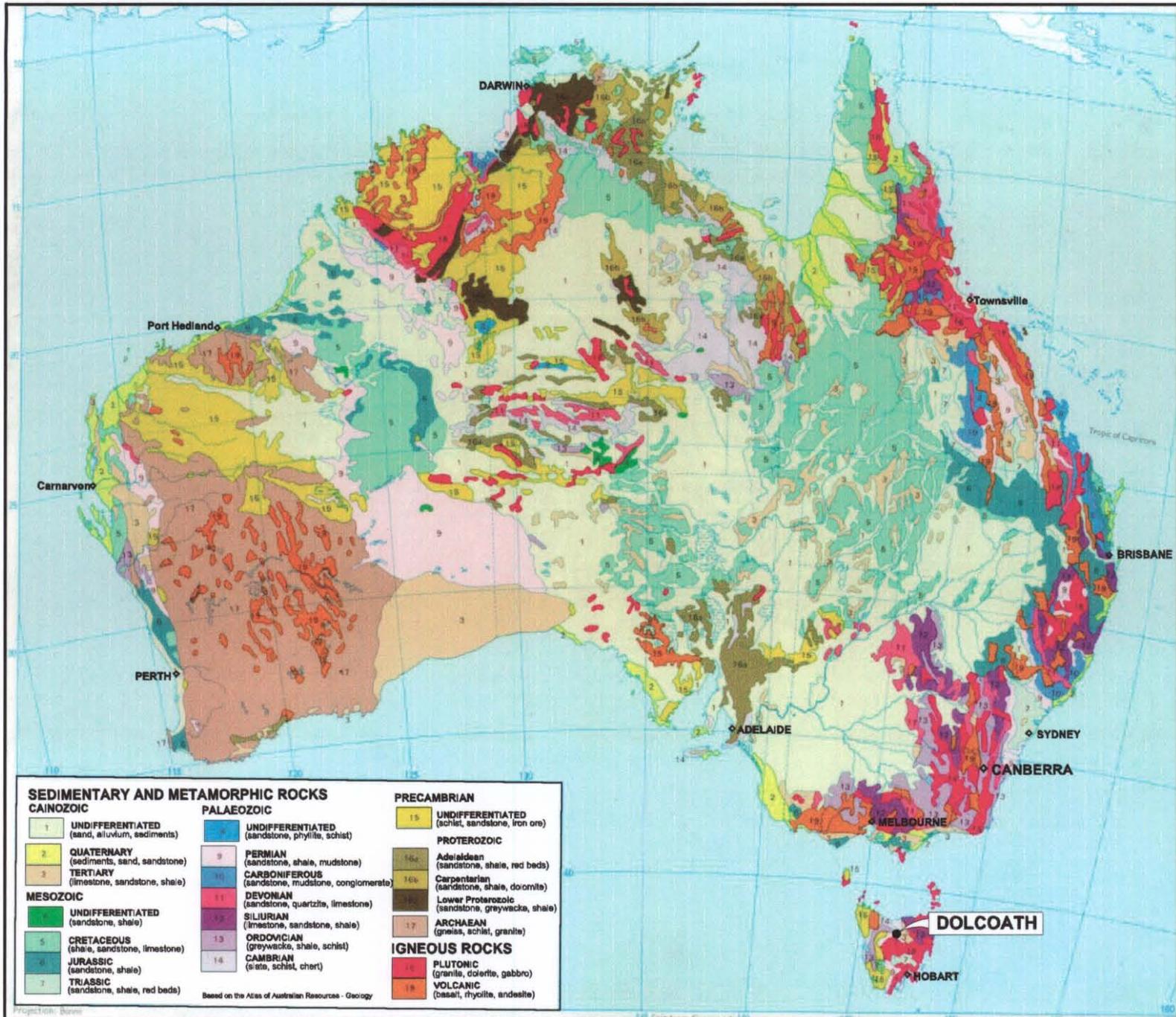
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**SUMMARY**

No field work was performed during the year.

A contract for a helicopter-borne electromagnetic geophysical survey has been signed but due to the loss of the contractor's "bird" on another survey there has been a delay in the survey.

# PROSPECT LOCATION



5 cm

669003

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**APPENDIX**

Contract for Helicopter-borne Electromagnetic Geophysical Survey.

**ACCOMPANYING PLANS**

Tenement Location Plan	1:250,000
Geology	1:25,000

## INTRODUCTION

Dolcoath EL 37/97 (12.5 sq. km) is situated near the old township of Moina, 40 km south of Ulverstone in NW Tasmania. The terrain is rugged and forested, but accessible via several unsealed roads and numerous all-weather 4WD tracks. The sealed Cradle Mountain Road traverses the area.

The licence covers strongly altered Ordovician sediments, principally the quartzose Moina Sandstone, adjacent to the Devonian Dolcoath Granite. There are numerous old mines and prospects on the tenement, mainly of tin-tungsten, gold, lead-zinc, bismuth and molybdenum. None were significant producers and total gold production is estimated at 1,000 oz (Jack, 1961).

EL 37/97 was taken up by Jervois Mining N.L. in April 1998 to test the gold and associated basemetal potential of part of the Dolcoath Granite aureole. Previous exploration and small-scale mining had delineated significant gold and lead-zinc mineralisation in the catchment of Narrawa Creek, centered on the old Higgs and Narrawa Reward goldmines.

Drilling by Jervois in late 1998 discovered a deposit of gold and basemetal mineralisation at Higgs. This outcropping resource is estimated to contain 215,000t @ 3.5 g/t Au, 23 g/t Ag, 1.5% Pb & 1.3% Zn (Purvis, 1999).

EL 37/97 lies less than 1km east of Australia's largest undeveloped fluorite resource, the skarn-hosted Moina deposit of 26 mmt @ 18% CaF<sub>2</sub> (Askins, 1979). The deposit contains patchy gold values in the 0.2-0.4 g/t Au range. Higher grade

gold mineralisation is hosted by peripheral pyrrhotite and sphalerite-rich parts of the skarn, with the Hugo Deposit (300m west of the EL 37/97 boundary) estimated to contain 250,000t @ 5-6% Zn, 1 g/t Au and 0.1% Bi (Newnham, 1997).

In the two previous years of tenure Jervois drilled 17 diamond drill holes within the licence and expended \$182,137 (requirement \$164,000) on exploration.

### **TENEMENT**

The Dolcoath EL 37/97 covers 12.5 sq. km and was granted to Jervois Mining N.L. on 3<sup>rd</sup> April 1998. The licence will expire on 3<sup>rd</sup> April 2003.

The area was won by Jervois in competitive tender for ETA 457, which became available as a result of a statutory 50% reduction in the adjacent EL 20/92 then held by the Goldstream Mining - Titan Resources JV. EL 20/92 is now held by Jervois under a royalty arrangement with Goldstream-Titan.

EL 37/97 is predominantly Crown Land. It includes State Forest (Multiple Use Forest Land), RFA – Informal Reserves, Land Vested in the HEC and a small amount of Private Property. A 10ha Mining Lease (part of a 16ha Gravel Lease beside the Cradle Mountain Road) is excluded from the licence.

EL 37/97 abuts the eastern and northern boundaries of Retention Licence 8810, held by AngloGold and Rio Tinto over the Moina fluorite deposit.

**GEOPHYSICAL**

The Commonwealth and Tasmanian Governments have provided funds for airborne geophysical surveys over parts of Western Tasmania. In the Moina region lines will be flown 200 metres apart and electromagnetic and magnetic data will be collected.

Subsequently Jervis has contracted with the geophysical contractor, GeolInstruments Pty. Ltd., for the interspersed 100 metre lines to be flown as well. A copy of the contract appears in the Appendix.

Jervis were informed in February 2001 that the survey would be delayed because GeolInstruments had lost the "bird" in an accident on another survey. It may be some months before the survey can be completed.

**DISCUSSION**

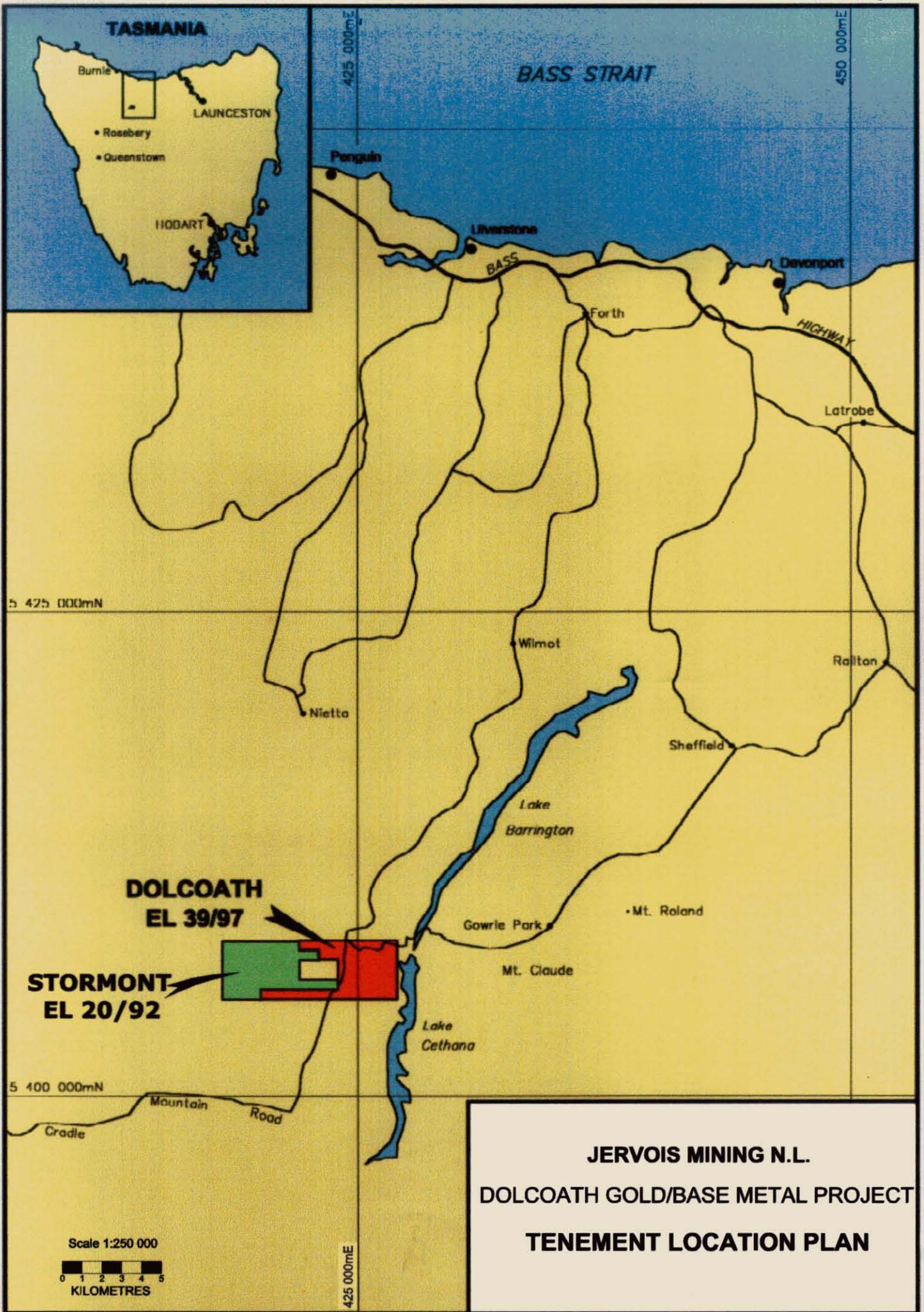
The Second Progress Report of last year has recommendations that are still to be implemented.

Follow-up work will be planned when the results of the airborne electromagnetic survey have been received and interpreted.

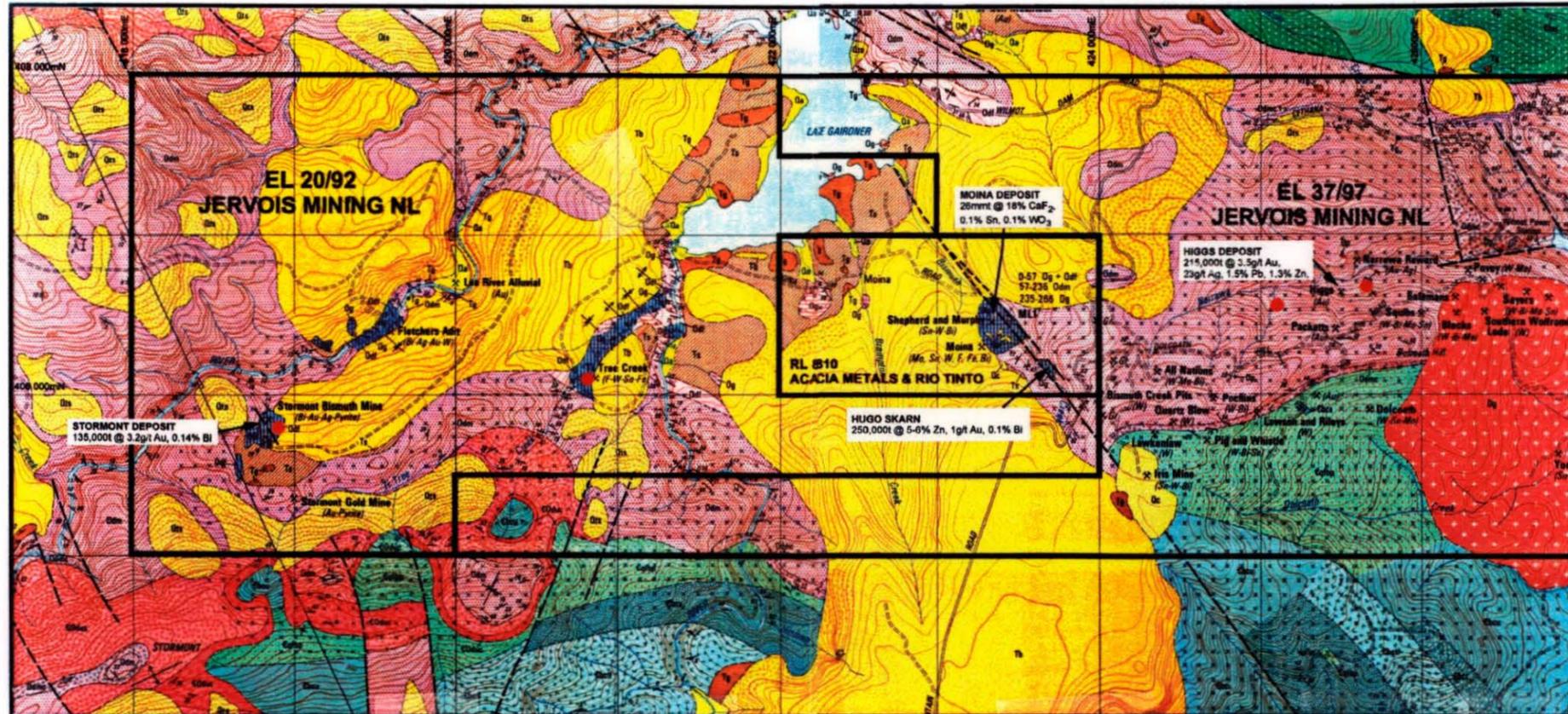
*Douglas McKenna Partners Pt. Ld.*

Douglas McKenna & Partners Pty. Ltd.

8<sup>th</sup> March, 2001



5 cm



<p>× (Ag-Pb) Prospect or abandoned mine with commodity indicated.</p> <p>× Gr Gravel pit or quarry.</p> <p>— Prominent quartz vein.</p> <p>● Macro fossil locality.</p> <p>◊ Plant fossil locality (Tertiary).</p> <p>--- Geological boundary — accurate or approximate.</p> <p>- - - Fault — accurate or approximate.</p> <p>- - - Fault — inferred or concealed.</p> <p>↗ ↘ Axial surface trend of major anticline, syncline with plunge where known.</p> <p>↗ ↘ Minor fold with plunge where known, anticline, syncline, unspecified.</p> <p>↗ ↘ Strike and dip of bedding — facing known, unknown, overturned, vertical, horizontal.</p> <p>↗ ↘ Bending in volcanic or igneous rock, vertical bending.</p> <p>↗ ↘ Strike and dip of dominant cleavage of unspecified type in Cambrian or younger rocks; vertical cleavage.</p> <p>↗ ↘ Joint-dipping, vertical.</p>	<p><b>TERTIARY</b></p> <p>T<sub>1</sub> Unconsolidated sediments — gravel, sand, clay and minor lignite with some horizons of plant fossils.</p> <p>T<sub>2</sub> Vesicular to massive basalt flows. Columnar jointing common. Overprint indicates areas of hydroclastic breccias.</p> <p>T<sub>3</sub> Silicified gravel and/or breccia of locally derived rock type ("Greyhill").</p> <p><b>LATE CAMBRIAN — EARLY ORDOVICIAN DENISON GROUP — OWEN CONGLOMERATE</b></p> <p>Out Fawn weathering siltstone and calcareous sandstone — Correlates of Florentine Valley-Pudstone.</p> <p>Sand Grey siliclastic sandstone, thick bedded to massive, commonly bioturbated and with tubular burrows — Moine Sandstone.</p> <p>Stones Grey medium to coarse-grained sandstone and pebble-cobble conglomerate, rarely bioturbated (Dimec).</p> <p>xxxxx Contact aureole associated with Dolcoath Granite. Variable effects include pervasive silicification, epidote-chlorite actinolite alteration and local formation of epidote lenses in Cambrian rocks; recrystallisation, silicification and local muscovite alteration in Moine Sandstone. Local quartz-wollastonite-muscovite mineralisation in country rocks.</p>	<p><b>BOND RANGE-STORMONT-BULL CREEK AREA</b></p> <p>Quartz-feldspar-biotite ± hornblende porphyry ("Bond Range Porphyry").</p> <p>Interbedded tuffaceous sandstone, vitric tuff and minor crystal lithic tuffs, generally quartz-phyric.</p> <p>5 cm</p> <p>● AREAS DRILLED 1999-2000</p> <p><b>INTRUSIVE ROCKS</b></p> <p>LATE DEVONIAN</p> <p>Quartz-feldspar porphyry with associated muscovite-rich greisen zones.</p> <p>Alkali-feldspar granites. Cream to pink medium to coarse grained equigranular to porphyritic with minor microgranite apilite, pegmatite and greisen — Dolcoath Granite.</p>	<p><b>JERVOIS MINING N.L.</b></p> <p>COMPILED: J. G. Purvis</p> <p>DATE: January 2000</p> <p>DRAWN: G.M.S.</p> <p>LOCATION: Tasmania</p> <p>FILE:</p> <p>DRAWING No. SCALE 1:25,000 FIG. No. 2</p> <p><b>MOINA AREA GEOLOGY</b></p> <p>FROM MAP 9 - MT READ VOLCANICS PROJECT</p> <p>GEOLOGICAL SURVEY OF TASMANIA</p>
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**APPENDIX**



**INSTRUMENTS**

ABN 72 000 978 174 Pty. Limited

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www.geoinstruments.com.au

348 Rocky Point Road, Ramsgate  
NSW 2217 Sydney, AUSTRALIA

Ph: +61 2 9529 2355 • Fax: +61 2 9529 9726

Email: sales@geoinstruments.com.au

## CONTRACT

for

**HELICOPTER-BORNE ELECTROMAGNETIC GEOPHYSICAL SURVEY  
EL20/92 and EL37/97 AREA, TASMANIA**

to

JERVOIS MINING N. L.  
LEVEL 4, 114 WILLIAM STREET  
MELBOURNE VIC. 3000

Attention: Anthony Jannink

Ph: 03 9670 3766  
Fax: 03 9670 3691  
Email: jervois@bigpond.com

15 January, 2001

Page 1 of 10

(Ref: EH6719 Jervois Mining\_HEMContract)

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**SERVICE AGREEMENT**

THIS SERVICE AGREEMENT is made on the date set out in Schedule 1 hereto

BETWEEN

GEO INSTRUMENTS PTY. LIMITED a company incorporated in the State of New South Wales whose office is situated at 348 Rocky Point Rd., Ramsgate in the State of New South Wales (hereinafter with its successors and assigns referred to as "GEO INSTRUMENTS") of the one part AND the CLIENT being the person whose name and address appears in Schedule 2 hereto (hereinafter with its successors in title and permitted assigns referred to as "the CLIENT") of the other part

WHEREAS

The CLIENT is desirous of obtaining from GEO INSTRUMENTS certain technical services and GEO INSTRUMENTS is desirous of providing those technical services to the CLIENT upon the terms and conditions hereinafter, contained.

NOW IT IS HEREBY AGREED as follows:-

1. SERVICES

GEO INSTRUMENTS will provide the services described and detailed in the documents annexed hereto, a list of which is contained in Schedule 3 hereto and which are herein called "the Specifications" and upon the terms and conditions set out below and such additional services as may be agreed in writing by GEO INSTRUMENTS and the CLIENT.

2. PAYMENT

(a) the charges for the provision of the services described in clause 1 shall be as described in the Specifications.

(b) the payment schedule for the said services shall be made according to the Specifications.

(c) subject to the Specifications all sums becoming due and payable to GEO INSTRUMENTS by the CLIENT shall be payable to GEO INSTRUMENTS at its office hereinbefore described, in Australian dollars AND IT IS HEREBY AGREED AND DECLARED that any sum of money to be paid or tendered by either party hereto shall be validly and effectually paid or tendered if such payment is given, delivered or made in legal currency or by bank cheque or by the party's own cheque after presentment and clearance.

3. TERM

This Agreement shall remain in full force and effect until completion of the said services unless terminated at an earlier date by either party hereto in accordance with the provisions contained in clause 10 hereto.

**4. GEO INSTRUMENTS' DEFAULT**

(a) GEO INSTRUMENTS shall not be liable to the CLIENT for any loss or damage, consequential or otherwise, suffered by the CLIENT either during the continuance of this Agreement or subsequent, if by force majeure (as defined in clause 4 (d)) GEO INSTRUMENTS is rendered unable, wholly or in part, to carry out its obligations under this Agreement, or is delayed in its operation to be performed pursuant to this Agreement.

(b) If a force majeure substantially prohibits performance by GEO INSTRUMENTS of its obligations or the carrying out of its operations pursuant to this Agreement within any period herein specified or implied GEO INSTRUMENTS hereby agrees to give written notice to the CLIENT of the particulars of the force majeure within a reasonable time of its happening and to further use due diligence to remove the effects of such force majeure.

(c) In the event of the force majeure not being removed within that number of days of the date of occurrence thereof specified in Schedule 4 hereto, then either party may by notice in writing determine this Agreement and thereafter no party shall be under any further obligation to the other party, except that GEO INSTRUMENTS will supply to the CLIENT all information acquired to the date of the existence of the force majeure, and will be paid in full for its services rendered to the date of the existence of the force majeure in the manner provided hereinbefore.

(d) The term "force majeure" shall include but not be limited to fire, floods, storms and other damage of the elements, strikes, riots and civil disturbances, acts of God, acts of the enemy including but not limited to wars, blockades or insurrections, or direct legislative or administrative interference or any acts whatsoever by the Government of the Commonwealth of Australia or by the Government of the State or Territory where GEO INSTRUMENTS is at the material time or times carrying out the services for the CLIENT pursuant to the provisions of this Agreement and any other cause whether of the kind specifically enumerated above or otherwise which is not reasonably within the control of GEO INSTRUMENTS but shall not include a party's lack of finance.

**5. LIABILITY AND INSURANCE**

IT IS EXPRESSLY AGREED AND DECLARED that:

(a) GEO INSTRUMENTS is acting pursuant to its obligations under this Agreement as an independent contractor for the CLIENT and not as a servant, agent or employee of the CLIENT and the CLIENT has no right to control the manner or mode of the performance by GEO INSTRUMENTS of its duties and obligations hereunder.

(b) GEO INSTRUMENTS will during the continuance of this Agreement save and hold harmless the CLIENT from all suits, claims, causes of action, liability and damages, brought, asserted or recovered against the CLIENT, including the amount of the CLIENT's reasonable legal costs (on a party basis) associated therewith, arising out of any deliberate or negligent act or omission of GEO INSTRUMENTS in the performance of its duties and obligations pursuant to the provisions of this Agreement.

(c) GEO INSTRUMENTS will during the continuance of this Agreement maintain in full force and effect insurance against risks to persons and property which may occur in the course of providing any services under this Agreement, including Public Liability and Workers' Compensation Insurance to the maxima specified in Schedule 5 hereof and will deliver to the CLIENT, if so requested by the CLIENT in writing, copies of relevant policies endorsed to enable the CLIENT to make claim thereunder and proof of payment of relevant premiums.

#### 6. CLIENT'S DEFAULT

In the event of the CLIENT not paying in full any account rendered to it by GEO INSTRUMENTS for any payment due and payable pursuant to the provisions of this Agreement within thirty (30) days of the date of the invoiced account and remaining in default for ten days after receipt of a written notice from GEO INSTRUMENTS claiming payment and threatening termination or further in the event of the CLIENT neglecting or refusing to comply with or perform any other obligation, condition or warranty contained in this Agreement within ten (10) days of the date of receipt of written notice from GEO INSTRUMENTS requesting same, GEO INSTRUMENTS shall immediately thereafter be entitled to terminate this Agreement and be at liberty to pursue such other remedies at law as are applicable.

#### 7. PROPRIETARY INFORMATION, DUPLICATION AND DISCLOSURE

(a) GEO INSTRUMENTS hereby agrees that any confidential documents and information provided to it by the CLIENT to enable it to perform its obligations and duties under this Agreement shall be held in confidence by GEO INSTRUMENTS until such time as it is in the public domain and may be utilised solely for the performance of its obligations and duties hereunder and shall be returned to the CLIENT upon receipt by GEO INSTRUMENTS of a written request for same AND GEO INSTRUMENTS further agrees and acknowledges that all specifications, results, data materials and maps relating to the services to be provided hereunder are the sole property of the CLIENT AND FURTHER GEO INSTRUMENTS shall use their best endeavours to ensure that its lawful employees, agents and contractors shall not without the prior written consent of the CLIENT retain for its or their own use, duplicate or disclose to any third party any such said confidential documents and information.

(b) The CLIENT hereby agrees that any confidential documents, programmes, processes or materials which do not incorporate any part of the CLIENT'S documents, programmes, processes or materials used by GEO INSTRUMENTS better to perform its obligations and duties under this Agreement shall be held at all material times in confidence by the CLIENT AND the CLIENT further agrees that it shall use its best endeavours to ensure that its lawful employees, agents and contractors shall not without the prior written consent of GEO INSTRUMENTS duplicate or disclose to any third party any such confidential documents or information as hereinbefore described.

## 8. CHANGES

(a) The CLIENT may by written notice to GEO INSTRUMENTS request changes in the manner and mode of service to be rendered by GEO INSTRUMENTS hereunder and in the event that any such said changes causes either an increase or a decrease in the cost of the said service and, or in the alternative, in the time required for the proper performance of the said service, GEO INSTRUMENTS shall within thirty (30) days of the date of receipt of the said notice requesting the change, formally notify the CLIENT in writing of its claim, if any, for any adjustment to be made to either the charges to be rendered hereunder and, or in the

alternative, to the time required to perform and complete the said service and PROVIDED THAT such said request is fair and reasonable in the circumstances then the provisions of this Agreement shall thereby be deemed to be amended to that extent PROVIDED HOWEVER that any such said change shall not permit or excuse GEO INSTRUMENTS from continuing to perform its duties and obligations hereunder in a timely and orderly manner.

(b) Save as provided in clause 7, the CLIENT hereby acknowledges that the issuance of any information, advice, approvals or instructions by any of its technical personnel or representatives shall be deemed to be expressions of personal opinions only and shall not affect either GEO INSTRUMENTS' or the CLIENT's rights and duties hereunder unless the same shall be in writing and in accordance with the provisions of clause 8(a).

## 9. WAIVERS AND REMEDIES

(a) No failure on the part of either party to exercise, nor any delay in exercising, any right or remedy under any provision of this Agreement shall operate as a waiver thereof; nor shall any single or partial exercise of, or failure to exercise, any right or remedy prevent any further or other exercise thereof or the exercise of any other right or remedy.

(b) The rights and remedies provided in this Agreement are cumulative to and not exclusive of any other rights or remedies provided by law.

## 10. PREMATURE TERMINATION

(a) This Agreement may be terminated upon thirty (30) days written notice by the CLIENT hereto. -

(b) Upon receipt by GEO INSTRUMENTS of such written notice as referred to in clause 10(a) GEO INSTRUMENTS shall within sixty (60) days of the date of termination furnish the CLIENT with its claim for all work performed by it prior to the date of termination including the costs of acquisition and processing and mobilisation and demobilisation.

(c) Upon payment by the CLIENT to GEO INSTRUMENTS of its claim as referred to in clause 10(b) GEO INSTRUMENTS shall provide the CLIENT with all completed programmes, reports, data diagrams and other materials generated and obtained during and in accordance with the terms of this Agreement.

## 11. ARBITRATION

In the event of any dispute or difference arising between the parties hereto, either whilst this Agreement is in effect, or after the determination or abandonment or breach of this Agreement, as to construction of this Agreement, or as to any matter or thing whatsoever arising hereunder or in connection herewith, then either party may give to the other notice in writing of such dispute or difference and requiring the same be submitted to arbitration under this clause. Forthwith after giving of such a notice, the parties shall consult in order to agree upon two arbitrators and, within seven (7) days of the date on which the notice is received the dispute shall be referred to arbitration by the two arbitrators, one selected by each party. In the event of disagreement

between the two arbitrators so selected, the dispute shall be decided by an umpire selected by the said two arbitrators. An award made by the arbitrators or umpire under this clause shall be final and binding on the parties. Any such arbitrators or umpire shall have power not only to determine the strict legal rights of the parties, but also to determine what is fair and reasonable that should be done by both or either of them in the circumstances, and in particular to fix or render certain and definite anything which is, as provided herein, vague, uncertain or indefinite; and such arbitrators or umpire shall have power to give directions in relation to the matter being arbitrated to both or either parties hereto and such party/parties shall promptly give effect to any such direction.

## 12. GOVERNING LAW

This Agreement shall be governed by and construed in accordance with the laws of the State of N.S.W. and the parties hereto submit to the jurisdiction of the courts of that State and any courts competent to hear appeals therefrom.

## 13. PARTIAL INVALIDITY

If at any time any provision of this Agreement is, or becomes illegal, invalid or unenforceable in any respect under the law of any jurisdiction, that provision shall be deemed severable from the rest of this Agreement and neither the legality, validity or enforceability of the remaining provisions hereof, nor the legality, validity or enforceability of such provision under the law of any other jurisdiction shall in any way be affected or impaired thereby.

## 14. TAXATION

GEO INSTRUMENTS will take full responsibility for its own tax obligations.

**15. STAMP DUTY**

Any stamp duty payable on this Agreement shall be born and paid by the CLIENT.

**16. NOTICE**

Any notice, request, consent, demand or other communication to be given to any party hereto shall be deemed to be duly given to that party if it is in writing addressed to that party and either delivered at or sent by registered post or pre-paid recorded delivery service to the address of that party hereinbefore stated or to such other address as that party has advised in writing is appropriate. Any such notice, request, consent, demand or communication shall be deemed duly prepared by a party if it is signed or purports to be signed on behalf of that party by a principal of that party or by its manager or secretary or one of its directors or any other responsible officer thereof and such notice, request, consent, demand or communication if sent by post shall be deemed to have been received three (3) working days after it was posted.

**17. ENTIRE AGREEMENT**

This Agreement together with the Specifications contain the complete and final agreement between GEO INSTRUMENTS and the CLIENT in relation to the subject matter hereof AND IT IS HEREBY AGREED AND DECLARED that there are no conditions, warranties, promises, representations or obligations, written or oral, express or implied, which in any way purport to modify the terms and conditions hereof which shall be binding in any way upon the parties. This Agreement shall not be varied except by instrument in writing duly executed by the parties hereto.

**18. INTERPRETATION**

Except to the extent that such interpretation shall be excluded by or be repugnant to the context:

- (a) In the event that there is more than one party named in Schedule 2, every covenant or agreement expressed or implied in this Agreement shall bind all such parties jointly and each of them severally and each provision expressed or implied in this Agreement which applies to more parties than one shall apply to such parties and every two or more of them jointly and each of them severally;
- (b) the word "person" shall include corporation;
- (c) words importing the singular or plural number shall include the plural and singular number respectively and words importing a particular gender only shall include all genders.

## SCHEDULE .... 1

The date of this Service  
Agreement is :

15 January 2001

## SCHEDULE .... 2

Name of CLIENT:

Jervois Mining N.L.

Address of CLIENT:

Level 4, 114 William Street,  
MELBOURNE VIC 3000

## SCHEDULE .... 3

List of Annexed Documents:

- A. Specifications for Airborne Geophysical Survey
- B. Aircraft, Instrumentation and Personnel
- C. Data Processing
- D. Final Data Presentation and Deliverable Items
- E. Pricing and Payment Schedule

## SCHEDULE .... 4

The Period for Removal of Force Majeure: Sixty (60) days

## SCHEDULE .... 5

INSURANCE MAXIMA:

Workers' Compensation: Full Benefits and  
Unlimited Common Law Liability

Public Liability: \$A 10 million

IN WITNESS WHEREOF the parties hereto have executed this Agreement.

JERVOIS MINING N.L.

Signed:

Anthony Jannink

By:

ANTHONY JANNINK

Position:

DIRECTOR

In the presence of:

[Signature]

Date:

18 January 2001

GEO INSTRUMENTS PTY LIMITED

Signed

Rog Henderson

By:

Roger Henderson

Position:

General Manager

In the presence of:

[Signature]

Date:

15-01-2001

**AIRBORNE ELECTROMAGNETIC SURVEY  
TASMANIA****CONTENTS**

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**A. SPECIFICATIONS FOR HELICOPTER-BORNE ELECTROMAGNETIC GEOPHYSICAL SURVEY****1. SURVEY AREA**

Geo Instruments proposes to carry out a Helicopter Electromagnetic Geophysical Survey of an area within the Mineral Resources Tasmania survey program at Moina, totalling 63 line km.

**2. FLYING SPECIFICATIONS**

Flight line direction	- 090°AMG - 270°AMG
Flight line spacing	- 100 metres
Bird mean terrain clearance	- 30 metres (or as safety permits)
Time base - for magnetics	- 0.1 sec.
- for electromagnetics	- 0.1 sec.

**3. ELECTROMAGNETIC (EM) READINGS**

The in-phase and the quadrature signals for all horizontal coplanar and vertical coaxial coils operating at the frequencies specified in B2.1 are measured simultaneously with a time constant of 0.1 seconds. The EM sample interval is approximately 3.5 metres.

**4. MAGNETIC READINGS**

Readings of the total magnetic field will be recorded to a sensitivity of 0.01 nT. Geo Instruments will endeavour to attain a noise envelope not to exceed 0.4 nT. The sample interval will be approximately 3.5 metres.

**5. CALIBRATIONS**

The following calibrations will be carried out before and after each days flying. The electromagnetic response is calibrated using an external Q coil at the commencement of the survey program. Calibration checks are then conducted at the beginning and end of each sortie using internal coils, and at the beginning of each day using a ferrite phasing bar. Drift is monitored by flying out of ground effect (above 350 metres) twice per hour to record electromagnetic zero levels. Prior to the commencement of surveying each day, the EM system is run for at least an hour to stabilise temperatures and verify that the system drift is be less than 5 ppm in 5 minutes.

**6. IN-FIELD VERIFICATION AND PROCESSING**

Stringent real time data validity checks are employed. Geo Instruments will conduct a daily post-flight verification of all acquired data by our in-field quality control staff. The following products are generated on site by a mixture of Geosoft and Geo Instruments proprietary software.

- (1) Flight path plots, to demonstrate quality of navigation.
- (2) Magnetic stacked profiles, to demonstrate character of magnetic data.
- (3) Multi-parameter screen presentations of inphase and quadrature data.
- (4) Statistical summary of line data.
- (5) GPS base station (parked helicopter) plots.
- (6) Progressive images of selected parameters.
- (7) Magnetometer base station plots.

7. NAVIGATION AND POSITIONING

Navigation will be by electronic means using a mobile Ashtech G12 GPS receiver integrated with an Omnistar Model LR3000 virtual base station to provide flight guidance to the helicopter pilot as well as to record the flight path for subsequent processing. Differential GPS data will be obtained in real time using static GPS data obtained from the "Omnistar" wide area GPS service. A ground base GPS station will also be maintained to allow post flight processed differential positions to be obtained. Under normal circumstances differential GPS is expected to yield a positional accuracy of better than 5 metres RMS.

Altitude control is provided by the radar altimeter and displayed directly in front of the pilot together with a dual needle display indicating line tracking. This system has proven to be simple and highly effective for the survey pilots.

8. SPATIAL TOLERANCES

If the flight line separation exceeds 1.5 times the nominated line spacing over a distance of one kilometre or more, fill-in lines which cross tie lines at their extremities will be flown. Any segments of a line which cannot be flown for reasons of safety or cultural sensitivity will be excluded from the coverage.

If the surveying altitude data is not recorded for any distance exceeding 200 metres, which is within the operating range of the altimeter, then fill-in lines will be flown which cross tie lines at their extremities.

9. DIURNAL MONITOR

The base station magnetometer will be positioned within or as near as possible to the MRT survey area and will record to a sensitivity of 0.1 nT every 5 seconds. Noise levels on the base station magnetometer (i.e. instrument noise) should not exceed +/- 1.0 nT. This is a combined EM, magnetic and DTM survey and the aim is to collect high quality data for all datasets. The intention is to minimise downtime due to periods of natural geomagnetic field disturbance, and if the diurnal magnetic variations can be adequately subtracted from the airborne data, then acquisition should continue. However, acquisition will be halted during periods of recognised magnetic storms.

10. TIMING AND DURATION

Mobilisation would commence in March, 2001, providing a signed contract has been exchanged and the wet season is finished. Under favourable weather conditions, the flying for should be completed in one day.

*this survey area*

11. SAFETY

Safety of the public, the Client's employees and the survey crew is of paramount importance at all times. A risk analysis of the survey area will be conducted prior to commencement of geophysical surveying. Each pilot and operator in the aircraft will wear a personal EPIRB in addition to the aircraft ELT. A failure to receive SAR transmissions while on survey will generate an immediate response.

**B. HELICOPTER, INSTRUMENTATION AND PERSONNEL****1. HELICOPTER**

Aero Spatiale AS350BA "Squirrel" helicopter which is owned and operated by Heli-Aust Pty Ltd of Bankstown, plus an experienced survey pilot known to us. Copies of Heli-Aust's insurance certificate and operating permits / licences are available for inspection.

**2. SURVEY INSTRUMENTATION****2.1 ELECTROMAGNETIC SYSTEM**

The electromagnetic system is the Hummingbird 5-frequency system developed and manufactured by Geotech Pty Ltd. It consists of two vertical coaxial coil pairs operating at 980 Hz and 7001 Hz and three horizontal coplanar coil pairs operating at 880 Hz, 6606 Hz, and 34133 Hz housed in a 6.5m long boom together with the magnetometer sensor. The transmitter-receiver separation for each coil pair is 6.3 metres. The lightweight EM bird is towed 30 metres below the helicopter. Measurements of the in-phase and out-of-phase signals for each frequency are recorded at the rate of 10 times per second, with a resolution of 0.5 part per million.

**2.2 MAGNETOMETER**

The Geometrics G822A Magnetometer is a highly sensitive unit incorporating an optically pumped sensor. The constant harmonic frequency from the sensor is proportional to the surrounding scalar magnetic field. This frequency is resolved by the Counter/ Processor which provides the magnetic field to a nominal accuracy of 0.01nT at 10 times per second both in analogue and digital forms. The sensor and pre-amp will be mounted in the EM bird which will be attached by approximately 30 metres of cable to the helicopter.

**2.3 RADAR ALTIMETER**

A Collins ALT-50 Radar Altimeter or similar type system being a high resolution, short pulse radio altitude system designed for automatic continuous operation over a wide variation of terrain, target reflectivity, weather and aircraft altitude. The radar altimeter indicator provides a terrain clearance display from 0 - 750 metres (0 - 2,500 feet) above ground.

**2.4 BAROMETER**

Barometric pressure is recorded using a Sentra pressure transducer with a range of 600 to 1600 Hpa and a resolution of 0.04 Hpa (equivalent to 0.4 metres). The sensor is calibrated to the height given by the GPS.

**2.5 DATA ACQUISITION SYSTEM**

Geo Instruments Model G2002 Mk 3 data formatting/recording unit stores data in non volatile RAM modules for post flight transfer via PCMCIA Flash Drives to CD-ROM medium. Data from all the sensors are processed from this medium in the field and serve as a backup to working copies stored on hard disk of the in-field processing systems. The G2002 features an industrial computer, a 16 channel 12 bit analogue to digital converter and solid state recording medium. It incorporates a counter card, if necessary, for the magnetometer to convert Larmor frequency to nanoTeslas and a GPS navigation card.

**2.6 NAVIGATION EQUIPMENT**

The GPS receivers are Ashtech Model G12 twelve channel parallel tracking receivers capable of providing sub-metre resolution at five times per second. A base GPS station will be maintained at the accommodation block to allow post-processing of the GPS data.

**2.7 BASE STATION MAGNETOMETER**

Geometrics Recording Base Station Model G-856 with analog and digital recording will be used as a diurnal monitor and run continuously during the survey periods. The sensor of the magnetometer will be placed in a low gradient area beyond the region of expected influence of any man-made interference.

**3. PERSONNEL**

Geo Instruments will provide an experienced electronics engineer and an experienced operator, one of whom will be designated the Party Leader. The Client may be requested to provide field personnel to assist with logistical activities and/or a local representative to provide liaison with the local community and landowners relevant to the airborne survey program.

**4. INSURANCE**

Geo Instruments hold certificates of currency of insurance policies summarised as follows:

	<b>Class</b>	<b>Sum Insured</b>
1.	<i>Public Liability</i>	<i>\$10 Million</i>
2.	<i>Workers Compensation</i>	<i>As per legislation</i>

Insurance details pertaining to these policies and to the survey aircraft are available on request and would form part of the Contract.

## C. OPTIONS FOR PROCESSING OF DATA

Various options for optimum presentation will be reviewed with the Client's representative prior to finalising data processing requirements. These options are summarised below:

### ELECTROMAGNETIC DATA

- Filtering to remove major spheric events and reduce system noise;
- Base level drift correction using high altitude EM zero levels;
- Calculation of apparent resistivity;
- Gridding and micro-levelling if required;
- Presentation as contour maps, colour images or stacked profiles

### MAGNETIC DATA

- Diurnal variation removal;
- System parallax removal;
- The removal of the IGRF derived from the secular variation model 1995-2000 updated to the actual time of the survey;
- Tie line levelling of the data;
- Gridding at approximately 25% of the line spacing;
- Micro-levelling if required;
- Production of preliminary contours and images of total magnetic intensity;
- Reduction to the pole;
- Calculation of first vertical derivative, second vertical derivative;
- Calculation of analytic signal;
- Presentation as contour maps, stacked profiles, colour plots or images.

### DIGITAL TERRAIN MODEL

- Subtraction of radar altimeter data from the Z component of differentially corrected GPS data;
- Tie line levelling;
- Gridding at approximately 25% of the line spacing;
- Presentation as a line contour map, colour image or three dimensional display.

### DIGITAL DATA

- Delivery of digital data as located data files of all recorded data in standard format on CD-ROM;
- Delivery of grid files of topographic, magnetic and / or radiometric parameters in Client's preferred format on CD-ROM;
- Geo Instruments will retain one copy of the digital data on CD-ROM in secure storage to enable further processing if required by the Client and as an off-site back-up for your data. We understand the commercial in confidence nature of this information. Please advise if you do not require this back-up service.

## D. DESCRIPTION OF OPTIONS FOR FINAL DATA PRESENTATION AND OVERVIEW OF DELIVERABLE ITEMS

### 1. DATA PRESENTATION

The Client may request a quotation for compilation of data involving the production of flight path maps, images, stacked profiles and contour maps. The grid datum and map scale will be advised by the Client. Final presentation of black and white maps will be on to a stable mylar base transparency. Hard copy laminated images in colour may also be presented. Digital data will be delivered on CD-ROM.

#### 1.1 ELECTROMAGNETIC CONTOUR MAPS

Contour maps of apparent resistivity or other electromagnetic parameters will show:

- o the longitude and latitude and grid coordinates;
- o a location map or sheet index map;
- o technical specifications of the survey;

#### 1.2 MAGNETIC CONTOUR MAPS

Contour maps of the IGRF-corrected Total Magnetic Intensity or other product (TMI Reduced to the Pole, TMI First Vertical Derivative, Analytic Signal) will show:

- o the longitude and latitude and grid coordinates;
- o a location map or sheet index map;
- o technical specifications of the survey;

#### 1.3 FLIGHT PATH PLOTS

Flight path plots will show:

- o the longitude and latitude;
- o the grid coordinates labelled with their northing and easting along orthogonal borders;
- o the flight lines numbered at the ends;
- o the recovered fiducials labelled with their number oblique to the flight line.

#### 1.4 STACKED PROFILES (Optional)

Stacked magnetic (TMI, RTP, 1VD, 2VD, Analytic Signal) profiles and electromagnetic profiles will show:

- o the longitude and latitude and grid coordinates;
- o the flight lines numbered at the ends;
- o for each profile the location of the base level which is the line joining the ends of the flight lines on each sheet;
- o on each sheet the ends of the profiles are joined to the ends of the corresponding flight line as plotted on the flight path map by a line normal to the base level;
- o profiles are plotted at a constant vertical scale such that each parameter value is related to its corresponding fiducial by a line normal to the base level;
- o single noise spikes will be removed manually from the database;
- o a constant base level for the stacked profiles will be determined separately for each sheet based on the average level over the sheet;
- o the profiles will be plotted without flyback or scale change except as agreed in areas of extreme relief;
- o the magnetic data will be levelled and the IGRF removed.

#### 1.6 DIGITAL TERRAIN MODEL

Contour maps of the Digital Terrain Model will show:

- o the longitude and latitude and grid coordinates;
- o a location map or sheet index map;
- o technical specifications of the survey;

## 1.7 FLIGHT LOGS

If requested by the Client, a set of computer generated flight logs will be delivered at the end of the project.

## 2. DELIVERABLE ITEMS

### 2.1 FINAL PRODUCTS

All final products will be supplied to the Client as outlined in the Presentation of Data.

### 2.2 FIELD TAPES

Video tapes (if recorded) and digital field tapes will be supplied to the Client, if required.

### 2.3 LOCATED DATA FILE

Located data files on CD-ROM will include all field data corrected and merged with locations in a standard map grid co-ordinate system and organised in line number order.

### 2.4 GRIDDED DATA FILE

The grid values used to produce the required image products will be delivered on CD-ROM, organised in a column and row ERMapper format or Geosoft GRD format as instructed by Client.

### 2.5 OPERATIONS REPORT

If requested, an Operations Report will be submitted at the completion of this contract, accurately specifying the actual parameters and techniques utilised on the survey.

### 2.6 ALL OTHER MATERIAL

All other material supplied by the Client or acquired by Geo Instruments in relation to this survey will be supplied to the Client.

**E. PRICING AND PAYMENT SCHEDULE**

The following Pricing Schedule is for the Helicopter Electromagnetic Geophysical Survey of an area within the Mineral Resources Tasmania survey program at Moina, totalling 63 line km.

Geo Instruments reserves the right to requote should the size of the survey change substantially.

All prices below are inclusive of GST.

**1. MOBILISATION AND INSTALLATION**

	AUD
a) Mobilisation of crew, aircraft and all necessary electromagnetic and magnetic equipment to survey area and return	\$ 1,700
b) Installation, calibration and demounting of the equipment into the helicopter	\$ Nil

**2. DATA ACQUISITION**

Includes crew and all necessary electromagnetic and magnetic equipment to undertake this survey including crew meals and accommodation, local transport, helicopter lease charges, helicopter fuel: \$ 47.00 / km

No charge will be made for periods of crew or equipment unavailability.

**3. STANDBY CHARGES**

There will be a Standby Charge for each day or part day that Geo Instruments is unable to fly due to bad weather, excessive diurnal activity or if the helicopter is commandeered by authorities for emergencies.

The standby charge will also apply if survey operations cannot proceed due to a failure of the Client to fulfil its obligations under this agreement.

The Standby Charge will be determined by the survey production accomplished during the day under consideration as follows:

Survey production of less than 20 kms	\$ 2,500
Survey production between 20 and 69 kms	\$ 2,000
Survey production between 70 and 139 kms	\$ 1,500
Survey production between 140 and 199 kms	\$ 1,000
Survey production of 200 kms or more	N/A

**4. DATA PROCESSING AND PRESENTATION**

All computer processing will be undertaken by Geo Instruments using the Geosoft HEM module, under the supervision of senior Geo Instruments personnel.

All grids will be generated at a cell size equal to one quarter of the line spacing, unless otherwise agreed.

**4.1 Processing**

Data input, flight path construction, diurnal correction, tie line levelling and removal of current IGRF, gridding and levelling of TMI

Level electromagnetic data, then calculate, grid and level the Apparent Resistivity for 880 Hz, 6.6 KHz and 34KHz coplanar coil datasets

Calculate, level and grid Digital Terrain Model

**4.2 Map Production**

Flight path maps

CHECK: Field quality multi-parameter plots of EM data plus TMI and DTM at A3 size

**4.3 Digital Data Files**

Located data file in a standard ASCII format on CD-ROM

Gridded data files in Geosoft GRD format on CD-ROM

Charge for items 4.1 to 4.3:

**\$ 3,500**

**4.4 Other Products**

Final maps on plasticised mylar or laminated paper at additional cost (to be advised on Client request of additional products). Other colour and/or contour map products are also available.

**4.5 Delivery of Products**

Flight path plots, digital terrain model image, coplanar coil resistivity images and magnetic images (preliminaries) will be delivered for review by the Client's representative no later than six (6) weeks after the delivery of all final products for Mineral Resources Tasmania.

Final digital data files, and any required resistivity contour maps or magnetic contour maps will be delivered four (4) weeks after approval of preliminaries and any required hardcopy multi-parameter profile plots will be delivered six (6) weeks after approval of the preliminaries. Such approval by the Client is to be confirmed in writing.

**5. OPERATIONS REPORT**

The preparation of an Operations Report at the completion of the survey

**\$ 800**

**6. PAYMENT SCHEDULE**

The following terms are proposed:

**6.1 UPON EXECUTION**

Upon execution of a contract, 20% (twenty per cent) of the estimated total cost of the contract will be invoiced and payable within fourteen days to provide for necessary outlays.

**6.2 UPON COMPLETION OF FLYING OF EACH BLOCK**

As data acquisition for each of survey block is completed the acquisition charge for that block will be invoiced and payable within fourteen days.

**6.3 UPON COMPLETION OF PROCESSING OF EACH BLOCK**

As the data processing specified in Clause E4.1 to E4.3 for each survey block is completed the data processing charge for that block will be invoiced and payable within fourteen days.

**6.4 FINAL INVOICE**

A final invoice for each block, payable within fourteen days, will be presented by Geo Instruments when all data have been delivered, to reflect any adjustment required between the Contract value stipulated in this Annexure and the amount paid by the Client.

**7. FINAL KILOMETRES**

The final kilometres charged for all data acquisition, data compilation and processing will be determined by computer measurement of such kilometres actually processed.