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EPM15646 "Lynd"
Third Annual Report

For the Period 15/05/2009 – 14/05/2010

Volume 1 of 1

Tenure Holder:	**Anglo American Exploration (Australia) Pty Ltd**
Tenement Operator:	**Anglo American Exploration (Australia) Pty Ltd**
Compiled By:	**Kylie Dixon and Paul Polito**
Date:	**May 2010**

Distribution

Department of Natural Resources and Mines Queensland - (1)
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SUMMARY

EPM15646 "Lynd" covers an area of approximately 321.3 km^2 and is located within the Georgetown Inlier, Queensland. Anglo American Exploration Australia Pty Ltd (AAEA) was granted the tenement on 15th May 2007 for a period of five years. This tenement, along with EPM15915, EPM16070 and the applications EPM17806, EPM17983, EPM18023 and EPM18056, make up the Lynd Project.

AAEA is seeking to discover significant NiS deposits in the Lynd area using a variety of magmatic NiS related empirical criteria and models.

The tenement area consists dominantly of Cambrian to Ordovician metasediments intruded by a Silurian mafic complex with minor Quaternary cover. The targets are Voisey's Bay style NiS and the area has not seen NiS exploration. Anglo American has the rights to proprietary technology that we believe will be able to detect massive NiS at great depths.

During the current reporting period, exploration consisted of a Spectrem Airborne Geophysics Survey (TMI, EM and Radiometrics), a ground magnetic geophysics survey, termite mound sampling including detailed heavy mineral analysis, 45 RC drill holes for 2196 metres and a petrology study.

Keywords

Geographical (Greenvale)
Commodities (nickel, copper, PGE)
Ages (Proterozoic)
Geological Province (Georgetown Inlier, Tasman Orogenic Zone)
Exploration (Aerial Geophysical Survey, ground magnetics, termite sampling, RC drilling and Petrology)

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1. INTRODUCTION

EPM15646, is part of the Lynd Project group comprising the tenements EPM15915, EPM16070 and the applications EPM17806, EPM17983, EPM18023 and EPM18056 (Figure 1). EPM15646 is located approximately 35 km west-south-west of Greenvale. Access to the tenement from Townsville is via the Gregory Development Rd that links Charters Towers to the Lynd Junction and then various station tracks. The tenement is on the Clarke River (SE55-13) 1:250,000 map sheet and the Burges (7,859) 1:100,000 map sheet.

This report summarises the exploration activities conducted on EPM15646 during the reporting period 15th May 2009 to 14th May 2010 by Anglo American Exploration (Australia) Pty Ltd (AAEA).

2. TENURE

The tenement EPM15646, was granted to AAEA on 15th May 2007 and consists of 99 graticule blocks covering an area of approximately 321km^2. The tenement details are in Table 1 below and the tenement location plan is presented as Figure 1.

Table 1: Tenements Details

Tenement	Holder	Date Granted	Expiry Date	Area Km^2	No Sub Blocks
EPM15646	AAEA	15/05/2007	14/05/2012	321.3	99

Table 2 and Figure 2 details the 99 sub blocks that comprise the lease on the Townsville 1: Million map sheet.

Table 2: Graticular Sub-blocks - EPM15646

1:1,000,000 Plan Name	Primary Number	Graticular Section	No of Blocks
Townsville	2599	e k p u z	5
	2600	a b c d e f g h j k l m n o p q r s t u v w x y z	25
	2601	a b f g h l m n q r s v w x	14
	2671	.e k p u z	5
	2672	a b c d e f g h j k l m n o p q r s t u v w x y z	25
	2673	l q r v w	5
	2743	.e k p u z	4
	2744	a b c d f g h j l m n o q r s t	16
		TOTAL	***99***

3. REGIONAL GEOLOGY

EPM15646, The Lynd Project, is located in northeast Queensland along the Tasman Orogenic zone, on the south eastern margin of the predominantly Palaeoproterozoic to Early Mesoproterozoic Georgetown Inlier (Figure 3). At this location, Palaeoproterozoic rocks of the Georgetown inlier are in faulted contact with younger Ordovician to Carboniferous sediments of the Broken River Province further east (Fergusson et al., 2007). Recent work has replaced the western contact of the Tasman Orogenic zone from the Burdekin River Fault westward along the Lynd Mylonite Zone; the area between the two structural elements is named the Greenvale Province (Nishiya et al., 2003 and Fergusson et al., 2007).

The roughly N-S trending Balcooma Mylonite Zone and Nickel Mine Fault divide the Greenvale Province between the Lynd Mylonite Zone and the Burdekin River Fault further (Fergusson *et al.*, 2007). Early Palaeozoic metamorphic units and intrusions make up the majority of rocks in the Greenvale province (Whitnall *et al.*, 1991). The stratigraphy is younging towards the East from the Cambrian (486±5 to 477±6 Ma) Oasis Metamorphics and Lynwater complex west of the Balcooma Mylonite zone; the Ordovician (471±4 Ma) Balcooma Meta Volcanic Group and Silurian (431±7 Ma) Dido Tonalite East of the Balcooma Mylonite Zone (Whitnall *et al.*, 1991; Fergusson *et al.*, 2007). An increase in age is documented through the stratigraphy further east with the Ordovician Lugano Metamorphics, Cockiespring Tonalite, Eland Metavolcanics and Paddys Creek Phyllite west of the Nickel Mine Fault; through to the Cambrian Halls Reward Metamorphics located between the Nickel Mine Fault and the Burdekin River Fault (Fergusson *et al.*, 2007; Nishiya *et al.*, 2003).

The older units in the Greenvale province; Oasis Metamorphics, Lynwater Complex and Halls Reward Metamorphics, have been affected by amphibolite grade metamorphism related to the Cambrian Delamerian Orogeny (Fergusson *et al.*, 2007). Deposition of the Balcooma Volcanic group took place in a back-arc setting (Withnall *et al.*, 1991). Subsequent amphibolite grade metamorphism during the Silurian to Early Devonian deformed the Balcooma Volcanic Group (Withnall *et al.*, 1991). The emplacement of the Dido Tonalite, the focus of this study, is associated with this Silurian deformation event (Withnall *et al.*, 1991). Later deformation produced the predominantly N-S trending foliation found in the Greenvale Province (Fergusson *et al.*, 2007).

The rocks exposed in the central NNE-SSW trending axis on tenement EPM15646 are the Silurian Dido Tonalite (Withnall *et al.*, 1991). Several gabbroic intrusions of unknown age have been located within the Dido Tonalite and on the tenement EPM15646. Metasediments of the Lugano Metamorphics and Eland Metavolcanics are the most eastern exposed rocks on tenement EPM15646. However, lithological contacts are not exposed and the location of the western contact of the Dido Tonalite with the Balcooma Mylonite Zone is uncertain due to a significant amount of Tertiary cover in the area.

4. EXPLORATION RATIONALE

The Lynd Project, which incorporates EPM15646, was first identified in 2004 during a country wide data gathering and consolidation exercise that was constructed to specifically highlight areas within Australia that maybe prospective for magmatic Cu-Ni+/-PGE systems. This exercise incorporated regional geological, geochemical, DEM, magnetic, gravity and seismic tomographic data.

The combined datasets identified approximately 100 targets across Australia that were subsequently ranked using criteria that included the location of intersections of major structures with coincident Ni±Cu anomalies and permissive geology. The Lynd project was one of the top ten ranked targets identified as having potential to host a Cu-Ni+/-PGE system based on a bullseye magnetic feature located on a craton margin directly related with known layered mafic intrusions.

The exploration target is the south eastern margin of Georgetown Inlier, which is an under explored region within Queensland. AAEA is targeting magmatic-hosted Ni-Cu-PGE mineralisation, analogous to either Voisey's Bay (Canada) or Noril'sk style (Russia), both of which are giant, world class ore bodies.

5. PREVIOUS EXPLORATION

A summary of previous exploration is summarised in earlier annual reports. The exploration completed by AAEA on the tenement is outlined below.

Exploration conducted in 2007 included: a geological reconnaissance field trip to identify major lithologies and prospective areas for nickel mineralisation, local mapping of the limited outcrop (Figure 4), regolith geology, soil (398 samples), tree bark (87 samples) and rock chip (84 samples) sampling programs over areas identified as having thin regolith cover. Several targets were generated by the soil geochemistry and these were followed up by 20 line km of dipole-dipole IP ground geophysics and air core drilling. A program of 49 holes for 812m was initiated; however was cut short due to unfavourable weather conditions.

Exploration during the 2008 field season targeted numerous discrete geophysical anomalies with 1,400 soil samples, 46 rock chips and 113 holes for 3081m of RAB drilling completed. This drilling identified previously unknown areas of ultramafic and mafic intrusives hidden beneath the transported cover.

Geochemical results from the newly identified mafic-ultramafic intrusions showed that Ni and PGE depletion has occurred, indicating that Ni-enrichment, in the form of an ore deposit, may be located near-by. These intrusions required follow-up investigation to establish their extent and prospectivity. Consequently, AAEA engaged researchers from the University of Tasmania to conduct petrology and geochemistry studies on samples from the drilling programs to try and quantify the Nickel prospectivity of these intrusions. These studies obtained several

SHRIMP and LA-ICP-MS U-Pb ages from mafic and intermediate samples within the tenement. It was found that two distinct ages dates consistently occur; an older intrusive event occurred at 460 to 470Ma and a younger intrusive event occurred at 430Ma.

A 9 hole, 2,643m diamond drilling program, focused on one large (2.2km long x 500m wide) and several smaller (500m x 200m) Ni-Cu-Cr-Co-PGE soil anomalies that also had coincident IP geophysical anomalies. The diamond drilling program intersected multiple zones (>15m intercept width) of disseminated, weakly anomalous Ni-Cu (±PGE) sulphide mineralisation (max Ni of 0.58%, 0.28% Cu) in previously undocumented mafic and ultramafic lithologies that are known to occur at the world class Voisey's Bay Nickel Deposit. These areas were followed up with a further 17 lines of dipole-dipole Induced Polarisation (DDIP) totalling 23.3 line km.

6. EXPLORATION CONDUCTED

Exploration work carried out on EPM15646, during the third year of the tenement has consisted of a Spectrem Airborne Geophysics Survey (TMI, EM and Radiometrics), a ground magnetic geophysics survey, termite mound sampling including detailed heavy mineral analysis, 45 RC drill holes for 2196 metres and a petrology study on RC chips from a selection of holes from the drilling. The location of this activity is shown on the Exploration Index Plan (Figure 5) and summarised in Table 3.

Table 3: Exploration Summary

Geophysics	Sampling	Drilling	Petrology
• Spectrem Survey – 1584 line km • Ground Magnetics – 17 line km at Vesper Prospect	• Termite Sample geochemistry • HMC analysis on Bulk (#09-001-001) • HMC analysis – Loam and Termite - Bulk Samples #AUA054802 and AUA054901 • HMC analysis on 2009 RC Samples.	• 45 holes for 2196m & 1114 samples	• 35 Samples

Four, small, pipe-like features were identified in aeromagnetic data over a 4km^2 in the north-western corner of the tenement EPM15646 in mid 2008 (Figure 6). The pipe-like features have a negatively polarised magnetic signature occurring within an area that has been mapped as a foliated, intermediate phase of the Dido Tonalite. On the basis of the pipe-like features being somewhat proximal to the Balcooma Mylonite Zone and the Teddy Mount Fault, which both appear to be crustal scale features linked to the margin of the North Australian Craton and the presence of kimberlite indicator minerals elsewhere in the Georgetown Inlier (Cranfield And Diprose, 2008), the pipe-like features were considered to be possible kimberlite or lamproite intrusions capable of hosting diamonds. The prospect was named Vesper after Vesper "Lynd" of Casino Royal fame and became the target area for the most exploration completed within the reporting period.

This exploration complies with the authorised activities specified for the first three years of the permit. The digital data associated with this report are presented in appendices as txt, zip or pdf files.

6.1 Aerial Geophysics – Spectrem Air Survey

In late 2009, Spectrem Air Limited conducted an Aerial Geophysical survey over The Lynd - Block 1 area. Data captured includes EM, Magnetics (Figure 7), DTM and Radiometrics. A total of 5,070 line km was surveyed for the whole of The Lynd - Block 1 area and 1584 line km was surveyed within EPM15646. The digital data, details of the survey, the system specifications, standard Spectrem Air data processing stream and an atlas of images are described and presented in Appendix I.

Since the majority of the geology in the area is under cover, the Spectrem geophysical data will prove to be invaluable to delineate prospective areas at depth and undercover. The results are preliminary at this stage, however, a number of possible EM anomalies have been identified in several channels, but require further processing and interpretation of the data.

6.2 Ground Magnetics Survey

A small ground magnetic geophysical survey was completed in May 2009 by AAEA geophysics personnel. The sampling was carried out using on 40m spaced lines over discrete area of interpreted circular magnetic "pipe" features on EPM15646 (Figure 8).

Table 4: Ground Geophysics - Magnetic Survey Details	
Instrument:	Geometrics G858 Caesium Vapour magnetometer with an inbuilt GPS
Base Station	Geometrics G856 proton precession magnetometer
Line Spacing	40m
Line Orientation	East - west.
Total No Lines	30
Line Km	~17 line km

The ground magnetic data revealed the presence of at least six, 80m to 130m diameter pipe-like features that ranged from 20 to 45m beneath the surface (Figure 9). The digital data of this survey are attached in Appendix II.

6.3 Termite Sampling – Geochemistry and Heavy Mineral Analysis

Several, small, pipe-like features were identified in aeromagnetic data were considered to be possible kimberlite or lamproite intrusions capable of hosting diamonds. The importance of these targets is given weight by reports of alluvial diamonds found by previous prospectors in the region (although a kimberlite source has never been located).

The termite samples were collected as close as possible over the known pipe-like features at spaces ranging from 30m to 200m apart (Figure 11). A two to three kilogram sample, considered to be representative of the entire termite mound was homogenised in the field and collected into calico bags. A 100 gram representative sample of <250 micron soil, sieved from the termite mound was sent to ACME Analytical Laboratory in Canada and analysed by the Group 1FMS method; an aqua regia digest followed by an ICP-MS finish (Appendix III).

The 36, two to three kilogram termite mound samples were bulked into one sample in Perth before being washed, screened and treated by both labs by processes that included various flotation methods, magnetic separation and mineral fusions to maximise heavy mineral recoveries. This process produced approximately 12.5 grams of heavy mineral concentrate for observation and sent to Diatech Laboratories and North Australian Diamond Labs in Perth for heavy mineral analysis, separation and observation (Appendix IV).

The concentrate was observed down to 0.2mm and revealed the following:

- Two 125 to 175 micron, nearly equi dimensional, cubo - to octahedron, light-grey to colourless, transparent diamonds that were recovered from the +0.5mm concentrate after fusion of the heavy mineral rejects (Figure 12 and 13).
- One black, dull, near spherical, highly granular and weathered Cr-spinel of possible kimberlite origin,
- One black, dull, subrounded, granular and weathered Cr-spinel of probable kimberlite origin, and
- Several Fe-oxide and Fe-oxihydroxides, epidotes, ilmenites and spessartines.

The <250 micron soil/termite sample geochemistry revealed that three of the six pipe-like features correspond to weakly anomalous concentrations of Ni-Co-Cr-Nb-Ta; a geochemical signature that is typical of kimberlite pipes that can host diamonds (Figure 14 and 15).

A follow-up termite and loam sampling program was conducted in August 2009 to collect a larger "bulk" sample over the same area. The same 36 termite mounds (Figure 11) were resampled for a combined weight of 308kg and a 77kg combined sample of lag and loam was collected from areas devoid of termite mounds. This bulk termite sample produced 33.3 grams of heavy mineral concentrate for observation, whereas the loam sample produced 19.7 grams of heavy mineral concentrate for observation (Appendix V).

The combined concentrate was observed down to 0.2mm and revealed the following:

- One 125 micron, multi-twinned colourless, transparent diamond that was recovered from the +0.5mm concentrate after fusion of the heavy mineral rejects (Figure 8).
- Two black-brown, dull, well rounded, anhedral, Cr-spinel with bright granular interiors of possible kimberlite origin,
- Four brown, dull, finely frosted, hyercinitic-spinels of improbable kimberlite origin, and
- Several Fe-oxide and Fe-oxihydroxides, epidotes, ilmenites and spessartines.

Five, >25kg composite samples from five drill holes considered to contain the most likely candidates for kimberlite material were submitted to Diatech Laboratories and North Australian Diamond Labs for heavy mineral separation and observation. None of the three samples revealed the presence of diamonds or diamond indicator minerals (Appendix VI). Several minerals were identified as being possible indicator minerals and therefore required microprobing to determine their species. However, it was concluded that the garnets were all almandine or spessartine, the olivine was in fact sphene and the brown minerals were amphibole not pyroxene.

6.4 Drilling

A 45 hole (VSAC09-001- 045) 2196 m, RC drill program (Figure 17).was conducted in November 2009 to test the cluster of magnetic features at the Vesper Prospect.

One thousand one hundred and fourteen (1114) samples were taken on 2m composites but logging occurred on a meter scale. Assaying was performed by ALS Chemex in Townsville using ME-ICP61 – 33 element four acid ICP-AES method. All samples were homogenized in situ, and approximately 3 to 5 kg was sieved in the field for a <250 micron fraction. Duplicate samples were collected at a rate of 3 per 100 soil samples and a standard was inserted every 33rd sample for QAQC purposes.

The drilling revealed that brecciated volcaniclastics and fine-grained mafic intrusives were responsible for the magnetic anomalies. Trace amounts of pyrite, bornite and <1% malachite were observed over a one metre interval in drill hole VSAC09036. This drill hole returned a 38m interval of 345ppm Cu from 14m including two metres at 1035ppm Cu from 28m. Nb, Cr, Ni, La and Ce concentrations were were not anomalous in any of the drill holes confirming that none of the pipe-like magnetic features were of ultramafic affinity.

The Vesper prospect will not be considered for follow-up exploration. However, it is clear that the microprobe geochemistry data for the heavy minerals extracted from the termite mounds is significantly different from the data obtained from heavy minerals in the RC drill chips. This suggests that the origin of the three micro-diamonds and four indicator minerals found in the termite samples has not been determined and it is proposed that future work on Anglo American tenements in the southern Georgetown area will incorporate some aspect of diamond exploration.

The hole locations are presented on Figure 18, the digital data and the code definitions of lithologies are include in Appendix VII.

6.5 Petrology

AAEA commissioned Anthony Ahmat to complete a petrographic report on 35 representative samples from the drill holes completed in 2009. This report reveals that the main rock type in most drill holes is a hornblende lamprophyre of intermediate composition. This lamprophyre intrudes granitoids, gneisses, cataclastic quartzofeldspathic rocks, intrusive breccias and amphibolites. Several of the rocks are highly altered and veined by alkali feldspar and carbonate. The diamond potential of the area based on the petrological report is reduced by the lack of evidence for kimberlite, lamproite or ultramafic lamprophyre. However, the mere presence of lamprophyre is significant. Diamonds have been linked to lamprophyric minettes in some parts of the World. The report is presented in Appendix VIII.

7. REHABILITATION

RC holes were rehabilitated at the end of the drilling program and the samples were back filled into the holes. All drill holes have been rehabilitated to the satisfaction of the Queensland Department of Mines, AAEA and the station owner.

8. PROPOSED FUTURE EXPLORATION

Exploration in the fourth year of the permit will include interpretation and target generation of the Spectrem Airborne Geophysical surveys and drilling. This data will define areas for further exploration including geochemistry, ground geophysics and drilling, in accordance with the tenement agreements.

9. CONCLUSION

During the third year of the tenement, a ground magnetic geophysics survey, termite mound sampling including detailed heavy mineral analysis, 45 RC drill holes for 2196 metres, a petrology study from the 2009 RC drilling and a Spectrem airborne geophysics survey (TMI, EM and Radiometrics) was completed. Exploration proposed for the fourth year of the tenement will include interpretation of the airborne geophysics to define areas for future exploration.

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APPENDIX I

SPECTREM AIR LIMITED
SPECTREM SURVEY
OF
THE LYND- BLOCK 1 AREA
FOR EPM15646
(AUSTRALIA)

AERIAL GEOPHYSICS

Flight Survey Details,
Image Atlas &
Digital Data

SPECTREM AIR LIMITED

ANGLO AMERICAN EXPLORATION (AUSTRALIA) PTY LTD

SPECTREM SURVEY OF THE LYND - BLOCK 1 AREA (AUSTRALIA)

December 2009

AMENDED FOR EPM15646

KEYWORDS

Lynd - Block 1, Australia, Anglo American Exploration (Australia) Pty Ltd, SPECTREM, Airborne, Electromagnetic, Magnetic, Radiometric

SUMMARY

In November 2009, Spectrem Air Limited conducted an airborne electromagnetic survey over the Lynd - Block 1 area.

Good data quality was achieved for this 25 Hz Lynd 1 survey with X9 and Z9 noise levels were fairly low at around 200 PPM.

Unfortunately despite a very careful examination of the Spectrem AEM data no good sulphide conductors were detected in the Lynd 1 area.

However a few poor conductors were detected. These AEM anomalies, which have been given a D or lower grade rating, should be integrated with the available geological / GIS information and reviewed with the Spectrem team if necessary.

CONTRIBUTORS

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Shawn Letts

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CIRCULATION LIST

Copies of this report have been sent to:

- M Webb – Chief Geophysicists – AAEA (Perth)
- A Kneeshaw – Exploration Manager – AAEA (Perth)
- SPECTREM's Archive

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LIST OF FIGURES

1 INTRODUCTION

Between 10 to 21 November 2009, Spectrem Air Limited conducted an airborne electromagnetic, magnetic and radiometric survey over the Lynd Block 1 project in Australia. A total of 5 070 line kilometres were surveyed and 1584 Line kilometres within EPM15646. The general location of the survey is shown in Figure 1.

Details of the survey can be found in Appendix 1. The system specifications are presented in Appendix 2 and the standard Spectrem Air data processing stream is described in Appendix 3.

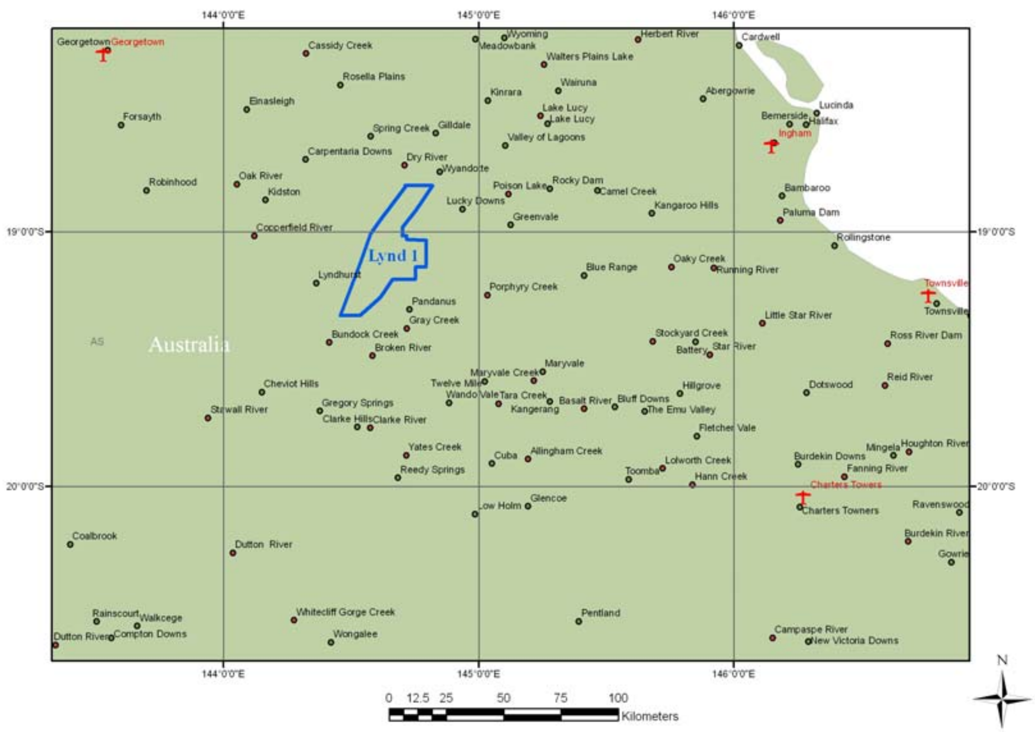

Figure 1 - Survey Location

A map of the total magnetic field (Figure 2) and of the conductivity Tau Z (Figure 3) of the Lynd Block 1 project within EMP15646 are shown below:

.

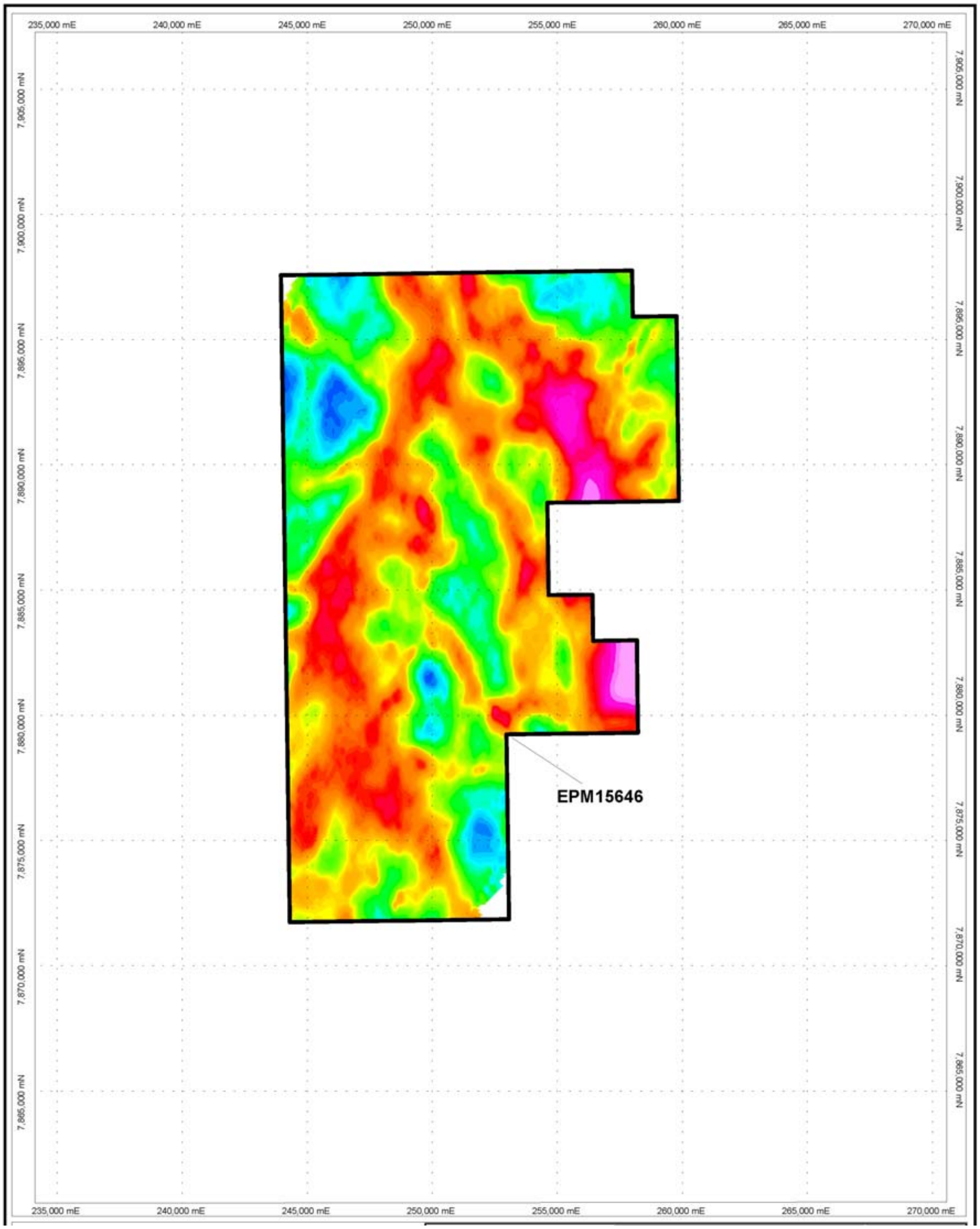

Figure 2 (amended) - An image of the EM Tau Z (LYND - Block 1 within EPM15646)

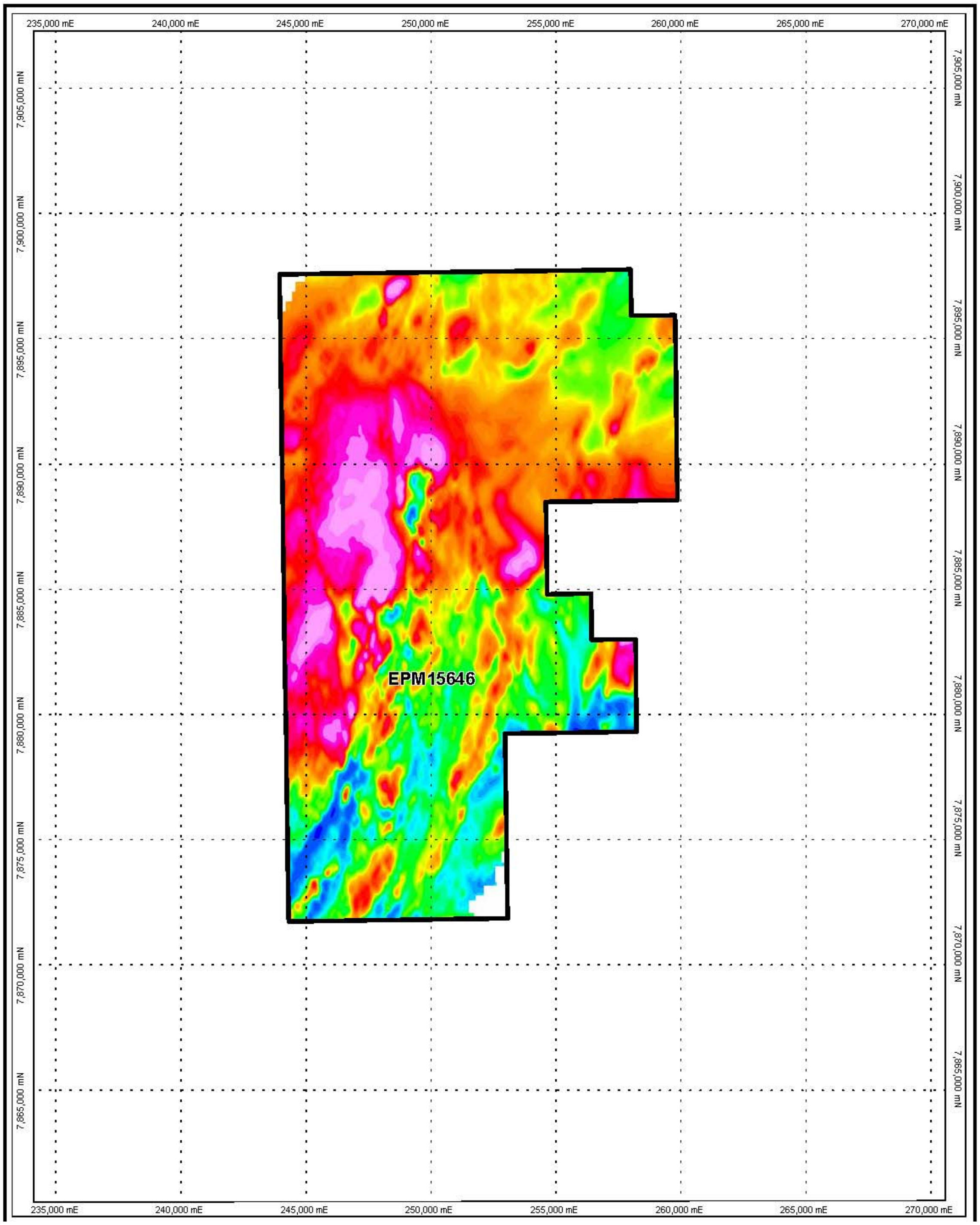

Figure 3 (amended) - An image of the Total Filed Magnetic Intensity (LYND - Block 1 within EPM15646)

2 APPENDIX 1: SURVEY DETAILS WITHIN EPM15646

2.1.1 Logistics

The specific details of the survey were as follows:

Base of operations	Ingam - Australia
Flying Dates	25 September to 06 November 2009
Survey type	Electromagnetic, magnetic, radiometric, terrain
Aircraft type	DC3 – TP67
EM Base Frequency	25 Hz
Nominal aircraft altitude	90 m
Nominal aircraft speed	60 m/s
Acceptable Kilometres flown: LYND - Block 1	5 070 line kilometres
Kilometres flown within EPM15646	**1584 Line kilometres**
Nominal flight-line spacing LYND - Block 1	200 m
Nominal flight-line direction: LYND - Block 1	90 degrees
Nominal tie-line spacing: LYND - Block 1	2 000 m
Nominal tie-line direction: LYND - Block 1	00 degrees

2.1.2 Datum

All coordinates provided in this report, in maps and in processed digital data-sets have the following datum parameters.

Datum	WGS84
Projection	UTM 55 S
Type	Transverse Mercator

2.1.3 Survey Area Coordinates

The corner coordinates of the survey within EPM15646 were:

LYND - Block 1within EPM15646	Easting (m)	Northing (m)
	250461	7871820
	251637	7872013
	251537	7872206
	251446	7872380
	251750	7872615
	252060	7872806
	252114	7873019
	252451	7873206
	252370	7873425
	252523	7873611
	252490	7873810
	252949	7874019
	252733	7874208
	252770	7874347
	253009	7874608
	252970	7879205
	252955	7879405
	258228	7879410
	258184	7882812
	256432	7882807
	256403	7884805
	255639	7884807
	255643	7884613
	254649	7884611
	254649	7884803
	254598	7888611
	259862	7888610
	259769	7895798
	258015	7895804
	257989	7897611
	246544	7897605
	245024	7897403
	244657	7897207
	244730	7897009
	244491	7896807
	244513	7896605
	244279	7896426
	244376	7896203
	244146	7896006
	244261	7895810
	244012	7895625
	244174	7895410
	243977	7895213
	244303	7871815
	250461	7871820

3 APPENDIX 2: SYSTEM SPECIFICATIONS

SPECTREM simultaneously takes electromagnetic, total field magnetic and radiometric measurements. Both the electromagnetic and magnetic sensors are towed behind the aircraft in "birds" while the radiometric crystals are installed inside the cabin. The geometry of the system is shown below in Figure 2. Other system specifications are listed below.

3.1.1 EM system

Transmitter height above ground	107 m
Tx – Rx vertical separation	37.1 m
Tx – Rx horizontal separation	122.9 m
Transmitter coil axis	Vertical
Receiver coil axes	X : horizontal, parallel to flight direction Y : horizontal, perpendicular to flight Z : vertical, perpendicular to flight direction
Current waveform	Square wave
Base frequencies for this survey	25 Hz
Transmitter loop area	420 m^2
RMS current	920 to 960 amperes
RMS dipole moment	386 400 to 403 200 $A.m^2$
Recording Rate	5 Hz
Window distribution	Pseudo-binary
Digitising rate	38 400 Hz /component

Window Times for 25 Hz

Frequency	Window	Window Center	Window Width (μs)
25	1	26.0	26.0
25	2	65.1	52.1
25	3	143.2	104.2
25	4	299.5	208.3
25	5	612.0	416.7
25	6	1237.0	833.3
25	7	2487.0	1666.7
25	8	4987.0	3333.3
25	9	9987.0	6666.7
25	10	16653.6	6666.7

3.1.2 Magnetic system

Bird height above ground	71 m
Bird location	19 m below and 41 m behind centre of
Sensor	Scintrex CS-2 Sensor with SPECTREM Counter/Sync System
Recording Rate	5 Hz
Sensitivity	0.01 nT
Resolution	0.1 nT

3.1.3 Positioning system

Sensor	Novatel OEMV-3 GPS receiver with Fugro Omnistar differential corrections
Recording Rate	5 Hz

3.1.4 Other sensors

Radar Altitude	Collins with 5 Hz sampling with 0.3 m
Laser Altitude	Riegl with 5 Hz sampling with 0.03 m
Barometric Pressure	Rose Mount with 1 Hz sampling
Temperature (OAT)	PT-100 RTD with 1 Hz sampling
Analogue Chart Recorder	RMS GR-33

4 APPENDIX 3: DATA PROCESSING

The EM data were processed in Johannesburg using Oasis Montaj and proprietary software.

4.1 Electromagnetic Processing

4.1.1 Aircraft Processing

Some of the most important EM data processing was carried out on the aircraft as it acquired the data. The first processing stage was stacking the data to 512 samples. The data was then deconvolved to remove system response and transformed to a square wave. A square transmitter waveform was chosen as a periodic approximation of the step response.

In the next stage of processing the data was binned into 8 channels or windows. As the SPECTREM system makes its measurement while the transmitter is switched on, it is necessary to separate the primary (transmitted) field from the (induced) secondary field. The assumption is made that the induced field will have decayed to a minimal amount at the time the last channel is sampled. As the last channel only measured the primary field, it can be subtracted from the other channels to separate the secondary field. Hence there are actually 8 channels with geological information in the final data.

4.1.2 Profile data

The spikes in the line data have been removed using a 3 point Naudy filter. The line data have also been drift corrected and micro-levelled. The drift is particularly noticeable on the later time channels and has been applied to channels 4 to 8. This is an iterative process, with the assumption that there is a constant drift on a single line. This is reasonable if the lines are short. The processing steps are:

- The channel data are clipped retaining the data in the resistive areas where the response should be close to zero.
- The average of the clipped data is then calculated and subtracted from the channel data.

The steps are then repeated, refining the correction.

Decorrugation and micro-levelling has been applied to all the channels to reduce small residual errors that have not been corrected through the drift correction method.

4.1.3 Apparent Conductivity

The apparent conductivity was calculated from its channel amplitudes and the aircraft height. An apparent conductivity is the conductivity of a half space that would produce an amplitude equivalent to the measured response. It is useful in providing a physically sensible unit and partially compensates for aircraft ground clearance variations. The unit for apparent conductivity is milliSiemens/meter.

4.1.4 Grids

The data were gridded using an Akima spline. System lag was corrected before gridding.

A decorrugation filter was applied to reduce the herringbone effects created by geometrical asymmetry inherent in AEM systems

4.2 Magnetic Processing

The leveling processing included:

- Tie-line levelling
- Decorrugation
- Micro-levelling

4.2.1 Tie-line Levelling

Tie line levelling is used to remove the diurnal variation and errors due to instrument drift, both are assumed to vary slowly over time.

Tie-line levelling is an iterative process:

- Calculate the mis-closures at the crossover points of the tie and traverse lines. The mis-closure is the difference between the magnetic value on the tie line and the traverse line. The mis-closures are weighted by the gradient of the total field at the crossover point.

$$Weight = 1 / e^{(0.1 \times gradient)}$$

- The error is approximated by a piecewise polynomial as a function of time along a flight and then along a tie line.

These steps are repeated until a good fit has been obtained.

4.2.2 Decorrugation

This is a grid based operation designed to reduce the residual errors that the tie-line leveling does not remove. These are due to inaccuracies in the crossovers, localised diurnal activity, and local altitude variations.

Elongated anomalies with the following characteristics are removed:

- 2 times the line spacing perpendicular to the line direction
- 2 times the tie line spacing parallel to the line direction
- small dynamic range

4.2.3 Micro-levelling

Applies the corrections made to the grid to the profile data and thereby enhances the line data by removing the final residual errors. The micro-levelled data are then gridded. The lag correction is 40m.

4.3 DEM processing

Initially, the GPS height and the radar altimeter channels are visually inspected and any spikes or discontinuities are removed. A Low Pass or Naudy Filter is then applied to both channels. The GPS height channel is then gridded and the resultant grid is checked. Due to the nature of the GPS data, it is normally necessary at this stage to perform some degree of decorrugation on the grid with the corrections then written back to the database.

The radar altimeter channel is then subtracted from the corrected GPS height channel in the database and the resultant channel is gridded and verified.

4.4 Radiometric Processing

The processing of the radiometric data uses the full 256 channel spectra for most of the corrections. This processing allows us to use the information from the full spectrum to enhance the regions of interest in the spectrum, namely, potassium, uranium and thorium.

5 APPENDIX 4: DELIVERABLES

5.1 Digital Products

5.1.1 Grids / Profile / Map Data

(Grids supplied in Geosoft format)

	Grids	Line Data	Maps
EM Data			
EMX1 to EMX8 / EMZ1 to EMZ8	Y	Y	-
Tau X or Tau Z	Y	-	Y
Anomaly Map	N/A	N/A	N/A
Conductivity Grids at Various Depths	-	-	-
TF Magnetic Data			
TFMI	Y	Y	Y
Terrain			
DEM	Y	Y	-
Radiometric Data			
TC, K, U, Th	Y	Y	-
CDI Data			
CDI Data - Individual Lines (All lines & Tie Lines)	-	Y	-
Conductivity 3D Voxel Model	-	-	-
Interpretation			
Preliminary Geological Interpretation	-	-	-

5.1.2 Report

- Logistics report.

6 APPENDIX 5: SOFTWARE VERSIONS

SpecDAS acquisition	1.16
Spectrem processing - SDALOG	1.06
Spectrem processing - SDASPEC	4.01
Spectrem processing - LEVEL	1.03
Autopick	EMPICK 1.03
Geosoft	6.3 (30) HF2
CDI	1.00

AAEA Lynd Ni-Cu-PGE project
North Queensland

First Pass Spectrem Survey Results: Lynd Block 1 – EPM15646

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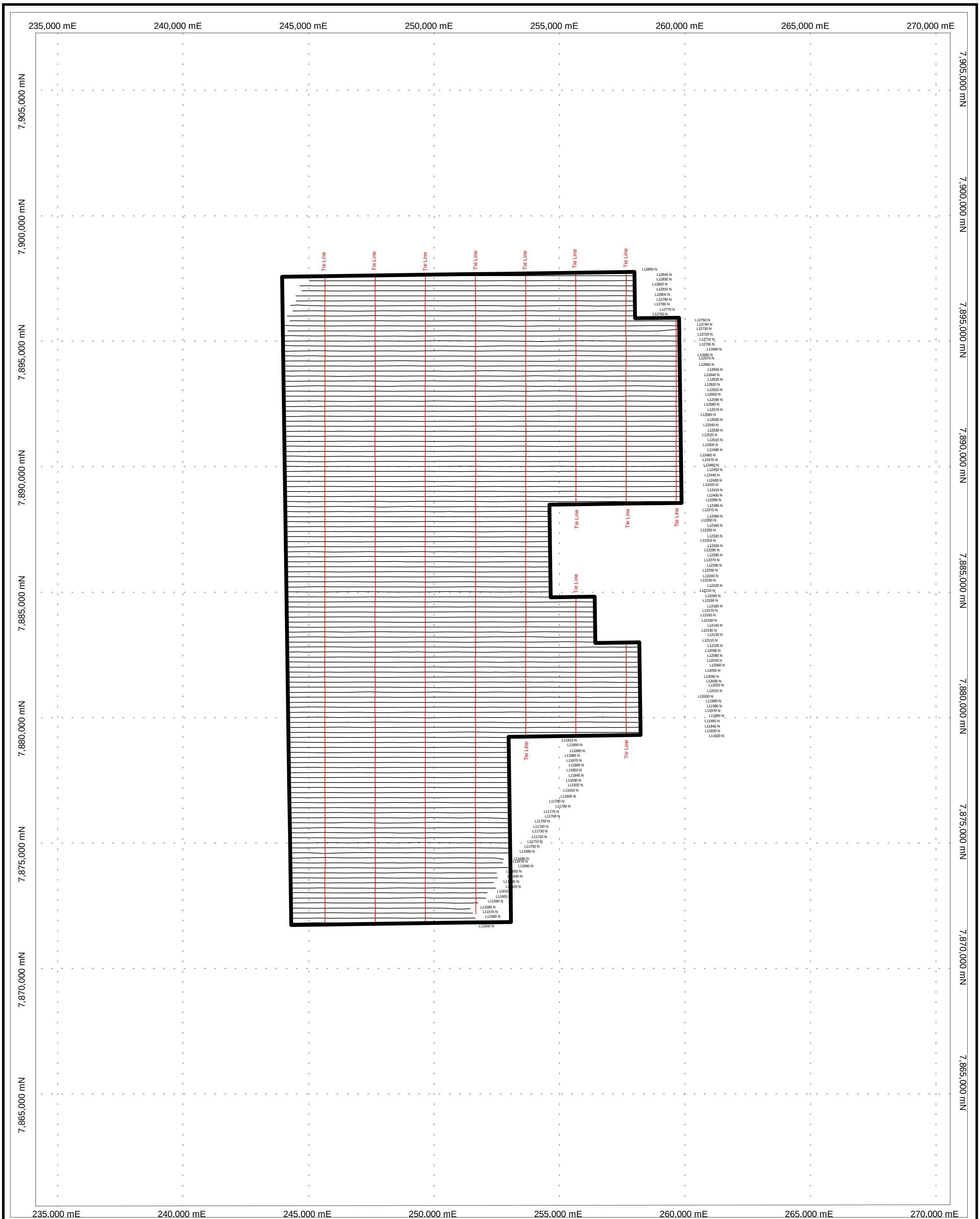

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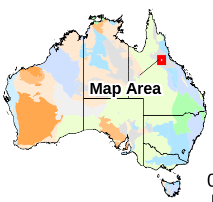

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ANGLO AMERICAN

REGION: GEORGETOWN

PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646
SPECTREM AERIAL
GEOPHYSICS SURVEY
Flight Lines

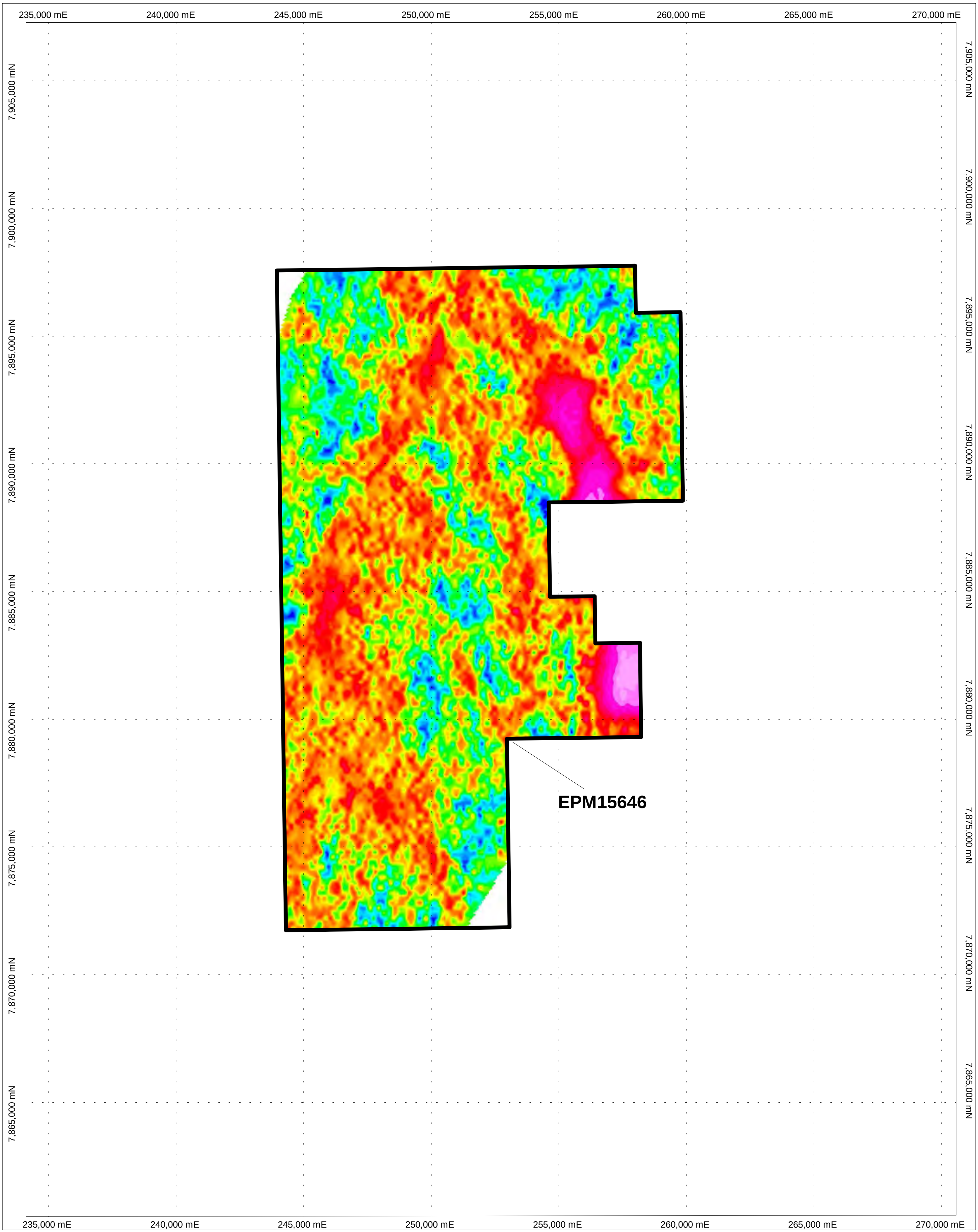
AUTHOR:
K Dixon

COMPILED BY:
C Lucy

DATE:
02/04/2009

PROJECTION:
MGA (Zone 55)

SCALE:
1:200,000



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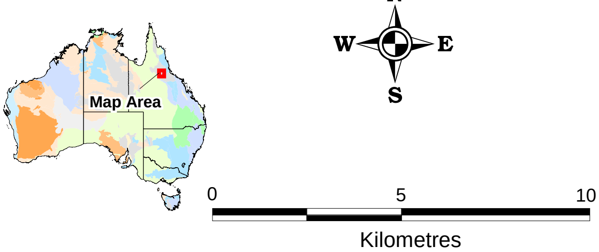

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REGION: GEORGETOWN

PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646
SPECTREM AERIAL GEOPHYSICS SURVEY
Cover

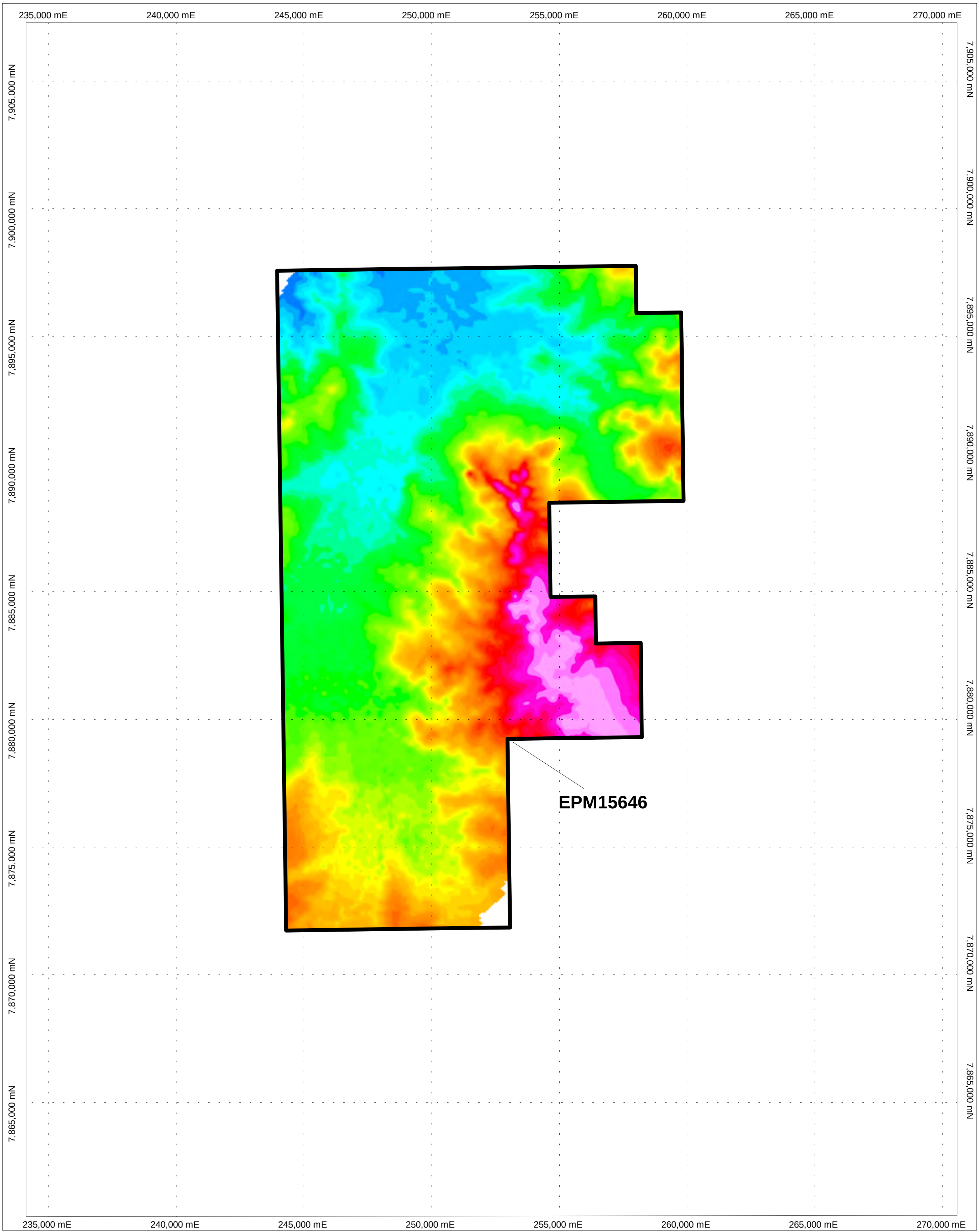
AUTHOR: K Dixon

COMPILED BY: C Lucy

DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

SCALE: 1:200,000



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REGION: GEORGETOWN

PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646
SPECTREM AERIAL GEOPHYSICS SURVEY
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AUTHOR:	K Dixon
COMPILED BY:	C Lucy
DATE:	02/04/2009
PROJECTION:	MGA (Zone 55)
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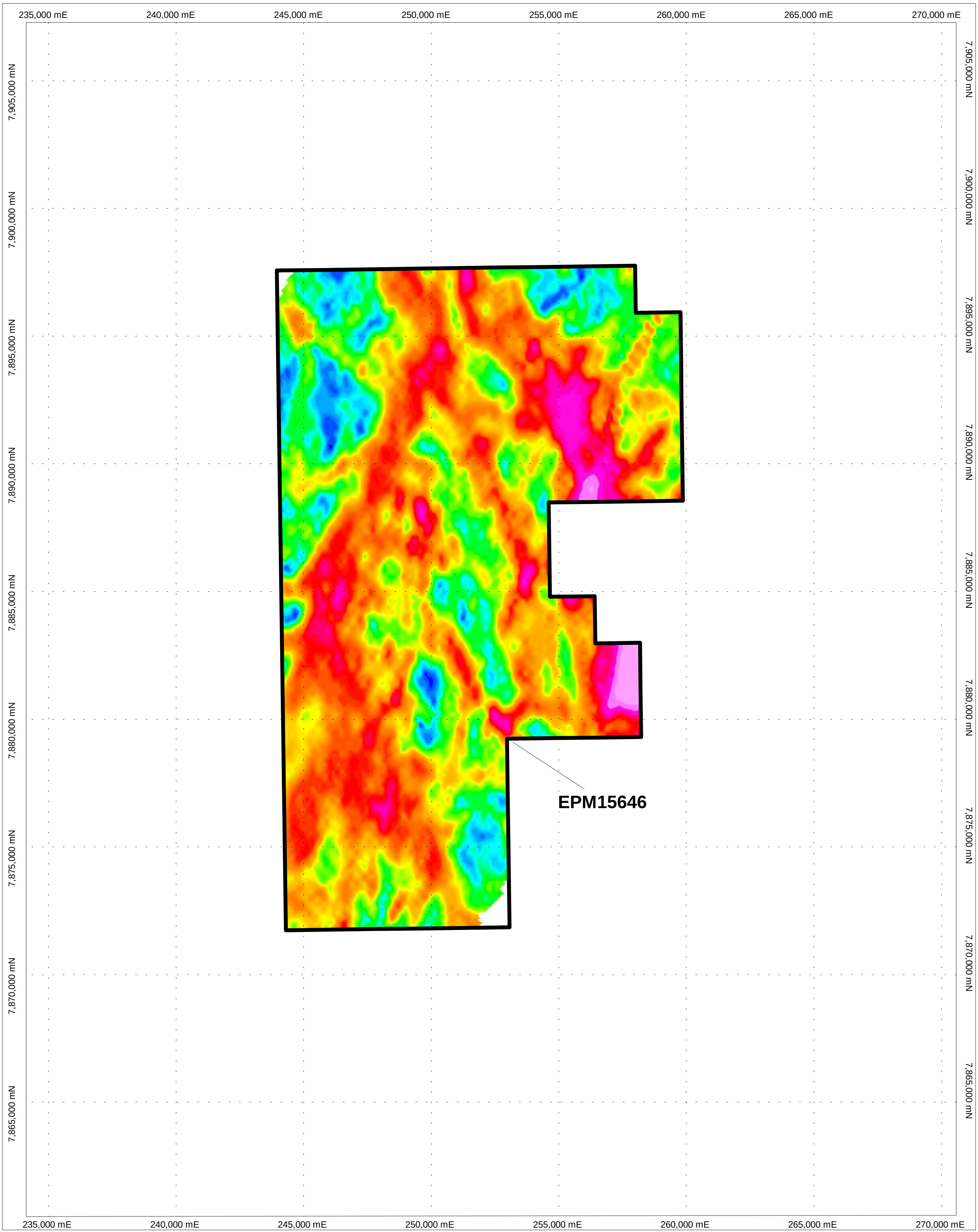

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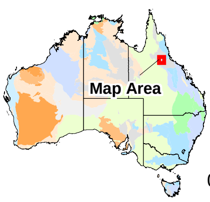

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LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY Tau X

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COMPILED BY: C Lucy

DATE: 02/04/2009

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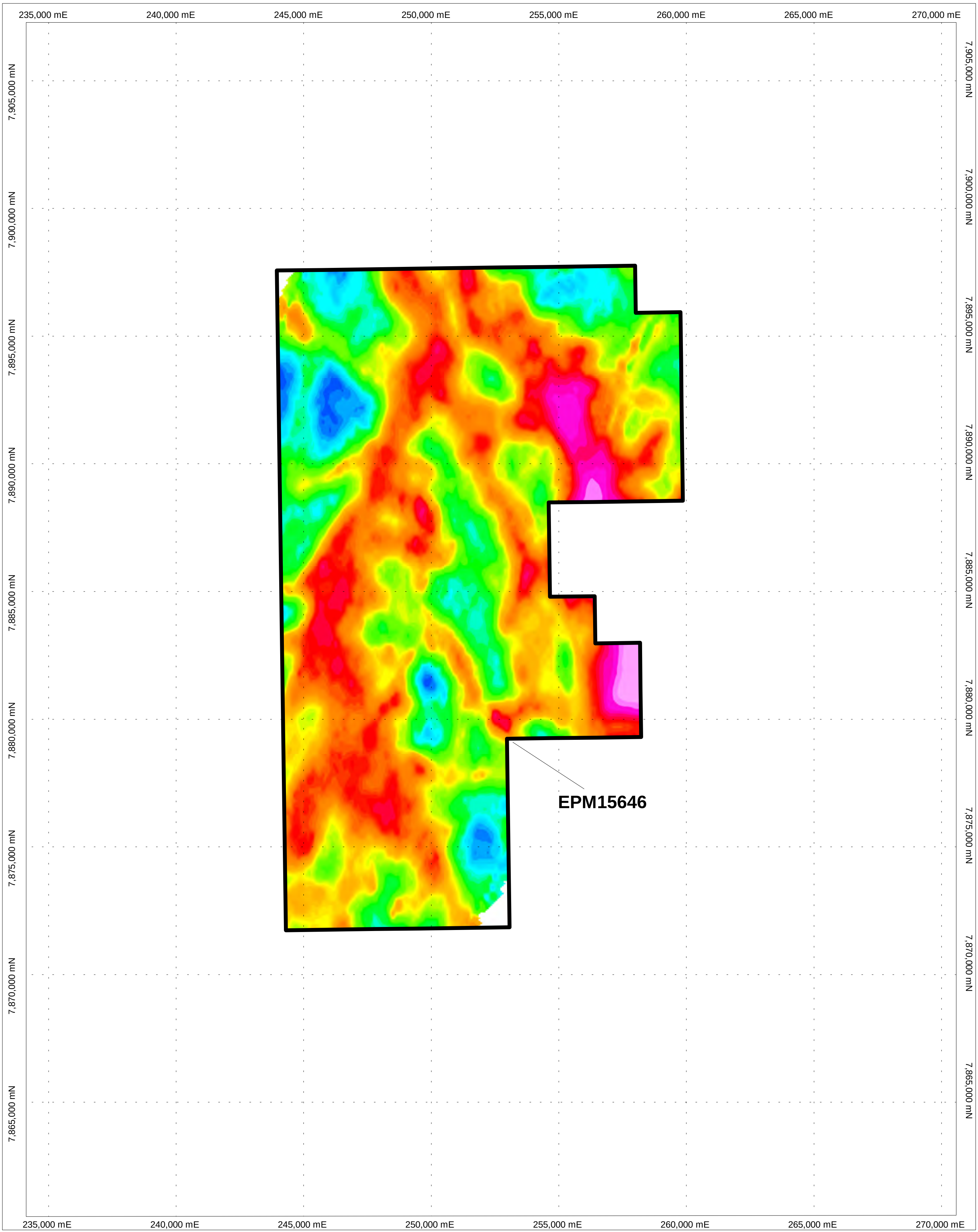

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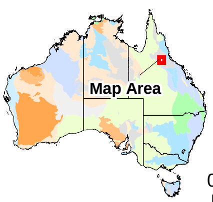

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LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY Tau Z

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COMPILED BY: C Lucy

DATE: 02/04/2009

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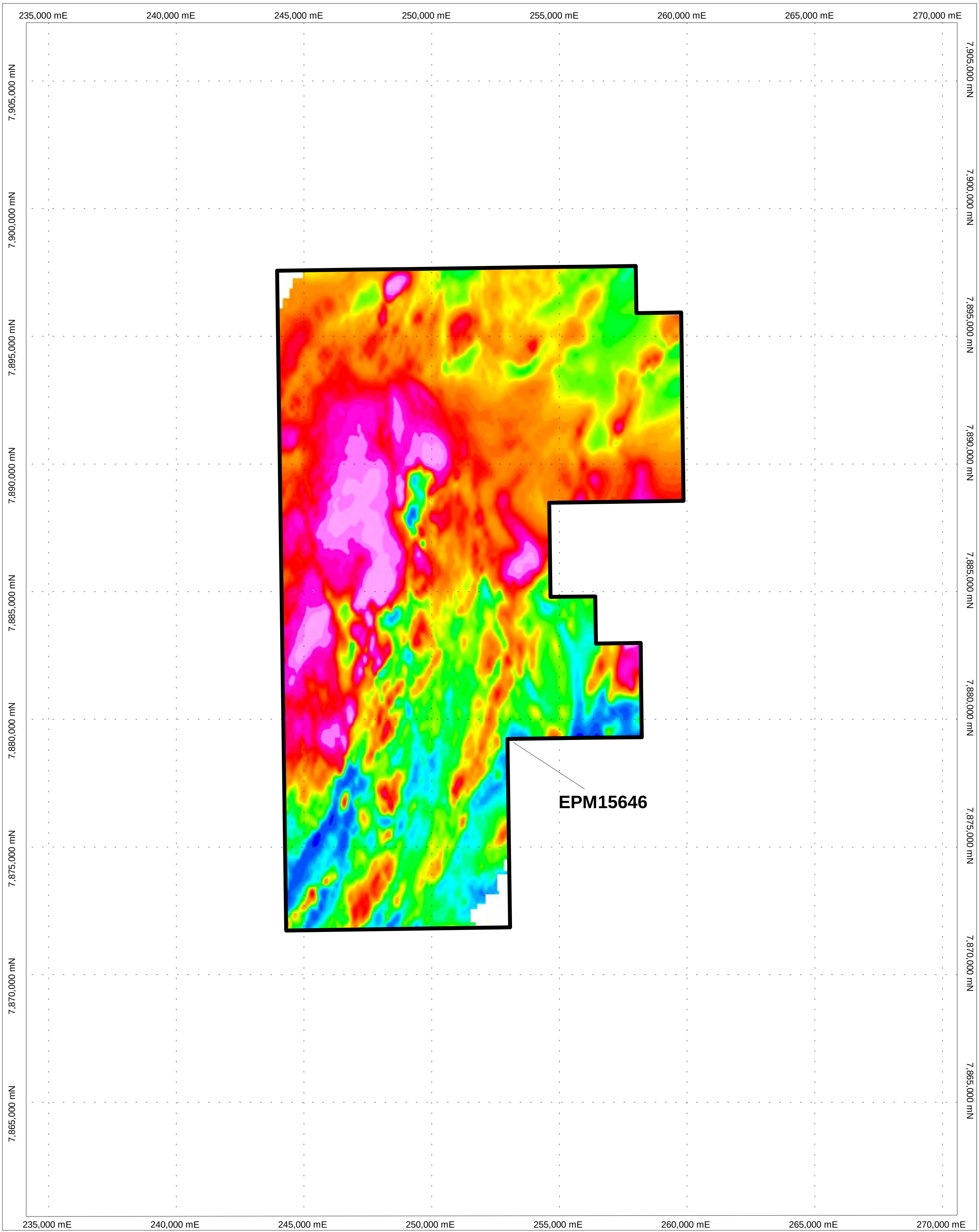

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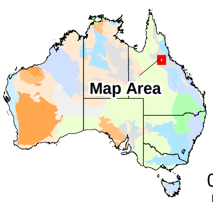

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REGION: GEORGETOWN

PROJECT: LYND

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LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY TMI

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COMPILED BY:	C Lucy
DATE:	02/04/2009
PROJECTION:	MGA (Zone 55)
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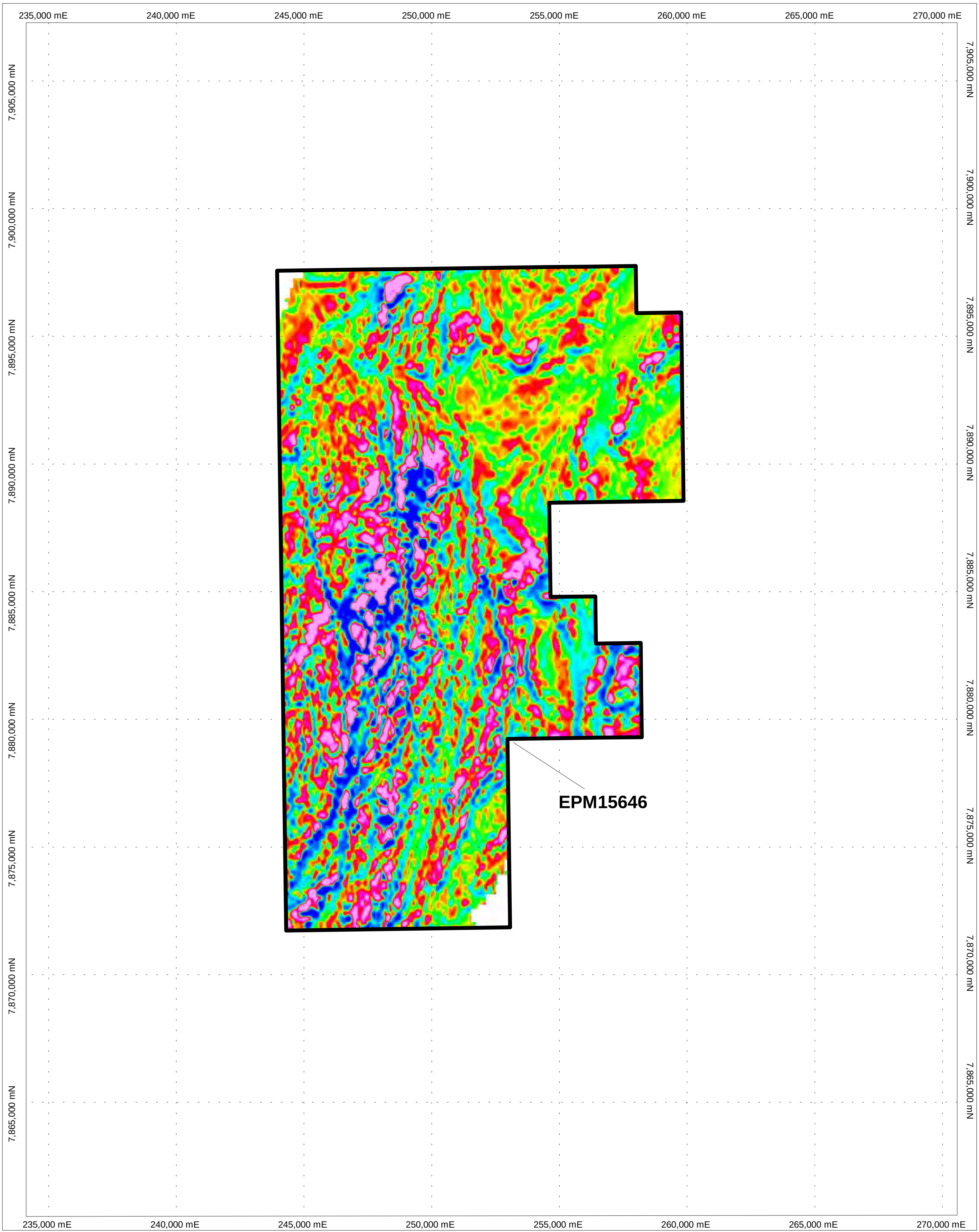

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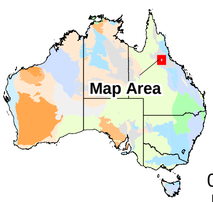

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LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY TMI 1VD

AUTHOR: K Dixon

COMPILED BY: C Lucy

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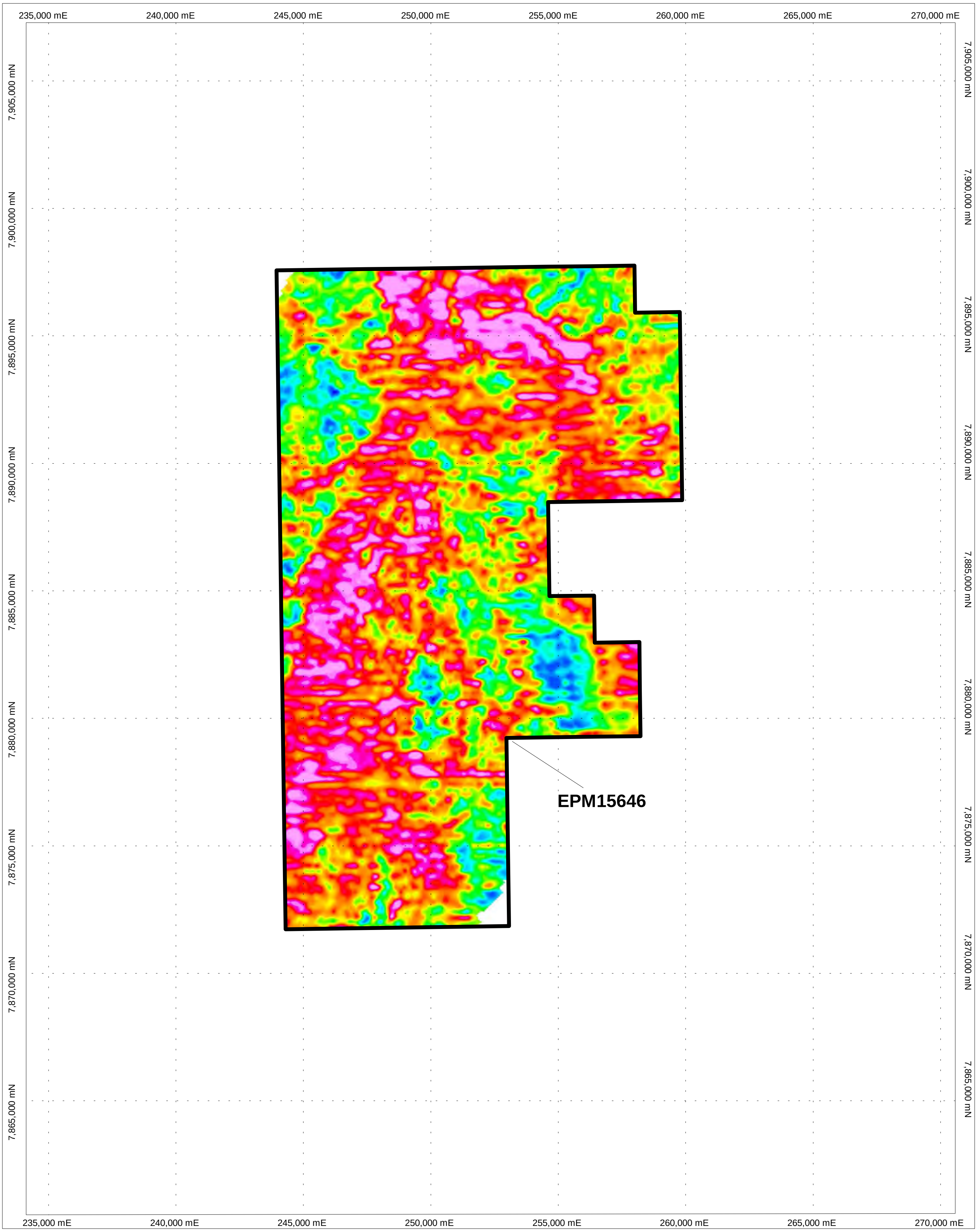

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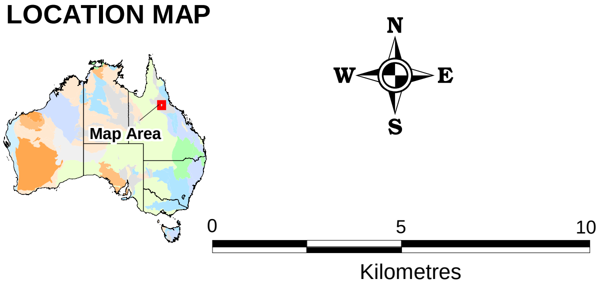

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AUTHOR: K Dixon

COMPILED BY: C Lucy

DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

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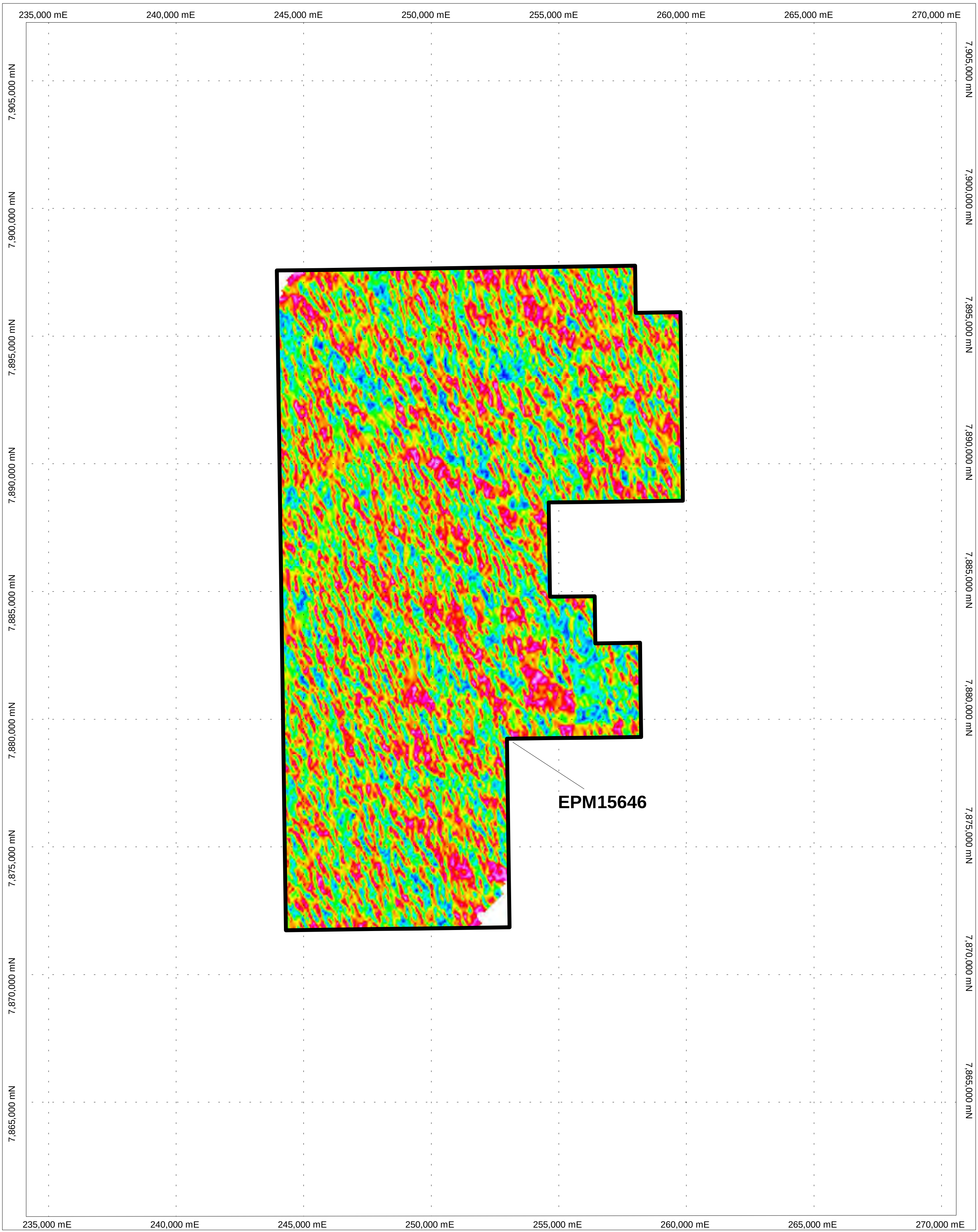

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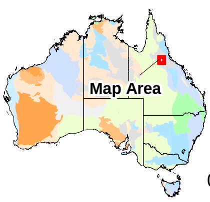

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LYND BLOCK 1 - EPM15646
SPECTREM AERIAL
GEOPHYSICS SURVEY
EM Channel 01 - Z

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COMPILED BY: C Lucy

DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

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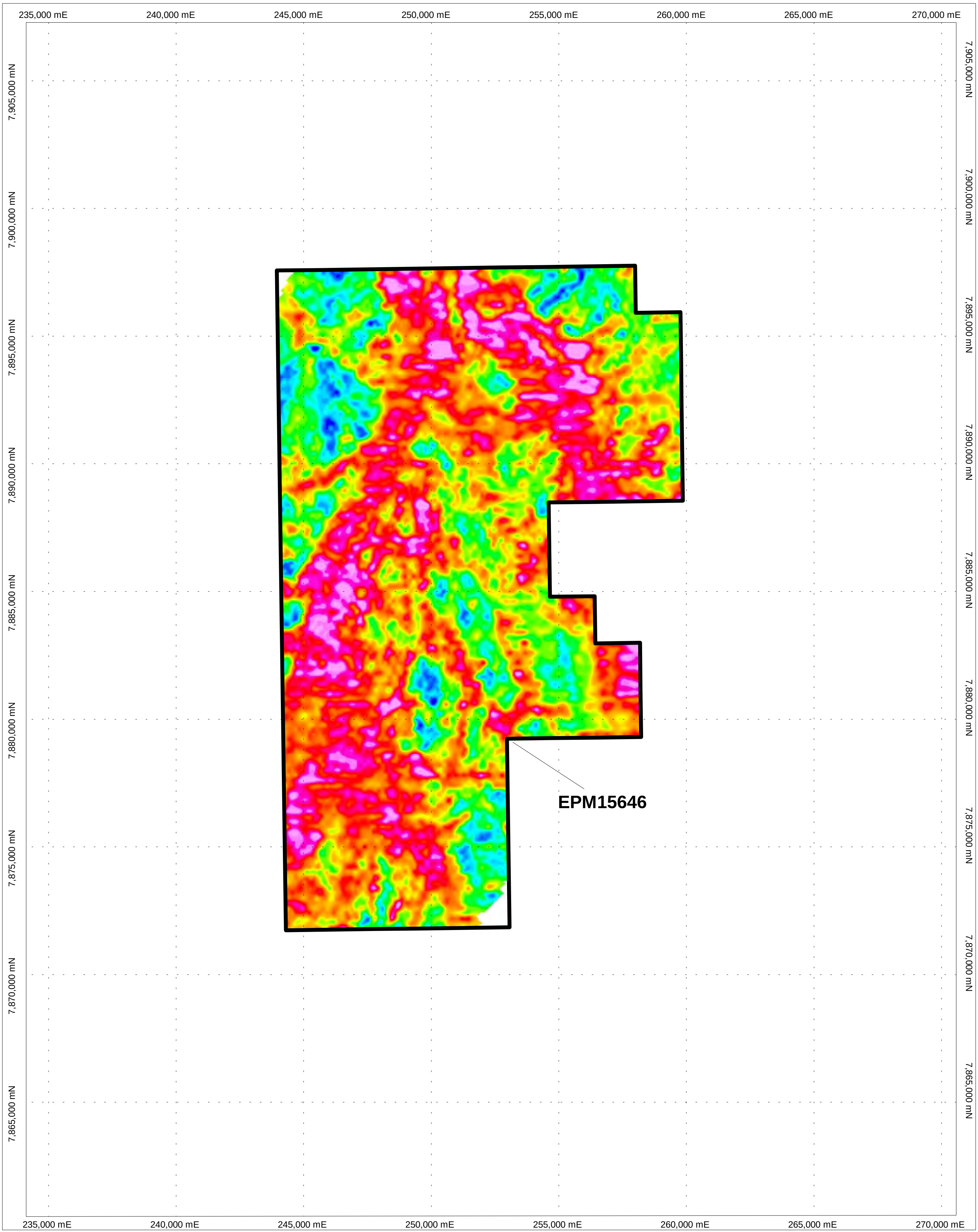

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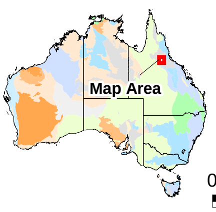

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PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646
SPECTREM AERIAL
GEOPHYSICS SURVEY
EM Channel 02 - X

AUTHOR: K Dixon

COMPILED BY: C Lucy

DATE: 02/04/2009

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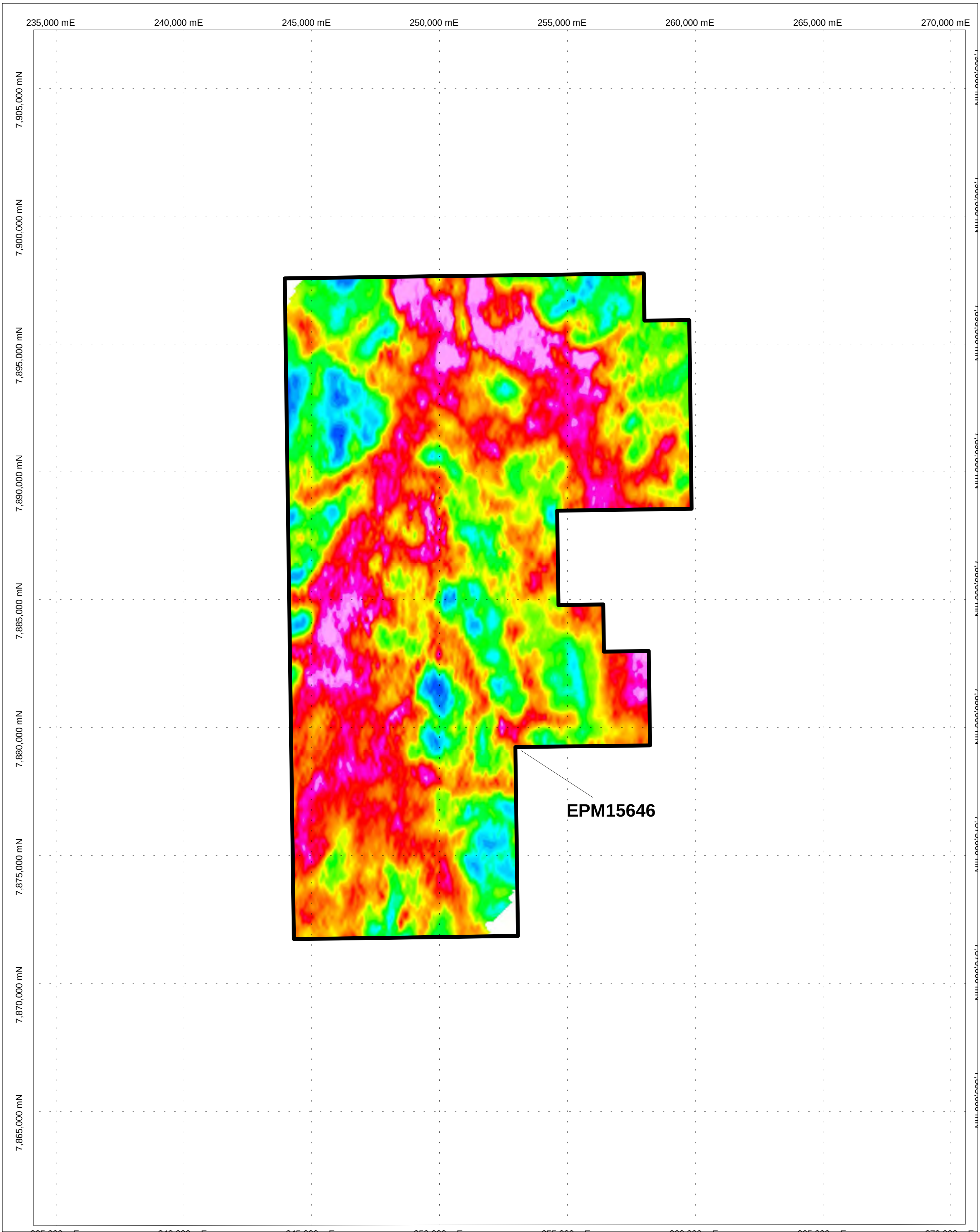

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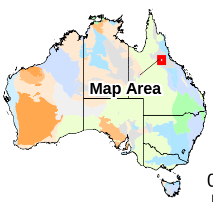

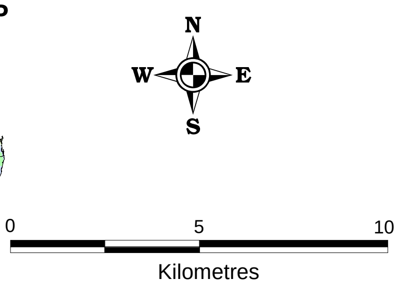

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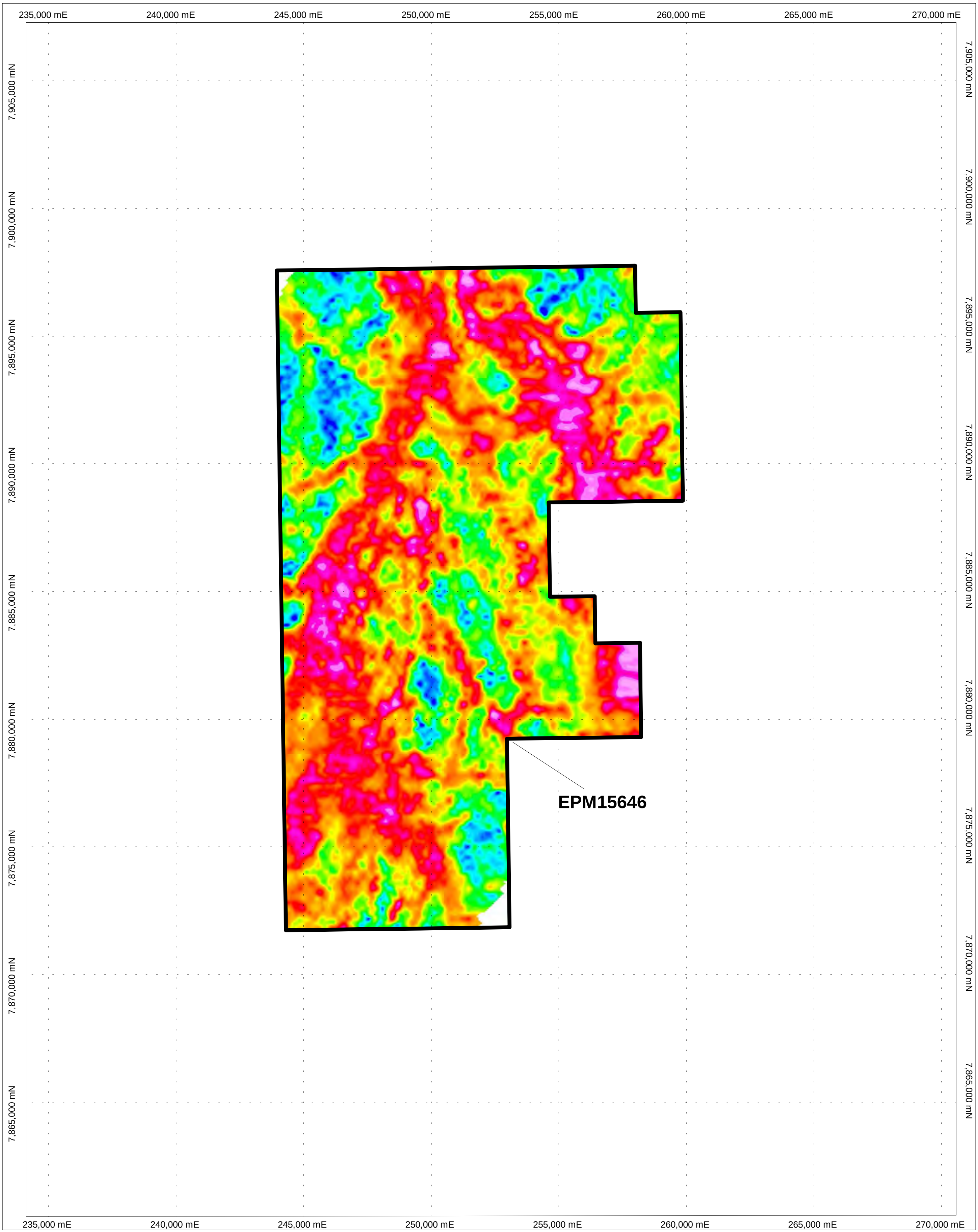

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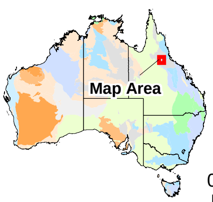

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LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY EM Channel 03 - X

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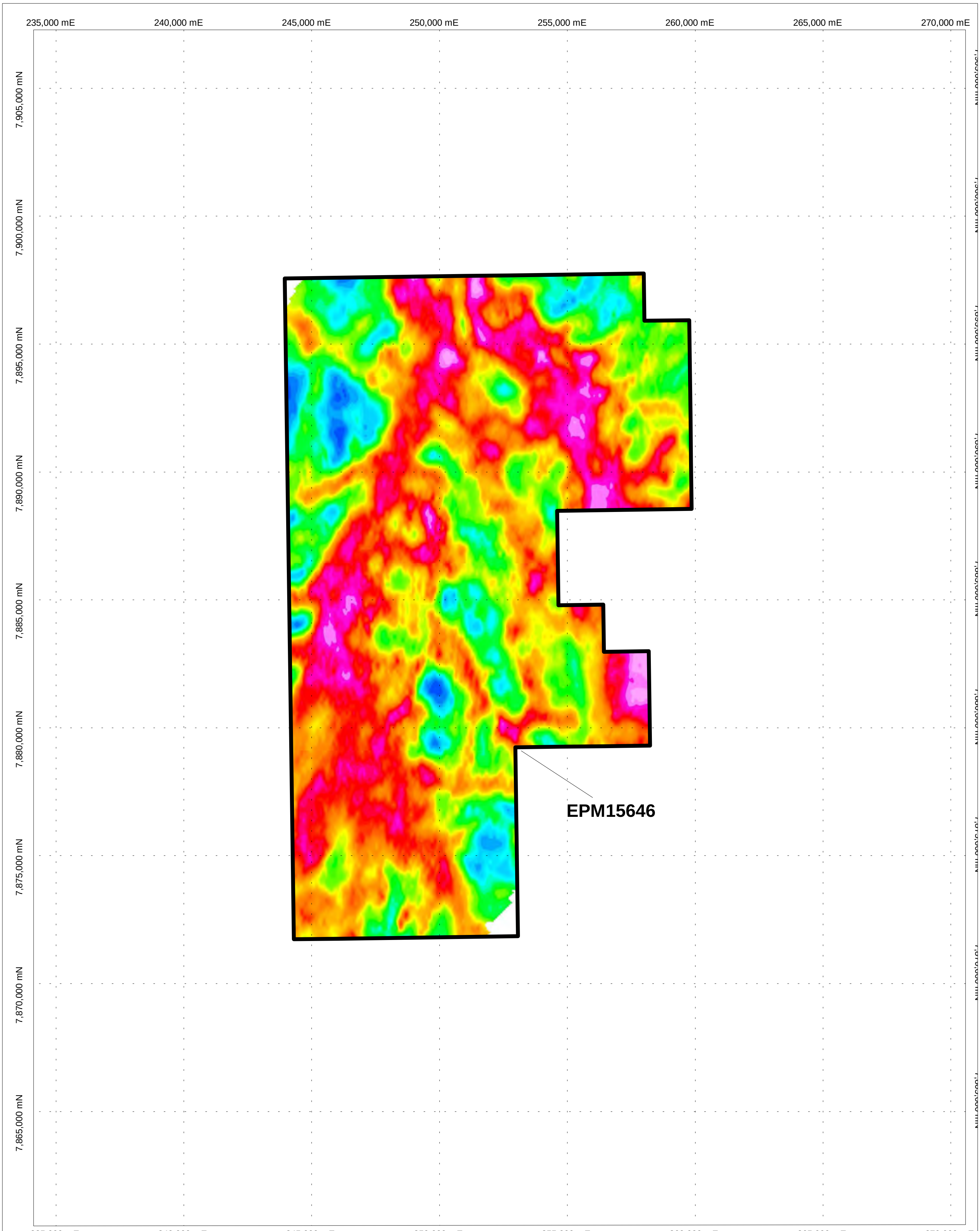

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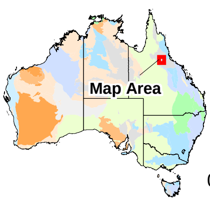

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LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY EM Channel 03 - Z

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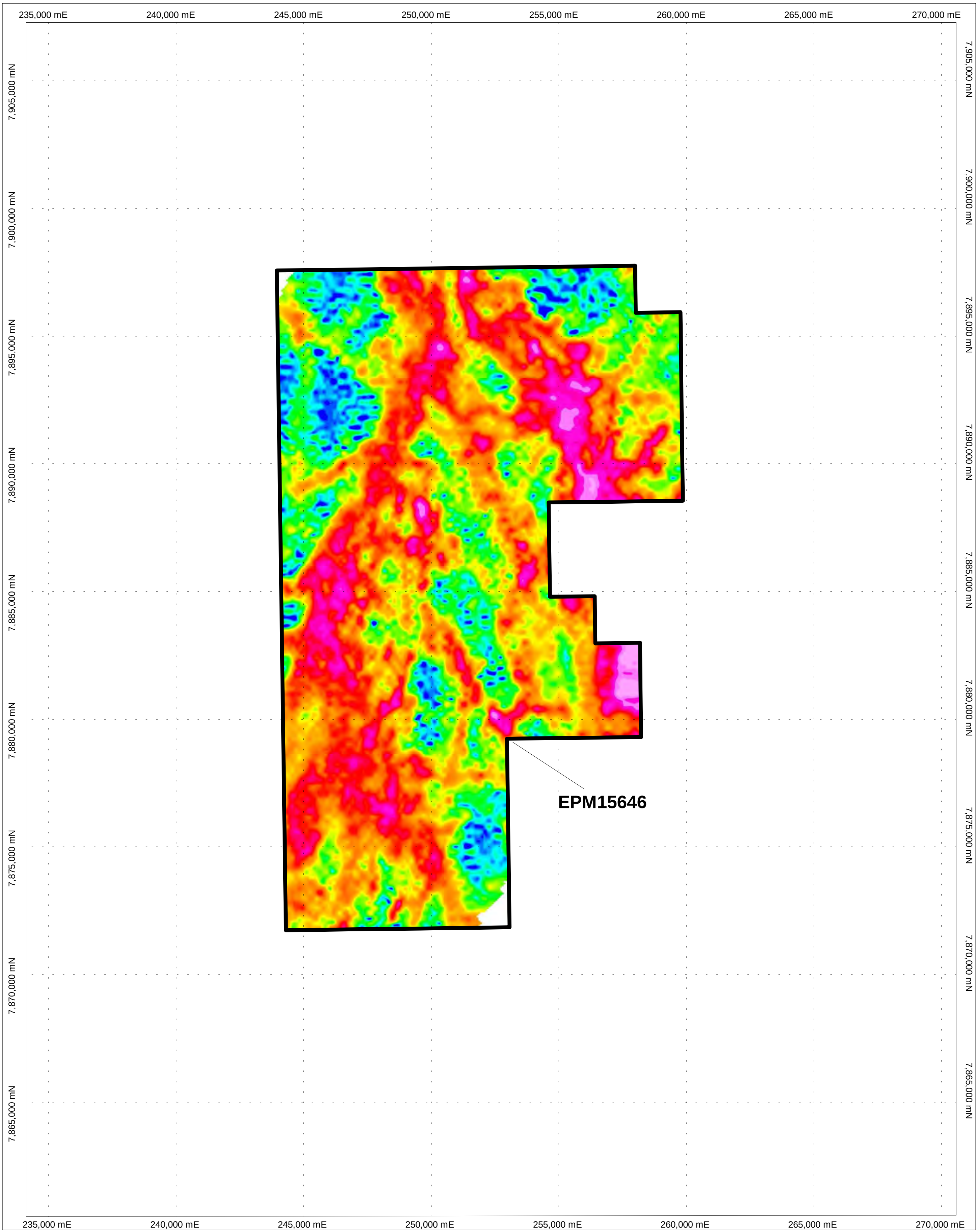

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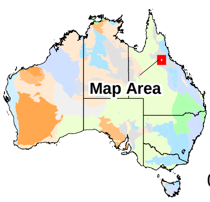

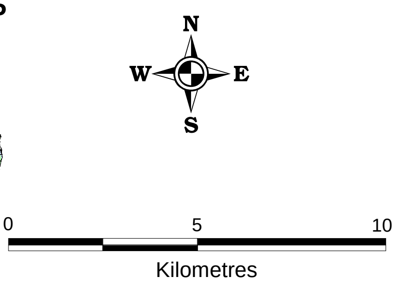

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LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY EM Channel 04 - X

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COMPILED BY: C Lucy

DATE: 02/04/2009

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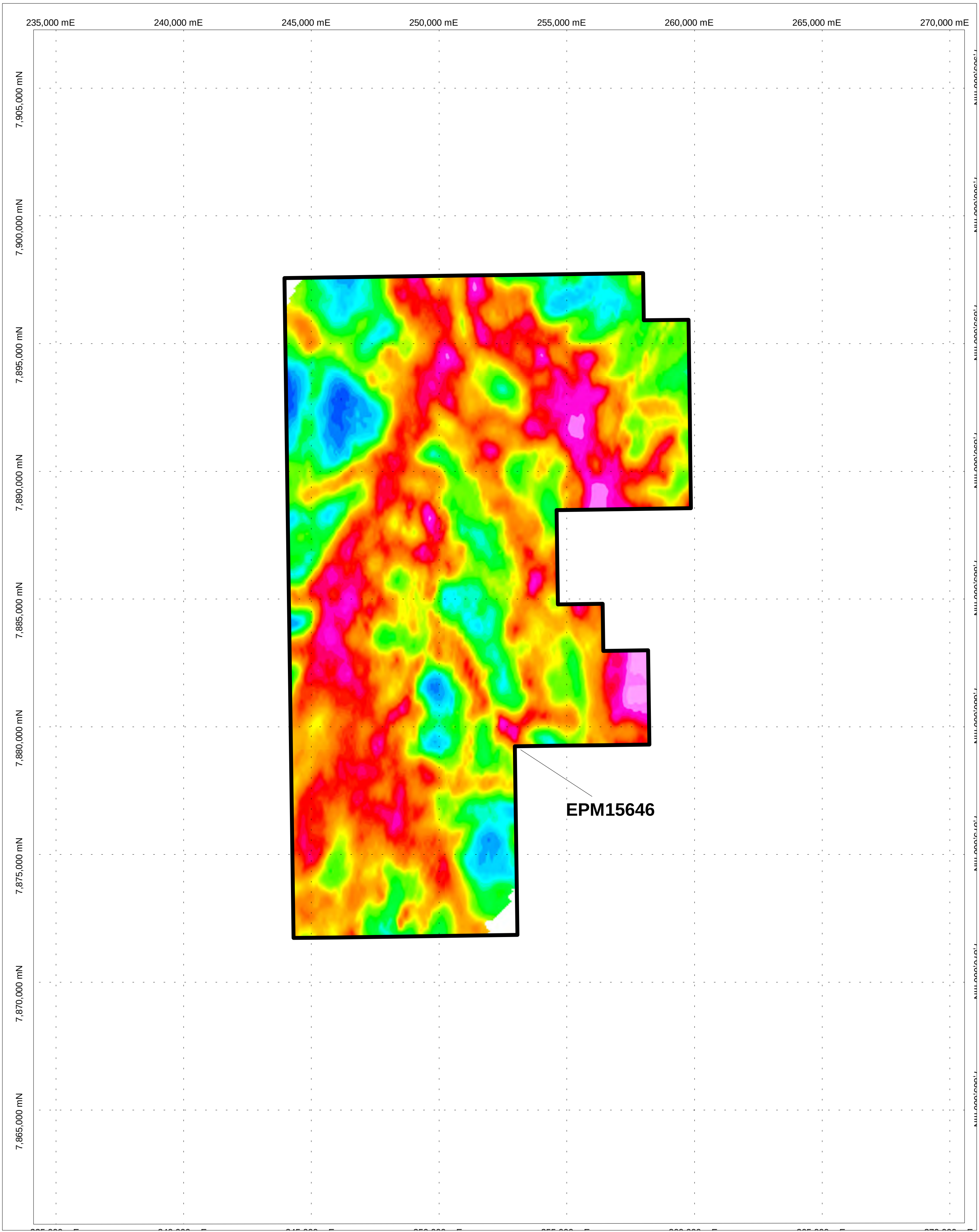

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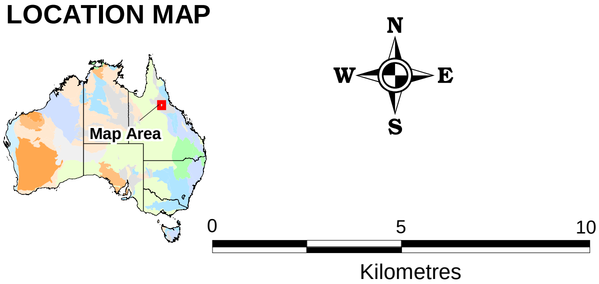

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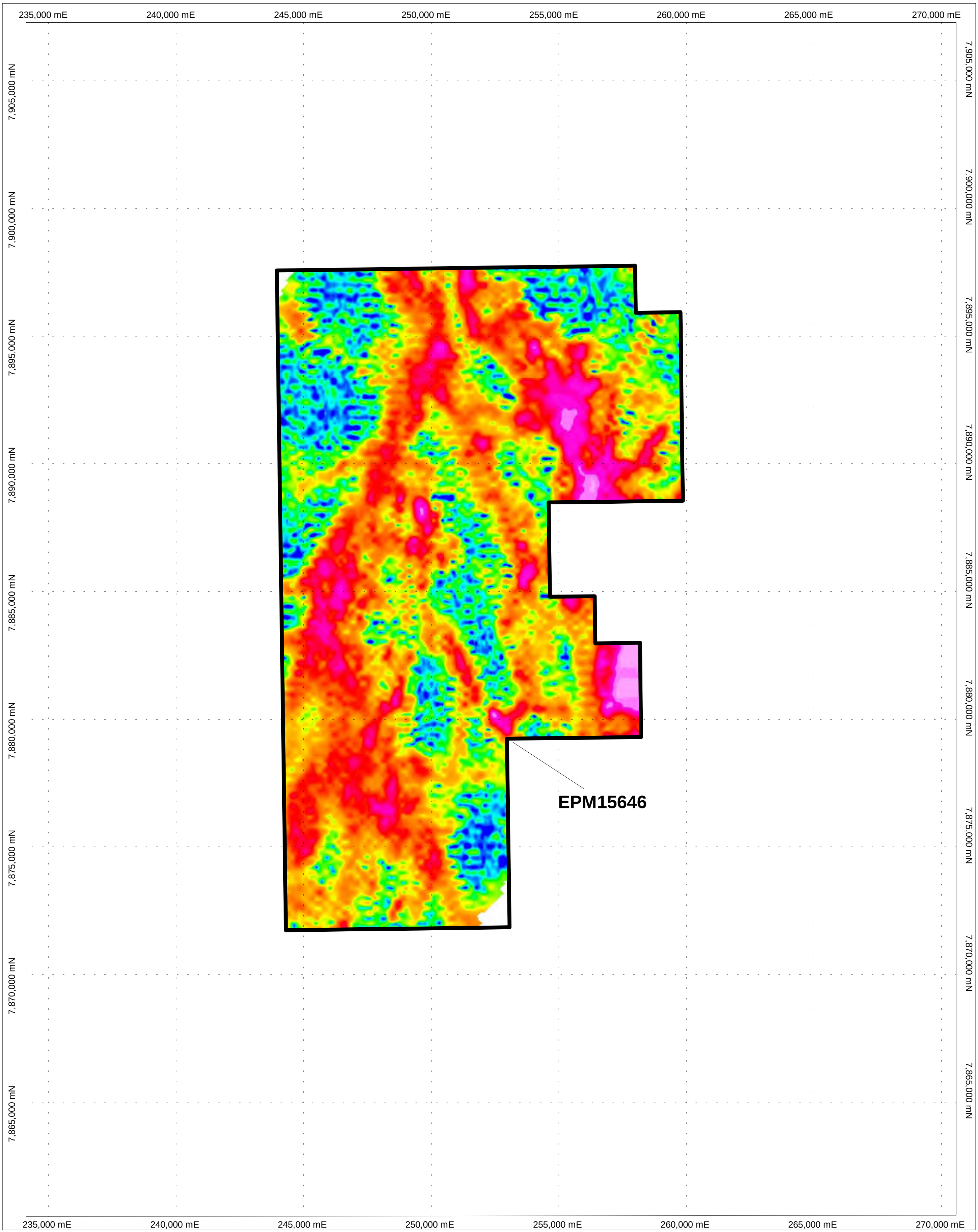

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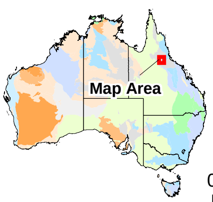

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ANGLO AMERICAN

REGION: GEORGETOWN

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DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY EM Channel 05 - X

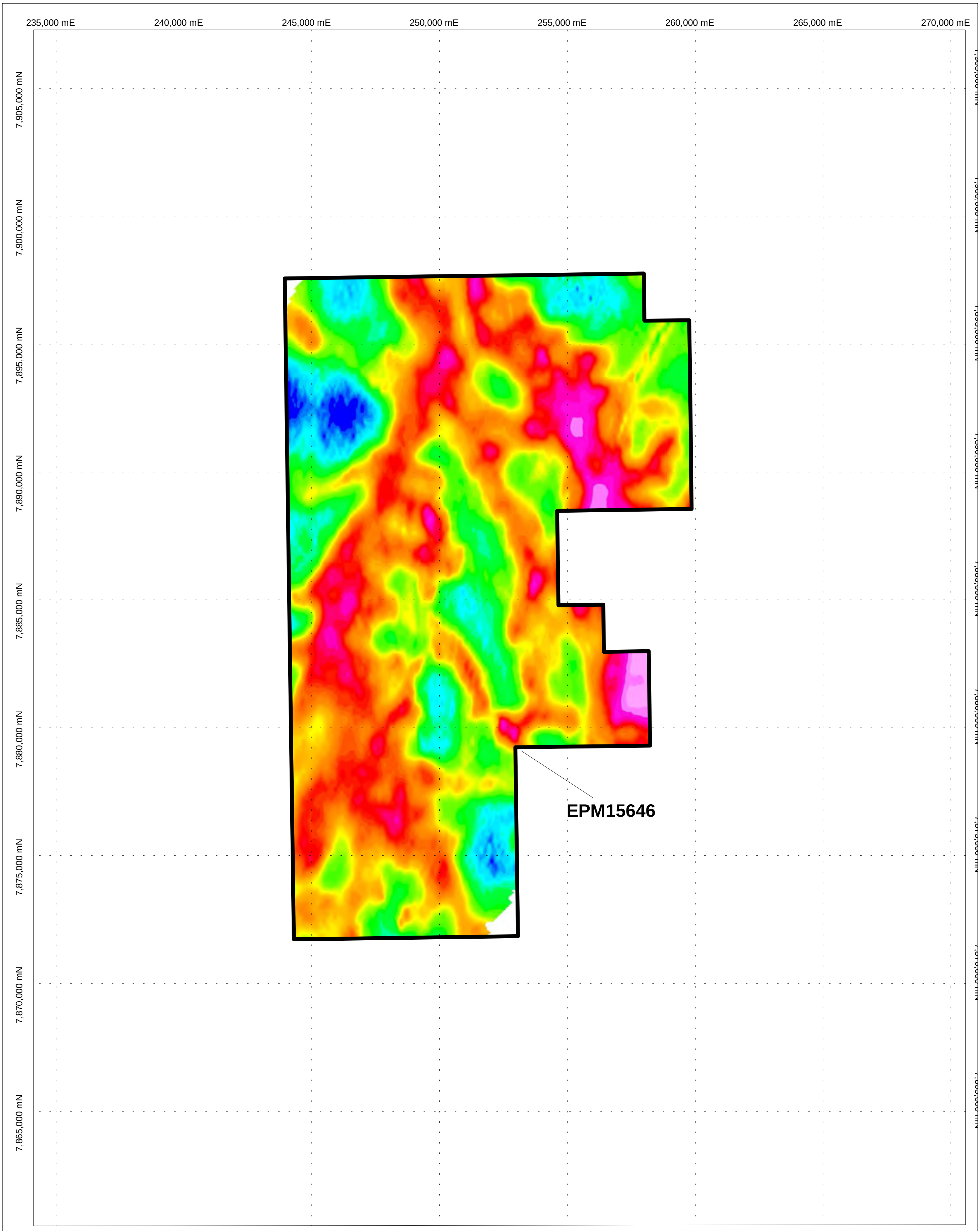
AUTHOR: K Dixon

COMPILED BY: C Lucy

DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

SCALE: 1:200,000



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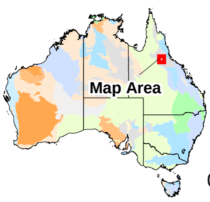

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REGION: GEORGETOWN
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DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY EM Channel 05 - Z

AUTHOR: K Dixon
COMPILED BY: C Lucy
DATE: 02/04/2009
PROJECTION: MGA (Zone 55)
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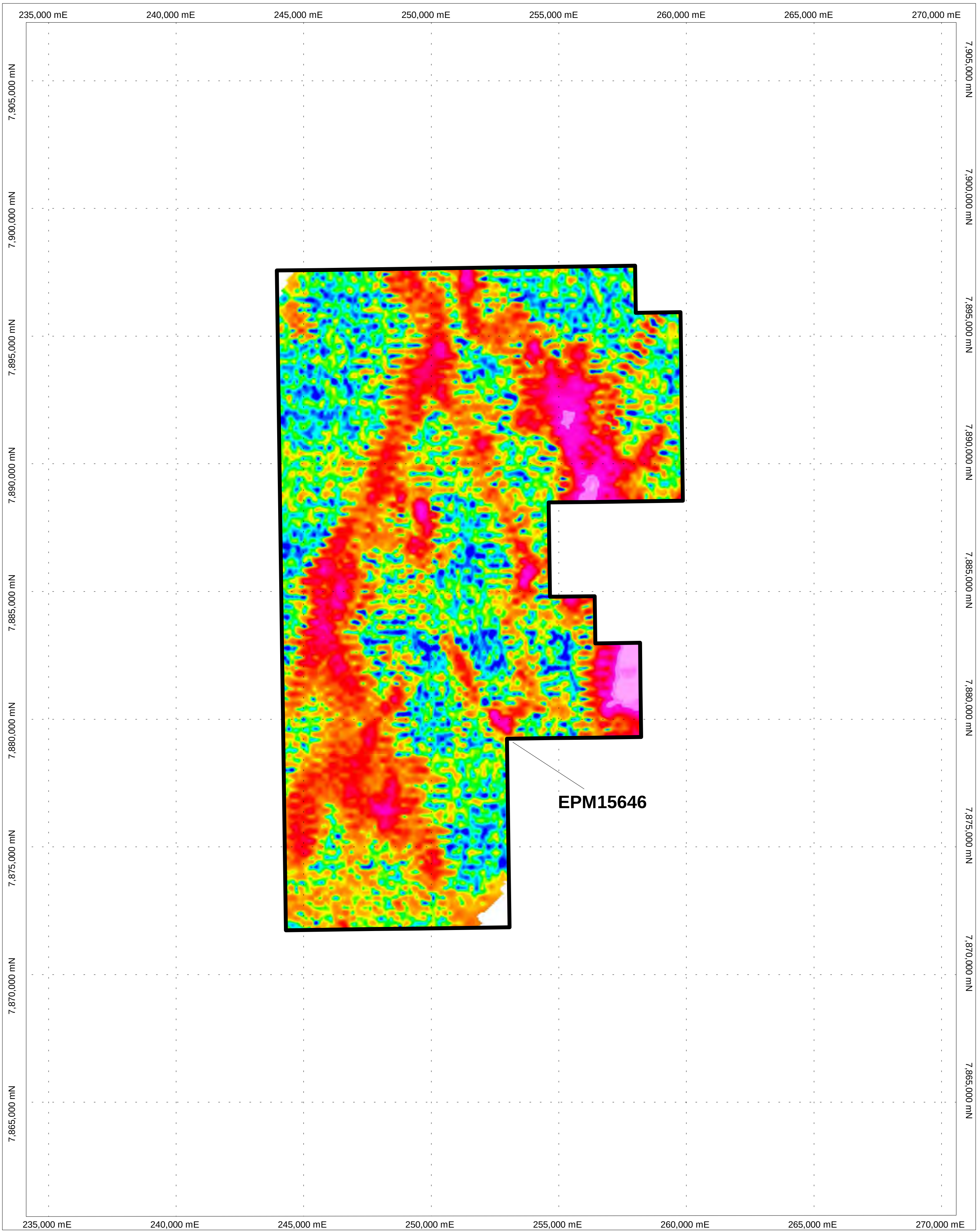

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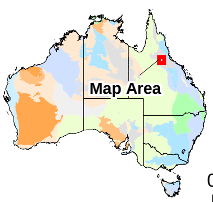

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ANGLO AMERICAN

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LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY EM Channel 06 - X

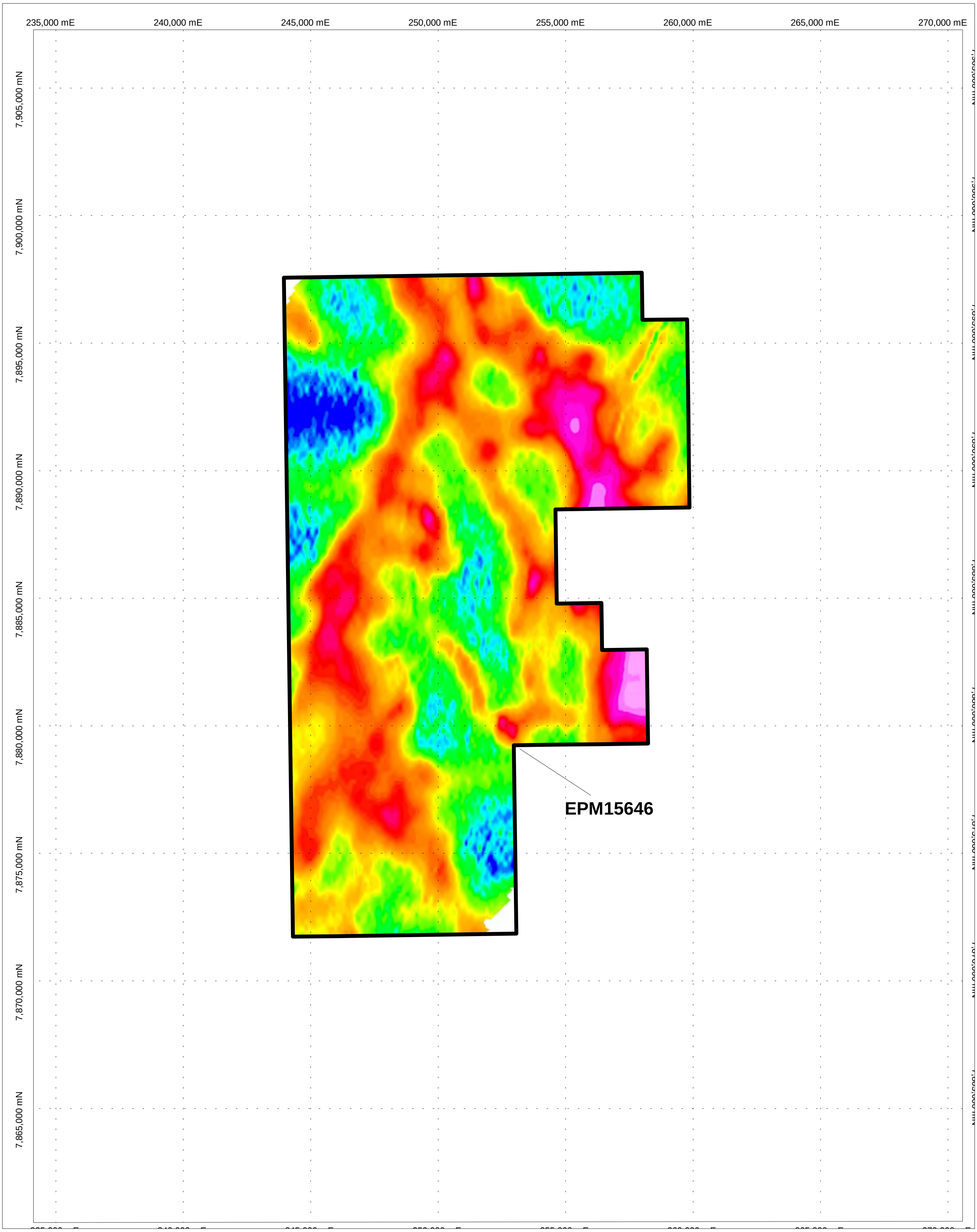
AUTHOR: K Dixon

COMPILED BY: C Lucy

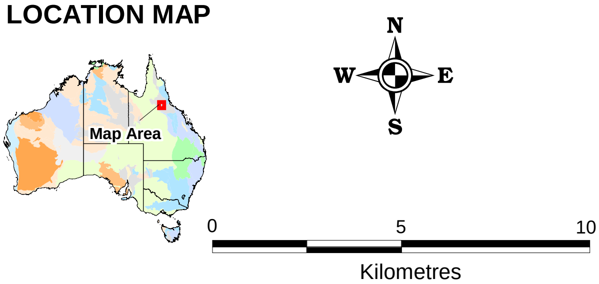
DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

SCALE: 1:200,000



LOCATION MAP



ANGLO AMERICAN

REGION: GEORGETOWN

PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY EM Channel 06 - Z

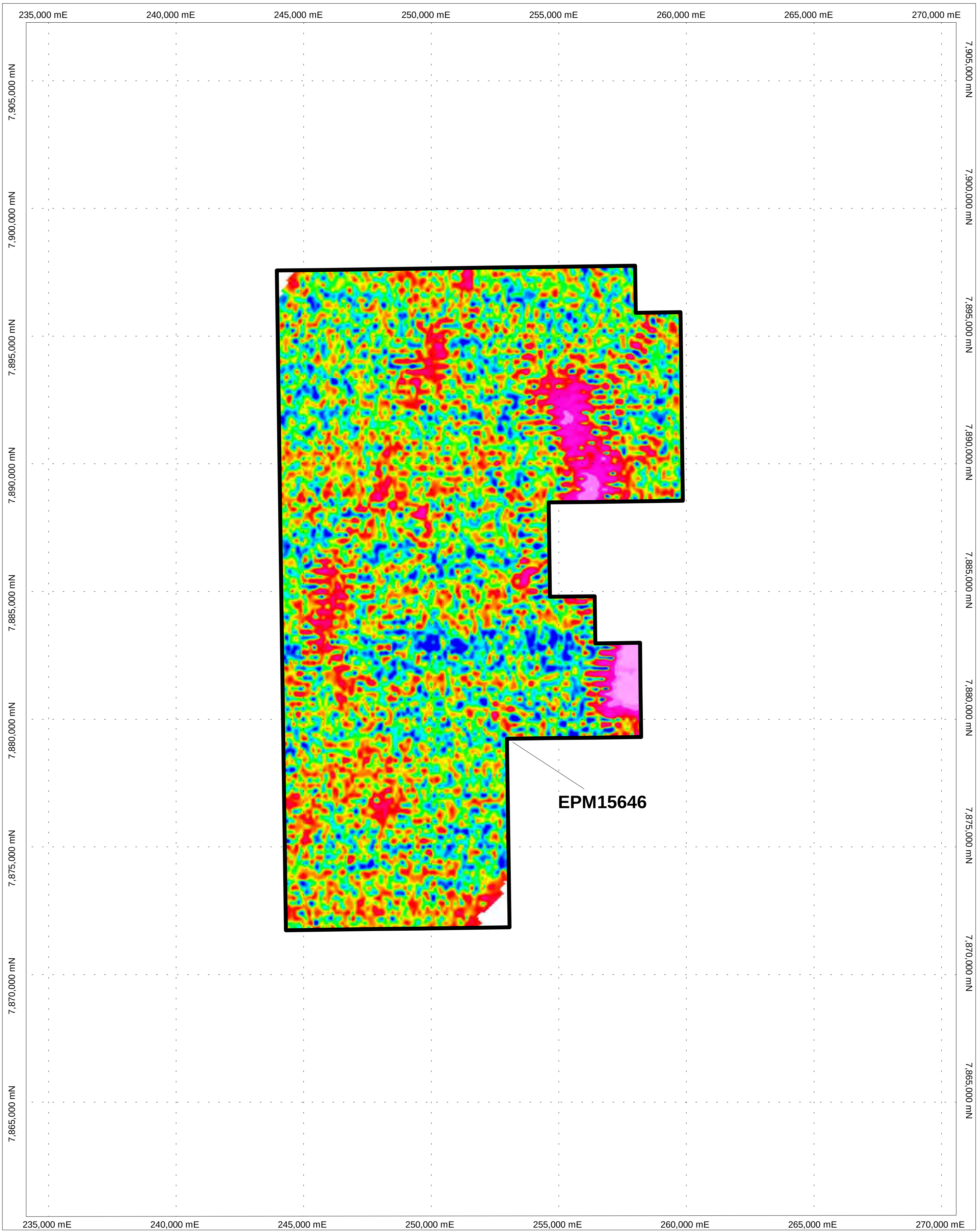
AUTHOR: K Dixon

COMPILED BY: C Lucy

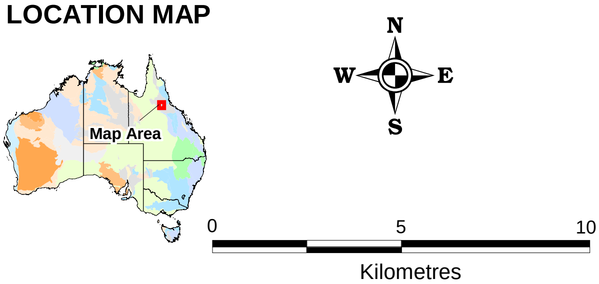
DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

SCALE: 1:200,000



LOCATION MAP



ANGLO AMERICAN

REGION: GEORGETOWN

PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY EM Channel 07 - X

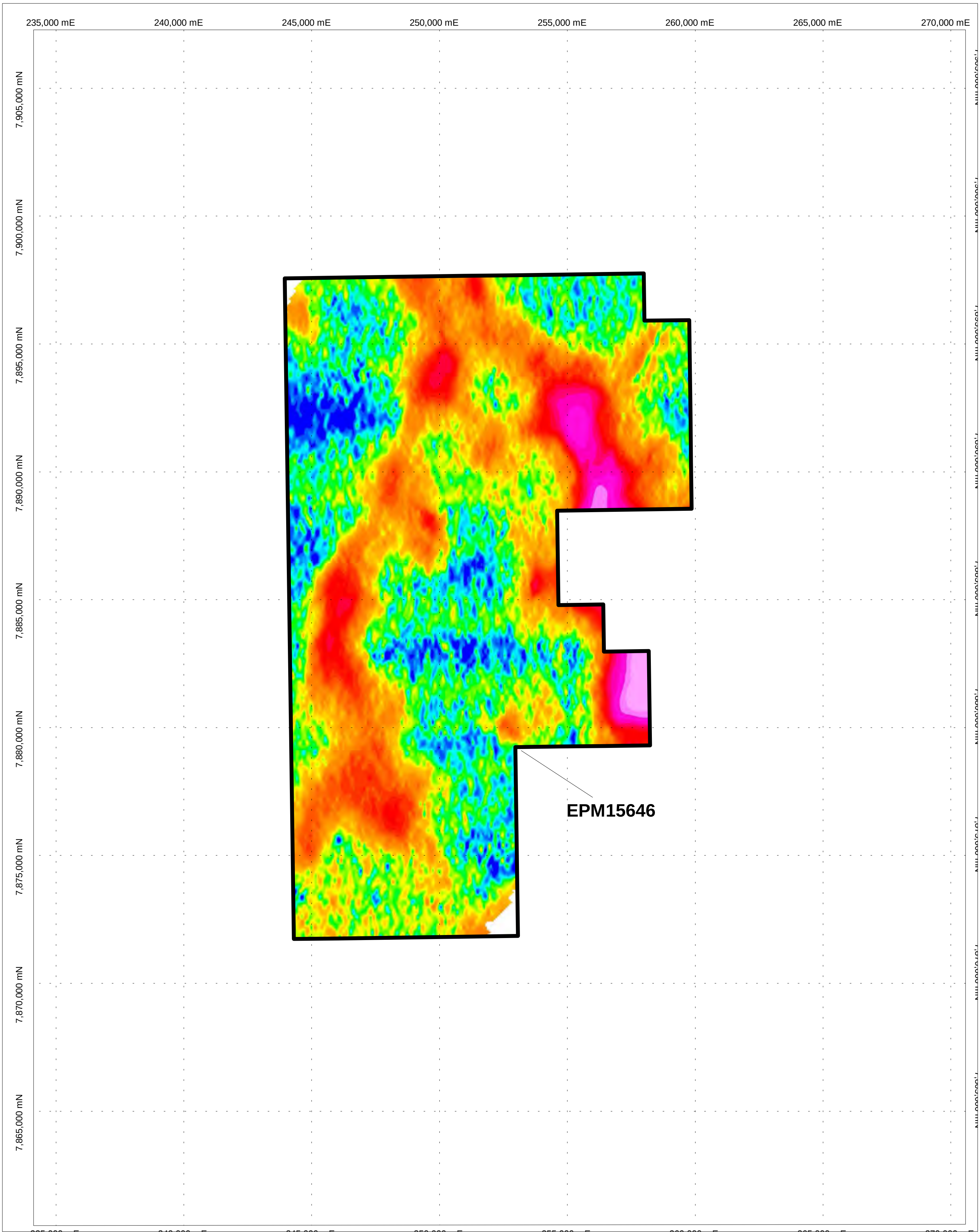
AUTHOR: K Dixon

COMPILED BY: C Lucy

DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

SCALE: 1:200,000



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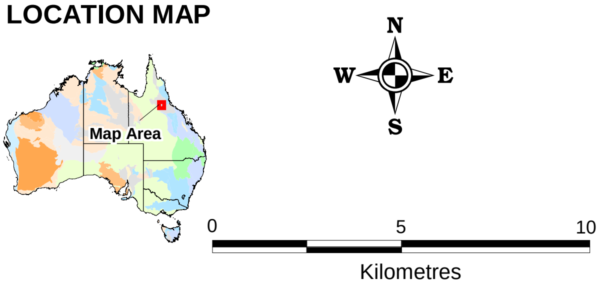


ANGLO AMERICAN

REGION: GEORGETOWN

PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY EM Channel 07 - Z

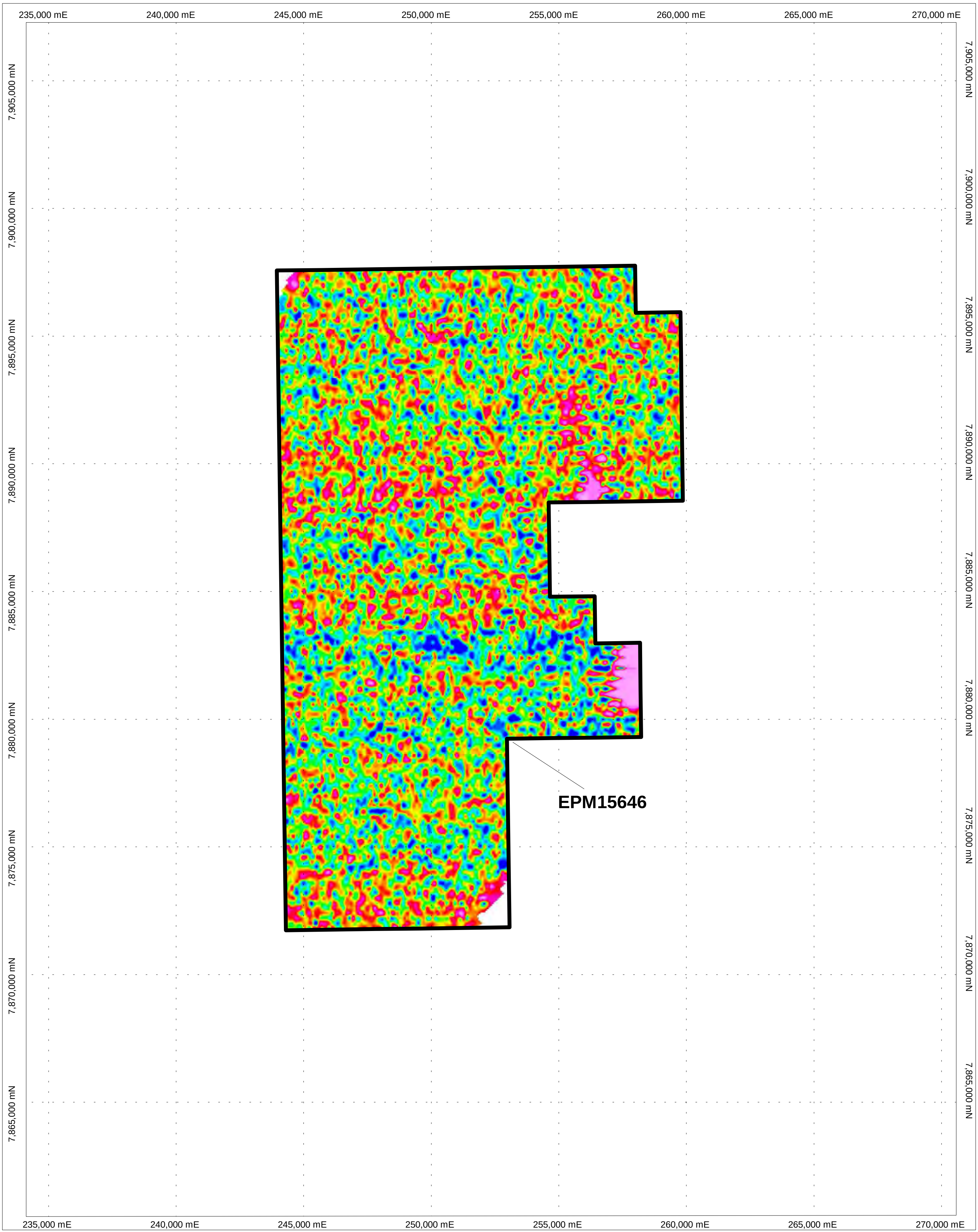
AUTHOR: K Dixon

COMPILED BY: C Lucy

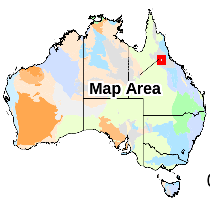
DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

SCALE: 1:200,000



LOCATION MAP



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ANGLO AMERICAN

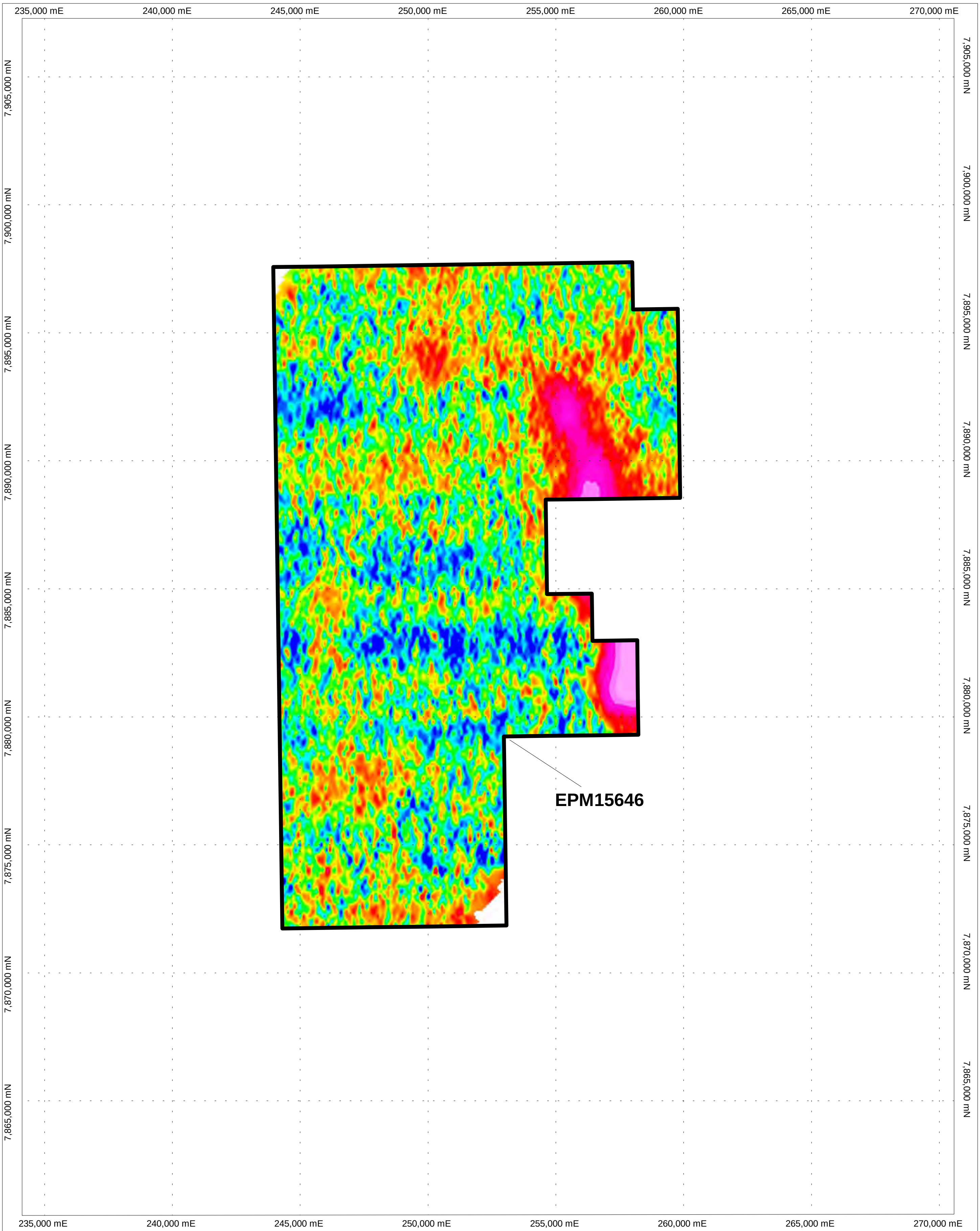
REGION: GEORGETOWN

PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY EM Channel 08 - X

AUTHOR:	K Dixon
COMPILED BY:	C Lucy
DATE:	02/04/2009
PROJECTION:	MGA (Zone 55)
SCALE:	1:200,000



LOCATION MAP

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Kilometres

ANGLO AMERICAN

REGION: GEORGETOWN

PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY EM Channel 08 - Z

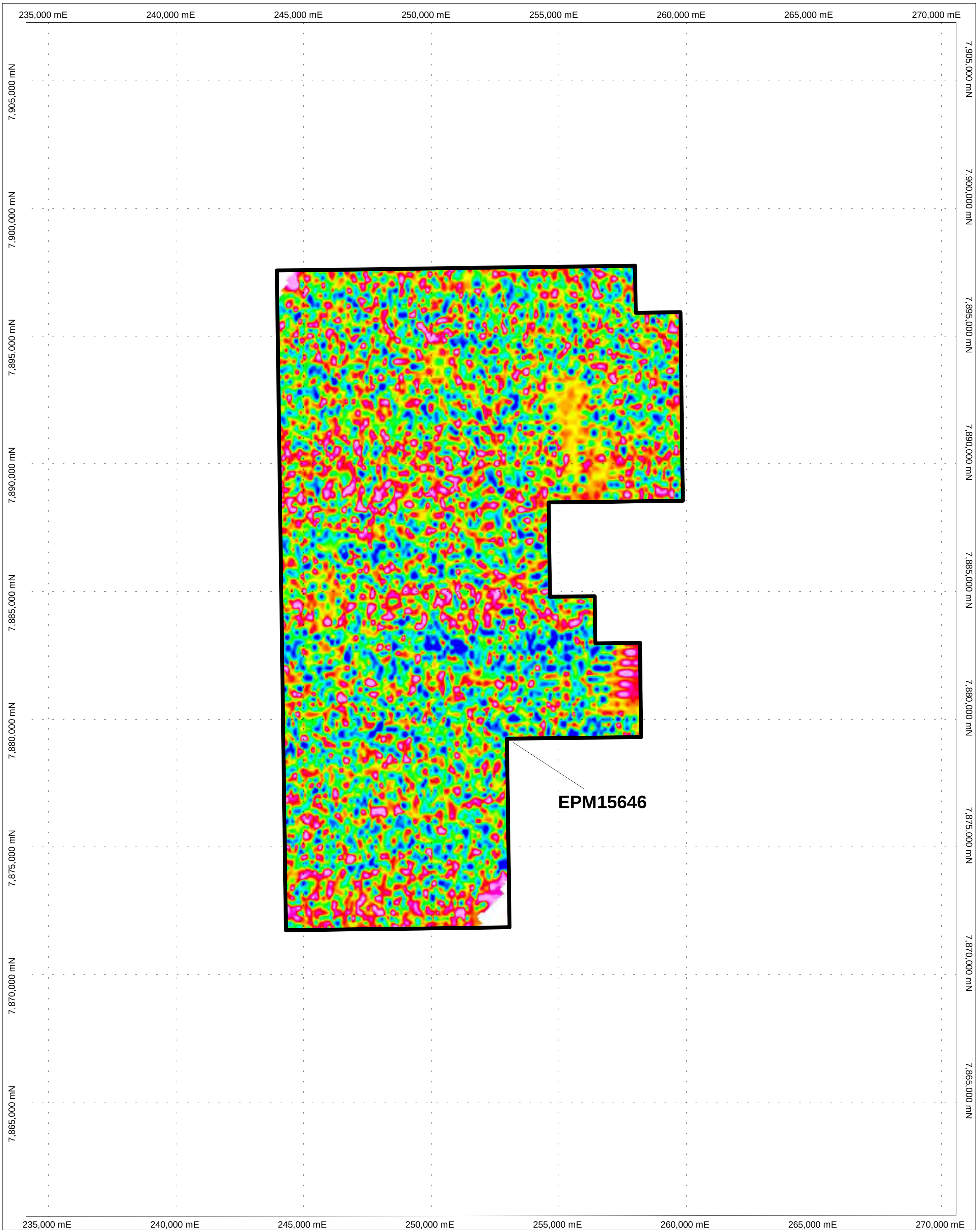
AUTHOR: K Dixon

COMPILED BY: C Lucy

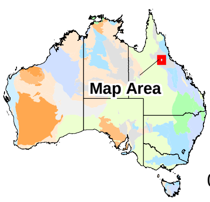
DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

SCALE: 1:200,000



LOCATION MAP



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Kilometres

ANGLO AMERICAN

REGION: GEORGETOWN

PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646
SPECTREM AERIAL
GEOPHYSICS SURVEY
EM Channel 09 - X

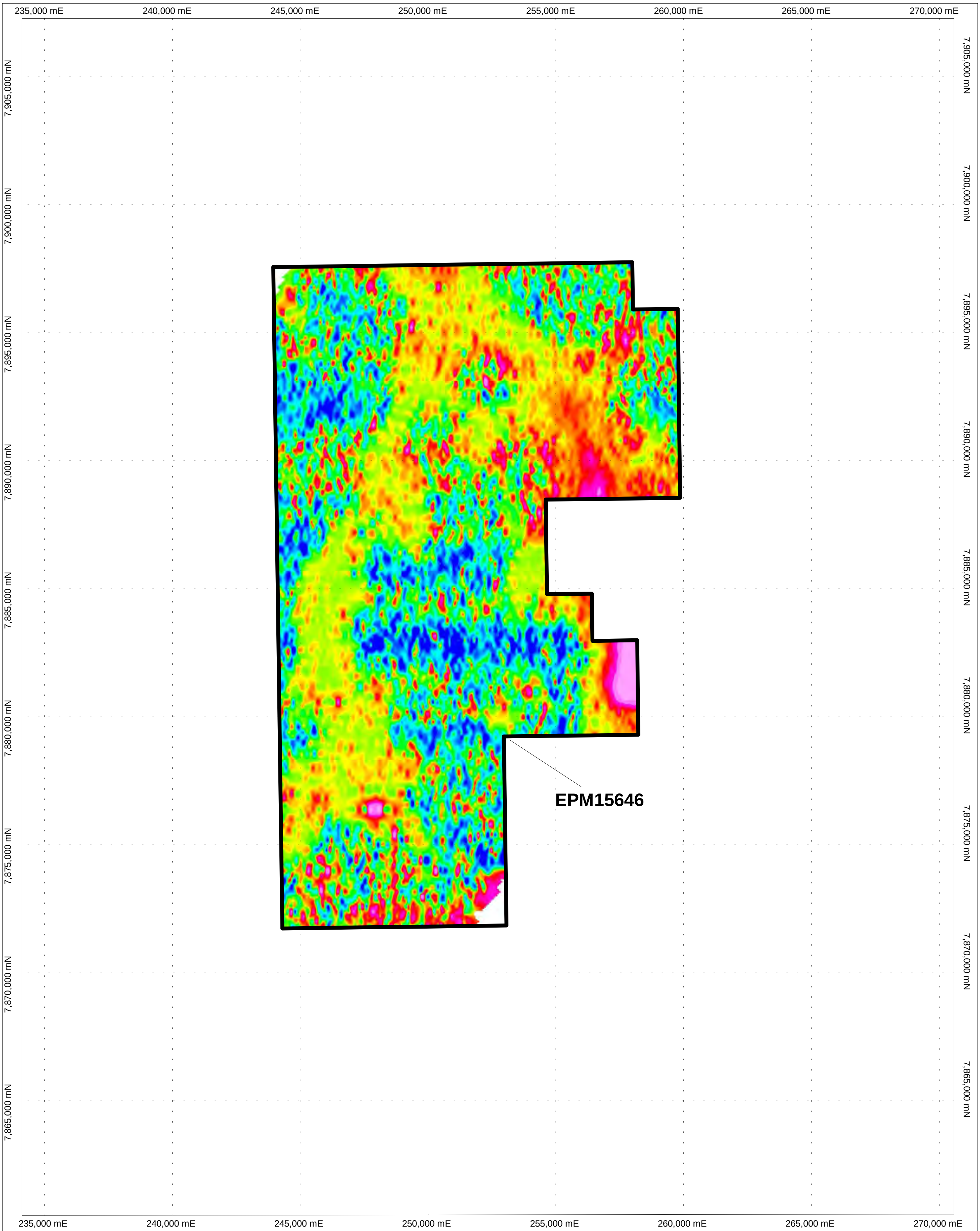
AUTHOR: K Dixon

COMPILED BY: C Lucy

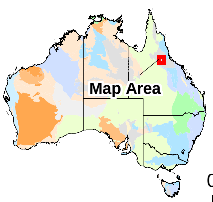
DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

SCALE: 1:200,000



LOCATION MAP



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Kilometres

ANGLO AMERICAN

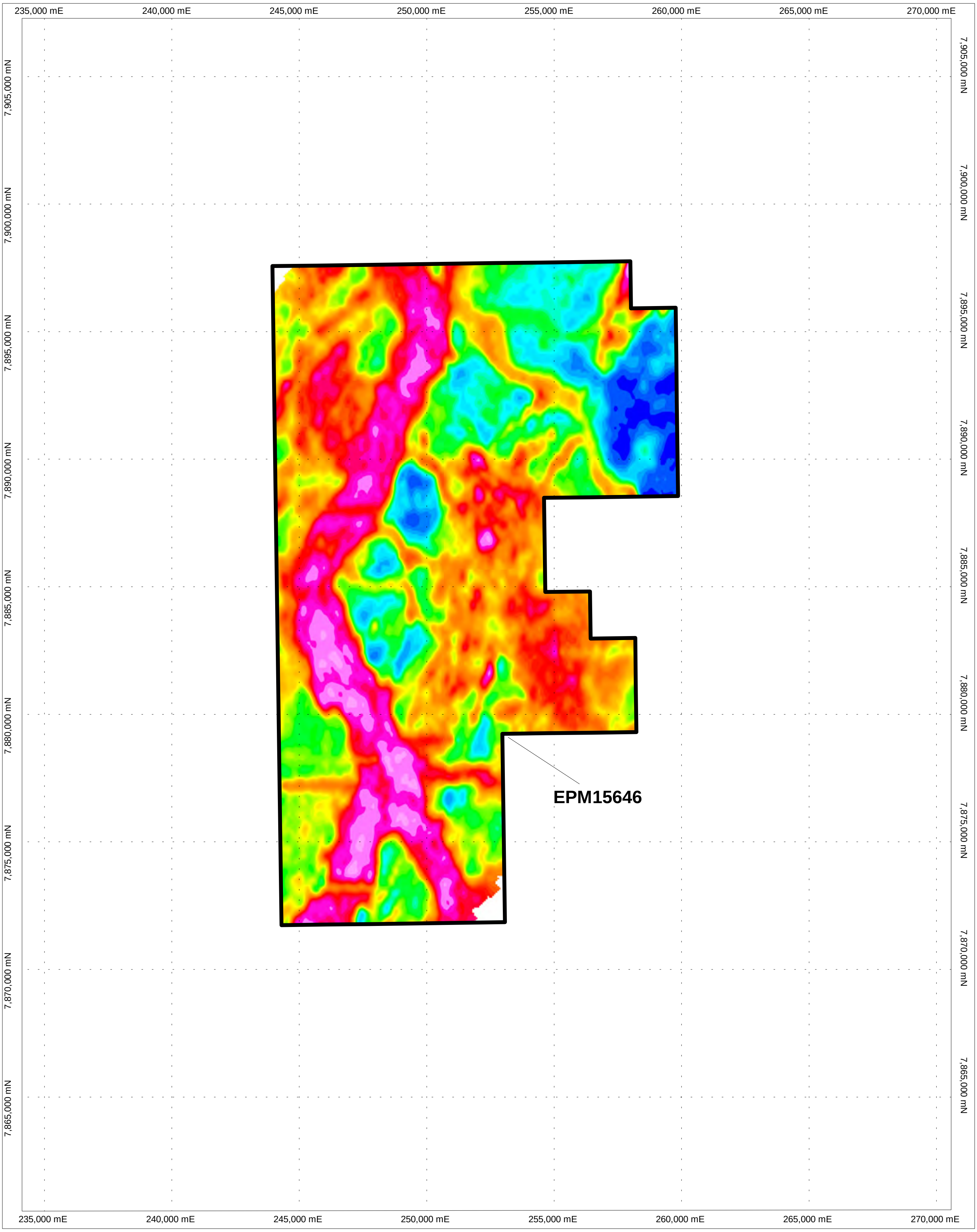
REGION: GEORGETOWN

PROJECT: LYND

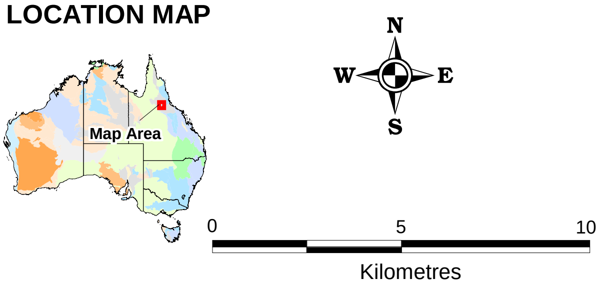
DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY EM Channel 09 - Z

AUTHOR:	K Dixon
COMPILED BY:	C Lucy
DATE:	02/04/2009
PROJECTION:	MGA (Zone 55)
SCALE:	1:200,000



LOCATION MAP



ANGLO AMERICAN

REGION: GEORGETOWN

PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY RAD - Total Count (TC)

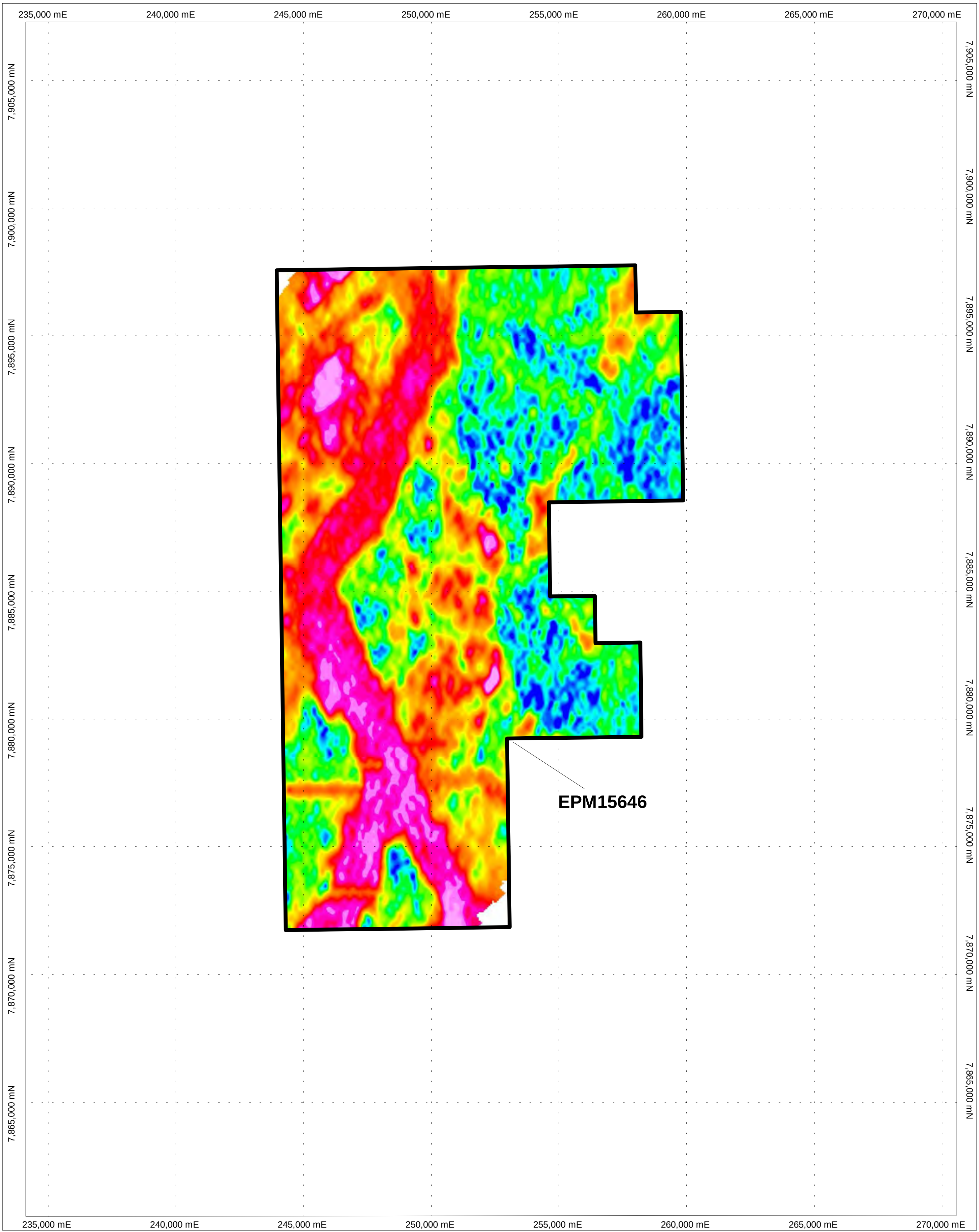
AUTHOR: K Dixon

COMPILED BY: C Lucy

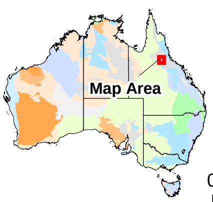
DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

SCALE: 1:200,000



LOCATION MAP



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Kilometres

ANGLO AMERICAN

REGION: GEORGETOWN

PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY RAD - Potassium (K)

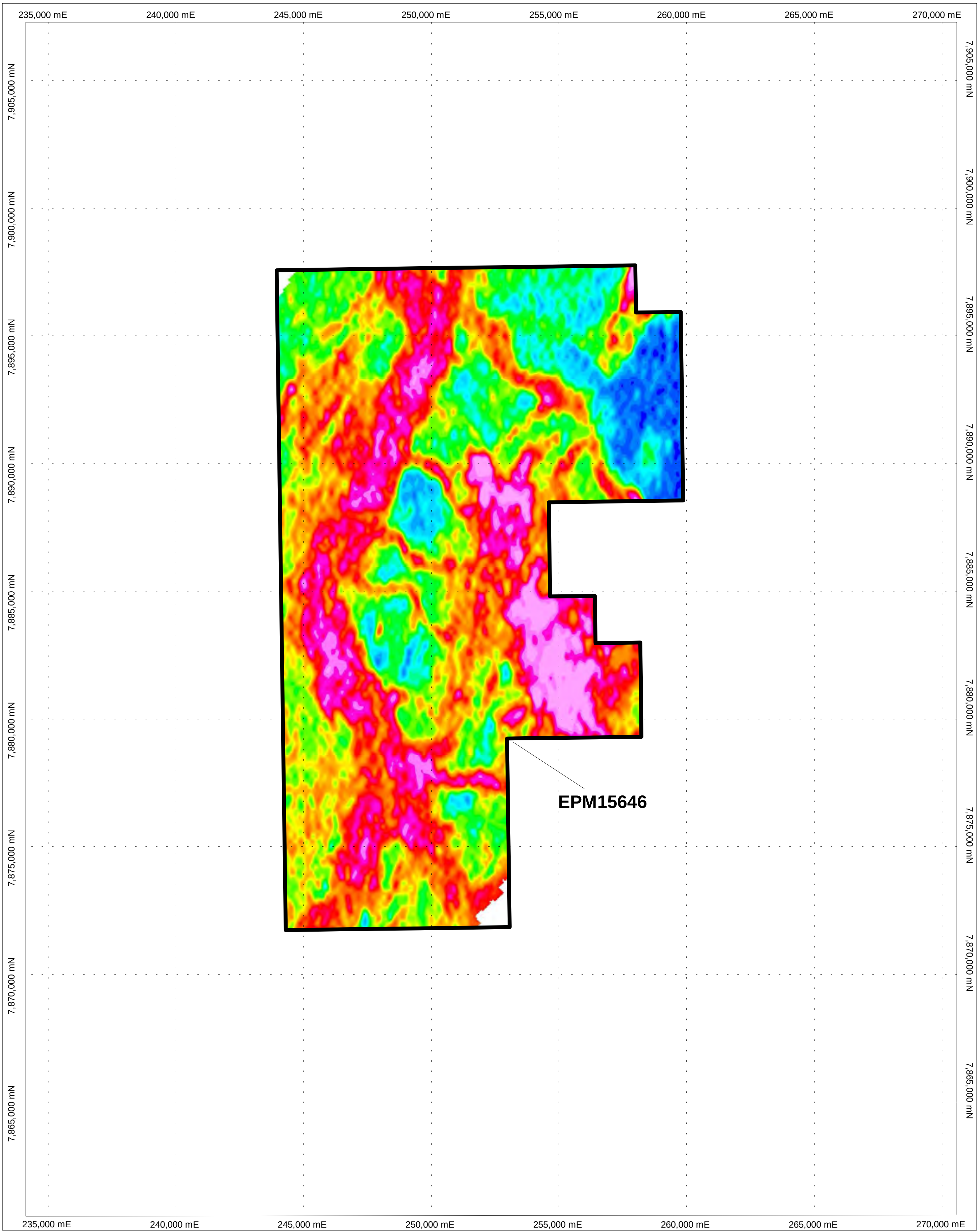
AUTHOR: K Dixon

COMPILED BY: C Lucy

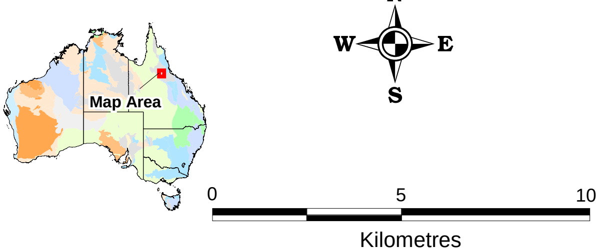
DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

SCALE: 1:200,000



LOCATION MAP



ANGLO AMERICAN

REGION: GEORGETOWN

PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY RAD - Thorium (Th)

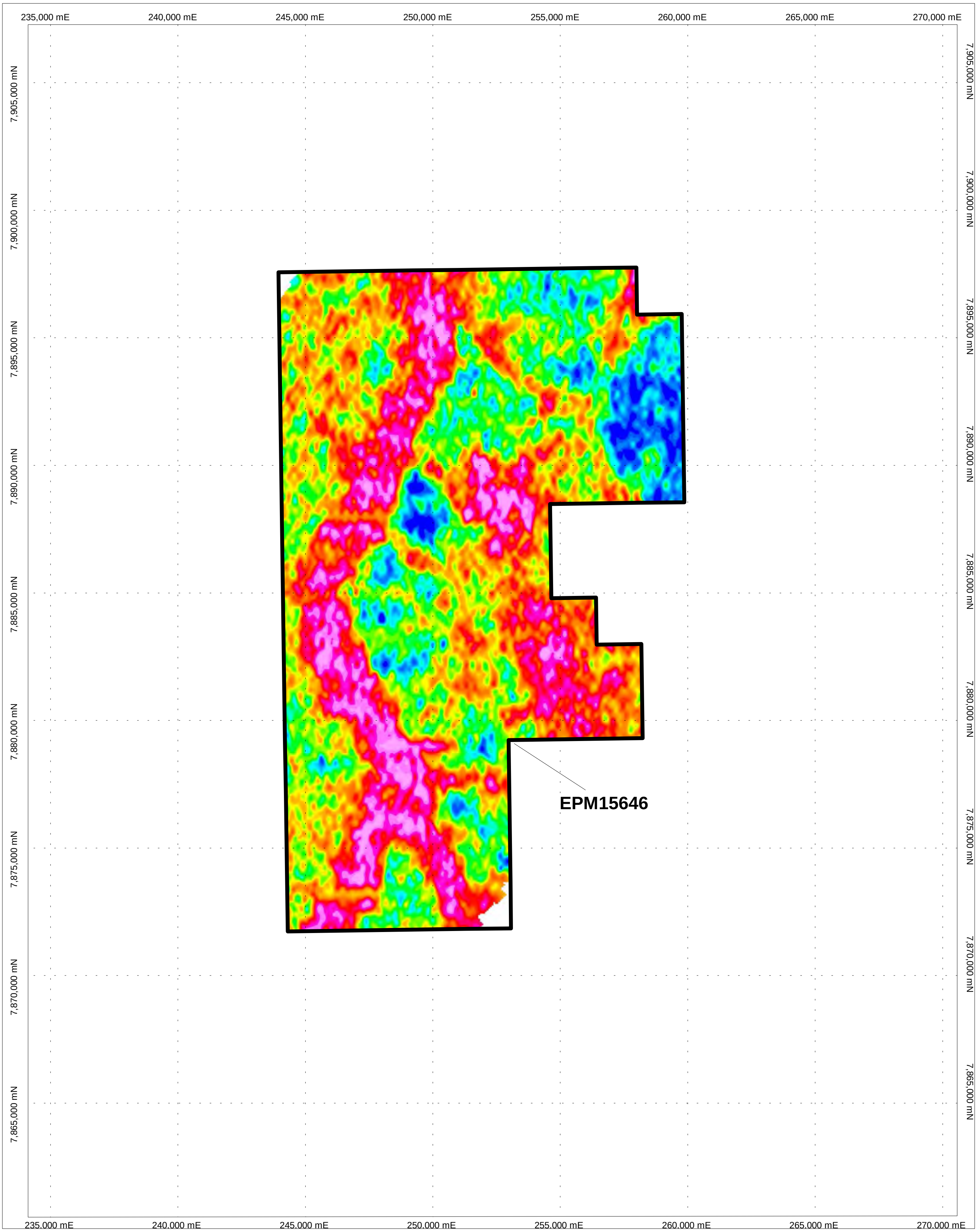
AUTHOR: K Dixon

COMPILED BY: C Lucy

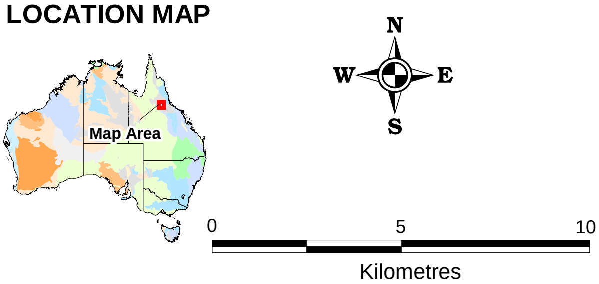
DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

SCALE: 1:200,000



LOCATION MAP



ANGLO AMERICAN

REGION: GEORGETOWN

PROJECT: LYND

DRAWING No: AUS_QLD_LYN_GP_13073a.wor

LYND BLOCK 1 - EPM15646 SPECTREM AERIAL GEOPHYSICS SURVEY RAD - Uranium (U)

AUTHOR: K Dixon

COMPILED BY: C Lucy

DATE: 02/04/2009

PROJECTION: MGA (Zone 55)

SCALE: 1:200,000

APPENDIX II

GROUND MAGNETIC GEOPHYSICAL SURVEY

Digital Data

APPENDIX III

TERMITE SAMPLING GEOCHEMISTRY

Digital Data

APPENDIX IV

DETAILED HEAVY MINERAL ANALYSIS

BULK SAMPLE #09-001-001

Report and
Digital Data

Extended Diamond Report

DIATECH
Ph 61 8 9361 2596
Fx 61 8 9470 1504

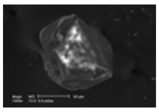
Diamond Detail Report

Our Job No.: 09058

Sample No: **ANGL0 09-001-001**

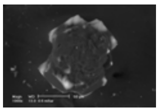
Your Project Code: S20 see PAP

Diamond No	Diamond Mesh Size	Weight (cts)	X (um)	Y (um)	Z (um)	Cleaned
1	-2+0.5		125.00	125.00	125.00	☐



Regularity	Nearly equidimensional
Resorption	Unresorbed to largely unresorbed (Class 5-6)
Morphology	Octahedron
Crystal State	Whole
Colour	Colourless
Transparency	Transparent
Inclusions	Absent
Surface Features	trigon on one surface
Comments	*This diamond was recovered from the +0.5mm conc after fusion

Diamond No	Diamond Mesh Size	Weight (cts)	X (um)	Y (um)	Z (um)	Cleaned
2	-2+0.5		175.00	150.00	125.00	☐



Regularity	Nearly equidimensional
Resorption	Unresorbed to largely unresorbed (Class 5-6)
Morphology	Cubo-octahedron
Crystal State	Whole
Colour	Light grey
Transparency	Translucent
Inclusions	Minor (-1%)
Surface Features	
Comments	*This diamond was recovered from the +0.5mm conc after fusion

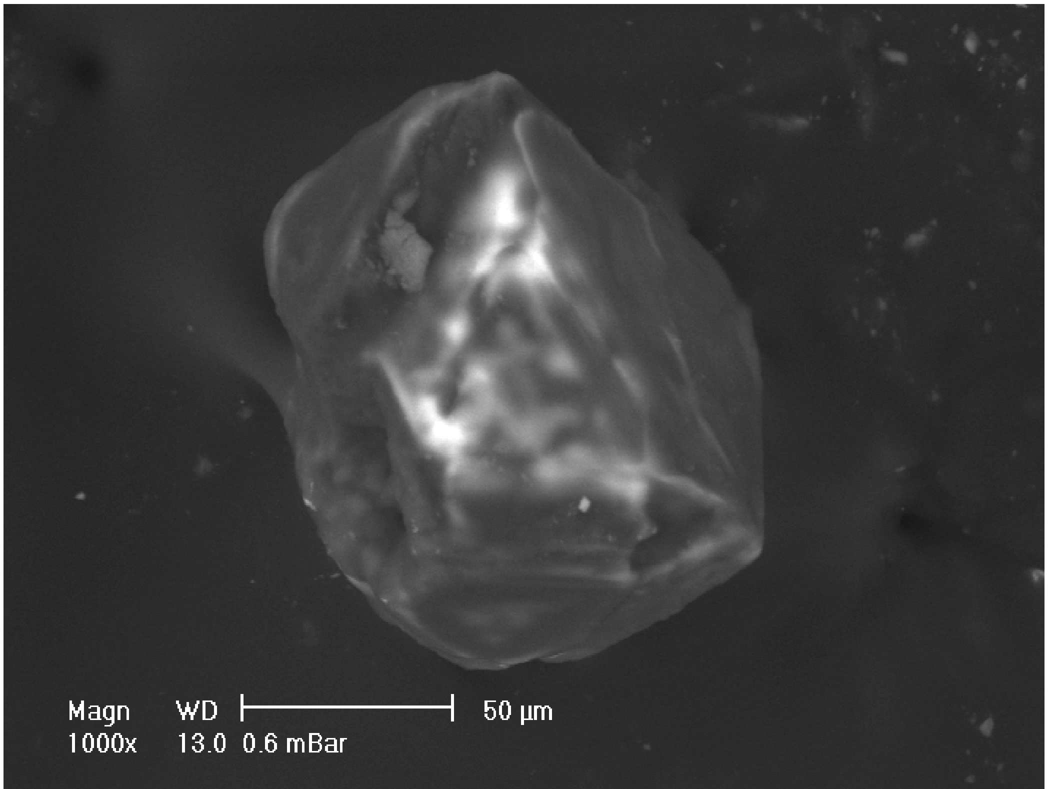


Figure 1: Sample_ID: ANGL0 09-001-001 Photo of Diamond 1 with SEM

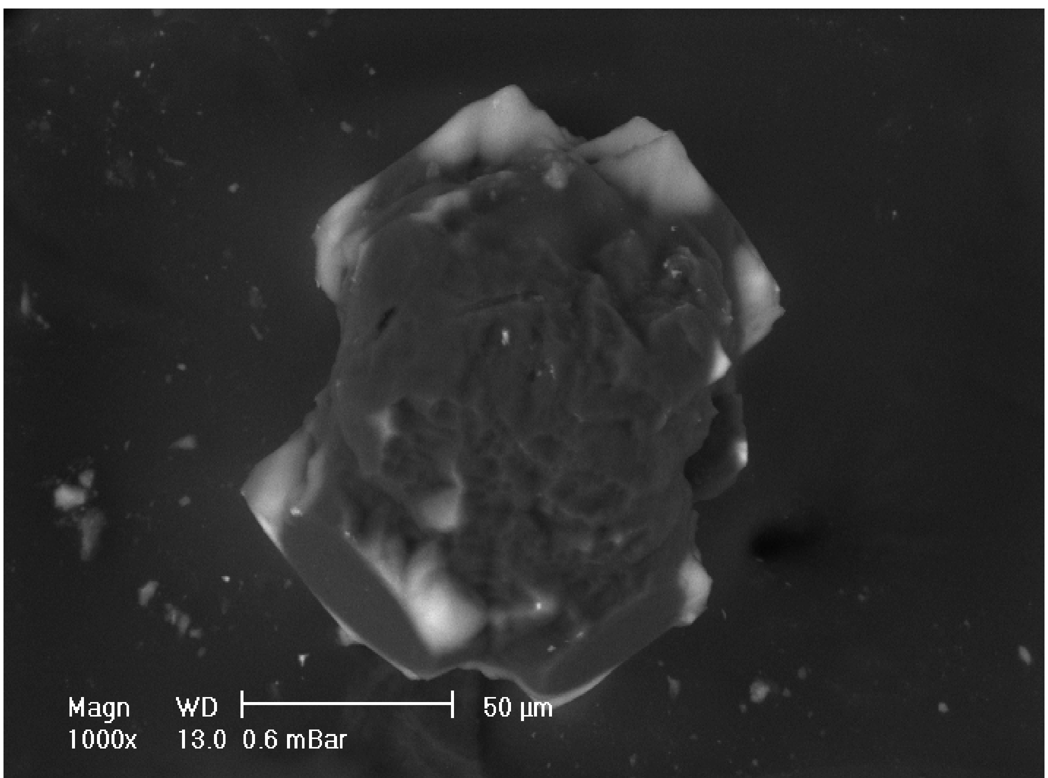


Figure 2: Sample_ID: ANGL0 09-001-001 Photo of Diamond 2 with SEM

Detailed Heavy Mineral Analysis Report

DIATECH
HEAVY MINERAL SERVICES
Ph 61 8 9361 2596
Fx 61 8 9470 1504

Detailed Heavy Mineral Analysis

Our Job No.: 09058
Disc No.: -

Sample No:	ANGL0 09-001-001
Overall Sample Assessment	Positive
Your Project Code:	S20 see PAP

Sample Type (as collected):	Loam	Head Weight	0.015	kg
Sample Type (as received):	MI Concentrate	Wet Weight		kg
Observed Sample Type:	MI Concentrate			

Diamond

Number of particles in each size fraction

Diamond (mm)	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Total particles	Description of these particles
Diamond								2	2	see attached descriptions

Key Minerals

Number of particles in each size fraction

Key Minerals (mm)	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Overall Morph. Group	Total particles	No of particles probed	PRIORITY based on Morphology only)	PRIORITY based on morphology and Probe)
Chromite/Cr-Spinel							1		UNK	B1	1		B	B
	black, dull, near spherical, highly granular and weathered													
Chromite/Cr-Spinel					1				UNK	B1	1		B	A
	black, dull, subrounded, granular and weathered.													

Other Minerals

% Percentage of particles in each size fraction

Other Minerals (mm)	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Colour	Angularity	Lustre	Transparency	Form/Shape
Amphibole					Tr		Tr		W	forest green		glassy	translucent	lath-like
Anatase							Tr		W	pale grey-blue, rare		greasy	transparent	pyramidal
Epidote			30	45	45		50	Tr	W	yellow-green, creamy green	subrounded	glassy to dull	translucent to opaque	irregular
Fe Oxide/Hydroxide			70	40	30		20		W	red-black, orange-black	rounded	dull	opaque	pisolitic
Ilmenite			Tr	Tr	10		15		W	silvery-black	subangular to rounded	metallic	opaque	irregular
Malachite					Tr		Tr		WW	malachite green		dull	opaque	irregular/granular
Rutile					Tr		Tr		WW	reddish-brown, red	rounded	submetallic	opaque	near spherical
Spessartine			Tr	15	15		15		MW	orange, rarely orange-pink		glassy	translucent	crystalline
Sphene			Tr	Tr	Tr		Tr		MW	cream, creamy-beige		dull	opaque	wedge-shaped, irregular
Tourmaline				Tr	Tr		Tr	Tr	WW	black	rounded	dull	translucent to opaque	irregular
Zircon				Tr	Tr		Tr	Tr	MW	colourless, orange		glassy	transparent	ovate crystals
TOTAL	%	%	100%	100%	100%	%	100%	0%						

What Has Been Observed?

Final Conc Weight	12.491000 g	Size Range	-2+0.1	mm
Weight Observed	12.491000 g			

Magnetic Fractions vs Size Fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10
NM			All	All	All		All	Resid
M6/7			All	All	All		All	
M4/5			All	All	All		All	

Technician: BJG
Date Observed: 17-Jul-09
Report Printed: 21/08/2009 4:27:24 PM

Comment about this sample:

2 microdiamonds were in the NADL processed '+0.5mm' fraction, 0 microdiamonds were in the NADL processed '-0.5mm' fraction

Diamond Analysis Report

Job Details

Client Name	Job Number	Technician	Order Number	Project Name	Project Code	State or Country	Date Received	Job Description
ANGLOAM	09058	Diatech	6397 Paul Polito	Australia	S20 see PAP	AUST	14/07/2009	1. Magnetically separte the concentrate as received from NADL. 2. Rotomag the -1.0+0.2mm M4/5 fraction. 3. Observe for diamonds and key minerals. Photogrpah and microprobe key minerals recovered. 4. Return conc to NADL for peroxide fusion. 5. Observe fused residue for microdiamonds. 6. Send microdiamonds to CSIRO for SEM photography. 7. Measure and describe microdiamonds.

Process Data

Client Name	Job Number	Sample Number	Technician	Sample Type	Sample Type Received	Observed Sample Type	Lab Assessment	Head Weight kg	Wet Weight kg	Oversize Weight kg	Oversize Grainsize mm
ANGLOAM	09058	ANGL0 09-001-001	Diatech	Loam	MI Concentrate	MI Concentrate	Positive	0.015		0	0

Process Data

Client Name	Job Number	Sample Number	Final Conc Grainsize mm	Non-mag Weight g	Mag Weight g	Final Conc Weight Total g	Final Conc Weight Observed g	% of Final Conc Weight Observed	Comment
ANGLOAM	09058	ANGL0 09-001-001	-2+0.1	2.700999975	9.789999962	12.49100018	12.49100018	100	

Key Mineral Summary

Client Name	Job Number	Sample Number	Technician	Lab Assessment	Overall Size Fraction	DIA A Morph	CHR A Morph	CHR B Morph	CHR C Morph	CHR A MorphProbe	CHR B MorphProbe	CHR C MorphProbe	CRD A Morph	CRD B Morph	CRD C Morph	CRD A MorphProbe	CRD B MorphProbe	CRD C MorphProbe	OTHER A Morph
ANGLOAM	09058	ANGL0 09-001-001	Diatech	Positive	-2+0.1	2	0	2	0	1	1	0	0	0	0	0	0	0	0

Key Mineral Summary																				
Client Name	**Job Number**	**Sample Number**	**OTHER B Morph**	**OTHER C Morph**	**OTHER A MorphProbe**	**OTHER B MorphProbe**	**OTHER C MorphProbe**	**PHL A Morph**	**PHL B Morph**	**PHL C Morph**	**PHL A MorphProbe**	**PHL B MorphProbe**	**PHL C MorphProbe**	**PIC A Morph**	**PIC B Morph**	**PIC C Morph**	**PIC A MorphProbe**	**PIC B MorphProbe**	**PIC C MorphProbe**	**PYR A Morph**
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Key Mineral Summary															
Client Name	Job Number	Sample Number	PYR B Morph	PYR C Morph	PYR A MorphProbe	PYR B MorphProbe	PYR C MorphProbe	EGAR A Morph	EGAR B Morph	EGAR C Morph	EGAR A MorphProbe	EGAR B MorphProbe	EGAR C MorphProbe	SYNDIA C Morph	CommentResult
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	2 microdiamonds were in the NADL processed '+0.5mm' fraction, 0 microdiamonds were in the NADL processed '-0.5mm' fraction

Key Mineral Details

Client Name	Job Number	Sample Number	Technician	Individual Size Fraction	DIA A Morph	CHR A Morph	CHR B Morph	CHR C Morph	CHR A MorphProbe	CHR B MorphProbe	CHR C MorphProbe	CRD A Morph	CRD B Morph	CRD C Morph	CRD A MorphProbe	CRD B MorphProbe	CRD C MorphProbe	OTHER A Morph
ANGLOAM	09058	ANGL0 09-001-001	DIATECH	-0.2+0.1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	DIATECH	-0.3+0.2	0	0	1	0	0	1	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	DIATECH	-0.4+0.3	0	0	1	0	1	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	DIATECH	-0.8+0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	DIATECH	-2+0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Key Mineral Details

Client Name	Job Number	Sample Number	OTHER B Morph	OTHER C Morph	OTHER A MorphProbe	OTHER B MorphProbe	OTHER C MorphProbe	PHL A Morph	PHL B Morph	PHL C Morph	PHL A MorphProbe	PHL B MorphProbe	PHL C MorphProbe	PIC A Morph	PIC B Morph	PIC C Morph	PIC A MorphProbe	PIC B MorphProbe
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Key Mineral Details

Client Name	Job Number	Sample Number	PIC C MorphProbe	PYR A Morph	PYR B Morph	PYR C Morph	PYR A MorphProbe	PYR B MorphProbe	PYR C MorphProbe	EGAR A Morph	EGAR B Morph	EGAR C Morph	EGAR A MorphProbe	EGAR B MorphProbe	EGAR C MorphProbe	SYNDIA C Morph
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Diamond Details													
Client Name	**Job Number**	**Sample Number**	**DiamondNo**	**DiamondMeshSize**	**Weight**	**Cleaned**	**X**	**Y**	**Z**	**Regularity**	**Resorption**	**Morphology**	**CrystalState**
ANGLOAM	09058	ANGL0 09-001-	2	-2+0.5		FALSE	175	150	125	Nearly	Unresorbed to	Cubo-octahedron	Whole
ANGLOAM	09058	ANGL0 09-001-	1	-2+0.5		FALSE	125	125	125	Nearly	Unresorbed to	Octahedron	Whole

Diamond Details							
Client Name	**Job Number**	**Sample Number**	**Colour**	**Transparency**	**Inclusions**	**SurfaceFeatures**	**DiamondComment**
ANGLOAM	09058	ANGL0 09-001-	Light grey	Translucent	Minor (-1%)		*This diamond
ANGLOAM	09058	ANGL0 09-001-	Colourless	Transparent	Absent	trigon on one	*This diamond

Other Minerals

Client Name	Job Number	Sample Number	Technician	Individual Size Fraction Observed mm	Almandine	Al-Silicates	Al-Spinel	Amphibole	Anatase	Andalusite	Andradite	Apatite	Axinite	Barite	Biotite	Bronzite	Calcite	Carbonate
ANGLOAM	09058	ANGL0 09-001-001	DIATECH	-0.2+0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	DIATECH	-0.3+0.2	0	0	0	Tr	Tr	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	DIATECH	-0.4+0.3	0	0	0	Tr	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	DIATECH	-0.8+0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	DIATECH	-2+0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Other Minerals

Client Name	Job Number	Sample Number	Cassiterite	Chalcopyrite	Chlorite	Chrysoberyl	Cinnabar	Clinopyroxene	Columbite	Copper Minerals	Cordierite	Corundum	Crocoite	Cr-Spinel	Demantoid	Diaspore
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Other Minerals

Client Name	Job Number	Sample Number	Diopside	Enstatite	Epidote	Fe Oxide/Hydroxide	Fergusonite	Florencite	Fluorite	Gahnite	Galena	Garnet	Glauconite	Gold	Gorceixite	Goyazite	Grossular	Gypsum
ANGLOAM	09058	ANGL0 09-001-001	0	0	Tr	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	50	20	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	45	30	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	45	40	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	30	70	0	0	0	0	0	0	0	0	0	0	0	0

Other Minerals

Client Name	Job Number	Sample Number	Haematite	Hercynite	Hornblende	Ilmenite	K-Richterite	Kyanite	Leucoxene	Limonite	Magnesite	Magnetite	Magnophorite	Malachite	Marcasite	Martite	Mica
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	15	0	0	0	0	0	0	0	Tr	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	10	0	0	0	0	0	0	0	Tr	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	Tr	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	Tr	0	0	0	0	0	0	0	0	0	0	0

Other Minerals

Client Name	Job Number	Sample Number	Micrometeorites	Mn Oxide	Moissanite	Molybdenite	Monazite	Muscovite	Nb-Rutile	Olivine	Orthopyroxene	Other Mineral	Pb Glass	Perovskite	Phlogopite	Phosphate
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Other Minerals

Client Name	Job Number	Sample Number	Piedmontite	Platinum	Prehnite	Priderite	Psilomelane	Pyrite	Pyroclore	Pyroxene	Rock Fragments	Rutile	Quartz	Scheelite	Sericite	Siderite	Sillimanite	Spessartine
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	Tr	0	0	0	0	0	15
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	Tr	0	0	0	0	0	15
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Tr

Other Minerals

Client Name	Job Number	Sample Number	Sphene	Spinel	Staurolite	Sulphides	Tantalite	Thorite	Topaz	Tourmaline	Unknown Mineral 1	Unknown Mineral 2	Unknown Mineral 3	Unknown Mineral 4
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	Tr	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	Tr	0	0	0	0	0	0	Tr	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	Tr	0	0	0	0	0	0	Tr	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	Tr	0	0	0	0	0	0	Tr	0	0	0	0
ANGLOAM	09058	ANGL0 09-001-001	Tr	0	0	0	0	0	0	0	0	0	0	0

Other Minerals

Client Name	Job Number	Sample Number	Unknown Mineral 5	Unknown Mineral 6	Uvarovite	Vermiculite	Wolframite	Xenotime	Zircon	Zoisite
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	Tr	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	Tr	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	Tr	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	Tr	0
ANGLOAM	09058	ANGL0 09-001-001	0	0	0	0	0	0	0	0

APPENDIX V

DETAILED HEAVY MINERAL ANALYSIS

BULK SAMPLES

#AUA054802 and AUA054901

Report & Digital Data

DIATECH
HEAVY MINERAL SERVICES
Ph 61 8 9361 2596
Fx 61 8 9470 1504

Detailed Heavy Mineral Analysis

Our Job No.: 09087
Disc No.: -

Sample No: AUA054802

Overall Sample Assessment: **Positive**

Your Project Code:

Sample Type (as collected):	Anthill	Head Weight	308.04	kg
Sample Type (as received):	Anthill	Wet Weight		kg
Observed Sample Type:	DMS Concentrate			

Diamond

Number of particles in each size fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Total particles	Description of these particles
Diamond								1	**1**	multi-twinned with cavities (see photograph). From the fused residue

Key Minerals

Number of particles in each size fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Overall Morph. Group	Total particles	No of particles probed	PRIORITY based on Morphology only)	PRIORITY based on morphology and Probe)
Chromite/Cr-Spinel							1		UNK	B1	1		B	C
	black-brown, dull, well rounded anhedra, bright to granular interior.													
Chromite/Cr-Spinel					1		1		UNK	B1	2		B	B
	black-brown, dull, well rounded anhedra, bright to granular interiors.													
Chromite/Cr-Spinel			1						MF	C1	1		C	C
	brown, dull, finely frosted, vitreous interior, hercynite. Many similar in the background.													

Other Minerals

% Percentage of particles in each size fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Colour	Angularity	Lustre	Transparency	Form/Shape
Almandine		Tr		Tr	Tr		Tr		MW	pink	subrounded	glassy	transparent	irregular
Amphibole		Tr							MW	blackish-green	subrounded	dull	opaque	fibrous, blocky
Epidote		60	65	50	10		25	Tr	MW	yellow-green, creamy green	subrounded	dull	translucent to opaque	blocky
Fe Oxide/Hydroxide		40	35	40	10		Tr		W	red-brown, brown	rounded	dull	opaque	irregular to near spherical
Gahnite					Tr		Tr		MW	deep sea green	rounded	glassy	translucent	irregular
Ilmenite		Tr		Tr	30		25		MW	silvery-black	rounded	metallic	opaque	irregular
Marcasite					Tr		Tr		MW	brassy yellow	rounded	metallic	opaque	granular
Rutile				Tr	Tr		Tr		MW	red, black	rounded	submetallic	opaque	irregular to near spherical
Spessartine		Tr	Tr	10	50		45	Tr	MW	orange, orange-pink		glassy	transparent	euhedral
Sphene		Tr	Tr	Tr	Tr		Tr		MW	beige, honey-brown		polished	opaque	wedged
Spinel			Tr	Tr	Tr		Tr	Tr	MF	black-brown	subrounded	frosted to glassy	translucent	hercynite-type similar in appearance to tourmaline
Staurolite			Tr	Tr	Tr		Tr		MW	brown	rounded	frosted	opaque	irregular
Tourmaline				Tr	Tr		Tr		W	black-brown	rounded	dull	translucent to opaque	irregular
Zircon				Tr	Tr		5		MW	colourless, orange, yellow		glassy	transparent	prismatic

Detailed Heavy Mineral Analysis

DIATECH
HEAVY MINERAL SERVICES
Ph 61 8 9361 2596
Fx 61 8 9470 1504

Our Job No.: 09087
Disc No.: -

Sample No: AUA054802

Overall Sample Assessment **Positive**

Your Project Code:

TOTAL	%	100%	100%	100%	100%	%	100%	0%

What Has Been Observed?

Final Conc Weight	33.3 g	Size Range	-2+0.1 mm
Weight Observed	33.3 g		

Technician: BJG

Date Observed: 22-Sep-09

Report Printed: 30/09/2009 3:32:31 PM

Magnetic Fractions vs Size Fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10
NotMag		All					Resid	Resid
NM			All	All	All		All	
M6/7			All	All	All		All	
M4/5			All	All	All		All	

Comment about this sample:

All material -2.0+0.2mm and the -0.2+0.1mm have been fused for microdiamonds at NADL

Detailed Heavy Mineral Analysis

DIATECH
Ph 61 8 9361 2596
Fx 61 8 9470 1504

Our Job No.: 09087
Disc No.: -

Sample No:	**AUA054901**
Overall Sample Assessment	**Negative**
Your Project Code:	

Sample Type (as collected):	Loam	Head Weight	77.64 kg
Sample Type (as received):	Loam	Wet Weight	kg
Observed Sample Type:	DMS Concentrate		

Diamond

Diamond (mm)	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Total particles	Description of these particles

Number of particles in each size fraction

Key Minerals

Number of particles in each size fraction

Key Minerals (mm)	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Overall Morph. Group	Total particles	No of particles probed	PRIORITY based on Morphology only)	PRIORITY based on morphology and Probe)
Chromite/Cr-Spinel							1		UNK	B1	1			C
									irregular, highly granular and weathered					
Chromite/Cr-Spinel							2		MW	C1	2			C
									octahedra, smooth, finely frosted surface					

Other Minerals

% Percentage of particles in each size fraction

Other Minerals (mm)	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Colour	Angularity	Lustre	Transparency	Form/Shape
Andradite				Tr	Tr		Tr		F	bright yellow	subangular	glassy	transparent	subhedra, rare
Epidote		10	20	30	10		10		MF	yellow-green	subangular	dull to glassy	translucent	irregular, blocky
Fe Oxide/Hydroxide		90	80	40	12		12		MW	red-brown	rounded	dull to polished	opaque	pisolitic
Gahnite					Tr		Tr		WW	aqua-green	subrounded	frosted	translucent	irregular
Ilmenite		Tr	Tr	5	40		40		MW		subrounded	submetallic	opaque	subhedral to irregular
Leucoxene			Tr	Tr	Tr		Tr		W	grey, beige	subrounded	porcelain-like	opaque	irregular
Rutile					Tr		Tr		W	cherry red	subrounded	submetallic	opaque to translucent	irregular
Spessartine			Tr	25	35		35		MF	reddish-orange	subangular	glassy	transparent	many euhedra, subhedra
Sphene			Tr	Tr	Tr		Tr		MF	orange-brown	subangular	resinous	translucent	subhedral, disc-shaped
Spinel				Tr	Tr		Tr	Tr	MF	black-brown	subrounded	frosted to glassy	translucent	hercynitic, similar in appearance to tourmaline
Staurolite				Tr	Tr		Tr		MW	brown	subrounded to rounded	frosted to glassy	translucent	near spherical
Tourmaline				Tr	Tr		Tr		WW	black-brown	rounded	frosted	translucent	near spherical
Xenotime					Tr		Tr		MW	dark reddish-brown	subangular	dull	translucent	euhedral
Zircon			Tr	Tr	3		3	Tr	W	colourless, stained	subangular to subrounded	vitreous to frosted	transparent	euhedra, subhedra.
TOTAL	%	100%	100%	100%	100%	%	100%	0%						

DIATECH
HEAVY MINERAL SERVICES
Ph 61 8 9361 2596
Fx 61 8 9470 1504

Detailed Heavy Mineral Analysis

Our Job No.: 09087
Disc No.: -

Sample No:	**AUA054901**
Overall Sample Assessment	**Negative**
Your Project Code:	

Technician: LF
Date Observed: 22-Sep-09
Report Printed: 30/09/2009 3:32:56 PM

What Has Been Observed?

Final Conc Weight 19.17 g | Size Range -2+0.1 mm
Weight Observed 19.17 g

Magnetic Fractions vs Size Fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10
NotMag		All						
NM			All	All	All		All	Resid
M6/7		All		All	All		All	
M4/5			All	All	All		All	

Comment about this sample:

All material -2.0+0.2mm and the -0.2+0.1mm have been fused for microdiamonds at NADL

APPENDIX VI

DETAILED HEAVY MINERAL ANALYSIS

RC DRILLING SAMPLES

Report &
Digital Data

Extended Diamond Report

Detailed Heavy Mineral Analysis

DIATECH
Ph 61 8 9361 2596
Fx 61 8 9470 1504

Our Job No.: 09108
Disc No.: -

Sample No:	**VSAC009-002**
Overall Sample Assessment	**Negative**
Your Project Code:	Queensland

Sample Type (as collected):	Drill Chip	Head Weight	43.68	kg
Sample Type (as received):	Drill Chip	Wet Weight		kg
Observed Sample Type:	MI Concentrate			

Diamond

Number of particles in each size fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Total particles	Description of these particles

Key Minerals

Number of particles in each size fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Overall Morph. Group	Total particles	No of particles probed	PRIORITY based on Morphology only)	PRIORITY based on morphology and Probe)

Other Minerals

% Percentage of particles in each size fraction

Other Minerals (mm)	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Colour	Angularity	Lustre	Transparency	Form/Shape
Almandine				Tr	Tr		Tr		MF	pale pink	subangular	glassy	transparent	irregular
Amphibole				10	10		10		F	mostly brown, some green	agular	glassy	translucent	striate crystals, some 'dog-tooth'
Apatite				Tr	Tr		Tr		F	colourless	subrounded	pearly to glassy	transparent	short, prismatic
Barite			Tr	Tr	Tr		Tr			white		waxy	translucent	granular aggregates
Biotite			Tr	Tr	Tr		Tr		MF	dark to pale brown, green-brown		pearly		flakes
Corundum								Tr	W					
Epidote			40	20	15		15		F	pistachio green	angular	glassy	translucent	granular to crystalline
Fe Oxide/Hydroxide			10	Tr	Tr		Tr		W	yellow-brown	rounded	polished	opaque	pisolitic
Ilmenite					Tr		Tr		MW	silvery-black	subrounded	submetallic	opaque	irregular to subhedral
Leucoxene			Tr	30	10		10		F	creamy white		porcelain-like	opaque	after sphene
Pyrite					Tr		Tr		F	brassy yellow	angular	metallic	opaque	rare, crystalline
Rock Fragments			50	20	25		25		F					composite fragments, includes martite
Rutile					Tr		Tr		MW	silvery to dark cherry red	subrounded	submetallic	translucent	rare, irregular
Spessartine					Tr		Tr		MF	pale orange	subangular	frosted to glassy	transparent	subhedral to euhedral
Sphene				20	40		40		F	honey brown	angular	resinous	translucent	tabular subhedra, often partly leucoxenised
Tourmaline				Tr	Tr		Tr		MF	black-brown	subangular	glassy	transparent	blocky, rare
Zircon				Tr	Tr		Tr	Tr	MW	pale pink, colourless, pale orange	subrounded	vitreous	transparent	sub-euhedral
TOTAL	%	%	100%	100%	100%	%	100%	0%						

DIATECH
HEAVY MINERAL SERVICES
Ph 61 8 9361 2596
Fx 61 8 9470 1504

Detailed Heavy Mineral Analysis

Our Job No.: 09108
Disc No.: -

Sample No:	**VSAC009-002**
Overall Sample Assessment	**Negative**
Your Project Code:	Queensland

Technician: JED
Date Observed: 14-Dec-09
Report Printed: 11/01/2010 11:20:06 AM

What Has Been Observed?

Final Conc Weight 8.8600002 g
Weight Observed 8.8600002 g
Size Range -1.2+0.1 mm

Magnetic Fractions vs Size Fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10
NM			All	All	All		All	
M6/7			All	All	All		All	
M4/5			All	All	All		All	

Comment about this sample:

Detailed Heavy Mineral Analysis

DIATECH
Ph 61 8 9361 2596
Fx 61 8 9470 1504

Our Job No.: 09108
Disc No.: -

Sample No:	**VSAC009-008**
Overall Sample Assessment	**Negative**
Your Project Code:	Queensland

Sample Type (as collected):	Drill Chip	Head Weight	19.19	kg
Sample Type (as received):	Drill Chip	Wet Weight		kg
Observed Sample Type:	MI Concentrate			

Diamond

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Total particles	Description of these particles

Number of particles in each size fraction

Key Minerals

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Overall Morph. Group	Total particles	No of particles probed	PRIORITY based on Morphology only)	PRIORITY based on morphology and Probe)

Number of particles in each size fraction

Other Minerals

% Percentage of particles in each size fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Colour	Angularity	Lustre	Transparency	Form/Shape
Almandine				Tr	Tr		Tr	Tr	MW					
Amphibole			Tr	Tr	Tr		Tr		F	brown				
Andradite					Tr		Tr		MW					
Apatite				Tr	Tr		Tr		F					
Barite			15	5	Tr		Tr							
Biotite			40	45	15		15	Tr	MF					
Epidote			Tr	Tr	10		15	Tr	F					
Fe Oxide/Hydroxide			20	10	15		15		W					
Ilmenite				Tr	Tr		Tr		MW					
Leucoxene			Tr	Tr	Tr		Tr		F					
Pyrite			Tr	Tr	Tr		Tr							
Rock Fragments			25	40	50		30		F					
Rutile							Tr	Tr	MW					
Spessartine					Tr		Tr		MW					
Sphene			Tr	Tr	10		25	Tr	F					
Tourmaline					Tr		Tr		MF					
Zircon					Tr		Tr	Tr	MW					
TOTAL	%	%	100%	100%	100%	%	100%	0%						

DIATECH
HEAVY MINERAL SERVICES
Ph 61 8 9361 2596
Fx 61 8 9470 1504

Detailed Heavy Mineral Analysis

Our Job No.: 09108
Disc No.: -

Sample No:	VSAC009-008
Overall Sample Assessment	Negative
Your Project Code:	Queensland

Technician: JED
Date Observed: 14-Dec-09
Report Printed: 11/01/2010 11:20:30 AM

What Has Been Observed?

Final Conc Weight 3.39 g | Size Range -1.2+0.1 mm
Weight Observed 3.39 g

Magnetic Fractions vs Size Fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10
NM			All	All	All		All	
M6/7			All	All	All		All	
M4/5			All	All	All		All	

Comment about this sample:

DIATECH
HEAVY MINERAL SERVICES
Ph 61 8 9361 2596
Fx 61 8 9470 1504

Detailed Heavy Mineral Analysis

Our Job No.: 09108
Disc No.: -

Sample No:	VSAC009-011
Overall Sample Assessment	**Negative**
Your Project Code:	Queensland

Sample Type (as collected):	Drill Chip	Head Weight	58.5 kg
Sample Type (as received):	Drill Chip	Wet Weight	kg
Observed Sample Type:	MI Concentrate		

Diamond

Number of particles in each size fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Total particles	Description of these particles

Key Minerals

Number of particles in each size fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Overall Morph. Group	Total particles	No of particles probed	PRIORITY based on Morphology only)	PRIORITY based on morphology and Probe)

Other Minerals

% Percentage of particles in each size fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Colour	Angularity	Lustre	Transparency	Form/Shape
Almandine			Tr	Tr	Tr		Tr		MF					
Amphibole			10	25	45		40		F	brown				
Apatite				Tr	Tr		Tr		F					
Barite			Tr	Tr	Tr									
Biotite			60	45	30		30	Tr	MF					
Epidote			Tr	15	Tr		Tr	Tr	F					
Fe Oxide/Hydroxide			Tr	Tr	Tr		Tr		W					
Ilmenite					Tr		Tr		MW					
Leucoxene			Tr	Tr	Tr		Tr		F					
Rock Fragments			30	15	25		30		F					
Spessartine				Tr	Tr		Tr		MF					
Sphene			Tr	Tr	Tr		Tr	Tr	F					
Tourmaline				Tr	Tr		Tr		MF					
Zircon					Tr		Tr		MW					
TOTAL	%	%	100%	100%	100%	%	100%	0%						

What Has Been Observed?

Final Conc Weight	19.820000 g	Size Range	-1.2+0.1 mm
Weight Observed	19.820000 g		

Technician: JED
Date Observed: 14-Dec-09
Report Printed: 11/01/2010 11:20:55 AM

Magnetic Fractions vs Size Fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10
NM			All	All	All		All	
M6/7			All	All	All		All	
M4/5			All	All	All		All	

Comment about this sample:

DIATECH
HEAVY MINERAL SERVICES
Ph 61 8 9361 2596
Fx 61 8 9470 1504

Detailed Heavy Mineral Analysis

Our Job No.: 09133
Disc No.:

Sample No:	**VSA009-018**
Overall Sample Assessment	**Negative**
Your Project Code:	Queensland

Sample Type (as collected):	Drill Chip	Head Weight	37.84	kg
Sample Type (as received):	Drill Chip	Wet Weight		kg
Observed Sample Type:	Ml Concentrate			

Diamond

Number of particles in each size fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Total particles	Description of these particles

Key Minerals

Number of particles in each size fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Assessment	Wear	Total particles	No of particles probed

Other Minerals

% Percentage of particles in each size fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Colour	Angularity	Lustre	Transparency	Form/Shape
Almandine					5		5		F					
Amphibole				Tr	Tr		Tr		F					
Andradite				Tr	Tr		Tr		F					
Epidote			Tr	Tr	Tr		Tr		MF					
Fe Oxide/Hydroxide				Tr	Tr		Tr	100	W					
Ilmenite			Tr	10	40		60		F					
Pyrite				Tr	Tr		Tr		F					
Rock Fragments			100	90	55		35		MF					
Zircon				Tr	Tr		Tr		F					
TOTAL	%	%	100%	100%	100%	%	100%	100%						

What Has Been Observed?

Final Conc Weight	1.5301	g	Size Range	-1.2+0.1 mm
Weight Observed	1.5301	g		

Magnetic Fractions vs Size Fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10
NotMag			All	All	All		All	Resid

Technician: LF
Date Observed: 11-Jan-10
Report Printed: 16/02/2010 12:28:39 PM

Comment about this sample:

DIATECH
Heavy Mineral Services
Ph 61 8 9361 2596
Fx 61 8 9470 1504

Detailed Heavy Mineral Analysis

Our Job No.: 09133
Disc No.:

Sample No: **VSA009-026**

Overall Sample Assessment: **Negative**

Your Project Code: Queensland

Sample Type (as collected):	Drill Chip	Head Weight	17.52	kg
Sample Type (as received):	Drill Chip	Wet Weight		kg
Observed Sample Type:	MI Concentrate			

Diamond

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Total particles	Description of these particles

Number of particles in each size fraction

Key Minerals

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Assessment	Wear	Total particles	No of particles probed

Number of particles in each size fraction

Other Minerals

% Percentage of particles in each size fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10	Wear	Colour	Angularity	Lustre	Transparency	Form/Shape
Almandine					Tr		Tr		F					
Amphibole					Tr		10		F					
Epidote					Tr		Tr		F					
Fe Oxide/Hydroxide			100	95	80		70	100	MW					
Ilmenite					Tr		Tr		F					
Pyrite					Tr		Tr		F					
Rock Fragments				Tr	Tr		Tr		F					
Sphene				5	20		20		F					partly leucoxenised
TOTAL	%	%	100%	100%	100%	%	100%	100%						

What Has Been Observed?

Final Conc Weight	0.6101 g	Size Range	-1.2+0.1	mm
Weight Observed	0.6101 g			

Technician: LF
Date Observed: 11-Jan-10
Report Printed: 16/02/2010 12:29:05 PM

Magnetic Fractions vs Size Fraction

mm	+2.0	+1.2	+.8	+.4	+.3	+.25	+.20	+.10
NotMag			All	All	All		All	Resid

Comment about this sample:

Diamond Analysis Report

Job Details

Client Name	Job Number	Technician	Order Number	Project Name	Project Code	State or Country	Date Received	Job Description
ANGLOAM	09133	Diatech	Paul Polito	Queensland	Queensland	QLD	1/12/2009	1. Diatech: Wet screen each sample at 100um, discard the -100um. 2. Diatech: Scalp off the +1.2mm material and retain. 3. Diatech: Concentrate the -1.2mm+0.1mm in heavy liquid – TBE initially (SG 2.96) and then MI after (SG 3.32). 4. Diatech: Magnetically separate to facilitate mineral observing (highly susceptibles removed by handmagnetic). 5. Diatech: Observe the concentrate from 1.2mm down to 0.2mm for key minerals and diamonds. 6. Diatech: send +1.2mm raw oversize and -1.2+0.1mm concentrate/magnetic fractions to NADL. 7. Observe fused residues returned to us by NADL.

Process Data

Client Name	Job Number	Sample Number	Technician	Sample Type	Sample Type Received	Observed Sample Type	Lab Assessment	Head Weight kg	Wet Weight kg	Oversize Weight kg	Oversize Grainsize mm
ANGLOAM	09133	VSA009-018	Diatech	Drill Chip	Drill Chip	MI Concentrate	Negative	37.84000015		11.85999966	1.200000048
ANGLOAM	09133	VSA009-026	Diatech	Drill Chip	Drill Chip	MI Concentrate	Negative	17.52000046		5.159999847	1.200000048

Process Data

Client Name	Job Number	Sample Number	Final Conc Grainsize mm	Non-mag Weight g	Mag Weight g	Final Conc Weight Total g	Final Conc Weight Observed g	% of Final Conc Weight Observed	Comment
ANGLOAM	09133	VSA009-018	-1.2+0.1			1.530099988	1.530099988	100	
ANGLOAM	09133	VSA009-026	-1.2+0.1			0.610099971	0.610099971	100	

Key Mineral Summary

Client Name	Job Number	Sample Number	Technician	Lab Assessment	Overall Size Fraction Observed mm	DIA A Morph	CHR A Morph	CHR B Morph	CHR C Morph	CHR A MorphProbe	CHR B MorphProbe	CHR C MorphProbe	CRD A Morph	CRD B Morph	CRD C Morph	CRD A MorphProbe
ANGLOAM	09133	VSA009-018	Diatech	N		0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	Diatech	N		0	0	0	0	0	0	0	0	0	0	0

Key Mineral Summary

Client Name	Job Number	Sample Number	CRD B MorphProbe	CRD C MorphProbe	OTHER A Morph	OTHER B Morph	OTHER C Morph	OTHER A MorphProbe	OTHER B MorphProbe	OTHER C MorphProbe	PHL A Morph	PHL B Morph	PHL C Morph	PHL A MorphProbe	PHL B MorphProbe	PHL C MorphProbe
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Key Mineral Summary																
Client Name	**Job Number**	**Sample Number**	**PIC A Morph**	**PIC B Morph**	**PIC C Morph**	**PIC A MorphProbe**	**PIC B MorphProbe**	**PIC C MorphProbe**	**PYR A Morph**	**PYR B Morph**	**PYR C Morph**	**PYR A MorphProbe**	**PYR B MorphProbe**	**PYR C MorphProbe**	**EGAR A Morph**	**EGAR B Morph**
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Key Mineral Summary

Client Name	Job Number	Sample Number	EGAR C Morph	EGAR A MorphProbe	EGAR B MorphProbe	EGAR C MorphProbe	SYNDIA C Morph	CommentResult
ANGLOAM	09133	VSA009-018	0	0	0	0	0	
ANGLOAM	09133	VSA009-026	0	0	0	0	0	

KeyMineralDetails

Client Name	Job Number	Sample Number	Technician	Individual Size Fraction Observed mm	DIA A Morph	CHR A Morph	CHR B Morph	CHR C Morph	CHR A MorphProbe	CHR B MorphProbe	CHR C MorphProbe	CRD A Morph
ANGLOAM	09133	VSA009-018	DIATECH	-0.2+0.1		0				0	0	0
ANGLOAM	09133	VSA009-018	DIATECH	-0.3+0.2		0				0	0	0
ANGLOAM	09133	VSA009-018	DIATECH	-0.4+0.3		0				0	0	0
ANGLOAM	09133	VSA009-018	DIATECH	-0.8+0.4		0				0	0	0
ANGLOAM	09133	VSA009-018	DIATECH	-1.2+0.8		0				0	0	0
ANGLOAM	09133	VSA009-026	DIATECH	-0.2+0.1		0				0	0	0
ANGLOAM	09133	VSA009-026	DIATECH	-0.3+0.2		0				0	0	0
ANGLOAM	09133	VSA009-026	DIATECH	-0.4+0.3		0				0	0	0
ANGLOAM	09133	VSA009-026	DIATECH	-0.8+0.4		0				0	0	0
ANGLOAM	09133	VSA009-026	DIATECH	-1.2+0.8		0				0	0	0

KeyMineralDetails

Client Name	Job Number	Sample Number	CRD B Morph	CRD C Morph	CRD A MorphProbe	CRD B MorphProbe	CRD C MorphProbe	OTHER A Morph	OTHER B Morph	OTHER C Morph	OTHER A MorphProbe
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0

KeyMineralDetails												
Client Name	Job Number	Sample Number	OTHER B MorphProbe	OTHER C MorphProbe	PHL A Morph	PHL B Morph	PHL C Morph	PHL A MorphProbe	PHL B MorphProbe	PHL C MorphProbe	PIC A Morph	PIC B Morph
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0

KeyMineralDetails

Client Name	Job Number	Sample Number	PIC C Morph	PIC A MorphProbe	PIC B MorphProbe	PIC C MorphProbe	PYR A Morph	PYR B Morph	PYR C Morph	PYR A MorphProbe	PYR B MorphProbe	PYR C MorphProbe
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0

KeyMineralDetails

Client Name	Job Number	Sample Number	EGAR A Morph	EGAR B Morph	EGAR C Morph	EGAR A MorphProbe	EGAR B MorphProbe	EGAR C MorphProbe	SYNDIA C Morph
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0

Diamond Details

No Diamond Details Data to Report

Other Minerals

Client Name	Job Number	Sample Number	Technician	Individual Size Fraction Observed mm	Almandine	Al-Silicates	Al-Spinel	Amphibole	Anatase	Andalusite	Andradite	Apatite	Axinite	Barite	Biotite	Bronzite	Calcite	Carbonate
ANGLOAM	09133	VSA009-018	DIATECH	-0.2+0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	DIATECH	-0.3+0.2	5	0	0	Tr	0	0	Tr	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	DIATECH	-0.4+0.3	5	0	0	Tr	0	0	Tr	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	DIATECH	-0.8+0.4	0	0	0	Tr	0	0	Tr	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	DIATECH	-1.2+0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	DIATECH	-0.2+0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	DIATECH	-0.3+0.2	Tr	0	0	10	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	DIATECH	-0.4+0.3	Tr	0	0	Tr	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	DIATECH	-0.8+0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	DIATECH	-1.2+0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Other Minerals

Client Name	Job Number	Sample Number	Cassiterite	Chalcopyrite	Chlorite	Chrysoberyl	Cinnabar	Clinopyroxene	Columbite	Copper Minerals	Cordierite	Corundum	Crocoite	Cr-Spinel	Demantoid	Diaspore
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Other Minerals

Client Name	Job Number	Sample Number	Diopside	Enstatite	Epidote	Fe Oxide/Hydroxide	Fergusonite	Florencite	Fluorite	Gahnite	Galena	Garnet	Glauconite	Gold	Gorceixite	Goyazite	Grossular	Gypsum
ANGLOAM	09133	VSA009-018	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	Tr	Tr	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	Tr	Tr	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	Tr	Tr	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	Tr	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	Tr	70	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	Tr	80	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	95	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0

Other Minerals																	
Client Name	Job Number	Sample Number	Haematite	Hercynite	Hornblende	Ilmenite	K-Richterite	Kyanite	Leucoxene	Limonite	Magnesite	Magnetite	Magnophorite	Malachite	Marcasite	Martite	Mica
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	Tr	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	Tr	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	Tr	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Other Minerals

Client Name	Job Number	Sample Number	Micrometeorites	Mn Oxide	Moissanite	Molybdenite	Monazite	Muscovite	Nb-Rutile	Olivine	Orthopyroxene	Other Mineral	Pb Glass	Perovskite	Phlogopite	Phosphate
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Other Minerals

Client Name	Job Number	Sample Number	Piedmontite	Platinum	Prehnite	Priderite	Psilomelane	Pyrite	Pyroclore	Pyroxene	Rock Fragments	Rutile	Quartz	Scheelite	Sericite	Shell Fragments	Siderite
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	Tr	0	0	35	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	Tr	0	0	55	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	Tr	0	0	90	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	Tr	0	0	Tr	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	Tr	0	0	Tr	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	Tr	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Other Minerals

Client Name	Job Number	Sample Number	Sillimanite	Spessartine	Sphene	Spinel	Staurolite	Sulphides	Tantalite	Thorite	Topaz	Tourmaline	Unknown Mineral 1	Unknown Mineral 2	Unknown Mineral 3
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	20	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	20	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	5	0	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0	0	0	0	0

Other Minerals

Client Name	Job Number	Sample Number	Unknown Mineral 4	Unknown Mineral 5	Unknown Mineral 6	Uvarovite	Vermiculite	Wolframite	Xenotime	Zircon	Zoisite
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	Tr	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	Tr	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	Tr	0
ANGLOAM	09133	VSA009-018	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0
ANGLOAM	09133	VSA009-026	0	0	0	0	0	0	0	0	0

APPENDIX VII

RC DRILLING FILES

AND

AAEA LOGGING CODES

Digital Data

ROCK TYPES:

Weathering Product & Transported / Superficial Deposits (prefix L…)			
LAL	Alluvium	LST	Silt
LCO	Colluvium	LSD	Sand
LSO	Soil	LGR	Gravel
LSCR	Scree	LSCO	Conglomerate
LLO	Loess	LGO	Gossan
LCY	Clay (produced by weathering or by alteration, include interp. of parent lithology in Rock 2)	LGYP	Gypsum / gypsiferous sediment (associated with salt lake systems)
LFE	Ferricrete (arid / desert environments *NOT* laterite)	LSIC	Silcrete (arid / desert environments)
LAT	Lateritic duricrust (general)	LCC	Calcrete (arid / desert environments)

Sediments (prefix S…)			
S	Sediment (undifferentiated)	SOC	Coal - "organic" sediments
SB	Black shale / carbonaceous (graphitic) sediments	SLC	Carbonate (undifferentiated or "dirty limestones")
SU	Mudstones (general - includes slate & shale)	SLD	Dolomite - if "dirty" add descriptor (eg: sandy, silty…)
ST	Siltstone (general)	SLL	Limestone - if "dirty" add descriptor (eg: sandy, silty…)
SD	Sandstones / quartz-rich sediments	SLM	Marl
SQZ	Quartzite (metamorphic)	SEV	Evapourites - gypsiferous
SA	Arenites (general)	SC	Conglomerates (general)
SAF	Arkosic arenites (>50% feldspathic / lithic fragments & 0-15% silty / clayey matrix)	SCM	Monomict / oligomict conglomerates
SAL	Lithic arenites (>50% rock / lithic fragments & 0-15% silty / clayey matrix)	SCP	Polymict conglomerates
SGW	Greywacke (15-75% silty / clayey matrix)	SFE	Ferruginous sediments -*not BIF*
SMF	Mass flow / debris flow		

Cherts (prefix C…)			
C	Chert (undifferentiated)	CJ	Jaspilitic chert
CB	Barite-bearing cherts (eg: in VHMS systems)	CL	White and grey / black banded cherts
CIF	BIF: Banded Iron Formation	CM	Cherts - massive

Felsic Volcanics (prefix F…)			
F	Felsic volcanic (undifferentiated)	FD	Rhyodacite
FR	Rhyolite (plutonic equivalent: granite)	FT	Trachyte (plutonic equivalent: syenite)
FVA	Felsic pyroclastic or volcaniclastic: ash / fine tuff (grain size <0.1mm)	FVG	Felsic pyroclastic or volcaniclastic agglomerate / breccia / lapilli tuff (grain size >4mm)
FVT	Felsic pyroclastic or volcaniclastic: tuff / sandstone (grain size 0.1-4mm)	FVB	Felsic pyroclastic or volcaniclastic: bomb breccia / agglomerate (grain size >32mm)

Intermediate Volcanics (prefix A…)			
A	Intermediate volcanics (undifferentiated)		
AA	Andesite (plutonic equivalent: diorite)	AB	Basaltic-andesite
AT	Latite / Trachy-andesite (plutonic equivalent: monzonite)	AD	Dacite (plutonic equivalent: granodiorite)
AVA	Intermediate pyroclastic or volcaniclastic: ash / fine tuff (grain size <0.1mm)	AVG	Intermediate pyroclastic or volcaniclastic agglomerate / breccia / lapilli tuff (grain size >4mm)
AVB	Intermediate pyroclastic or volcaniclastic: bomb breccia / agglomerate (grain size >32mm)	AVT	Intermediate pyroclastic or volcaniclastic: tuff / sandstone (grain size 0.1-4mm)

ROCK TYPES (cont'd):

Mafic Volcanics (prefix B…)

B	Mafic volcanics (undifferentiated)		
BA	Andesitic-basalt	BT	Basalt
BP	Plagioclase-phyric basalt	BB	Amphibole-phyric basalt
BK	Komatiitic basalt / High-Mg basalt (generally in Archaean terranes)	BOP	Picrite (olivine-basalt)
BVA	Mafic pyroclastic or volcaniclastic: ash / fine tuff (grain size <0.1mm)	BVG	Mafic pyroclastic or volcaniclastic agglomerate / breccia / lapilli tuff (grain size >4mm)
BVT	Mafic pyroclastic or volcaniclastic: tuff / sandstone (grain size 0.1-4mm)	BVB	Mafic pyroclastic or volcaniclastic: bomb breccia / agglomerate (grain size >32mm)

Komatiites (prefix K…)

K	Komatiite / ultramafic volcanics (undiff.)	KS	Komatiite, spinifex textured
KAC	Komatiite, adcumulate	KMC	Komatiite, mesocumulate
KOC	Komatiite, orthocumulate		

Granitoids / Felsic-Intermediate Intrusions (prefix G…)

G	Granitoid (undifferentiated)	GMZ	Monzonite (<5% quartz / "quartz-poor" granite - volcanic equivalent: latite / trachy-andesite)
GDI	Diorite (<5% quartz / plagioclase rich - volcanic equivalent: andesite)	GMZQ	Quartz-Monzonite (5%-20% quartz / "quartz-poor" granite - volcanic equivalent: latite / trachy-andesite)
GDIQ	Quartz-Diorite (5%-20% quartz / plagioclase rich - volcanic equivalent: andesite)	GQ	Quartz-rich granitoid (>60% quartz)
GGD	Granodiorite (volcanic equivalent: dacite)	GSY	Syenite (volcanic equivalent: trachyte)
GGR	Granite (volcanic equivalent: rhyolite)	GTO	Tonalite (>20% quartz / plagioclase-rich)
GK	Alkali-feldspar granite ("pink" granite)		

Minor Porphyry / "Other" Intrusives (prefix P…)

PF	Felsic intrusive (undifferentiated)	PI	Intermediate porphyry (undiff.)
PFF	Felsic porphyry, feldspar dominant / feldspar-phyric	PIA	Andesitic porphyry (keratophyre) *NOT* andesite lava
PFQ	Felsic porphyry, quartz dominant / quartz-phyric	PID	Dacitic porphyry (quartz keratophyre) *NOT* dacite lava
PAP	Aplite	PL	Lamprophyre (undifferentiated)
PEG	Pegmatite	PLA	Lamprophyre, amphibole dominant
PGF	Pegmatite, feldspar-rich	PLB	Lamprophyre, phlogopite / biotite dominant
PGQ	Pegmatite, quartz-rich	PLX	Lamprophyre, pyroxene dominant
PCB	Carbonatite	PK	Kimberlite (undifferentiated)

Mafic Intrusives (prefix D…)

D	Mafic intrusives (undifferentiated)		
DD	Dolerite	DDQ	Quartz dolerite
DG	Gabbro (*NO* olivine, <10% opx)	DHB	Hornblendite (>50% hornblende)
DGL	Leucogabbro (plag >>olivine & pyx)	DN	Norite (opx bearing, <10% cpx)
DGM	Melagabbro (olivine & pyx >>plag)	DNL	Leuconorite (plag >>olivine & pyx)
DGN	Gabbronorite (cpx & opx bearing)	DNM	Melanorite (olivine & pyx >>plag)
DGNL	Leucogabbronorite (plag >>olivine & pyx)	DNO	Olivine Norite (olivine & opx bearing *NO* cpx)
DGNM	Melagabbronorite (olivine & pyx >>plag)	DAN	Anorthosite (>90% plag, <10% olivine & pyx)
DGNO	Olivine Gabbronorite (olivine, cpx & opx bearing)	DT	Troctolite (olivine & plag nearing *NO* pyroxene)
DGO	Olivine gabbro (olivine bearing *NO* cpx)	DTL	Leucotroctolite (plag >>olivine & pyx)
DGQ	Quartz gabbro	DTM	Melatroctolite (olivine & pyx >>plag)

ROCK TYPES (cont'd):

Ultramafic Rocks (prefix U…)

U	Ultramafic (undifferentiated)	US	Serpentinised ultramafic (primary texture destroyed)
UPX	Pyroxenite (>50% pyroxene, <40%olivine, *NO* plagioclase)	USC	Serpentinite, chlorite dominated
UCPX	Clinopyroxenite (<40% olivine, cpx present, *NO* opx & *NO* plagioclase)	USM	Serpentinite, tremolite dominated
UOPX	Orthopyroxenite (<40% olivine, opx present, *NO* cpx & *NO* plagioclase)	UST	Serpentinite, talc dominated
UWB	Websterite (opx & cpx, *NO* olivine & *NO* plagioclase)	UDU	Dunite (>90% olivine, *NO* plagioclase)
UWBO	Olivine Websterite (opx & cpx, olivine present & *NO* plagioclase)	UPD	Peridotite; undiff (40-90% olivine, *NO* plagioclase)
ULZ	Lherzolite (>40% olivine, both opx & cpx present, *NO* plagioclase)	UHZ	Harzburgite (>40% olivine, opx present, *NO* cpx & *NO* plagioclase)
UWL	Wehrlite (>40% olivine, cpx present, *NO* opx & *NO* plagioclase)		

High-Grade Metamorphic / Gneissic Rocks (prefix M…)

MA	Amphibolite (undifferentiated)	MMB	Marble
MAC	Amphibolite, actinolite dominated	MMG	Migmatite / migmatitic gneiss
MAN	Amphibolite, anthophyllite dominated	MPE	Pelite (f.g. - c.g. aluminosilicate m'mic minerals). Use Key Mineral fields
MBMG	Banded magnetic / magnetite gneiss (eg: after Archaean BIF)	MPH	Phyllite (f.g. micaceous rock). *NOTE:* schist codes may be more appropriate.
MBDG	Banded gneiss	MPP	Psephite (original conglomerate)
MCH	Charnockite	MPS	Psammite (original sandstone)
MCS	Calc-silicate gneiss	MPX	Amphibolite, pyroxene dominated (high-grade)
MEC	Eclogite	MQF	Quartzo-feldspathic gneiss / felsic gneiss
MGN	Gneiss (undifferentiated)	MSZ	Schist, use Key Mineral fields
MGR	Granulite	MTR	Amphibolite, tremolite dominated
MHB	Amphibolite, hornblende dominated	MUGN	Ultramafic gneiss
MITG	Intermediate gniess	MXC	Clinopyroxene-plagioclase rocks (high-grade)
MLT	L-tectonite (use Key Mineral fields)	MXO	Orthopyroxne-plagioclase rocks (high-grade)
MMAG	Mafic gneiss		

Mylonites / Cataclasites

MCTC	Cataclasite (undifferentiated), use Key Mineral Fields	MYL	Mylonite (undifferentiated), use Key Mineral Fields

MASSIVE SULPHIDES (>50% / >20cm of core) Use KEY MINERAL FIELDS for additional / subordinate sulphide species		SEMI-MASSIVE SULPHIDES (>20% / >20cm of core) Use KEY MINERAL FIELDS for additional / subordinate sulphide species and lithic clast types in breccias	
$$	Massive Sulphides, undifferentiated	$S	Semi-massive sulphides, undifferentiated
$AS	Arsenopyrite-rich massive sulphide	$SAS	Arsenopyrite-rich semi-massive sulphide
$BO	Bornite-rich massive sulphide	$SBO	Bornite-rich semi-massive sulphide
$CH	Chalcocite-rich massive sulphide	$SCH	Chalcocite-rich semi-massive sulphide
$CP	Chalcopyrite-rich massive sulphide	$SCP	Chalcopyrite-rich semi-massive sulphide
$CR	Chromite / Chromitite (ie: PGE)	$SCR	Semi-massive Chromite / Chromitite
$GA	Galena-rich massive sulphide	$SGA	Galena-rich semi-massive sulphide
$ML	Millerite-rich massive sulphide	$SML	Millerite-rich semi-massive sulphide
$PN	Pentlandite-rich massive sulphide	$SPN	Pentlandite-rich semi-massive sulphide
$PO	Pyrrhotite-rich massive sulphide	$SPO	Pyrrhotite-rich semi-massive sulphide
$PY	Pyrite-rich massive sulphide	$SPY	Pyrite-rich semi-massive sulphide
$SP	Sphaleriteite-rich massive sulphide	$SSP	Sphaleriteite-rich semi-massive sulphide

ROCK TYPES (cont'd):

Breccias (prefix X…) Use TEXTURE CODES to describe clasts (composition, shape etc…)			
X	Breccia (undifferentiated)	XHY	Hydrothermal breccia (must have clear evidence of vein phases), use Key Mineral fields to describe important vein mineral phases.
XHE	Hematite-rich breccia (IOCG systems), use Key Mineral fields to describe other important minerals or clast types	XMT	Magnetite-rich breccia (IOCG systems), also use Key Mineral fields to describe other important minerals
XIN	Intrusive breccia (near margins of intrusion), use texture codes to describe clasts, use Rock 2 to describe composition of intrusive unit.	XVO	Eruptive volcanic breccia (eg: on margins of breccia pipe / diatreme)

Iron Ore Mineralisation (prefix I…)			
ICI	pisolitic channel iron deposit	IMH	massive hematite (eg: total replacement of BIF in BID systems)
IDI	dedrital iron deposit	IMM	massive magnetite (eg: total replacement of BIF)
IMG	massive geothite, undiff (eg: total replacement of BIF in BID systems)	ISMG	semi-massive geothite, undiff (eg: partial replacement of BI in BID systems)
IMGO	massive geothite, ochrous (soft, friable ores in BID systems)	ISMH	semi-massive hematite (eg: partial replacement of BIF in BID systems)
IMGV	massive geothite, vitreous / siliceous (hard, non-friable ores in BID systems)	ISMM	semi-massive magnetite (eg: partial replacement of BIF)

Other			
STOPE	Void / stope	NS	No sample / core loss
TAZ	Total alteration zone - not possible to determine original roc type: used as a *LAST RESORT*, must always indicate "bes guess" as to the original rock type	FLT	Fault - only to be used in *EXTREMELY* broken ground with near complete destruction of rock mass (eg: fault gouge): used as a LAST RESORT only if the mylonite / cataclasite codes are not applicable
QZV	Quartz vein (use Key Minerals to describe important minerals other than quartz).	VN	Vein, not quartz-rich (use Key Minerals to describe vein minerals & see vein description)

ROCK TEXTURES:

General Terms / Textures			
CLY	clayey (eg: as a descriptor in weathered /altered rocks)	BX	breccia / brecciated (structural, hydrothermal or volcanic - clasts should be angular)
SLT	silty (eg: as a descriptor for a dirty limestone)	IND	indurated / "hardpanised" (for surficial materials)
SND	sandy (eg: as a descriptor for a dirty limestone)	JNT	jointed (only for strongly joint fractured rocks)
QZ	quartzose / quartz-rich (as in sediment)	FR	fractured
GRV	gravel / gravelly (eg: as a descriptor for colluvium)	MLD	milled, for clasts in volcanic breccias (gas-streaming) or effusive veins (often associated with vein sediment)
PIS	pisolite / pisolitic	SPT	spotted
GOE	goethite / goethitic (eg: for oxidised rocks)	WD	wood / organic clasts or fragments
HEM	hematite / hematitic (eg: for oxidised rocks)	BND	banded (can be used in volcanic, metamorphic or sedimentary rocks - see also vein codes)
MT	magnetic / magnetite	BDD	bedded (can be used in volcanic, metamorphic or sedimentary rocks - see also vein codes)
GPH	graphitic (as in graphitic slate - higher grade than carbonaceous shale)	BOT	botryoidal / mammillated
CLC	calcareous (eg: in calcareous siltstones / shales)	BXW	boxworked
MSV	massive	HOM	homogeneous

ROCK TEXTURES (cont'd):

Grain Size Terms

VFG	very fine grained < 0.1mm (sediment)	PBL	pebbles / pebbly (sediment: 8-32mm)
FGR	fine grained <1mm (sediment & igneous)	CBL	cobbles / cobbly (sediment: 32-256mm)
MGR	medium grained (igneous: 1-5mm / sediment: 1-2mm)	BLD	boulder (sediment: >256mm)
CGR	coarse grained (igneous: 5-30mm / sediment: 2-4mm)	EQG	equigranular or granoblastic
VCG	very coarse grained (igneous: >30mm / sediment: 4-8mm)	SER	seriate (range in grain sizes)
MXT	megacrystic (eg: K-Spar megacrystic granite)	PEG	pegmatite / pegmatitic

Grain / Clast Morphology Terms / Textures

EUH	euhedral grains	RND	rounded clasts / grains / crystal fragments
SBH	subhedral grains	SRN	subrounded / grains / crystal fragments
ANH	anhedral grains	SAG	subangular clasts / grains / crystal fragments
		ANG	angular clasts / grains / crystal fragments

Sedimentary Terms / Textures

LAM	laminated (for sediments and possibly large veins - see vein codes)	CBN	carbonaceous (as in carbonaceous / black shale, *NOT* calcareous or graphitic)
FLG	flaggy	IJD	injection dykes / flame structures (sedimentary)
PHL	phyllitic (weakly metamorphosed shale)	RUC	rip up clasts
FSF	fossiliferous	ERS	erosional scours
PSO	poorly sorted (sedimentary / voclanic rocks / volcanic breccias)	MSU	matrix supported (sedimentary / voclanic rocks / volcanic breccias)
WSO	well sorted (sedimentary / voclanic rocks / volcanic breccias)	CSU	clast supported (sedimentary / voclanic rocks)

Bedding Terms / Textures

BTN	bedded - thinly (<1cm)	BFF	fine grained beds >> coarse grained beds (relative abundance of interbedded sediments: eg - sandstone and shale)
BMO	bedded - moderately (1cm? to 30cm)	BFC	fine grained beds > coarse grained beds (relative abundance of interbedded sediments: eg - sandstone and shale)
BTK	bedded - thickly (>30cm)	BFE	fine grained beds = coarse grained beds (relative abundance of interbedded sediments: eg - sandstone and shale)
BPM	bedded - poorly defined to massive (>1m) bedding	BCF	coarse grained beds > fine grained beds (relative abundance of interbedded sediments: eg - sandstone and shale)
ITB	interbedded	BCC	coarse grained beds >> fine grained beds (relative abundance of interbedded sediments: eg - sandstone and shale)
XBD	cross bedded (including trough and ripple cross bedding)	BGR	bedding - graded bedding

Volcano-Sedimentary Terms / Textures

AP	accretionary lapilli	LC	lithic / lithic clasts
ASH	ash / ash-rich (in matrix)	MM	momomict (conglomerates / volcanic sediments / volcanic breccias)
BIM	bimodal (generally grainsize for sediments - can be for composition of volcanic clasts)	PM	polymict (conglomerates / volcanic sediments / volcanic breccias)
XTR	crystal-rich / crystal fragments		

ROCK TEXTURES (cont'd):

Volcanic Terms / Textures

PH	phyric: for lavas with phenocrysts (use porphyritic / porphyroblastic for igneous / metamorphic rocks)	SX	spinifex textured; undifferentiated (specific to komatiites, may also occur at quench / contact zones)
APH	aphanitic (glassy lavas)	SXC	coarse spinifiex
FB	flow banded	SXF	fine spinifex
PLW	pillowed (for lavas)	SXM	medium spinifex
HYA	hyaloclastite / hyaolclastitic	SXR	randomly oriented spinifiex grains
PP	peperite / peperitic (lava intruding wet, unconsolidated sediments)	SXS	sheaf / book spinifex grains
SPH	spherultic	SXO	olivine spinifex
PBD	pebble dykes	SXP	pyroxene spinifex
VS	vesicular, amygdaloidal (in lavas)		
WLD	welded (for use in pumiceous tuffs / volcaniclastic rocks / ignimbrites): MUST have evidence of compaction or flowage	SXB	sheeted pyroxene spinifex ("stringy beef" texture)
PUM	pumiceous / pumice / scoria fragments		

Igneous / Metamorphic Terms / Textures

ACL	acicular / needle-like minerals (not bladed / spinifex textured)	AC	cumulate textured: adcumulate (generally in ultramafic rock or layered intrusions)
ATO	atoll textured grains (eg: quenched olivine crystals)	MC	cumulate textured: mesocumulate (generally in ultramafic rocks or layered intrusions)
AUG	augen textured	OC	cumulate textured: orthocumulate (generally in ultramafic rocks or layered intrusions)
INT	intruded / intercalated	LEU	leucocratic (<35% ferro-magnesian / dark minerals)
HF	hornfels / hornfelsed	MES	mesocratic (35-65% ferro-magnesian / dark minerals)
SCC	saccharoidal / sugary (mainly for metamorphic rocks)	MEL	melanocratic (>65% ferro-magnesian / dark minerals)
GN	gneissose	PMM	melanosome (partial melt texture)
GRP	graphic textured (as in granites & pegmatites)	PML	leucosome (partial melt texture)
SKL	skeletal grains	MIA	miarolitic cavities
SOP	sub-ophitic	MIG	migmatitic
HRS	harrisitic grains, distinct from acicular grain (eg: harrisitic olivine in komatiite)	MYR	myrmektite
HPR	hopper grains (olivine mineral texture)	OPH	ophitic (distinct in some dolerites)
HYP	hypidiomorphic	PK	poikolitic
IDO	idiomorphic	PO	porphyritic (generally for intrusive rocks) / porphryoblastic (metamorphic rocks)
VRT	varitextured	BOU	boudinaged
LAY	layered (for igneous rocks only, use bedding terms for sediments)	PTG	ptygmatic (as in ptygmatically veined gneiss)

Breccia Clast (compostions / litholotypes)

X$	breccia clast; sulphidic (undiff)	XI	breccia clast; intermediate (undiff)
XS	breccia clast; sediment (undiff)	XIV	breccia clast; intermediate volcanic
XSU	breccia clast; fine grained sediment (shale, slate, mudstone sitlstone etc…)	XM	breccia clast; mafic (undiff)
XSD	breccia clast; medium grained sediment (arkose, sandstone etc…)	XMV	breccia clast; mafic volcanic
XSC	breccia clast; coarse grained sediment	XDD	breccia clast; doleritic
XCB	breccia clast; carbonate / limestone	XDG	breccia clast; gabbroic
XC	breccia clast; chert / BIF	XDA	breccia clast; anorthositic
XF	breccia clast; felsic (undiff)	XDT	breccia clast; troctolitic
XFV	breccia clast; felsic volcanic	XU	breccia clast; ultramafic (undiff)
XGR	breccia clast; granitic	XPX	breccia clast; pyroxenitic
XDI	breccia clast; dioritic	XPD	breccia clast; peridotitic

ROCK TEXTURES (cont'd):

Sulphide Textural Terms Note: Use ORE MINERAL FIELDS to describe habits of important / ore minerals			
NT	net-textured sulphides	STR	stringer sulphides
NTR	reverse net-textured sulphide		

Structural Terms / Textures			
DH	downhole facing direction (younging direction)	FO	fold / folded (undifferentiated style)
UH	uphole facing direction (younging direction)	FM	fold: M-fold (looking up-hole)
CLV	cleavage	FS	fold: S-fold (looking up-hole): use ONLY in oriented drill co or if cleavage relationships can be determined
FOL	foliated (tightly spaced cleavage to weakly sheared)	FZ	fold: Z-fold (looking up-hole): use ONLY in oriented drill co or if cleavage relationships can be determined
SZ	strongly schistose	CRN	crenulated
MYL	mylonitic - strongly sheared	LIN	lineated (as in L- and L-S tectonites)
STY	stylolite / stylolitic		

MINERAL SPECIES:

Metal / Ore / Sulphide Minerals			
CU	Native copper	ILM	Ilmenite
AU	Native gold	LOE	Loellingite
AG	Native silver	MAL	Malachite
ELT	Electrum	MAR	Marcasite
PT	Platinum	ML	Millerite
PD	Palladium	MO	Molybdenite
ALL	Allanite	MNZ	Monazite
AN	Antinomy	NIC	Niccolite / Nickeline (NiAs)
AGT	Argentite	ORP	Orpiment
AS	Arsenopyrite	PN	Pentlandite
AZR	Azurite	PBL	Pitchblende
BI	Bismuthanite / Bismuth	PY	Pyrite
BO	Bornite	PO	Pyrrhotite
CAS	Cassiterite (tin)	SCH	Scheelite
CER	Cerussite (Pb Carbonate)	SP	Sphalerite
CH	Chalcocite	STB	Stibnite
CP	Chalcopyrite	SXX	Sulphide: unknown
CR	Chromite	S	Sulphur
CRY	Chrysocolla	TA	Tantalite
CNB	Cinnabar	TEL	Telluride (undifferentiated)
CBT	Cobaltite	TNN	Tennantite
CV	Covellite	TET	Tetrahedrite
CUB	Cubanite (Cu sulphide)	TBN	Torbenite (Cu-U Phosphate)
CUP	Cuprite	TRL	Troilite (FeS in meteroites)
DMD	Diamond	URN	Uranite
DSP	Diaspore (assoc with bauxite)	VIO	Violarite (Ni_2FeS_4)
ENR	Enargite	WO	Wolframite
GA	Galena	WLL	Willemite ($ZnSi0_2$)
GNT	Garnierite (Ni laterites)	WUR	Wurtzite
GDF	Gersdorffite (Ni(Pt)AsS)	ZIN	Zincite (ruby zinc)
GBB	Gibbsite (bauxite mineral)	ZRC	Zircon

Carbonate Minerals			
CB	Carbonate (undifferentiated)	DLM	Carbonate - Dolomite
ANK	Carbonate - Ankerite	MGN	Carbonate - Magnesite
CT	Carbonate - Calcite	SD	Carbonate - Siderite
ARG	Aragonite	RDC	Rhodocrosite (Mn-carbonate)
HZC	Hydrozincite	SMT	Smithsonite (Zn carbonate)

MINERAL SPECIES (cont'd):

Silicate Minerals

AXN	Axinite	ALB	Feldspar - Albite
BRL	Beryl	AMZ	Feldspar - Amazonite (Pb - bearing)
BST	Bustamite	ANO	Feldspar - Anorthite
FLR	Flourite	LAB	Feldspar - Labradorite
EPD	Epidote	MCR	Feldspar - Microcline
CLZ	Clinozoisite (epidote mineral)	OLG	Feldspar - Oligoclase
PDM	Piedmontite / Piemontite (red-brown epidote)	ORT	Feldspar - Orthoclase
SPN	Sphene / Titanite	PLG	Feldspar - Plagioclase
TPZ	Topaz	KFS	Feldspar - Potassium-feldspar (undiff)
TML	Tourmaline (undifferentiated)	SAN	Feldspar - Sanidine
AMP	Amphibole (undifferentiated)	FLD	Feldspar (undifferentiated)
ACT	Amphibole - Actinolite	PRX	Pyroxene (undifferentiated)
ANT	Amphibole - Anthophyllite	AUG	Pyroxene - Augite / Aegerine
CUM	Amphibole - Cummingtonite	BRZ	Pyroxene - Bronzite (opx)
GRN	Amphibole - Grunerite	CPX	Pyroxene - Clinopyroxene (undiff)
HMQ	Amphibole - Holmquistite (K-bearing)	DIO	Pyroxene - Diopside (cpx)
HBL	Amphibole - Hornblende	ENS	Pyroxene - Enstatite (opx)
TRM	Amphibole - Tremolite	HEN	Pyroxene - Hendenbergite (cpx: Fe-rich end member to Diopside)
ATG	Asbestos - Antigorite	HYP	Pyroxene - Hypersthene (opx)
ACR	Asbestos - Chrysotile	OMP	Pyroxene - Omphacite (cpx)
ASB	Asbestos (undifferentiated)	OPX	Pyroxene - Orthopyroxene (undiff)
QZ	Quartz (use for mesothermal grains)	SPO	Pyroxene - Spodumene (Li-bearing cpx)
QZS	Quartz: (sub)chalcedonic silica (amorphous) - common in epithermal veins	RHD	Rhodonite (pyroxenoid)
AMT	Quartz: Amethyst	OLV	Olivine (undifferentiated)
QZB	Quartz: blue quartz (BH type)	FAY	Olivine - Fayalite
QZM	Quartz: microcrystalline	FOR	Olivine - Forsterite
SI	Silica / Silicified (use for alteration instead of quartz)	ZEO	Zeolite (undifferentiated)
LAZ	Feldspathoid - Lazurite	LAU	Zeolite - Laumontite
LEU	Feldspathoid - Leucite	NAT	Zeolite - Natrolite
NPH	Feldspathoid - Nepheline	PRE	Zeolite - Prehnite
SOD	Feldspathoid - Sodalite	PUM	Zeolite - Pumpellyite
		SLB	Zeolite - Stilbite

Metamorphic Minerals

AND	Andalusite	GAR	Garnet (undifferentiated)
SLM	Sillimanite	ALM	Garnet - Almandine
KYA	Kyanite	ADR	Garnet - Andradite
COR	Cordierite	GGR	Garnet - Grossular
STR	Staurolite	PYP	Garnet - Pyrope
GHN	Gahnite (Zn-spinel)	SPS	Garnet - Spessertine / Spessarite
SCA	Scapolite (Ca-rich m'mic rocks / alt'n of plagioclase)	GLP	Glaucophane
SPL	Spinel	JAD	Jadeite (Hi-P pyroxene)
WLS	Wollastonite (Ca-pyroxenoid)	SPP	Sapphirine (Hi-P m'mic)
CRS	Cristobalite (Hi-T quartz)		

Epithermal / Porphyry Minerals

ADU	Adularia	KAO	Kaolinite
ALU	Alunite	MTM	Montmorillonite
DIK	Dickite	PYR	Pyrophyllite
ILT	Illite	SMC	Smectite
CLY	Clay (undifferentiated: illite / dickite / kaolinite / smectite……)		

Oxide Minerals

OX	Oxides (undifferentiated)	MGH	Maghemite
GOE	Goethite / Limonite	MNO	Manganese Oxide
HEM	Haematite	MKT	Mushketovite (magnetite psuedomorph on hematite)
SPC	Specularite / Specular Hematite	PRL	Pyrolusite (MnO2)
MT	Magnetite	RUT	Rutile / Leucoxene

MINERAL SPECIES (cont'd):

Phyllosilicate Minerals			
SER	Sericite / Phengite	GLC	Glauconite
MV	Muscovite	GPH	Graphite
BT	Biotite	LEP	Lepidolite
PHG	Phlogopite	PRG	Paragonite
BRU	Brucite (Mg(OH)2	PRV	Perovskite
CHL	Chlorite	SRP	Serpentine
TLC	Talc	STC	Stichtite (Mg-Cr muscovite, bright purple in serpentinite)
FU	Fuchsite (Cr muscovite)	STL	Stilpnomelane

Sulphate / Phosphate / Other Minerals			
ANH	Anhydrite	GYP	Gypsum
APA	Apatite	HAL	Halite / Salt
BAR	Barite	JAR	Jarosite
CRN	Corundum	SUL	Sulphates (undifferentiated)

VEINS & STRUCTURE:

Vein Type Codes			
BL	Bladed (epithermal veins)	PT	Ptygmatic veins
BN	Banded (eg: by mineral composition)	SH	Sheeted (numerous thin veins with similar orientation)
BX	Hydrothermal breccia	ST	Stringer veins
CB	Comb-textured ("sparry / dog-tooth")	SW	Stock-work (numerous veins with 2-3 dominant orientations)
CD	Chalcedonic	SY	Stylolitic veins
CF	Colloform (eg: fine rhythmic banding in epthermal veins)	TG	Tension gashes / en-echelon veins
LA	Laminated veins	VL	Veinlets - very thin, minor veins
MA	Massive vein (ie: massive quartz vein)	VU	Vughhy / drusy (open space)
PG	Pegmatitic / Pegmatite (granitic "veins")		

Degree of Shearing

% Breaks	Definition
0	**Unfoliated and undeformed rock**
10	**Very weak or incipient foliation;** no associated mineral growth or recrystallisation (may be mistaken for flow banding) stylolites, spaced cleavages
20	**Weak foliation;** continuous or slatey cleavages and other primary flattening deformation involving mineral alignment
30	**Moderate foliation;** poorly developed metamorphic segregation
40	**Strong foliation;** development of segregation banding. Micaceous minerals dominant to sub-dominant; pervasive foliation, original rock type discernible
50	**Schistocity;** moderate to strong segregation banding; some primary structures preserved; most textures destroyed in volcanic rocks preserved in sediments and phaneritic rocks
60	**Schistocity;** strong mineral segregation into compositional laminae
70	**Schistocity;** strong foliation with slickensiding and mineral growth on s-surfaces, broken rock.
>80	**Mylonite / cataclastite**

VEINS & STRUCTURE (cont'd):

Structure Types Max of 1 descriptor per feature / structure measured.			
S0	Bedding / Geological Contact	L	Lineation: undifferentiated
S1	1st Fabric / Cleavage (if structural relationships known accurately)	LM	Mineral lineation
S2	2nd Fabric / Cleavage (if structural relationships known accurately)	L1	Lineation related to 1st fabric / cleavage
S3	3rd Fabric / Cleavage (if structural relationships known accurately)	L2	Lineation related to 2nd fabric / cleavage
S4	4th Fabric / Cleavage (if structural relationships known accurately)	L3	Lineation related to 3rd fabric / cleavage
SA	Fabric / Cleavage - Axial Plane to fold (if structural relationships not accurately known)	L4	Lineation related to 4th fabric / cleavage
SE	Early Fabric / Cleavage - based on observed relationships/timing (if structural relationships not accuratel known)	FA	Fold axis / fold hinge: undifferentiated
SL	Late Fabric / Cleavage - based on observed relationships/timing (if structural relationships not accuratel known)	F1	Fold axis: 1st deformation event
SZ	Shear	F2	Fold axis: 2nd deformation event
SZDS	Shear with dip-slip movement sense (unable to determine if Reverse or Normal Shear)	F3	Fold axis: 3rd deformation event
SZDX	Shear with dextral movement sense (as determined by kinematic indicators)	F4	Fold axis: 4th deformation event
SZNM	**Normal Shear** (as determined by kinematic indicators)	FL	Foliation (default fabric/foliation if structural relationships ar not known)
SZRV	**Reverse Shear** (as determined by kinematic indicators)	FT	Fault (undifferentiated)
SZSS	Shear with strike-slip movement sense (unable to determine if Sinistral of Dextral movement)	FTDS	Fault with dip-slip movement sense (unable to determine if Reverse or Normal Fault)
SZSX	Shear with sinistral movement sense (as determined by kinematic indicators)	FTDX	Fault with **dextral** movement sense (as determined by kinematic indicators)
BD	Banding - in metamorphic rocks: ***NOT*** bedding	FTNM	**Normal Fault** (as determined by kinematic indicators)
BX	Breccia	FTRV	**Reverse Fault** (as determined by kinematic indicators)
IC	Geological Contact - Intrusive	FTSS	Fault with strike-slip movement sense (unable to determine if Sinistral of Dextral movement)
JN	Joint	FTSX	Fault with **sinistral** movement sense (as determined by kinematic indicators)
VN	Vein - undifferentiated (put composition in Vein Type & Vei Minerals columns)		

ALTERATION:

Breaks (%)	Alteration Intensity Guidelines: Definition
0	No alteration
10	Weak alteration
30	Moderate alteration
50	Strong alteration, replacement of mineralogy, fabric preserved
80	Intense alteration, near-total replacement of original fabric and mineralogy

ALTERATION (cont'd):

Nature / character / setting of ALTERATION (not composition)

Fracture / plumbing network that allows fluid access to the rock-mass

Maximum of 1 descriptor to be used. Use dominant/main descriptor.

prefix U:

UNDIFFERENTIATED / UNIDENTIFIED plumbing - ONLY for use when unable to confidently identify plumbing system for the alteration (eg: in large-scale High-sulphidation epithermal systems)

UP	**Pervasive** overprint without shearing	UC	Preferential replacement of **clast** in fragmental / clastic rock.
UI	**Irregular** or patchy alteration	UB	Preferential replacement of **bedding** in fragmental / clastic rock.
UX	Preferential replacement of **matrix** in fragmental / clastic rock.	UM	Preferential replacement of **specific mineral species** within rock-mass (distinct from pervasive alteration)

prefix S:

SHEARING / FOLIAITON acting as plumbing / pathway for alteration fluids (eg: in orogenic deposits)

SP	**Pervasive** within zone of shearing	SC	Preferential replacement of **clast** in fragmental / clastic rock - *ONLY* if still identifiable as clasts (eg: relict pebbles or cobbles are recognisable)
SI	**Irregular** or patchy alteration within shear	SB	Preferential replacement of **bedding** in fragmental / clastic rock - *ONLY* if bedding is preserved and recognisable
SX	Preferential replacement of **matrix** in fragmental / clastic rock - *ONLY* if still identifiable as matrix (eg: relict pebbles or cobbles are recognisable)	SM	Preferential replacement of **specific mineral species** within rock-mass (distinct from pervasive alteration)

prefix V:

Selvedge to VEIN / VEIN-SET that is the likely feature that acted as plumbing / pathway for alteration fluids

VP	**Pervasive** alteration centred on the vein / vein-set	VC	Preferential replacement of **clast** in fragmental / clastic rock
VI	**Irregular** or patchy alteration adjacent to the vein / vein-set	VB	Preferential replacement of **bedding** in fragmental / clastic rock - can produce the classic "telegraph" or "chirstmas-tree" alteration patterns at the local and/or deposit scale
VX	Preferential replacement of **matrix** in fragmental / clastic rock	VM	Preferential replacement of **specific mineral species** within rock-mass (distinct from pervasive alteration)

prefix W:

Alteration assoicated with a STOCKWORK set of veins that is the likely feature that acted as plumbing / pathway for alteration fluids

WP	**Pervasive** alteration centred on the vein stockwork	WC	Preferential replacement of **clast** in fragmental / clastic rock
WI	**Irregular** or patchy alteration adjacent to the vein stockwork	WB	Preferential replacement of **bedding** in fragmental / clastic rock
WX	Preferential replacement of **matrix** in fragmental / clastic rock	WM	Preferential replacement of **specific mineral species** within rock-mass (distinct from pervasive alteration)

prefix X:

HYDROTHERMAL BRECCIAS

X	Alteration associated hydrothermal / vein breccias (for alteration intensity >30% only) *NOTE* - different ambient conditions related to brecciation (eg: P & T) can produce modified alteration products from the same ore fluid

ORE MINERAL HABITS:

Ore Mineral Habits			
AC	Acicular	IC	Intercumulus
AG	Mineral aggregates	IN	Inclusions
AM	Amorphous	IT	Insterstitial
BC	Breccia clast	IR	Irregular
BD	Bedded (distinct from replacement of bedding)	MA	Massive
BL	Blebby	NT	Net-textured
BM	Breccia matrix	PK	Poikolitic
BN	Banded (distinct from replacement of bedding)	PV	Pervasive
BO	Botryoidal / mammillated	RA	Radiating
BX	Brecciated	RB	Preferential replacement of bedding (sediment / volcaniclastic)
CF	Colloform	RC	Preferential replacement of clasts (sediment / volcaniclastic)
CO	Concretion(s)	RM	Preferential mineral replacement
CV	Cleavage plane / foliation (along / aligned)	RN	Reverse net-textured
DN	Dendritic	RX	Preferential replacement of matirx (sediment / volcaniclastic)
DS	Disseminated	SM	Semi-massive
FB	Framboydal	ST	Stringer
FL	Flame-textured	TL	Telegraph
HD	Heavy disseminated	VN	Internal to vein
HY	Hydrothermal breccia infill (part of)	VS	Vein selvedge

REGOLITH & WEATHERING:

Regolith & Weathering Guidelines

Code	Description
TPD	**Transported or superficial deposits:** Material that has undergone significant transportation from source (eg: loess, gravels or colluvium). *NOT* scree.
SOIL	**Residual soil:** Dervided from basement / bedrock material
LAT	**Lateritic residuum:** Duricrust and lateritic gravels; complete replacement of primary and secondary fabric (rare in China) *NOTE:* Silcrete and ferricretes are often transported and not residual landform features.
USAP	**Upper saprolite:** Lack of primary rock fabric; clay dominated; leached or secondary cemented.
REDOX	**Redox front:** Strong Fe-rich zone between upper and lower saprolite denoting base of leaching of upper saprolite. Usually strongly goethitic (yellow) if acidic or occasionally hematitic (red) if alkaline. Generally <5m thick. *Not always present / identifiable*
LSAP	**Lower saprolite:** Clay mineral dominated; <70% secondary oxides; primary fabric preserved; sulphides absent or replaced; may preserve rock colour.
SAPRK	**Saprock:** <20% secondary oxides; fine detail in fabric preserved; sulphides weathered; preserved felsic minerals
FRESH	**Fresh rock:** Fresh sulphides and silicates.

PERCENTAGE RANGES:

To be used for: Mineral%, Shearing, Alteration Intensity, Vein%, Ore Mineral% & Sample Recovery

0, 0.5 (trace), 1, 2, 3, 5, 7, 10 (only 5% increments after 10%), 15, 20, 25, 30, 35……..85, 90, 95, 100

GEOTECHNICAL LOGGING CODES:

ROCK STRENGTH

Code	DEFINITION & DESCRIPTION
VW	**VERY WEAK:** Crumbles, can scratch with finger-nail, cut & peel with knife (eg: Clay)
W	**WEAK:** Can scratch with iron nail, can cut but not peel with knife (eg: Gypsum)
M	**MEDIUM:** Scratch with nail with difficulty, scratch with knife hammer 2-3 mm dent multiple blows to break
S	**STRONG:** Difficult to scratch with a knife, hammer makes small dent (>1-2 mm), multiple blows to break
VS	**VERY STRONG:** Hammer causes superficial damage (eg: Silicified rhyolite & BIF)

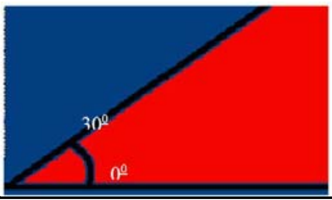
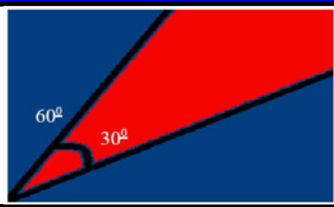
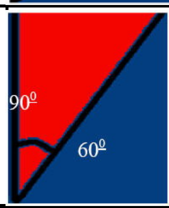
NUMBER OF FRACTURE SETS (NFS)

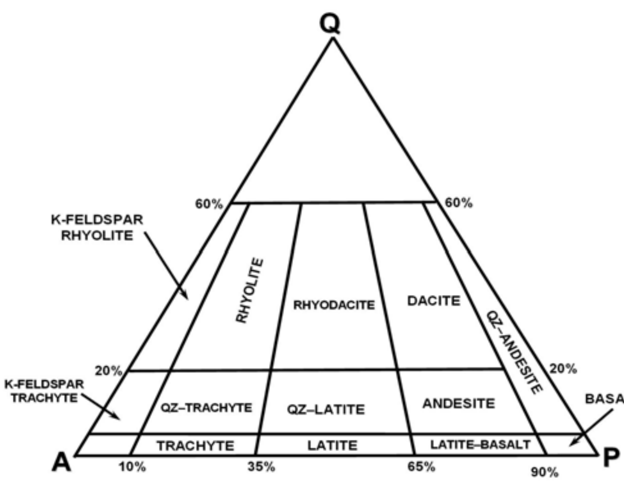
Any whole number equal or greater than 0 (no decimals).

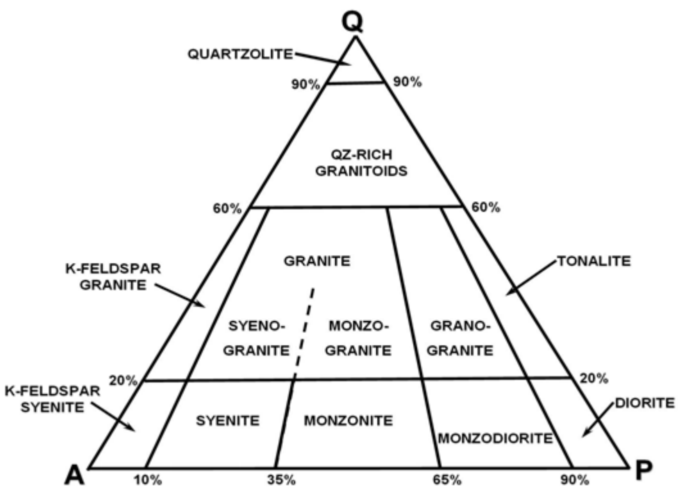
FRACTURE ROUGHNESS

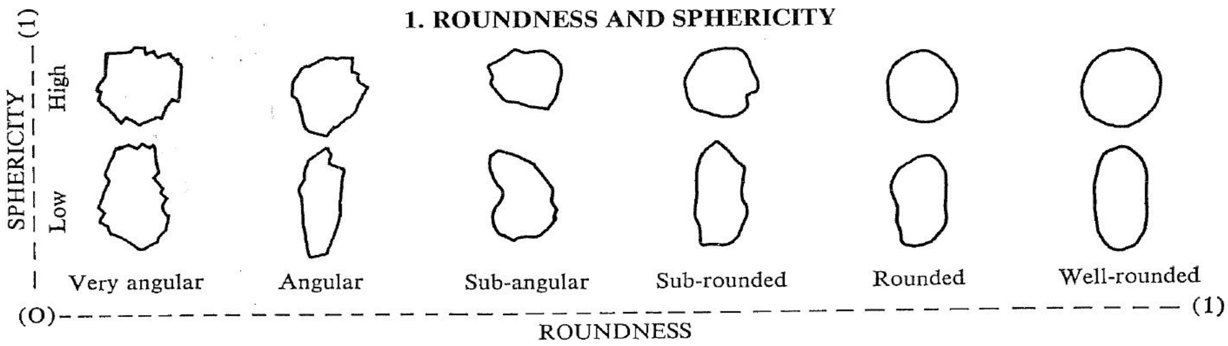
-	No Fractures		
PR	Planar rough	PP	Planar polished
PS	Planar smooth	PK	Planar slickensided
SR	Stepped rough	SP	Stepped polished
SS	Stepped smooth	SK	Stepped slickensided
UR	Undulating rough	UP	Undulating polished
US	Undulating smooth	UK	Undulating slickensided

FRACTURE ANGLE TYPE CATEGORIES

Type 1 (0^o to 30^o)		**Type 2 (30^o to 60^o)**	
Core Axis		**Type 3 (60^o to 90^o)**	



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SPHERICITY
High
Low
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Sub-rounded
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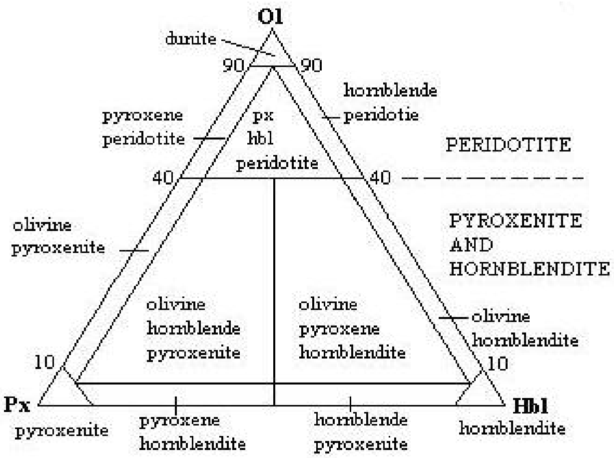
ROUNDNESS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AND
HORNBLENDITE
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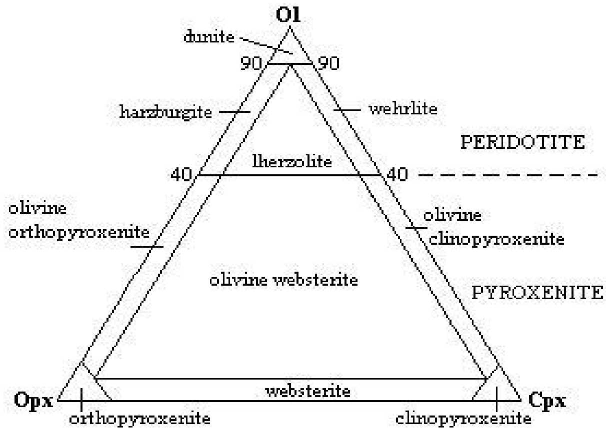
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Cpx
orthopyroxenite
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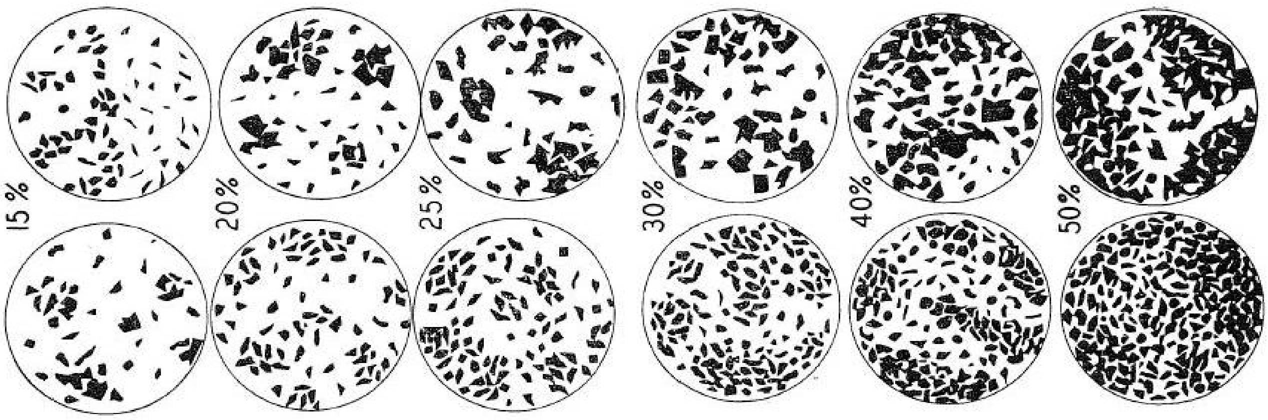
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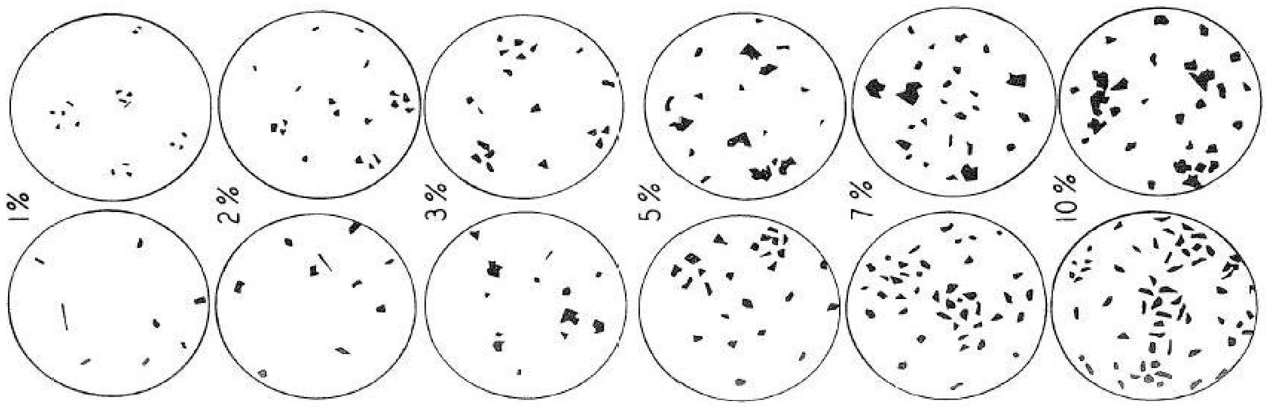
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APPENDIX VIII

PETROLOGY REPORT ON 35 SAMPLES FROM THE 2009 RC DRILLING AT VESPER.

Petrographic Report of 35 Polished Thin-Sections

Lynd Project

by

Anthony L. Ahmat

Distribution List

Paul Polito
Anglo American Exploration (Aust) Pty Ltd

19 February 2010

General Comments

The polished thin-sections were examined in numerical sequence and with the advent of time and the collection of more information, ideas evolved and changed. These changes will be self-evident in the petrographic descriptions. For example, initially it was not clear what the altered ferromagnesian phenocrysts were. They could have been pyroxenes, amphiboles, olivine or biotite. Subsequently it became clear that probably the only ferromagnesian mineral present in the porphyritic rocks is hornblende. Also, clasts of feldspar and quartz in these porphyritic were initially interpreted to be phenocrysts, but subsequently they were seen to be xenocrystic material derived from the disaggregation of granitoids.

Furthermore, initially it was assumed that all of the porphyritic rocks were extrusives (e.g. andesite), however, much later it became clear they were all intrusives.

Initially the porphyritic rocks were considered to be andesitic, or intermediate, in composition, but because the exact mineralogy of the groundmass is not known, the porphyritic rocks are just referred to as *dacitic-andesitic* in composition. Intuitively, it is felt that the groundmass of these rocks is quite rich in alkali feldspar, possibly even feldspathoid-bearing, so the rocks may be better described as being trachytic-trachyandesitic in composition.

Discussion/Conclusions

Kimberlite or lamproite was not recognised in the rock chips examined. However, the absence of such rocks does not necessarily preclude their existence because it is probably worth noting that such rocks can be highly weathered and friable and therefore may not be represented in the chips that were sampled. One chip in VSAC 26 9-11 contains a large pseudomorph (see Figs 66-67) which could be after olivine. If it was olivine, it may be significant in implying that olivine-bearing rocks were once present.

The main rock type represented by the rock chips is a hornblende lamprophyre of intermediate composition. Subordinate rocks that are present include granitoids, gneisses, cataclastic quartzo-feldspathic rocks, intrusive breccias and amphibolites. Many of the rocks are highly altered and veined by alkali feldspar, ?zeolites and carbonate.

My *simplistic* interpretation of the geology from the examination of the polished thin-sections is an area of granitoids and gneisses that experienced brittle (to ?ductile) deformation/fracturing prior to the intrusion of the lamprophyric magma. Fragments of granitoid and gneiss were incorporated into the magma and variably disaggregated, leading to the production of xenocrysts of feldspar, quartz and biotite. The rounding of some of the xenocrysts may have resulted from gas-streaming, resorption or physical abrasion.

Locally (e.g. VSAC 15 49-55), well-crystallised amphibolite was/is present in the area, probably as country-rock.

The diamond potential of the area based on the rock chips that have been examined is reduced by the lack of evidence for kimberlite, lamproite or ultramafic lamprophyre. However, the mere presence of lamprophyre is significant. Diamonds have been linked to minettes in some parts of the World.

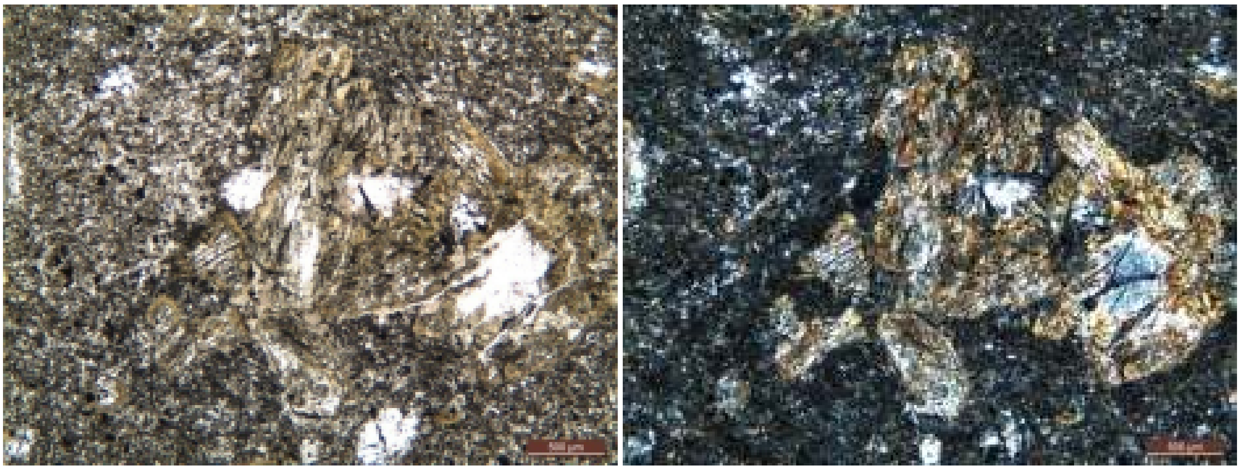
Petrographic List of Rock Types

VSAC 02 16-17	Altered porphyritic (trachy) andesite/intermediate lamprophyre
VSAC 02 17-18	Altered dacitic-andesitic lamprophyre + moderately deformed and recrystallised granodiorite-tonalite
VSAC 02 21-22	Recrystallised mylonitised granitoids
VSAC 02 36-37	Altered dacitic-andesitic hornblende lamprophyre + variably deformed and recrystallised granitic rocks
VSAC 11 10-12	Dacitic-andesitic hornblende lamprophyre + mixed lamprophyre-granitoid rocks + flaser granitoid
VSAC 11 12-14	Variably altered dacitic-andesitic hornblende lamprophyre; with minor xenocrysts and xenoliths of granitoid origin
VSAC 12 25-27	Variably altered dacitic-andesitic hornblende lamprophyre (with trace granitic material)
VSAC 12 28-30	Variably altered dacitic-andesitic hornblende lamprophyre + variably deformed and recrystallised granitoids + rare mafic amphibolites-granulite
VSAC 12 30-32	Dacitic-andesitic hornblende lamprophyre
VSAC 12 33-34	Dacitic-andesitic hornblende lamprophyre
VSAC 12 34-36	Dacitic-andesitic hornblende lamprophyre + variably deformed & recrystallised granitoid + late-stage alkali feldspar
VSAC 15 49-55	Fine- to medium-grained amphibolites + quartzo-feldspathic gneiss
VSAC 16 47-49	Biotite-bearing quartzo-feldspathic schist, deformed and recrystallised granitoid and granitic gneissic schists
VSAC 18 6-10	Coarsely devitrified, dacitic-andesitic hornblende lamprophyre
VSAC 18 21-22	Coarsely devitrified, dacitic-andesitic hornblende lamprophyre + highly altered, deformed and partially recrystallised biotite granitoid
VSAC 18 28-29	Devitrified dacitic-andesitic hornblende lamprophyre
VSAC 18 COMP 1	Coarsely devitrified dacitic-andesitic hornblende lamprophyre; strongly veined
VSAC 18 COMP 2	Coarsely devitrified dacitic-andesitic hornblende lamprophyre
VSAC 20 32-34	Dacitic-andesitic hornblende lamprophyre + hornblende (and biotite) monzonite-diorite
VSAC 20 37-39	Dacitic-andesitic hornblende lamprophyre
VSAC 21 18-19	Altered, devitrified, dacitic-andesitic hornblende lamprophyre
VSAC 26 9-11	Variably altered dacitic-andesitic hornblende lamprophyre + metamorphosed hornblende- and biotite-bearing granitoid
VSAC 26 15-17	Variably altered and devitrified hornblende lamprophyre
VSAC 32 66-67	Cataclasites, fault breccias and ?tuffs/volcaniclastics
VSAC 33 23-24	Highly altered cataclasites/intrusive breccias/?volcaniclastics
VSAC 34 47-48	Highly altered cataclasites/ fault breccia/ intrusive breccias in granitoids
VSAC 35 39-41	Variably altered dacitic-andesitic hornblende lamprophyre
VSAC 36 7-8	Weakly altered dacitic-andesitic hornblende lamprophyre
VSAC 36 27-28	Moderately altered, deformed and recrystallised hornblende- and biotite-bearing granitoids (some quartzitic)
VSAC 40 37-38	Highly altered fault and intrusive breccias derived from hornblende- and biotite-bearing granitoids
VSAC 41 11-12	Dacitic-andesitic hornblende lamprophyre
VSAC 41 18-19	Variably altered dacitic-andesitic hornblende lamprophyre
VSAC 41 19-20	Dacitic-andesitic hornblende lamprophyre
VSAC 43 12-13	Variably altered dacitic-andesitic hornblende lamprophyre (intrusive into biotite granitoid)
VSAC 43 25-26	Variably altered dacitic-andesitic hornblende lamprophyre (intrusive into biotite granitoid)

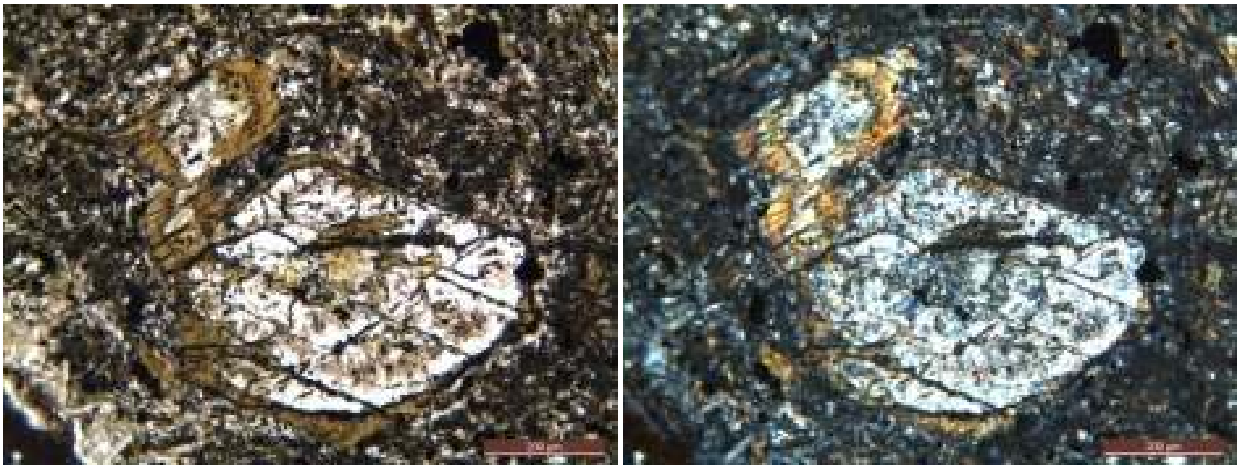
VSAC 02 16-17

Petrographic name: Altered porphyritic andesite/intermediate lamprophyre

The polished thin-section consists of seven rock chips comprising variants of the same, or similar, rock type, namely a highly altered, moderately porphyritic andesite or intermediate lamprophyre. Phenocrysts range up to 2 mm in length or diameter, in places occurring in clusters (Figs. 1 and 2), and making up 3-8 % of the chips. They appear to have been pyroxene*, amphibole (Fig. 3 and 4), biotite and feldspar. Euhedral forms are well-preserved but the original minerals are completely pseudomorphed by greenish brown and colourless phyllosilicates, the colourless type commonly being microcrystalline or cryptocrystalline. Many of the former phenocrysts have a zonal alteration pattern (Figs 1-4), with the greenish brown phyllosilicates forming a euhedral mantle, or rim, around the colourless phyllosilicate.



Figures 1 and 2. *Plane polarised light (PPL) and crossed-polaroid (XP) views of an altered ferromagnesian phenocryst cluster set in a very fine-grained felsitic groundmass. Note euhedral form of the phenocrysts and the two main alteration products. Scale bar = 0.5 mm.*



Figures 3 and 4. PPL and XP views. *Relict amphibole cleavage in phenocryst pseudomorphed by greenish brown and colourless phyllosilicates. Scale bar = 0.2 mm.*

The phenocrysts are set in a very fine-grained felted to trachytic groundmass of feldspars (possibly comprising plagioclase, highly saussuritised, and alkali feldspar, commonly recrystallised into cryptocrystalline material), altered ferromagnesians (many elongate crystals of amphibole and/or

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* Evidence acquired subsequently suggests that the altered ferromagnesian phenocrysts were all, or predominantly, hornblende.

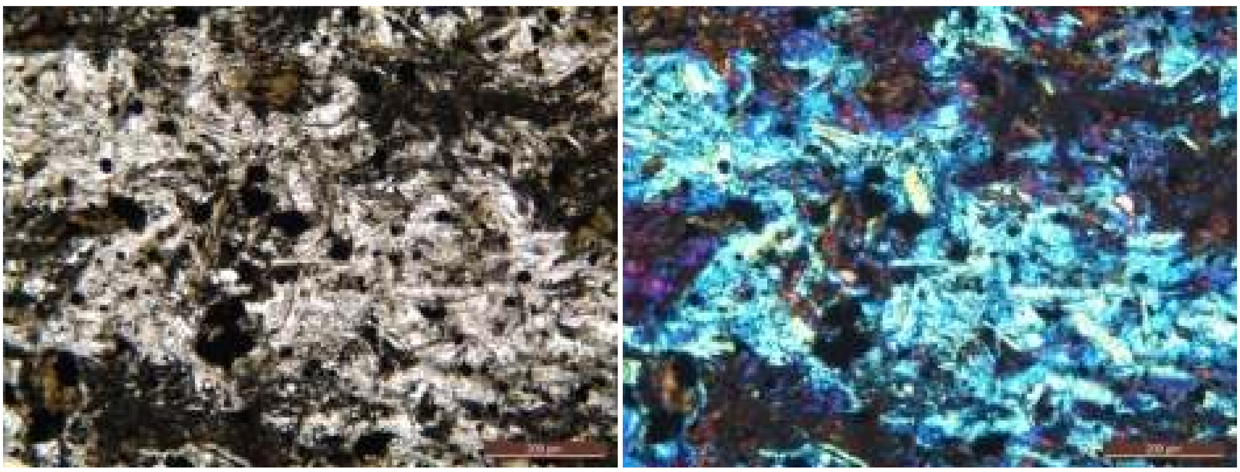
biotite), Fe-Ti oxides (3-5 %), quartz and apatite. In general, the very fine-grained nature of the groundmass in combination with the high degree of alteration, obscure much of the rock's original mineralogy.

The trachytic texture in the groundmass may vary from place to place, creating sub-domains, which give some of the rock chips a mild mottled texture (Figs 5 and 6).

Figures 5 and 6. PPL and XP views. *Sub-domain of trachytic textured groundmass. Polycrystalline aggregate of quartz (lower right) represents part of a granitoid-derived xenolith. Scale bar = 0.5 mm.*

Alteration in the rock also includes veining by alkali feldspar, ?zeolites, quartz and carbonate. In places these minerals may form pods or lenses. Some carbonate replaces former mafic phenocrysts. A 4 mm diameter aggregate of medium-grained quartz, now variably recrystallised, may represent a granitoid inclusion (xenolith) (Fig. 6).

A late-stage crystallisation feature of the rock is the porphyroblastic development of secondary alkali feldspar in the groundmass, extending over areas of 1-2 mm diameter (Figs 7 and 8; see also Fig. 6). In many places former feldspar micro-laths and/or microlites appear to be replaced by the "new" alkali feldspar as there is optical continuity between the two phases. The texture is interpreted, by me, to be a possible devitrification phenomenon that has become all pervasive.



Figures 7 and 8. PPL and XP (with gypsum plate inserted) views. *Optically continuous alkali feldspar forming an extensive base to the microlites of feldspar and altered ?amphibole and equant crystals of Fe-Ti oxides. Scale bar = 0.2 mm.*

The rock may have a significant alkali feldspar content which would make the rock a trachyandesite. As it is difficult to determine, petrographically, the exact amount of alkali feldspar that is present, a geochemical analysis of the rock is probably required to solve this issue. However, because of the widespread introduction (i.e. metasomatism) of late-stage alkali feldspar (and possibly zeolites) a geochemical analysis might not truly reflect the rock's original (primary) composition.

VSAC 02 17-18

Petrographic name: Altered dacitic-andesitic lamprophyre + moderately deformed and recrystallised granodiorite-tonalite

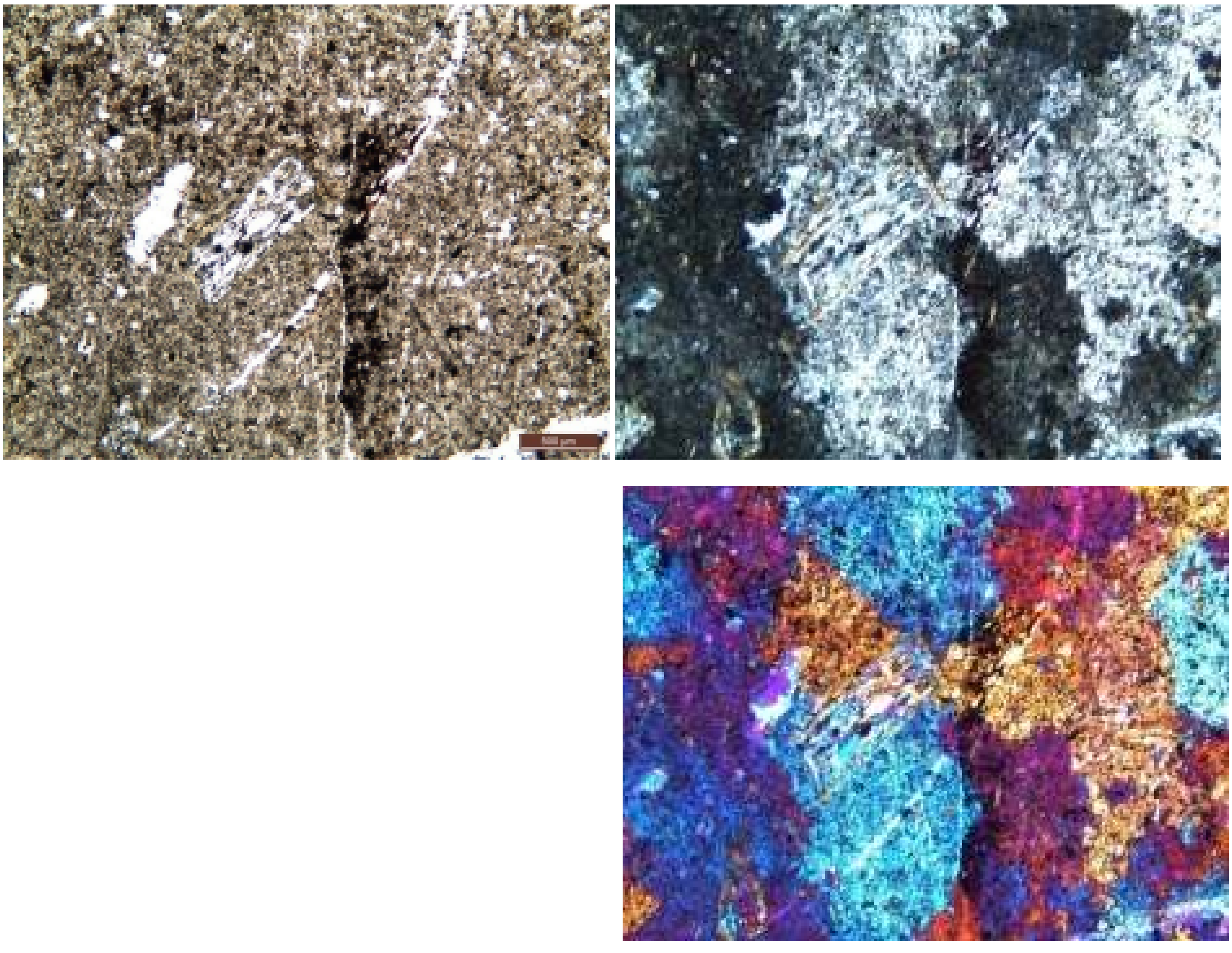
The polished thin-section of 8 rock chips comprising highly altered varieties of:

a) Porphyritic dacite-andesite (i.e. lamprophyre) (3)
b) Devitrified/recrystallised porphyritic dacite-andesite (i.e. lamprophyre) (1)
c) Porphyritic andesite (i.e. lamprophyre) (1)
d) Granitoids (3)

Porphyritic dacite-andesite: Characterised by altered, euhedral phenocrysts of feldspar (probably both plagioclase and alkali feldspar) and ferromagnesians (amphibole, pyroxene and possibly biotite) set in a very fine-grained felsic groundmass, which in many places has recrystallised/devitrified into broad optically continuous areas (up to 3 mm in diameter).

The rock is cut by numerous veins of alkali feldspar and is variously haematitised (Fe-stained), saussuritised/kaolinised and silicified/feldspathitised (microcrystalline-cryptocrystalline material).

Devitrified/recrystallised porphyritic dacite-andesite: This rock is very unusual in having a medium-grained, anhedral granular (allotriomorphic) texture superimposed on a porphyritic texture (Figs 9-11). In all other aspects, it is similar to the porphyritic dacite-andesite described above.



Figures 9-11. PPL, XP and XP (with gypsum plate) views of the same area. *Secondary anhedral granular texture superimposed on a primary porphyritic texture. Note the altered amphibole phenocryst and very fine-grained groundmass portrayed in Fig 9. Scale bar = 0.5 mm.*

It is interpreted that the groundmass has devitrified/recrystallised into a pseudo holocrystalline plutonic-looking rock.

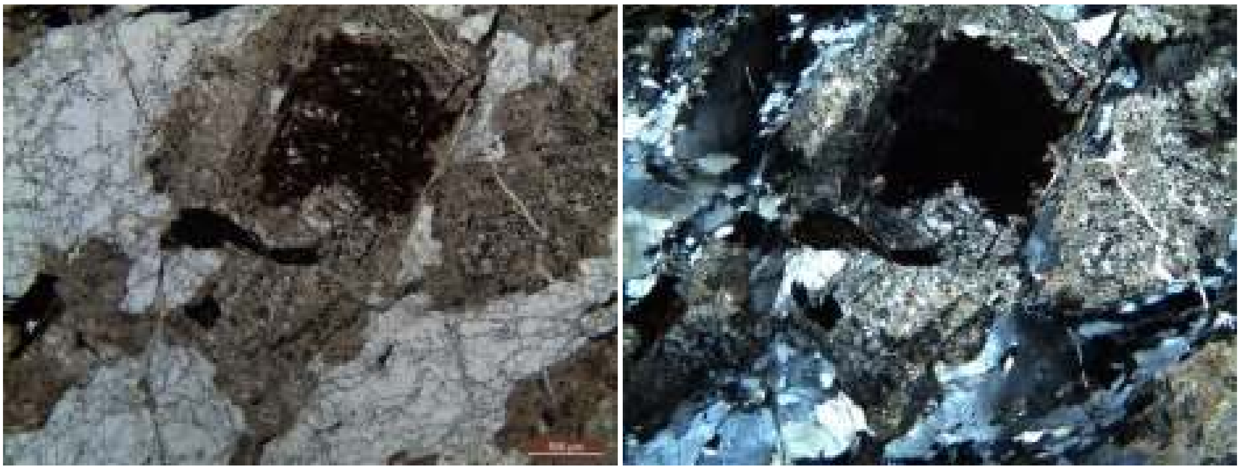
As typical, the rock is highly veined by alkali feldspar.

Porphyritic andesite: Possibility of former olivine phenocrysts having been present (Fig. 11).

Figure 12. XP. *Possible phenocrysts of altered olivine. Scale bar = 0.5 mm.*

Granitoids: Highly deformed, partly recrystallised (blastomylonitic) granodioritic-tonalitic rocks with accessory biotite (chloritised and oxidised), Fe-Ti oxides, sphene (titanate) and epidote (Figs 12-13). Plagioclase is typically mildly haematitised (strong in places) and saussuritised. Originally, the rocks had medium- to coarse-grained subhedral granular textures.

The granitoids are variably veined in a stock-work pattern by alkali feldspar and, in places, by carbonate. One granitoid chip is intruded by porphyritic andesite.

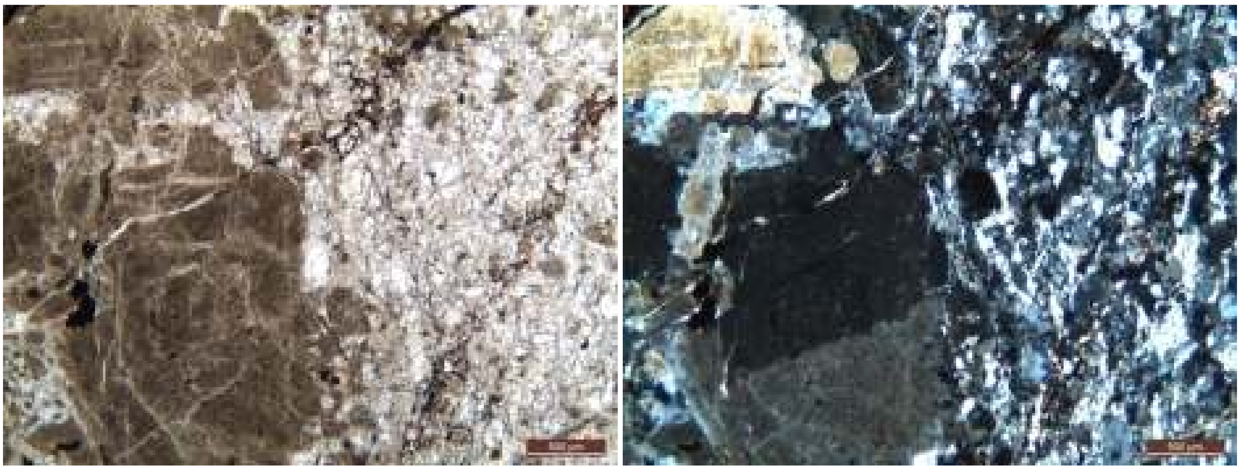


Figures 13 & 14. PPL and XP. *Partially altered, deformed and recrystallised granitoid. Feldspar (plagioclase) is variably kaolinised/saussuritised and haematitised, biotite is highly oxidised and quartz is deformed and recrystallised. Scale bar = 0.5 mm.*

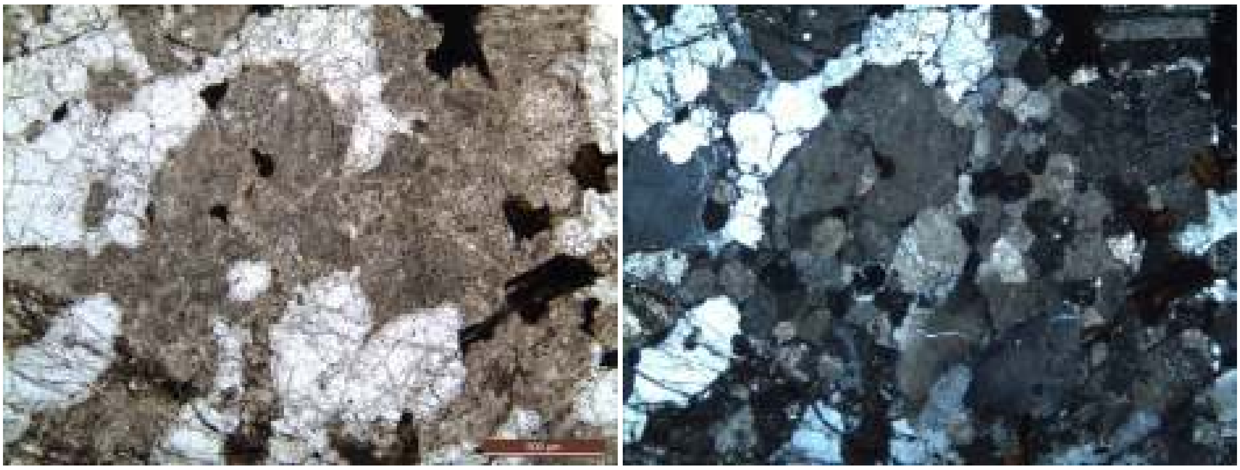
VSAC 02 21-22

Petrographic name: Recrystallised mylonitised granitoids

The polished thin-section consists of six chips that represent various types of granitoids, ranging from fine- to coarse-grained syenogranite to tonalite, which are variably deformed and recrystallised. Three of the chips are dominated by partially recrystallised mylonite (blastomylonite) zones (Figs 15-16), and two other chips have fine- to medium-grained granoblastic (metamorphic) textures (Figs 17-18), indicating major recovery from the mylonite stage.



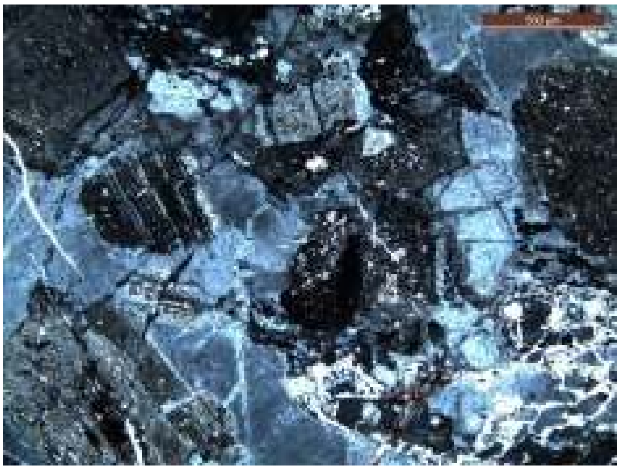
Figures 15 & 16. PPL and XP views. *Contact between granitoid and partially recrystallised mylonite. Scale bar = 0.5 mm.*



Figures 17 & 18. PPL and XP views. *Granoblastic polygonal texture developed in recrystallised feldspar. Scale bar = 0.5 mm.*

Plagioclase is typically murky/clouded (e.g. Figs 15, 17-19), partly very finely saussuritised, rarely partly sericitised. Alkali feldspar occurs as coarse-grained porphyritic crystals enclosing plagioclase in several of the chips (Fig. 20). Alkali feldspar also commonly occurs as a secondary product in stringer veins in quartz. In places, the secondary alkali feldspar appears to be replacing quartz (Figs 20).

Accessory minerals include biotite (mostly altered/chloritised), Fe-Ti oxides, sphene (titanate) and apatite. Carbonate is present in several of the chips (up to ~5 %), occurring as interstitial and poikiloblastic material.



Figures 19 & 20. PPL and XP views. *Porphyritic alkali feldspar enclosing plagioclase (lower left quadrant) and secondary alkali feldspar occurring in quartz (lower right quadrant). Scale bar = 0.5 mm.*

VSAC 02 36-37

Petrographic name: Altered dacitic-andesitic hornblende lamprophyre + variably deformed and recrystallised granitic rocks

The polished thin-section consists of ~100 small chips (average size ~3 mm; range = 1-12 mm) comprising sub-equal amounts of dacitic-andesitic and granitic material.

The dacitic-andesitic material is slightly more prevalent than the granitic material and includes both porphyritic and non-porphyritic varieties, although the presence of non-porphyritic chips might be just a reflection of the small size of the chips. Where porphyritic, the principal phenocryst mineral is hornblende (brownish green, olive green). However, the identity of many former phenocrysts is not clear as they are commonly replaced by greenish brown phyllosilicates ± chlorite ± carbonate.

The groundmass of the dacitic-andesitic rocks is typically felsitic, ranging from felted to trachytic. The exact identity of the feldspar laths is not known and there is no evidence to indicate that it is plagioclase. Chlorite and greenish phyllosilicates, which replace former ferromagnesian minerals (e.g. microlites of ?pyroxene, amphibole and ?biotite), make up 3-10 % of the groundmass. Fe-Ti oxides typically comprise 3-4 % of the groundmass. Apatite is an accessory phase. As seen in previous thin-sections, the feldspars in the groundmass commonly show optical continuity over wide areas.

Many of the dacitic-andesitic chips are cut by late-stage alkali feldspar and carbonate veins. In places the alkali feldspar occurs in aggregates made up of subhedral to euhedral, fine- to medium-grained crystals.

The granitic chips show the exact range of rock types seen in VSAC 02 17-18 and VSAC 02 21-22, namely, weakly altered and deformed to highly altered and deformed (i.e. mylonitised) biotite monzogranite-tonalite. Some granitoid chips are variably replaced by carbonate.

VSAC 11 10-12

Petrographic name: Dacitic-andesitic hornblende lamprophyre + mixed lamprophyre-granitoid rocks + flaser granitoid

The polished thin-section consists of eight (8) chips:

Porphyritic (hornblende) dacite/andesite (or lamprophyre)	(4)
Mixed granitic and dacite/andesite material	(2)
Deformed (flaser) granitoid	(1)
Hybrid ("contaminated") dacite/andesite	(1)

The dacitic-andesitic hornblende lamprophyre contains relict green to brownish green hornblende (up to 5 % volume and up to 3 mm in size) as the main phenocrystic phase. The crystals are commonly euhedral. As is characteristic, the lamprophyre is cut by, and contains pods of, late-stage alkali feldspar.

One chip comprises a highly deformed (flaser structure), altered and partly recrystallised granitoid. Many of the crystals are in advanced stages of disaggregation.

Two chips represent mixtures of (a) deformed granitoid and (b) dacitic-andesitic lamprophyre (Figs 21-22). The lamprophyre is strongly contaminated with crystals and aggregates of feldspar, quartz and biotite, producing a pseudo "clast-support" fabric.

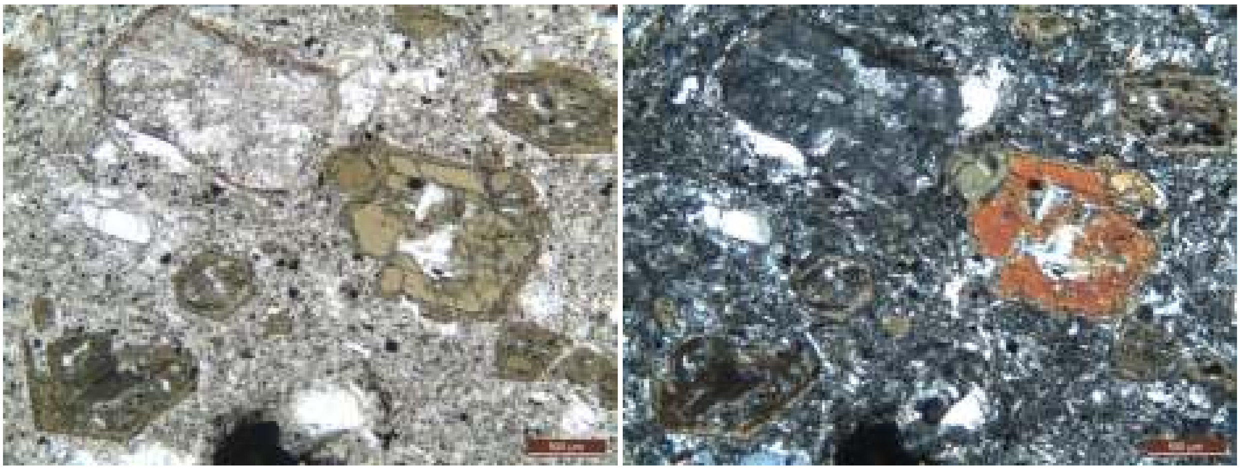
One chip represents dacitic-andesitic lamprophyre that is highly contaminated with granitic material. The rock is dominated by crystals and aggregates of feldspar and quartz.

Figures 21 & 22. PPL and XP views. *Contact zone between biotite-bearing granitoid (lower portion) and "contaminated" dacitic-andesitic lamprophyre (upper portion). Note clasts of granitic material (far left) and xenocrysts of feldspar (clouded material), quartz and biotite (top of field of view) in the dacitic-andesitic lamprophyre. Scale bar = 0.5 mm.*

VSAC 11 12-14

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre; with minor xenocrysts and xenoliths of granitoid origin

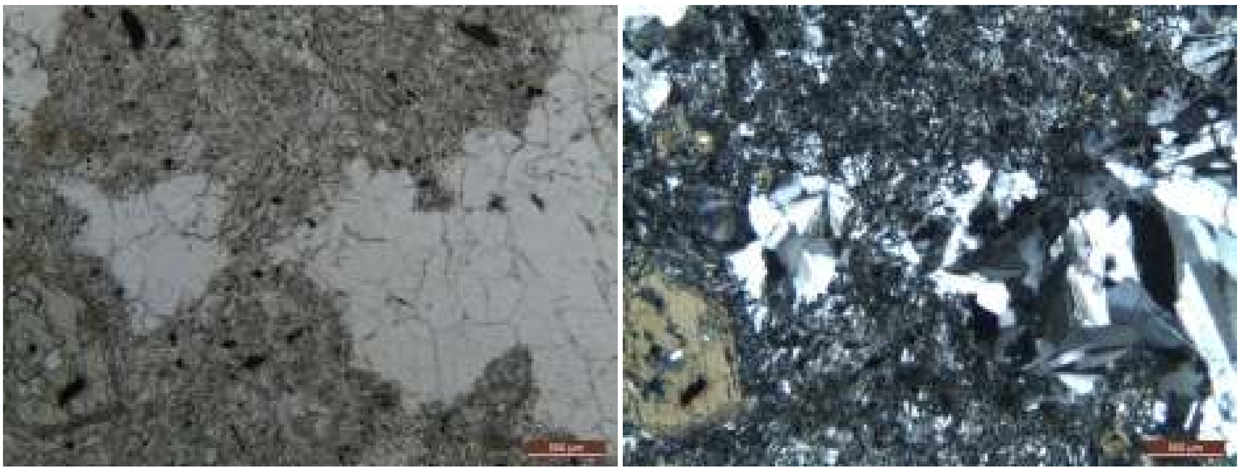
The polished thin-section consists of six chips comprising weakly to strongly altered dacitic-andesitic hornblende lamprophyre. In some chips the hornblende is euhedral and fresh (Figs 23 & 24), in others it is completely altered.



Figures 23 & 24. PPL & XP views. *Dacitic-andesitic hornblende lamprophyre. Note euhedral and subhedral hornblende phenocrysts with altered rims and cores. Clast of feldspar (upper left), with attached quartz and haematitised/altered margins and recrystallised interior, is probably derived from disaggregated granitoid. Small quartz clast left of centre. Scale bar = 0.5 mm.*

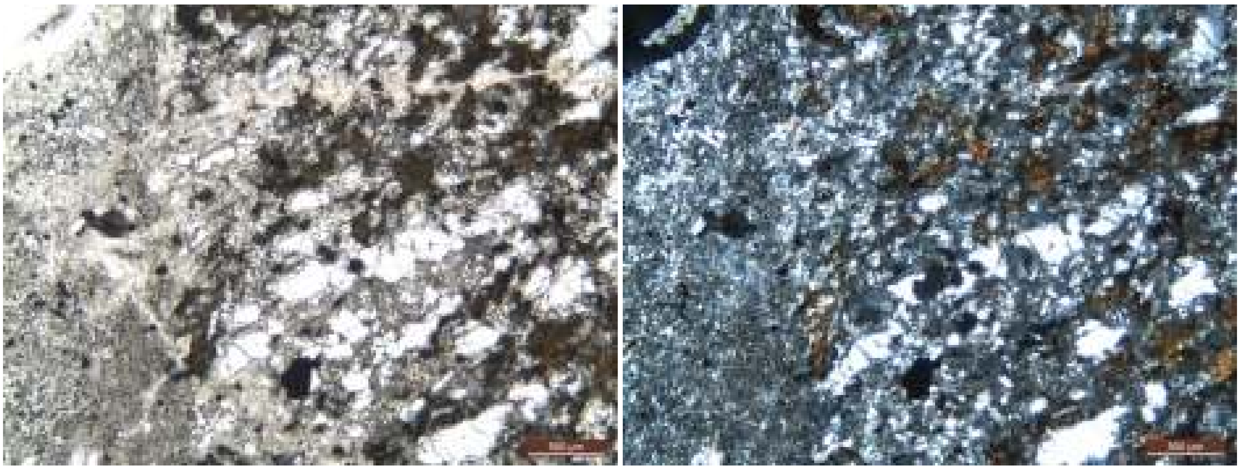
Several chips contain clasts of feldspar, quartz and biotite, which generally have reaction rims, indicating they are probably xenocrysts derived from granitoid (e.g. Figs 23-24).

One chip contains large, semi-amoeboid domains (up to 3.5 mm diameter) of euhedral (equant to elongate) alkali feldspar Figs 25-26). The shapes of the domains suggest they may have been former vesicles.



Figures 25 & 26. PPL & XP views. *Amoeboid ?amygdales filled with ?alkali feldspar in hornblende lamprophyre. Scale bar = 0.5 mm.*

One clast contains a 7 mm wide unit of quartzo-feldspathic gneiss with a fine-grained granoblastic-elongate texture, composed of altered feldspar (~52 %), quartz (~35 %), biotite (~10 %), Fe-Ti oxides (3 %) and accessory apatite (<1 %) (Figs 27-28). The contacts with the host dacite/andesite are sharp, suggesting that the quartzo-feldspathic gneiss is a xenolith.



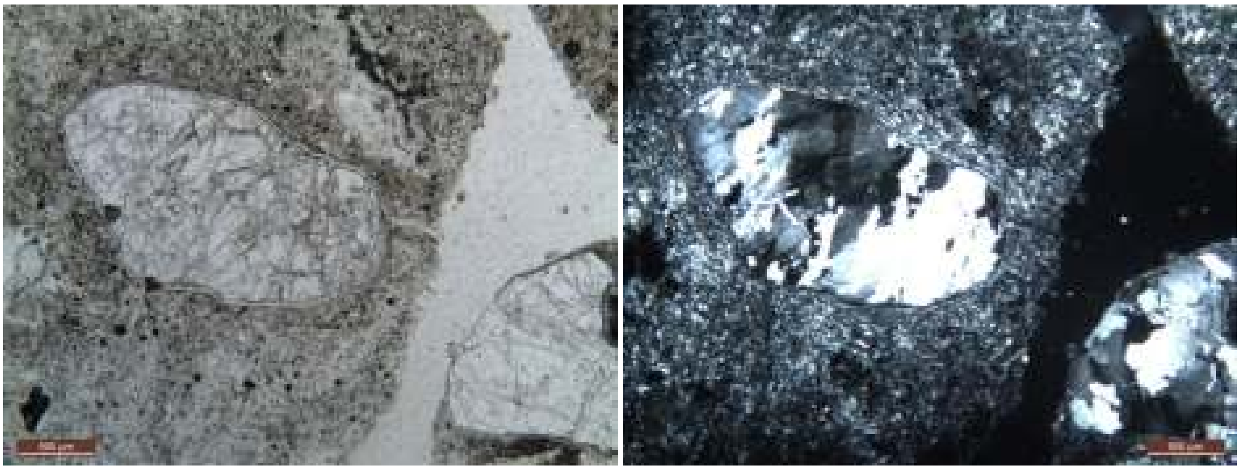
Figures 27 & 28. PPL & XP views. *Sharp (vertical) contact between lamprophyre (left-hand side) and biotite-bearing quartzo-feldspathic gneiss xenolith. Scale bar = 0.5 mm.*

VSAC 12 25-27

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre (with trace granitic material)

The polished thin-section consists of ~100 small chips (average size ~ 3-4 mm; range = 1-9 mm), roughly 98 % of which are very fine-grained (aphanitic) felsitic dacitic-andesitic hornblende lamprophyre. Many of them contain subhedral to euhedral phenocrysts of brownish green hornblende (1-3 %, crystals up to 2 mm in size). Some of the chips contain altered feldspar crystals, which may be phenocrysts, but more likely to be xenocrysts. A few chips contain granitic clasts (xenoliths), chiefly of recrystallised quartz aggregates (Figs 29 & 30). Roughly one-third of the chips contain alkali feldspar veins or aggregates and several of the smaller chips are dominated by the alkali feldspar crystals. In a similar manner, several of the smaller chips are dominated by secondary carbonate.

One of the chips in the polished thin-section is an aggregate of recrystallised and strained quartz. It is presumably derived from granitic material.



Figures 29 & 30. PPL & XP views. *Rounded clast (xenolith) of recrystallised quartz in hornblende lamprophyre. Note similar clast in adjacent rock chip. Scale bar = 0.5 mm.*

VSAC 12 28-30

Petrographic name: Variably altered dacitic-andesitic lamprophyre + variably deformed and recrystallised granitoids + rare mafic amphibolites-granulite

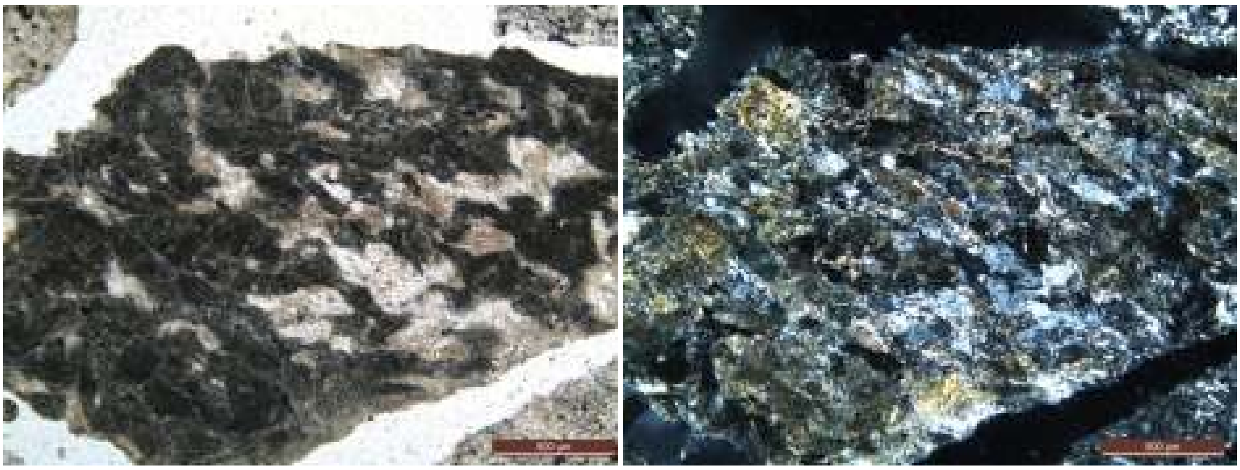
The polished thin-section consists of ~100 chips (average size ~3 mm; range = <1-12 mm), of which more than 90 % comprise very fine-grained (aphanitic) felsitic dacitic-andesitic hornblende lamprophyre, similar to VSAC 12 25-27. Roughly 40-50 % of the dacitic-andesitic lamprophyre chips contain hornblende phenocrysts, and a small number contain clasts of feldspar, quartz, biotite (altered) and granitic rock. The felsitic matrix ranges from decussate to trachytic, and a few are very fine-grained granular (a result of devitrification).

The other main rock type making up the chips is biotite-bearing granitoid (Figs 31-32), ranging from weakly deformed and recrystallised to strongly deformed and recrystallised.

Figures 31 & 32. PPL & XP views. *Tonalitic granitoid with clouded plagioclase and partly recrystallised quartz. Scale bar = 0.5 mm.*

One chip is quite different from the rest (Figs 33-34), having a basic composition, a fine-grained crystalloblastic (±granoblastic-elongate) texture and composed of roughly equal amounts of hornblende (strongly retrograded) and feldspar (highly altered).

The rock could represent a mid-crustal basic amphibolite-granulite.



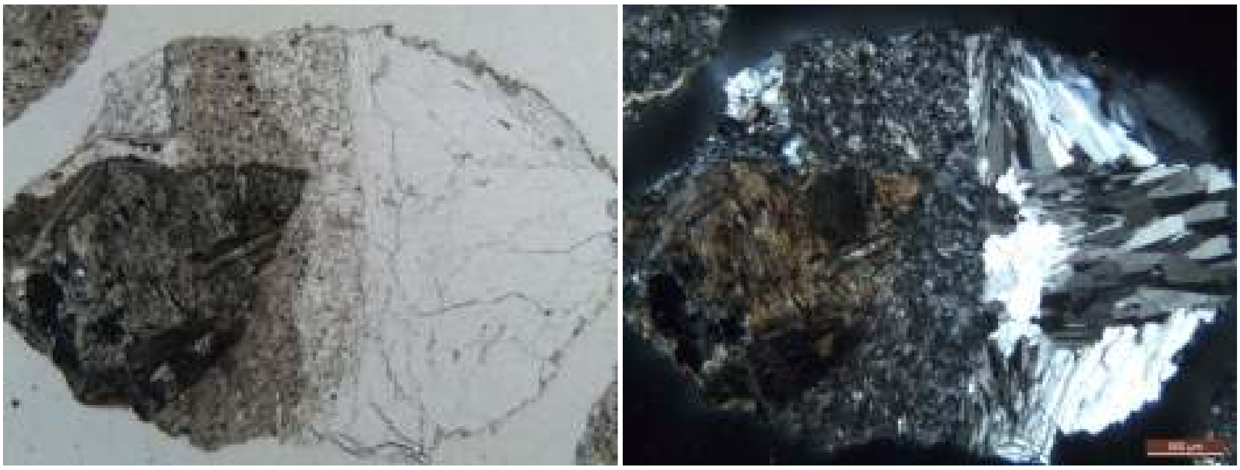
Figures 33 & 34. PPL & XP views. *Highly altered fine-grained amphibolite with a granoblastic-elongate texture. Scale bar = 0.5 mm.*

VSAC 12 30-32

Petrographic name: Dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of ~100 chips (average size ~4 mm; range = <1-13 mm), of which all them represent dacitic-andesitic hornblende lamprophyre. About 50 % of the chips are weakly hornblende-phyric, with phenocrysts up to 3.5 mm in diameter. Most chips contain patches and/or veins of alkali feldspar. Several chips contain xenocrystic feldspar and xenolithic granitoid clasts.

One chip contains a >2.4 mm, (altered) biotite-rich clast, with accessory Fe-Ti oxide, ?zircon and apatite (Figs 35-36). The biotite flakes are up to 1.2 mm long. The clast must be derived from a granitoid.



Figures 35 & 36. PPL & XP views. *Biotite clast in hornblende lamprophyre. Note columnar ?alkali feldspar domain, small granitoid clast and two varieties of lamprophyre. Scale bar = 0.5 mm.*

The same chip is interesting in that it has two varieties of dacitic-andesitic lamprophyre, one less haematitised and more granular in texture. The chip also contains a granitoid clast and a very impressive vein, or amygdale, composed of bladed-columnar alkali feldspar. (Could it be adularia, orthoclase or something like stilbite?).

Hornblende microlites (unaltered) are well-represented in the groundmass.

Small euhedral crystals of hornblende occur in some alkali feldspar domains, indicating that the so-called "late-stage" crystallisation of the alkali feldspar is possibly spread over an extensive time frame.

As usual, ~5-10 % of the chips are affected by secondary carbonate replacement.

VSAC 12 33-34

Petrographic name: Dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of ~100 chips (average size ~3 mm; range = <1-10 mm), all of which comprise variants of dacitic-andesitic hornblende lamprophyre, similar to VSAC 12 30-32.

Some chips are extremely haematitised/Fe-stained.

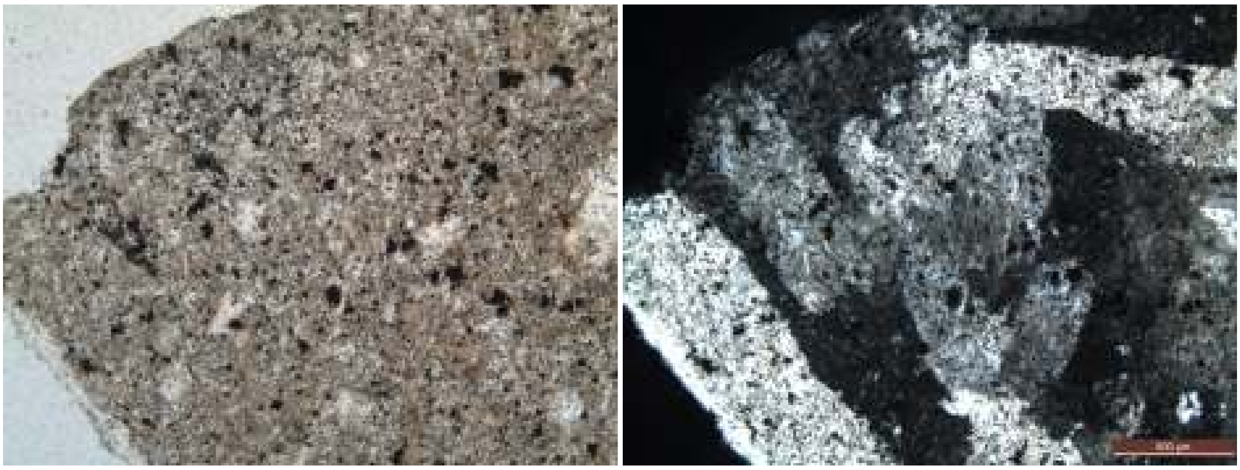
One hornblende phenocryst, intergrown with (or replaced by) alkali feldspar, is ~50 % replaced by carbonate.

VSAC 12 34-36

Petrographic name: Dacitic-andesitic hornblende lamprophyre + variably deformed & recrystallised granitoid + late-stage alkali feldspar

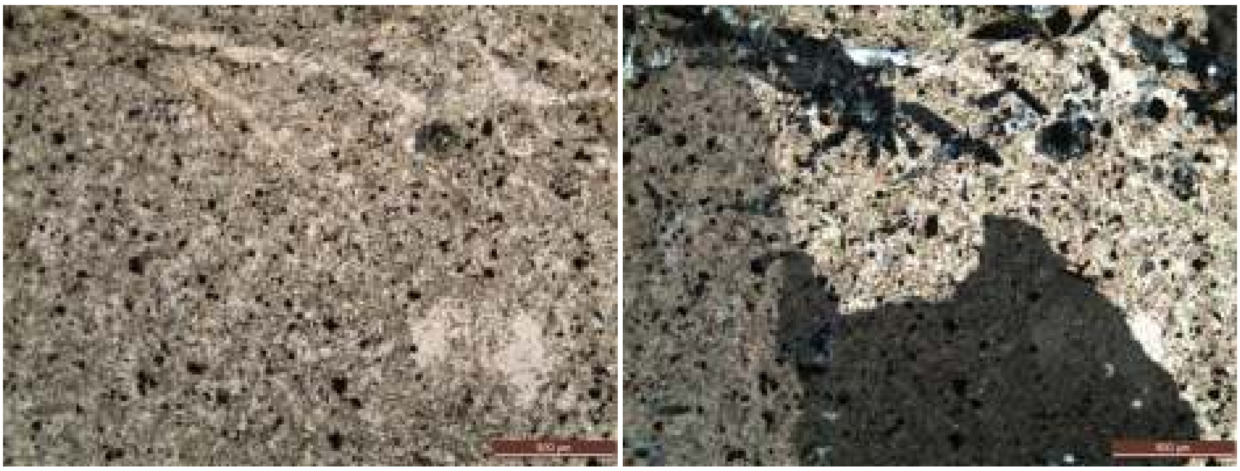
The polished thin-section consists of ~100 chips (average size 3-4 mm; range = 1-12 mm), of which roughly 85 % are dacitic-andesitic hornblende lamprophyre, many with granitoid xenoliths, and the remainder of chips comprising granitoids, fine- to medium-grained crystalloblastic secondary alkali feldspar and carbonate-rich chips.

The dacitic-andesitic lamprophyre chips are generally slightly less porphyritic than seen in the previous thin-sections looked at, but are different because many of them are characterised by well-developed, fine- to medium-grained crystalloblastic, devitrified alkali feldspar. Relict felsitic textures are well-preserved in these new crystals (Fig.37-38).



Figures 37 & 38. PPL & XP views. *Fine- to medium-grained crystalloblastic, "devitrified" alkali feldspar overprinting a primary very fine-grained felsitic texture. Scale bar = 0.5 mm.*

In a similar manner, fine- to coarse-grained poikiloblastic carbonate is a very conspicuous phase within which relict felsitic textures are perfectly preserved (Figs 39-40).



Figures 39 & 40. PPL & XP views. *The area shown is occupied by three porphyroblastic crystals of carbonate (see Fig. 40), overprinting the former felsitic texture. Scale bar = 0.5 mm.*

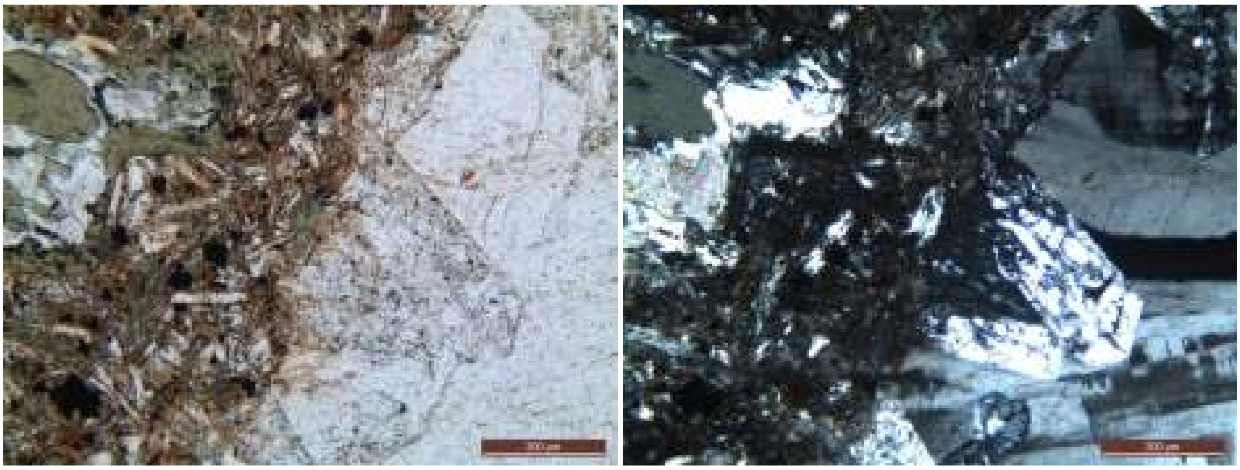
Former hornblende phenocrysts are mainly altered and are represented by rims of brownish green phyllosilicates.

An interesting feature of some of the chips of dacitic-andesitic lamprophyre is the presence of equant to hexagonal alkali feldspar aggregates (Figs 41-42).

Figures 41 & 42. PPL and XP views. *Equant to semi-hexagonal ?alkali feldspar aggregates in lamprophyre. Scale bar = 0.5 mm.*

Granitoid chips (and xenoliths) are generally biotite-bearing and display the full range from weakly deformed and recrystallised to strongly deformed and recrystallised.

One chip (Figs 43-44) contains euhedral alkali feldspar crystals (prismatic, variably replaced, or melted) interfingering with columnar ?microcline.



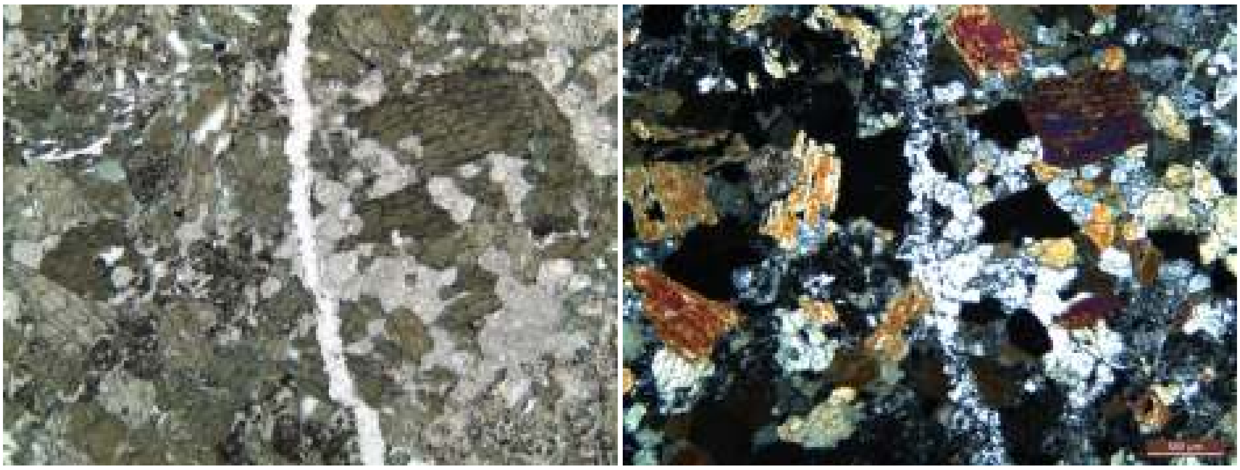
Figures 43 & 44. PPL & XP views. *Several generations of ?alkali feldspar in hornblende lamprophyre host. Note partially replaced nature of the euhedral ?alkali feldspar. Scale bar = 0.2 mm.*

VSAC 15 49-55

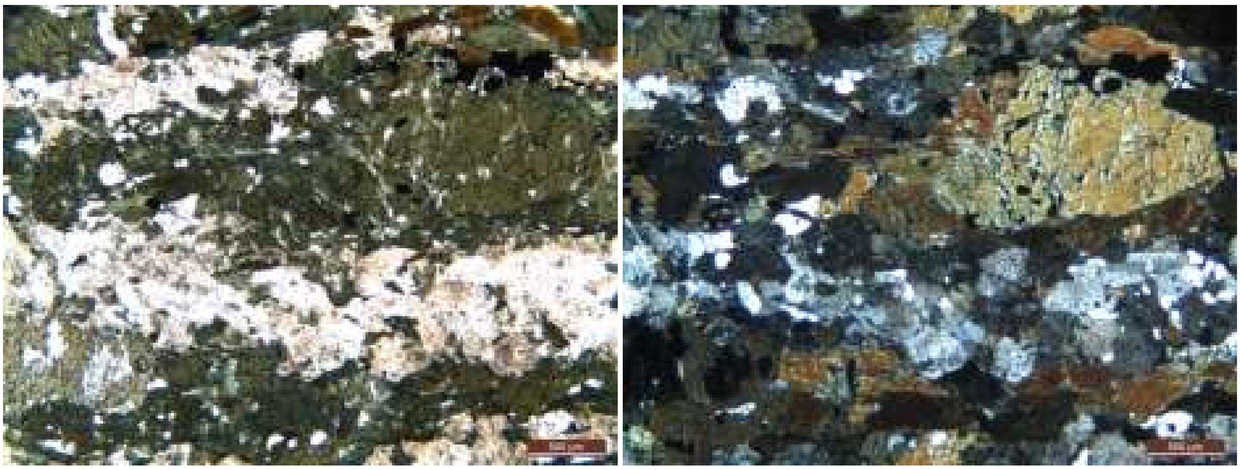
Petrographic name: Fine- to medium-grained amphibolites + quartzo-feldspathic gneiss

The polished thin-section consists of ~100 chips (average size ~4 mm; range = <1-15 mm), of which approximately 95 % are amphibolites, characterised by granoblastic-polygonal to nematoblastic textures (Figs 45-48). The remainder of the chips comprise varieties of quartzo-feldspathic gneiss (very fine- to medium-grained varieties), late-stage/secondary alkali feldspar aggregates and a fine-grained Fe-Ti oxide (~50 %) + quartz + feldspar + biotite + hornblende rock.

The amphibolites are fine- to medium-grained and range from homogeneous to layered, from equigranular to seriate, to foliated/lineated (i.e. nematoblastic). Typically, they comprise sub-equal amounts of hornblende (brownish green, bluish green, green) and feldspar (mostly moderately clouded, i.e. kaolinised and/or sericitised), with accessory Fe-Ti oxides and apatite. Some amphibolites chips contain quartz (up to ~20 %) and biotite (up to ~5 %). Hornblende content varies between ~30-70 %.

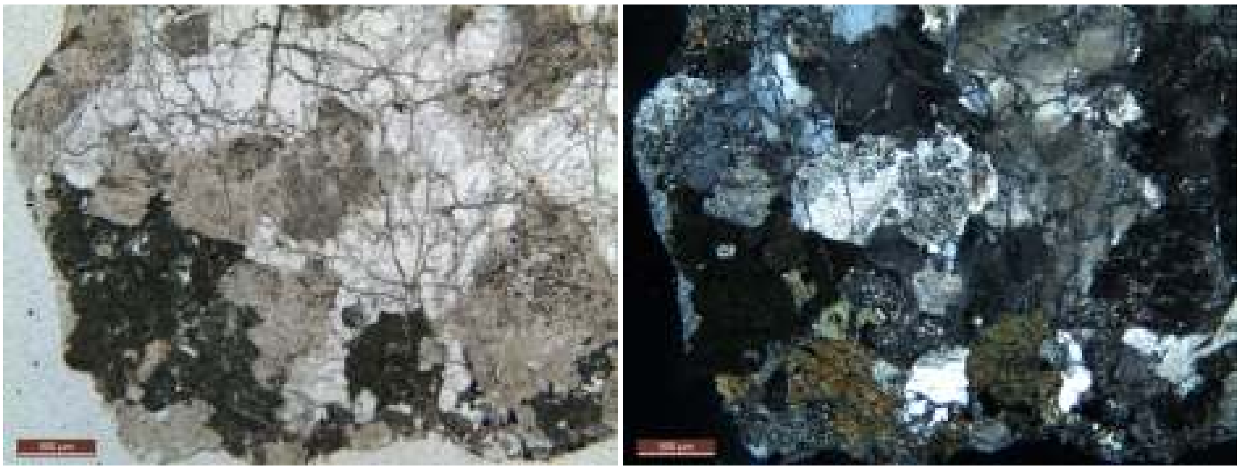


Figures 45 & 46. PPL & XP views. *Amphibolite with equigranular to seriate granoblastic-polygonal texture. Plagioclase clouded and rock cut by late-stage alkali feldspar vein. Scale bar = 0.5 mm.*



Figures 47 & 48. PPL & XP views. *Layered and foliated amphibolite. Scale bar = 0.5 mm.*

The quartzo-feldspathic gneisses are also characterised by granoblastic, moderately polygonal textures (Figs 49-50). Biotite may be more prevalent than hornblende in some chips. One chip looks like a highly recrystallised mylonitised granitoid.



Figures 49 & 50. PPL & XP views. *Hornblende-bearing tonalitic gneiss/granitoid. Scale bar = 0.5 mm.*

The late-stage alkali feldspar ranges from fine- to medium-grained and occurs in veins and aggregates.

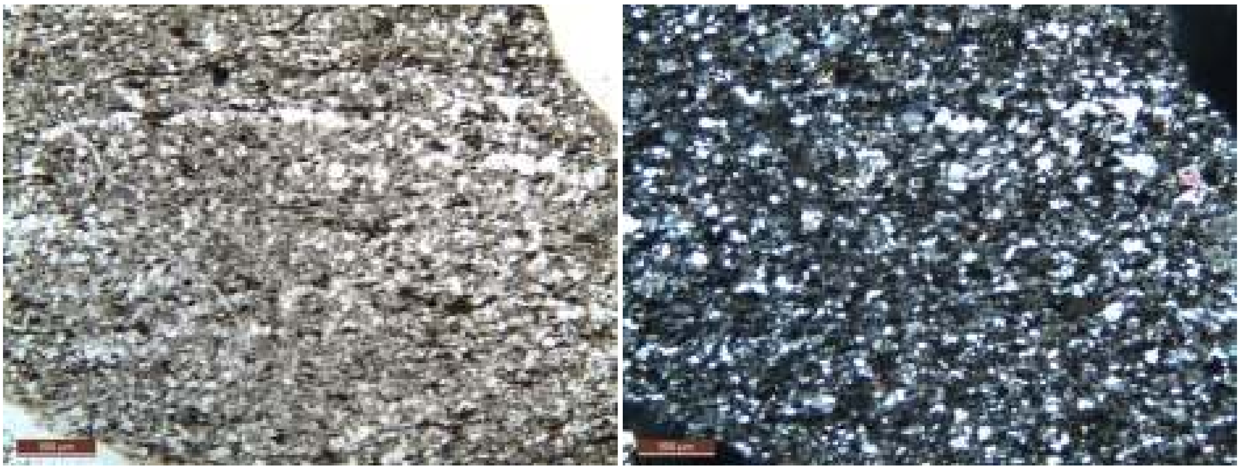
Carbonate is a minor, late-stage replacement mineral, with one crystal over 3 mm in size.

Discussion/Interpretation: The extremely well-crystallised nature of the amphibolites (and gneiss) indicates upper amphibolite (to lower granulite) facies metamorphism, probably at mid-crustal levels.

VSAC 16 47-49

Petrographic name: Biotite-bearing quartzo-feldspathic schist, deformed and recrystallised granitoid and granitic gneissic schists

The polished thin-section consists of ~80-100 chips (average ~4 mm; range = <1-11 mm) of which ~80 % are fine-grained biotite quartzo-feldspathic schists, with up to ~25 % red-brown to reddish biotite (Figs 51-52). Typically, quartz and feldspar form a granoblastic (±polygonal) base for highly aligned biotite flakes (i.e. lepidoblastic texture). Muscovite is present as an accessory mineral in several of the chips.



Figures 51 & 52. PPL & XP views. *Very fine-grained biotite quartzo-feldspathic schist/gneiss. Scale bar = 0.5 mm.*

The remainder of the chips comprise biotite-bearing fine- to medium-grained quartzo-feldspathic gneisses and schists, variably deformed and recrystallised granitoids and fine- to medium-grained alkali feldspar aggregates. Many of the gneiss and gneissic schists have augen structures and display a wide spectrum of deformation and recrystallisation features.

Figures 53 & 54. PPL & XP views. *Biotite gneiss, variably foliated, layered, deformed and recrystallised. Scale bar = 0.5 mm.*

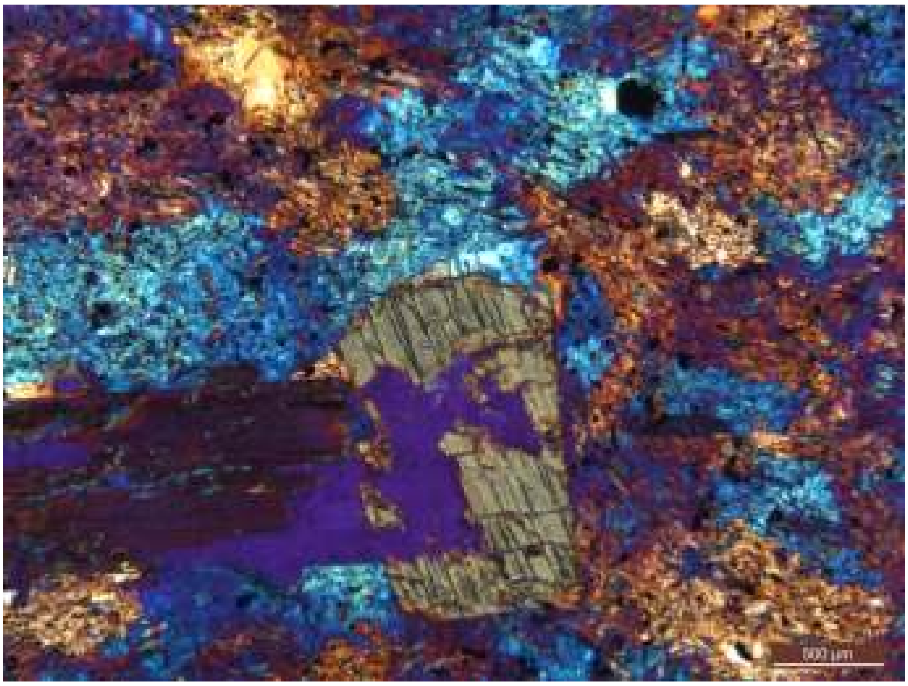
One chip has a cataclastic texture.

Many chips are veined by alkali feldspar and, in places, by carbonate.

VSAC 18 6-10

Petrographic name: Coarsely devitrified, dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of six chips (average size ~1.5 cm; range = 1.3-2 cm) of coarsely devitrified dacitic-andesitic hornblende lamprophyre (Figs 55-56). Hornblende phenocrysts (2-4 %) range from euhedral to subhedral and from equant to elongate (up to 4.5 mm long). In the groundmass the hornblende occurs as microlites and acicular to lath-like crystals.



Figures 55 & 56. PPL and XP (gypsum plate) views. *Hornblende lamprophyre with coarse porphyroblastic "devitrification" (or metasomatic) texture. Scale bar = 0.5 mm.*

The rock chips generally contain a few percent of alkali feldspar patches and aggregates. Veins of alkali feldspar also cut the rock.

VSAC 18 21-22

Petrographic name: Coarsely devitrified, dacitic-andesitic hornblende lamprophyre + highly altered, deformed and partially recrystallised biotite granitoid

The polished thin-section consists of five chips (average size ~2 cm) of which four are coarsely devitrified dacitic-andesitic hornblende lamprophyre (like VSAC 18 6-10) and one is a highly altered medium- to coarse-grained biotite granitoid.

The granitoid chip contains accessory apatite, ?allanite (Figs 57-58) and zircon. The rock is highly fractured and veined (by alkali feldspar), moderately deformed, and partly recrystallised (typically around grain boundaries). The appearance of the rock suggests it has been partially melted, with remobilisation of alkali feldspar into fractures and veins.

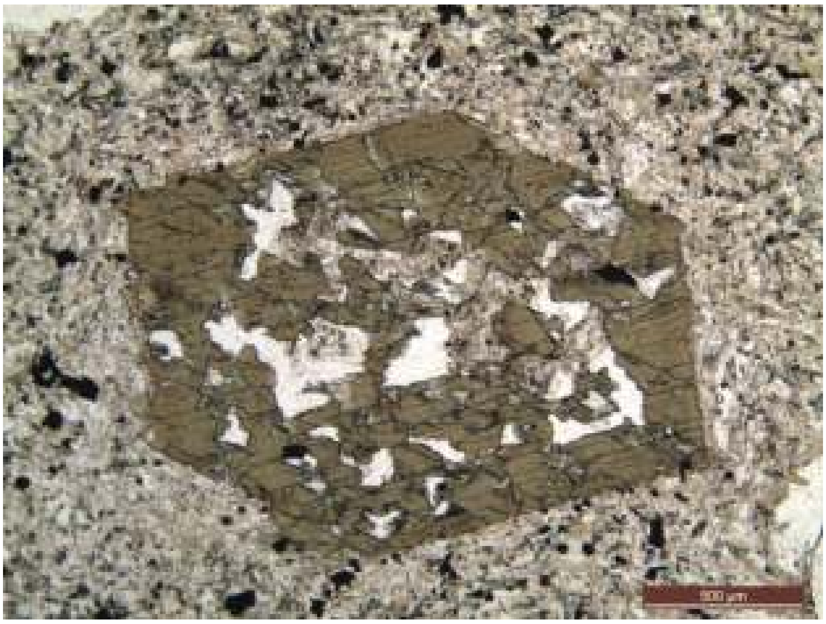
Figures 57 & 58. PPL & XP views. *?Allanite in partly altered, deformed and recrystallised biotite granitoid. Scale bar = 0.5 mm.*

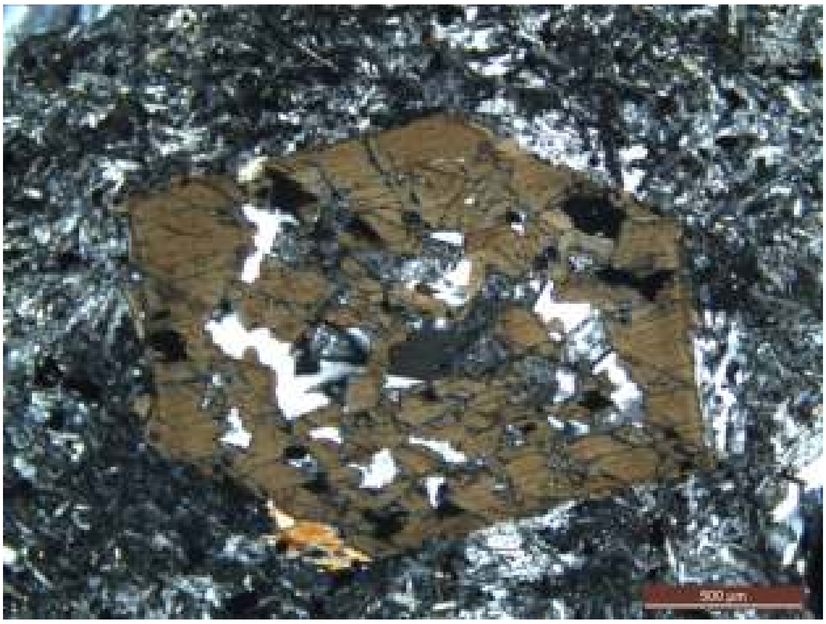
VSAC 18 28-29

Petrographic name: Devitrified dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of ~35 chips (average size ~10 mm; range = 1-20 mm), comprising devitrified dacitic-andesitic hornblende lamprophyre (Figs 59-60). The devitrification phenomenon is not as common or as coarse-grained as it is in VSAC 18 6-10 and VSAC 18 21-22.

Characteristically, the dacitic-andesitic lamprophyre rock chips contain patches (equant to lenticular, up to 2 mm diameter or length) of well-recrystallised alkali feldspar. Some of the patches are vein-related, some amygdaloidal and some possibly pseudomorphic after equant precursors. Some of the so-called alkali feldspar may be something like stilbite, especially the radiating columnar material.





Figures 59 & 60. PPL & XP views. *Euhedral, "poikilitic" hornblende phenocryst with alkali feldspar inclusions set in a felsitic groundmass. Devitrification/metasomatic textures evident in the groundmass. Scale bar = 0.5 mm.*

VSAC 18 COMP 1

Petrographic name: Coarsely devitrified dacitic-andesitic hornblende lamprophyre; strongly veined

The polished thin-section consists of five chips (average size ~1.8 cm), comprising comparatively coarsely devitrified dacitic-andesitic hornblende lamprophyre. The chips are generally more Fe-stained and kaolinised than the previously described VSAC 18 rocks. Some of the hornblende phenocrysts have dark green cores. Several clasts (xenoliths) of feldspar and quartz are present.

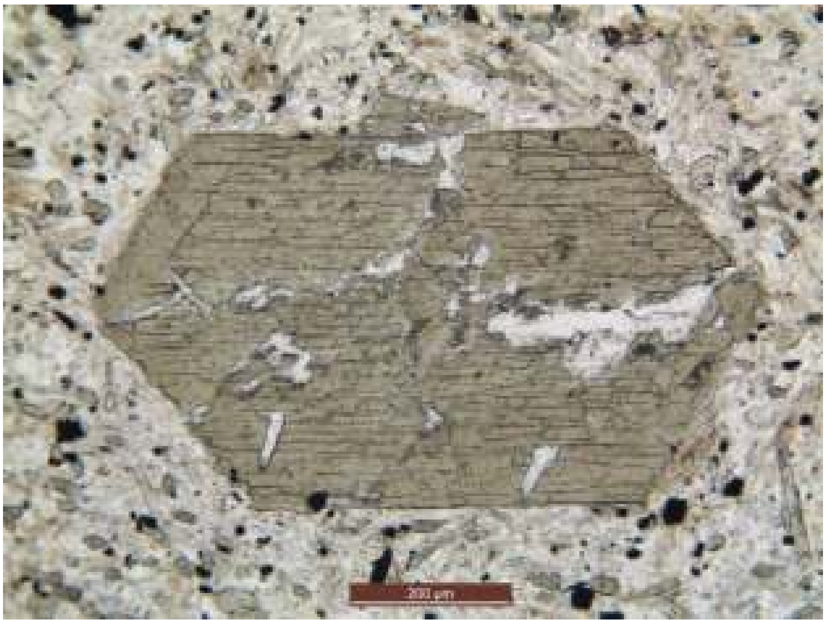
A conspicuous feature of this polished thin-section is the presence of thick veins (up to 1 mm) filled with alkali feldspar and carbonate. Carbonate generally occupies the centre of the veins.

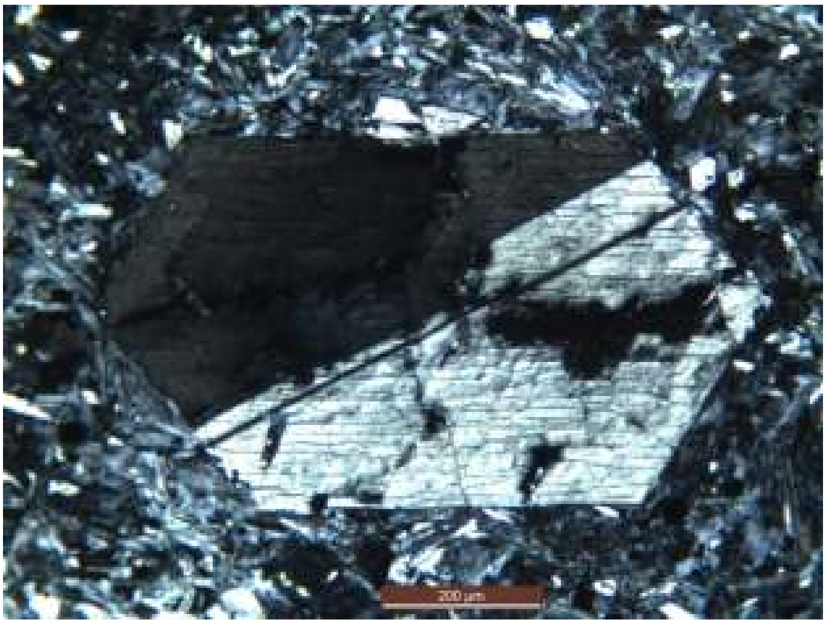
VSAC 18 COMP 2

Petrographic name: Coarsely devitrified dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of seven chips (average size ~1.5 cm), comprising coarsely devitrified dacitic-andesitic hornblende lamprophyre. Several of the hornblende phenocrysts have green cores. One hornblende phenocryst has an euhedral form that is not unlike that of olivine (Figs 61-62).

A few xenocrysts of feldspar and (altered) biotite are present.





Figures 61 & 62. PPL & XP views. *Euhedral, twinned hornblende phenocryst which has a form not unlike that of olivine. Scale bar = 0.2 mm.*

VSAC 20 32-34

Petrographic name: Dacitic-andesitic hornblende lamprophyre + hornblende (and biotite) monzonite-diorite

The polished thin-section consists of six chips (average size ~1.5 cm) comprising three of hornblende lamprophyre and three of foliated and recrystallised hornblende- and biotite-bearing quartz monzonite-diorite.

One of the three lamprophyre chips is similar to the preceding material, but two of them are different in that they are (or were) mostly glassy, i.e. vitrophyric (Fig 63). This implies that the vitrophyric chips represent contact or chilled zones.

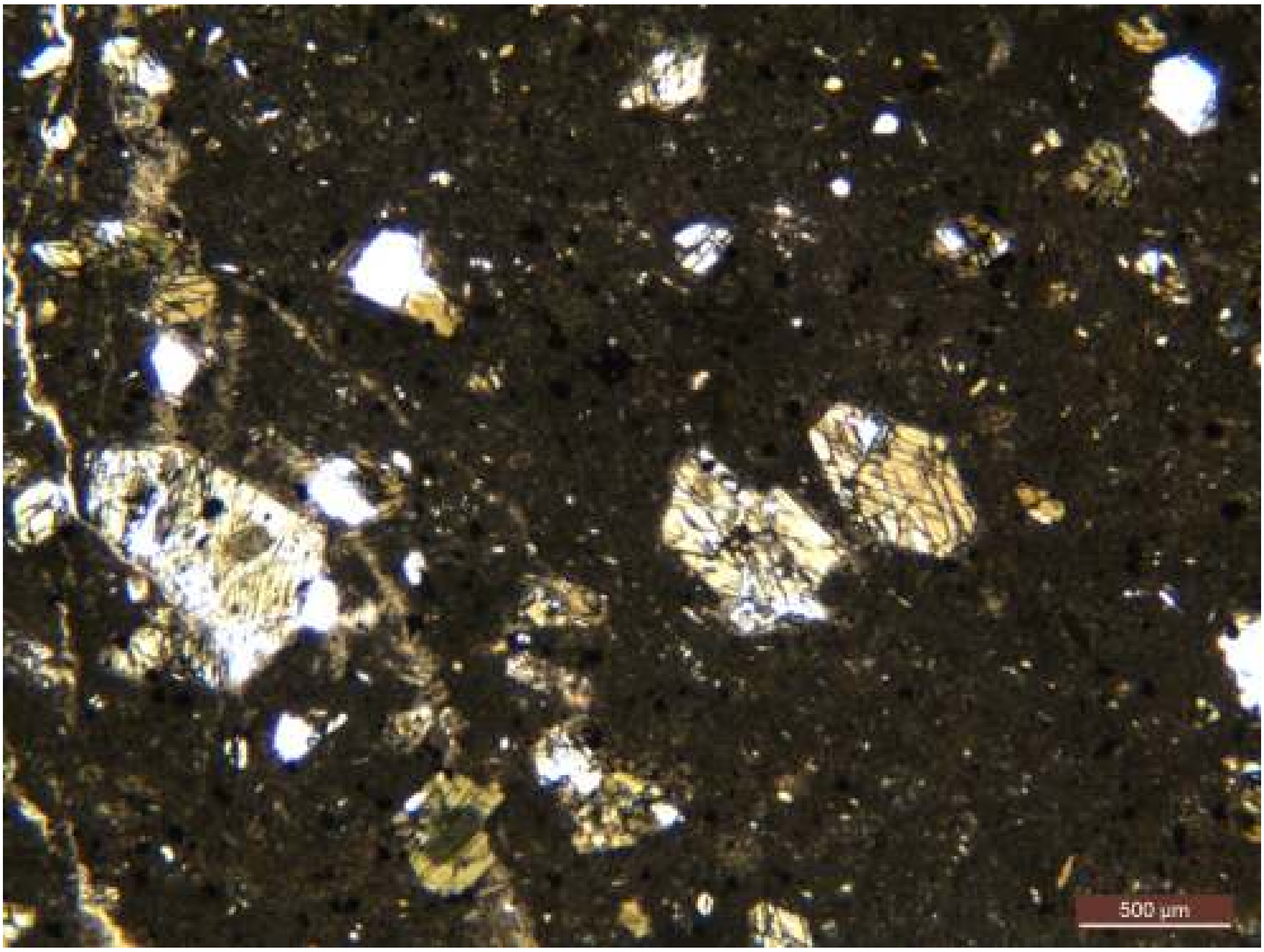


Figure 63. PPL view. *Hornblende phenocrysts set in a very fine-grained, more-or-less glassy groundmass. Several hornblende phenocrysts have green cores. Scale bar = 0.5 mm.*

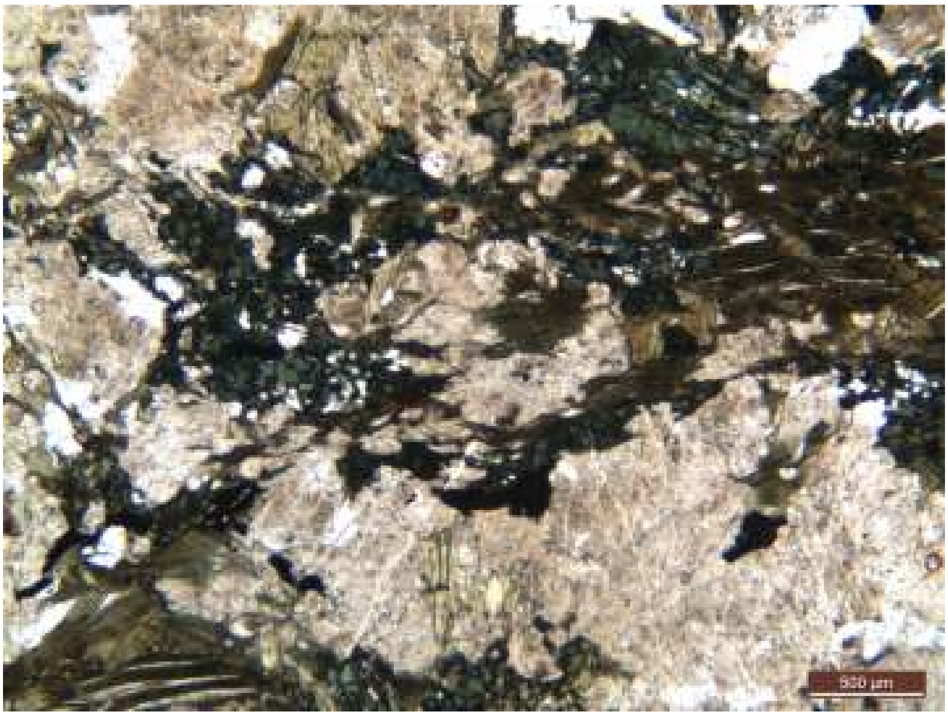
One lamprophyre chip contains rare feldspar and quartz xenocrysts. As common, the lamprophyre chips are variably affected by late-stage alkali feldspar and carbonate veining/replacement.

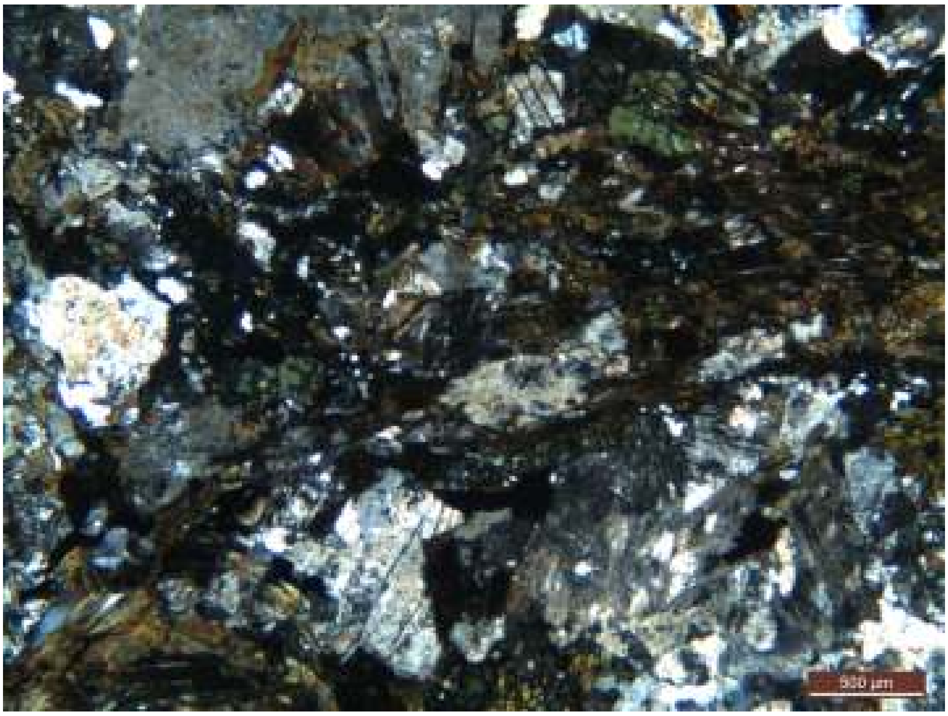
The quartz monzonite-diorite rocks (e.g. Figs 64-65) are fine- to coarse-grained, but prior to recrystallisation they were mainly medium- to coarse-grained. They comprise, very approximately (each chip is different):

Feldspar (predominantly plagioclase, red-stained)	~65 %
Biotite	10-12 %
Hornblende	8-10 %

Quartz	0-20 %
Fe-Ti oxides	2-3 %
Apatite	<=1 %

Textures range from relict subhedral granular (igneous) ones to metamorphic granoblastic-polygonal and lepidoblastic granular ones.





Figures 64 & 65. PPL & XP views. *Partly altered and recrystallised green hornblende- and biotite-bearing quartz monzonite-diorite. Plagioclase is clouded and hornblende is variably poikilitic. Biotite is moderately aligned, producing a mild foliation in the rock. Scale bar = 0.5 mm.*

VSAC 20 37-39

Petrographic name: Dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of ~50 chips (average size ~5 mm; range = <=1-18 mm), comprising a range of dacitic-andesitic hornblende lamprophyre types, from semi-glassy to weakly recrystallised-devitrified. Some of the chips are >70 % composed of late-stage alkali feldspar. In some of the larger chips, some of the alkali feldspar veins and pods are up to 3 mm wide. Late-stage carbonate is present in some of the chips.

VSAC 21 18-19

Petrographic name: Altered, devitrified, dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of five chips (average size ~15 mm; range = 5-20 mm) of highly altered dacitic-andesitic hornblende lamprophyre. Only trace amounts of original hornblende are left unaltered. Pods and lenses (0.4-6 mm) of fresh alkali feldspar make up ~1-5 % of the chips. Most of the chips show fine- to medium-grained crystalloblastic devitrified textures.

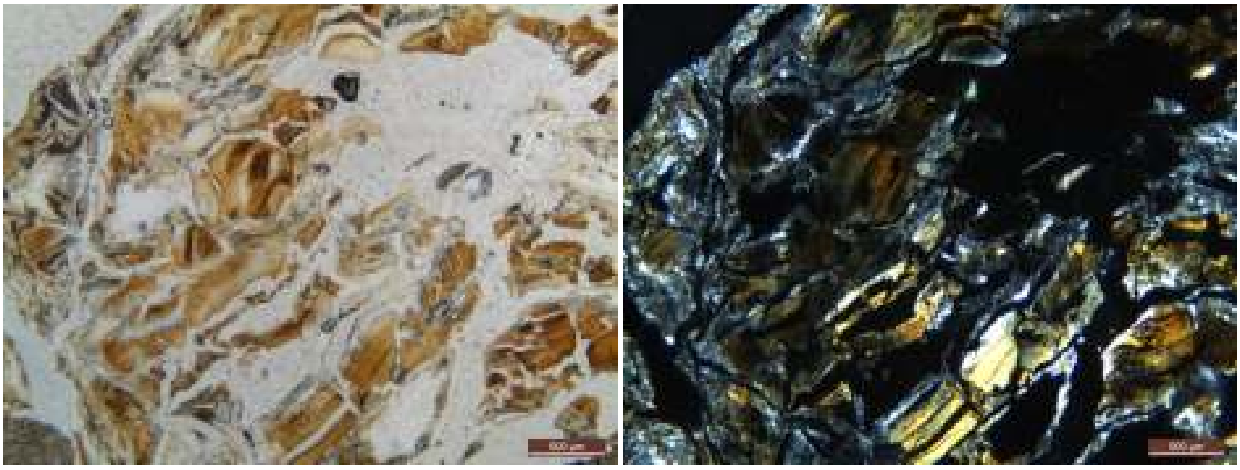
VSAC 26 9-11

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre + metamorphosed hornblende- and biotite-bearing granitoid

The polished thin-section consists of 19 chips (average size ~10 mm; range = 3-17 mm) of which 16 are dacitic-andesitic hornblende lamprophyre and three are fine- to coarse-grained, metamorphosed hornblende- and biotite-bearing granitoids.

Hornblende phenocrysts in the lamprophyre range from fresh to completely altered. Some have alteration rims and a few have green cores and internal zoning. Some of the lamprophyre chips contain angular to irregular clasts (xenocrysts) of quartz and feldspar.

One lamprophyre chip is dominated by a large (~10 x 6 mm) patch of yellow-orange to colourless phyllosilicates pseudomorphing a large phenocryst or phenocryst cluster of what may have been hornblende, or possibly even olivine (Figs. 66-67).



Figures 66 & 67. PPL & XP views. *Former large crystal of altered hornblende or olivine. Scale bar = 0.5 mm.*

The metamorphosed granitoid rocks are highly altered, particularly the former biotite, which is now all semi-opaque to opaque Fe-oxides/hydroxides.

VSAC 26 15-17

Petrographic name: Variably altered and devitrified hornblende lamprophyre

The polished thin-section consists of nine chips (average size ~2 cm long; range up to 2.8 cm long) comprising variably altered and variably devitrified hornblende lamprophyre. Several chips have a heterogeneous texture caused by the presence of finer grained and more porphyritic sub-domains (?cognate xenoliths) (Fig. 68).

Most of the chips contain minor amounts of xenocrysts of quartz and feldspar and xenoliths of granitoid material.

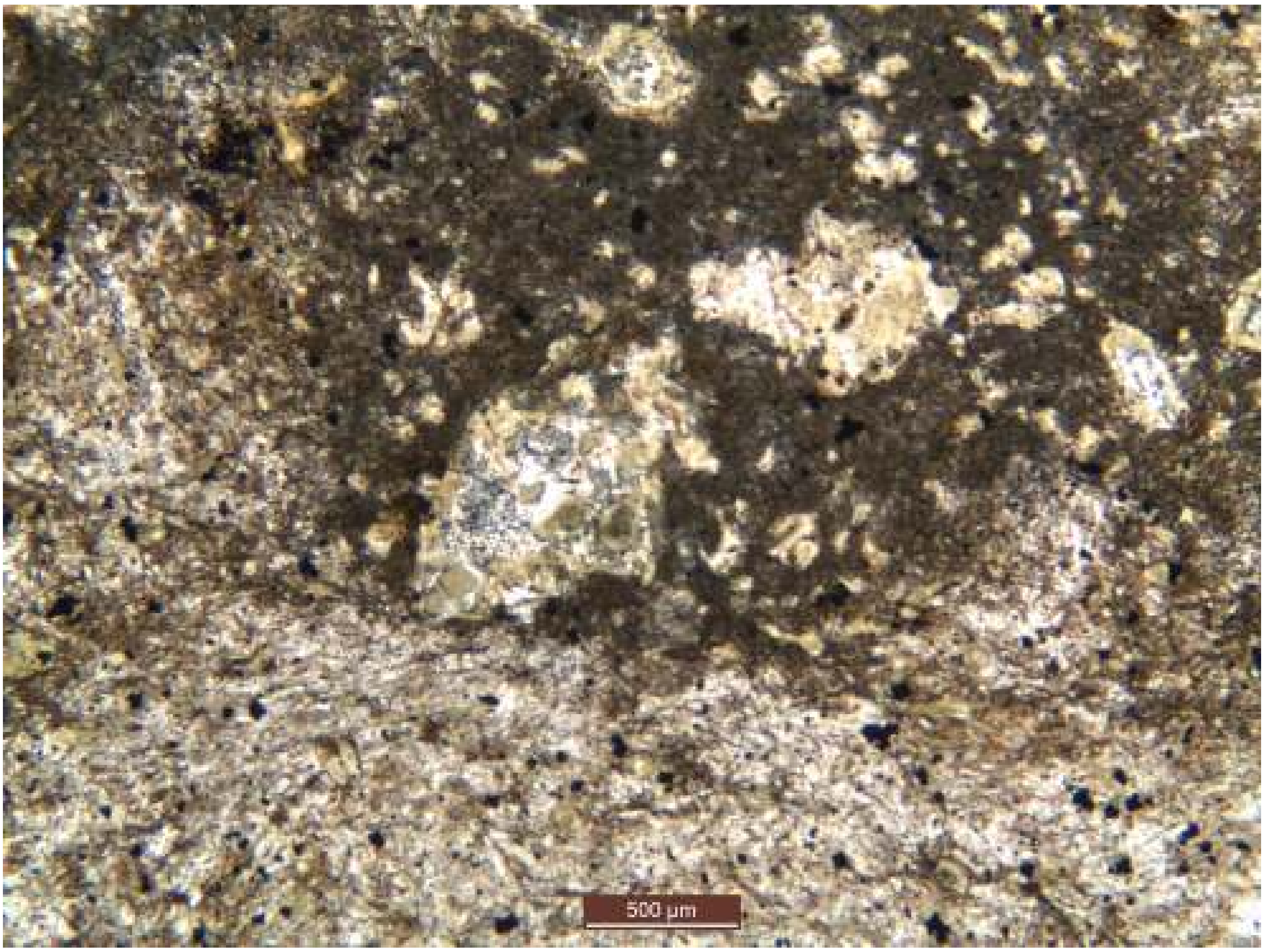


Figure 68. PPL view. *Mottled lamprophyre caused by the presence of darker, finer grained and more porphyritic material set in coarser grained, less porphyritic lamprophyre. Hornblende phenocrysts partially to completely altered. Scale bar = 0.5 mm.*

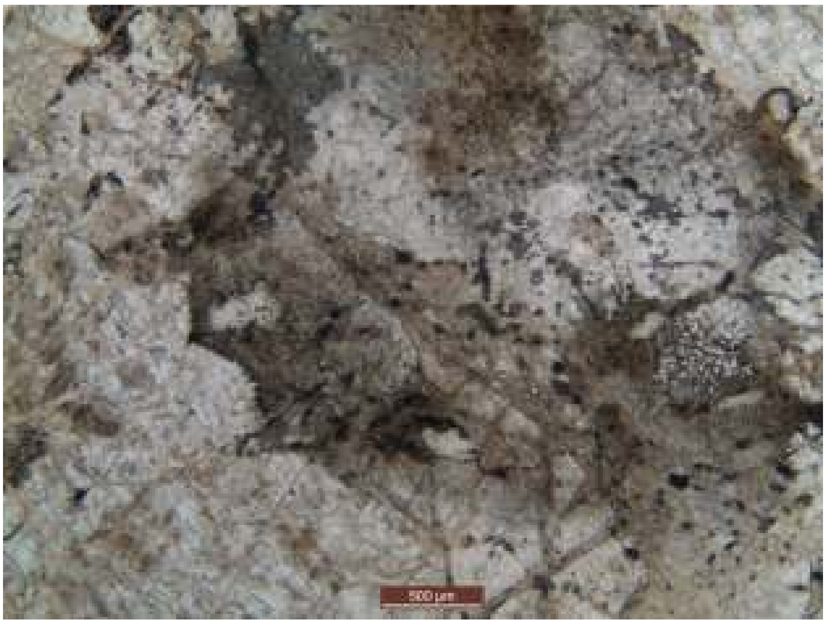
VSAC 32 66-67

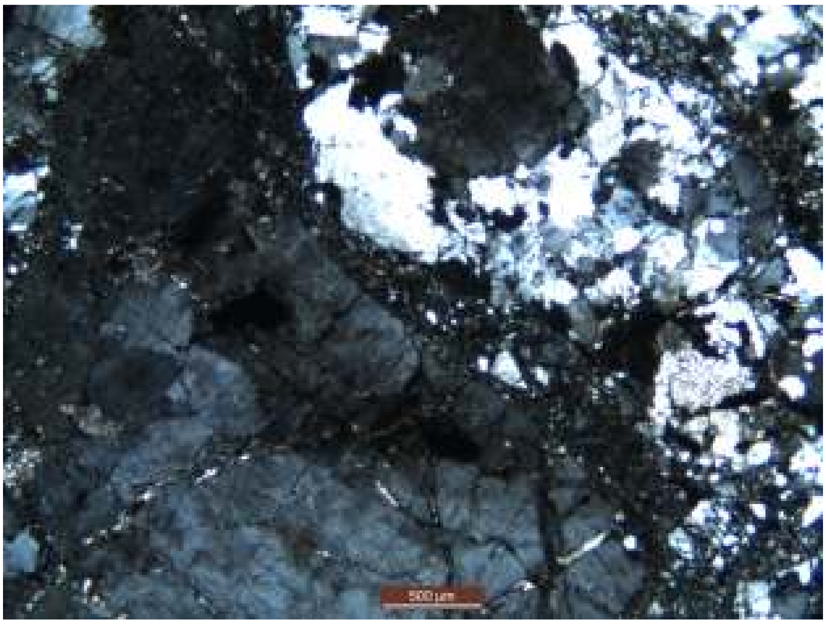
Petrographic name: Cataclasites, fault breccias and ?tuffs/volcaniclastics

The polished thin-section consists of 12 chips (average size ~1.5 cm) comprising:

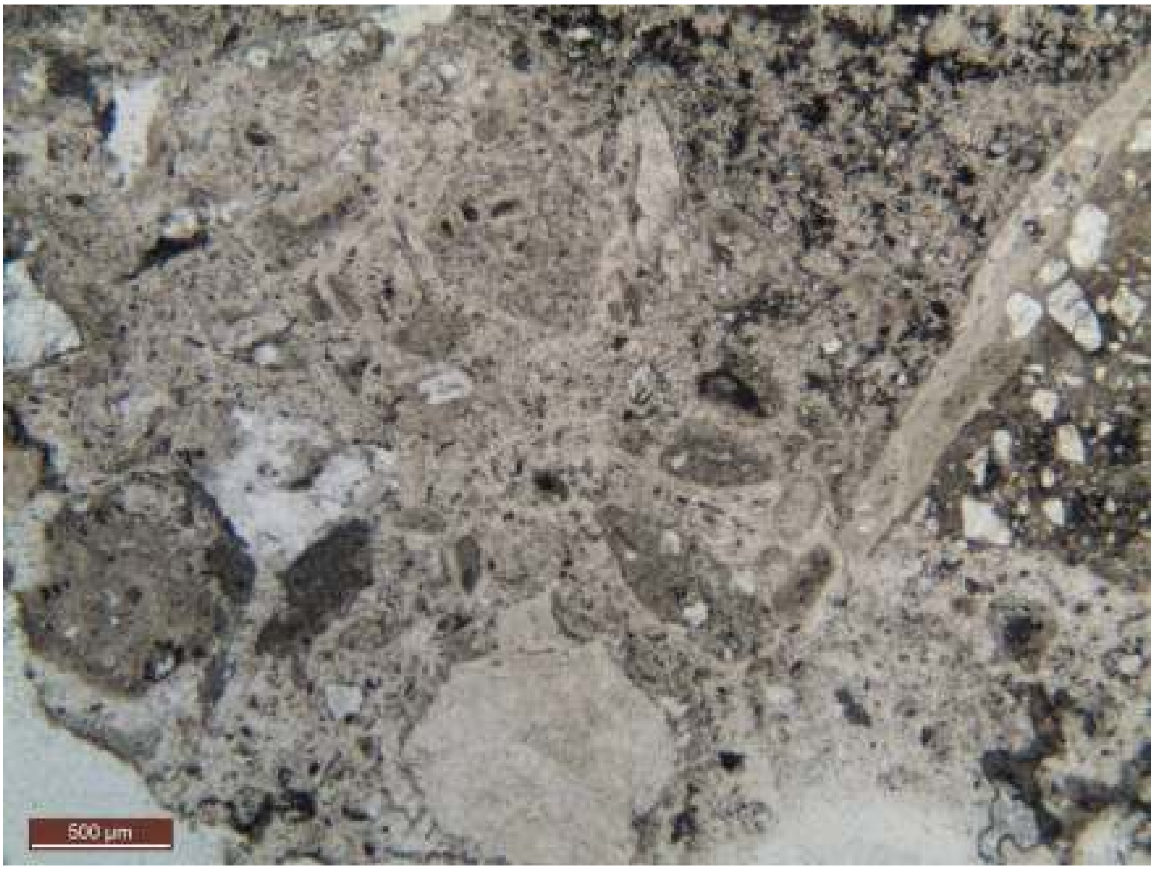
a) Cataclastic medium- to coarse-grained granitoid
b) Feldspathised fault breccia or crystal lithic tuff

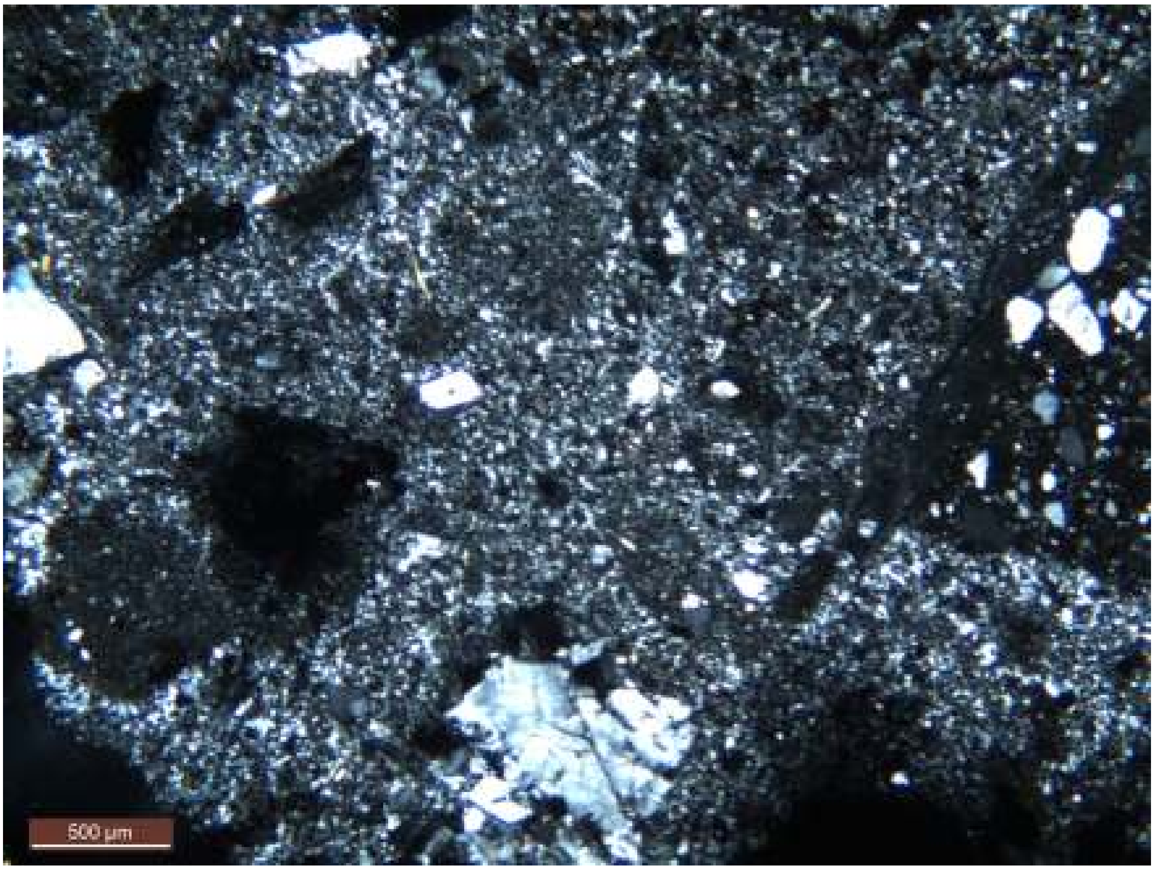
The granitoid rocks are variably deformed and recrystallised and are cut by numerous cataclastic zones, producing, in places, pseudo tuff-like or fault breccia textures (Figs 69-72).





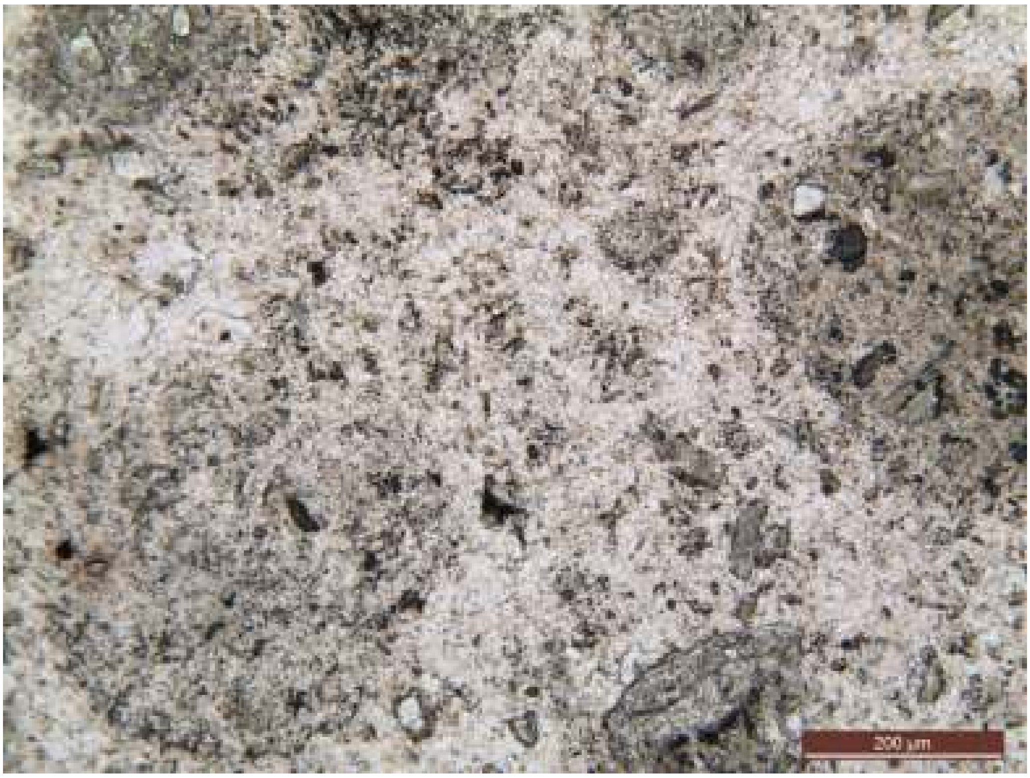
Figures 69 & 70. PPL & XP views. *Thin breccia zone in granitoid, trending NW-SE in the centre of the field-of-view. Scale bar =0.5 mm.*

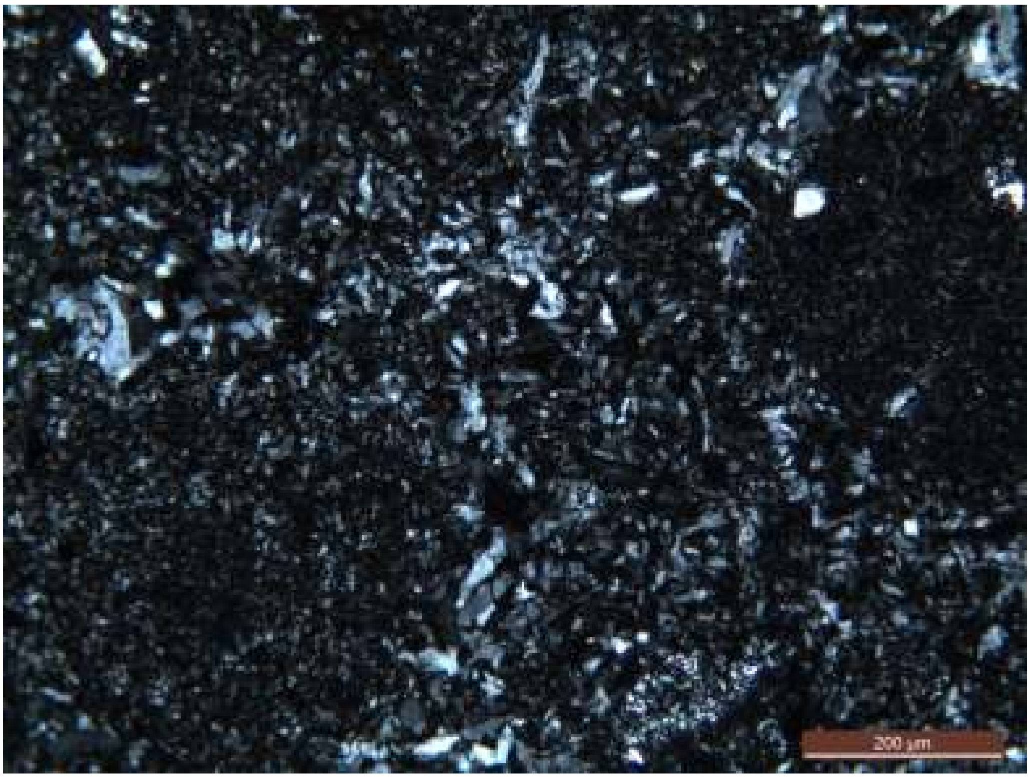




Figures 71 & 72. PPL & XP views. *Breccia produced in granitoid rock. Feldspar clast lower centre. Scale bar = 0.5 mm.*

The feldspathised fault breccia or "tuff" are dominated by microcrystalline-cryptocrystalline feldspar, replacing, and/or forming a matrix to clasts (rounded to angular) of feldspar (fresh to totally altered), quartz, granitoid and cryptocrystalline (?lamprophyre) material (Figs 73-74). Chlorite (ex-biotite) and epidote (<=1 %) is present in some of the chips. Unfortunately, the pervasive feldspathisation has obscured many primary features and textures.





Figures 73 & 74. PPL & XP views. *Two ovoid clasts overprinted by cryptocrystalline ?alkali feldspar crystallisation/metasomatism. Matrix is more micro-crystalline. Scale bar = 0.2 mm.*

Carbonate is present in some of the chips as porphyroblastic material (crystals up to 5 mm in size).

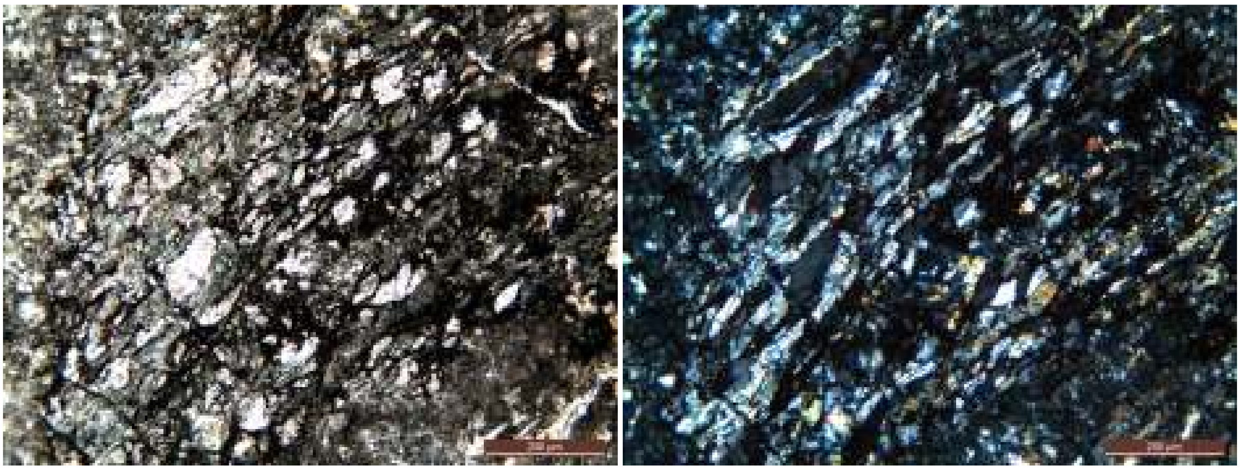
Although there is prima facie evidence to suggest many of the chips are tuffaceous or volcaniclastics, there is also strong evidence to suggest that some of the rocks are cataclasites.

VSAC 33 23-24

Petrographic name: Highly altered cataclasites/intrusive breccias/?volcaniclastics

The polished thin-section consists of 11 chips (average size ~1.5 cm) comprising a wide range of highly altered (e.g. kaolinised, haematitised, feldspathised, carbonated) fault breccias (Figs 75-76). Some chips are sheared and foliated. One chip contains green hornblende (Figs 77-78), possibly related to former porphyritic/poikiloblastic crystals, similar to material seen in VSAC 20 32-34.

Figures 75 & 76. PPL & XP views. *(Intrusive) breccia. Note secondary carbonate (colourless). Scale bar = 0.5 mm.*



Figures 77 & 78. PPL & XP views. *Semi-poikilitic/poikiloblastic hornblende, possibly representing a former tonalitic rock fragment. Scale bar = 0.2 mm.*

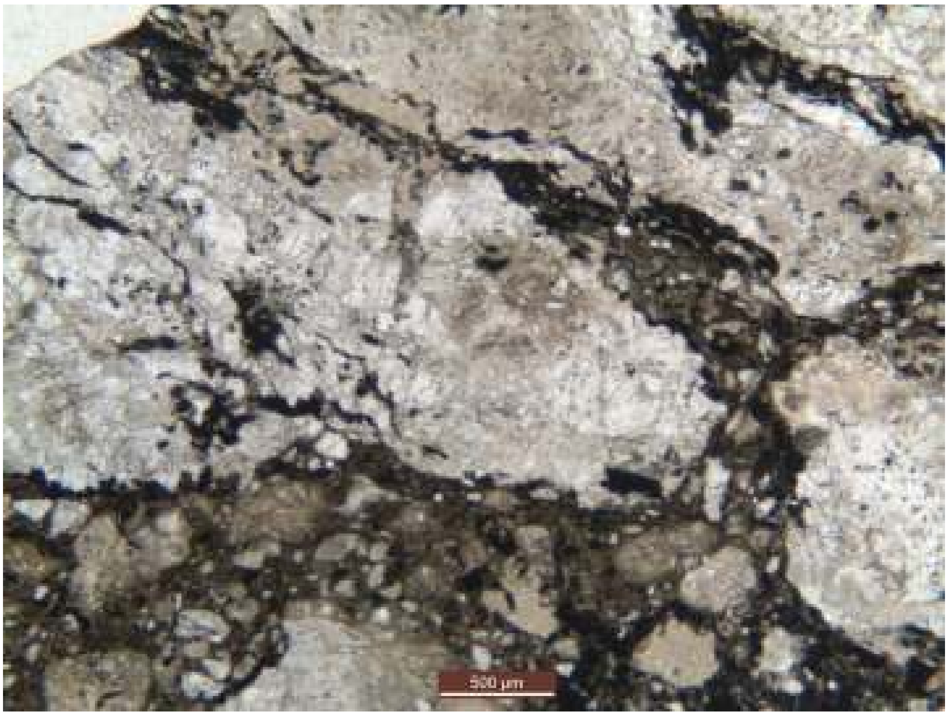
Carbonate replacement is strong in places, occupying interstitial zones between fragmented host rock, occurring in veins up to 10 mm thick and replacing former crystals (e.g. feldspar).

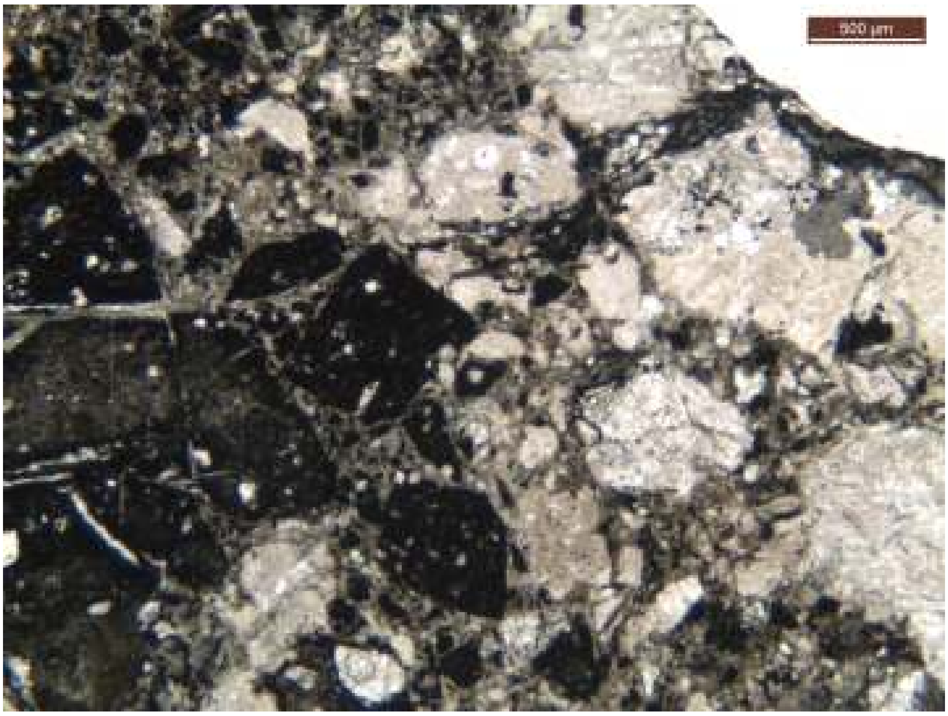
<u>Comment.</u> My favoured interpretation of the rocks represented in this polished thin-section is that they are intrusive breccias produced by the intrusion of dacitic-andesitic lamprophyre into granitoids that had been brecciated by hydraulic fracturing processes. This may have been accompanied with, or followed by, gas-streaming, which resulted in the rounding of some of the clasts.

VSAC 34 47-48

Petrographic name: Highly altered cataclasites/ fault breccia/ intrusive breccias in granitoids

The polished thin-section consists of 16 chips (average size ~15 mm; range = 3-26 mm) comprising a full spectrum of variably deformed and recrystallised hornblende- and biotite-bearing granitoids that grade into fault-breccias (Figs 79-80), some of which look like tuffs/volcaniclastics.





Figures 79 & 80. PPL. *Two different chips demonstrating the progressive disaggregation and brecciation of granitoids by the intrusion of lamprophyric magma. Scale bar = 0.5 mm.*

However, there is irrefutable evidence of the progressive disaggregation of the granitoid rocks, with the penetration of the "tuff' (i.e. intrusive breccia) into fractures (e.g. Fig. 79)..

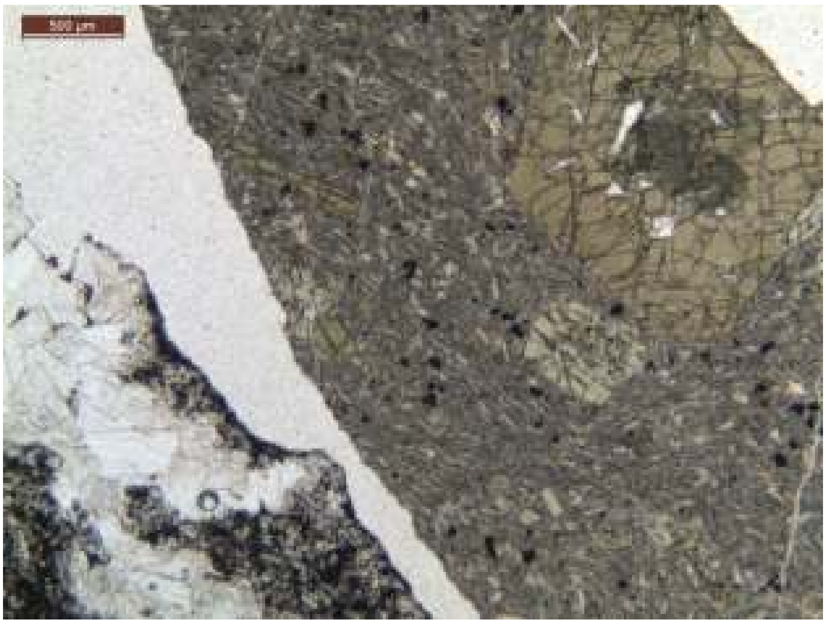
A very unusual feature of the rock is the blackening of many of the former minerals (especially hornblende and biotite) and clasts when viewed under the microscope (Fig. 80).

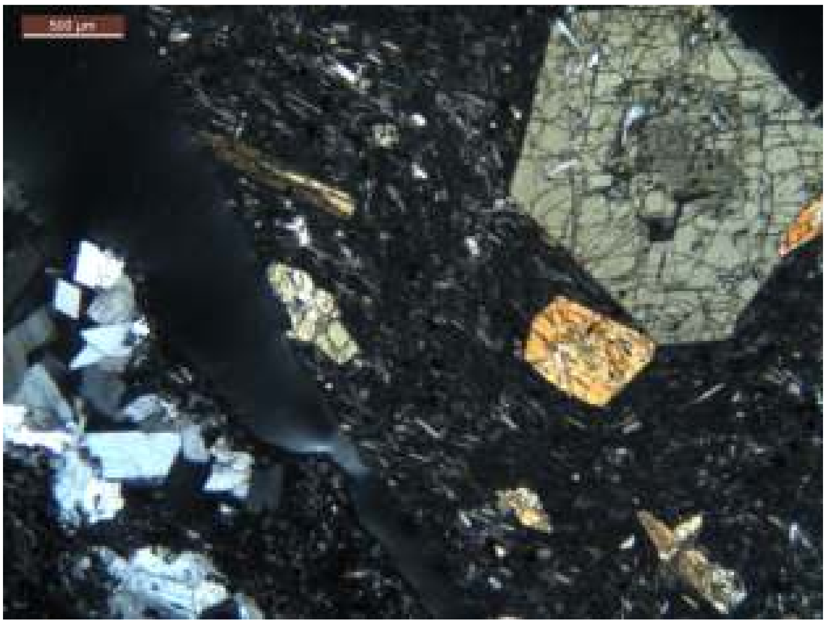
VSAC 35 39-41

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of 26 chips (average size ~10 mm; range = 3-15 mm) comprising dacitic-andesitic hornblende lamprophyre (Figs 81-82), some of which are blackish (see Fig. 81) and most of which are veined by late-stage alkali feldspar (see Figs 81-82). Several chips contain xenocrystic feldspar.

Hornblende phenocrysts are commonly euhedral. A few show euhedral zoning and several have greenish cores (see Fig. 81).





Figures 81 & 82. PPL & XP views. *Two chips of hornblende lamprophyre, one with euhedral, zoned hornblende, the other with late-stage euhedral ?alkali feldspar. Scale bar = 0.5 mm.*

VSAC 36 7-8

Petrographic name: Weakly altered dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of 22 chips (average size ~10 mm; range = 3-18 mm) comprising slightly different variations of dacitic-andesitic hornblende lamprophyre. Some have a cryptocrystalline groundmass and were probably glass-rich, originally.

Hornblende is glomeroporphyritic in places. A few phenocrysts are intergrown with or replaced by alkali feldspar.

Most of the chips are traversed by alkali feldspar. Some are also cut by carbonate veins.

VSAC 36 27-28

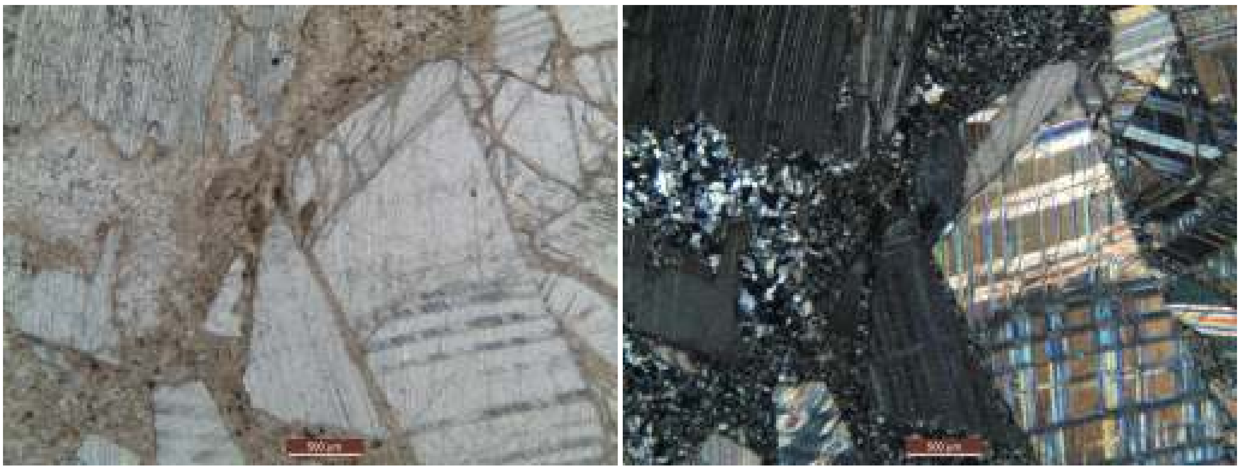
Petrographic name: Moderately altered, deformed and recrystallised hornblende- and biotite-bearing granitoids (some quartzitic)

The polished thin-section consists of 17 chips (average size ~10 mm; range = 3-15 mm) comprising mainly medium- to coarse-grained hornblende- and biotite-bearing granitoids. Several of them are very quartz-rich, ~80%, possibly reflecting a very coarse-grained granitoid precursor. Comparatively coarse-grained Fe-Ti oxides make up to 10 % of some of the granitoid chips (Figs 83-84).

Figures 83 & 84. PPL & XP views. *Fe-Ti oxides in a hornblende- and biotite-bearing granitoid. Scale bar = 0.5 mm.*

One chip in the polished thin-section, measuring 10 x 6 mm, consists of poikilitic plagioclase enclosing anhedral quartz, producing a coarse "pegmatitic" texture.

Three chips in the polished thin-section are dominated by well-crystallised medium- to coarse-grained carbonate, generally in a microcrystalline "groundmass" of crystalloblastic alkali feldspar, with minor chlorite and elongate hornblende crystals (Figs 85-86). It is possible that the chips were originally dacitic-andesitic lamprophyre.

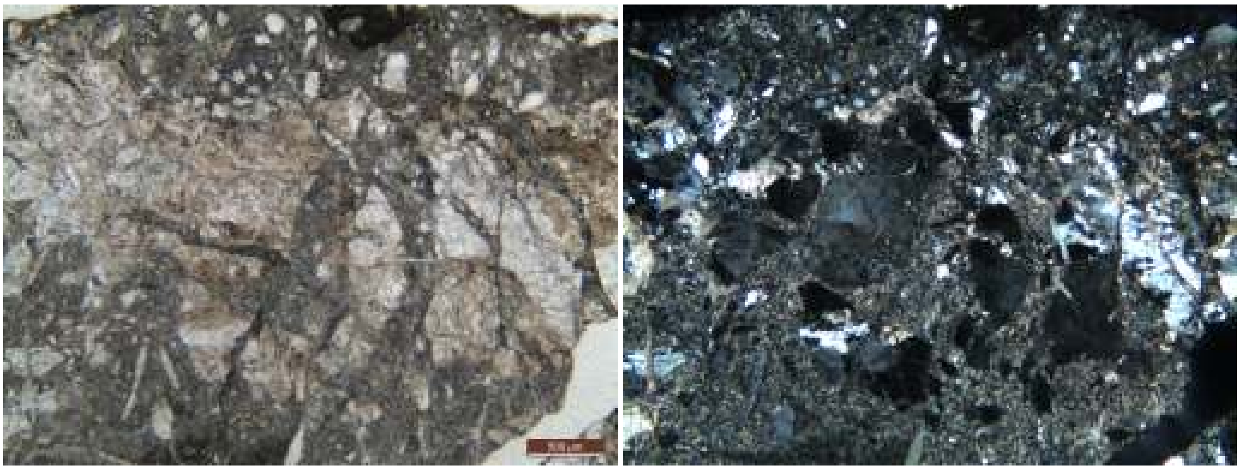


Figures 85 & 86. PPL & XP views. *Carbonate-dominated rock chip. Scale bar = 0.5 mm.*

VSAC 40 37-38

Petrographic name: Highly altered fault and intrusive breccias derived from hornblende- and biotite-bearing granitoids

The polished thin-section consists of ~38 chips (average size ~8 mm; range = 2-15 mm), most of which are fault- and intrusive-breccias derived from hornblende- and biotite-bearing granitoids. All types of gradational relationships of disaggregation are observed (Figs 87-88).



Figures 87 & 88. PPL & XP views. *Brecciation and disaggregation of granitoid. Matrix comprises mainly ?alkali feldspar and white mica. Scale bar = 0.5 mm.*

The granitoids rocks were originally mostly medium- to coarse-grained. Now they show all degrees of deformation, fracturing, recrystallisation and alteration (i.e. kaolinisation). Many now contain secondary carbonate and epidote.

One chip contains a sharp contact between microcrystalline-cryptocrystalline cataclasite/mylonite and disaggregated granitoid (Figs 89-90).

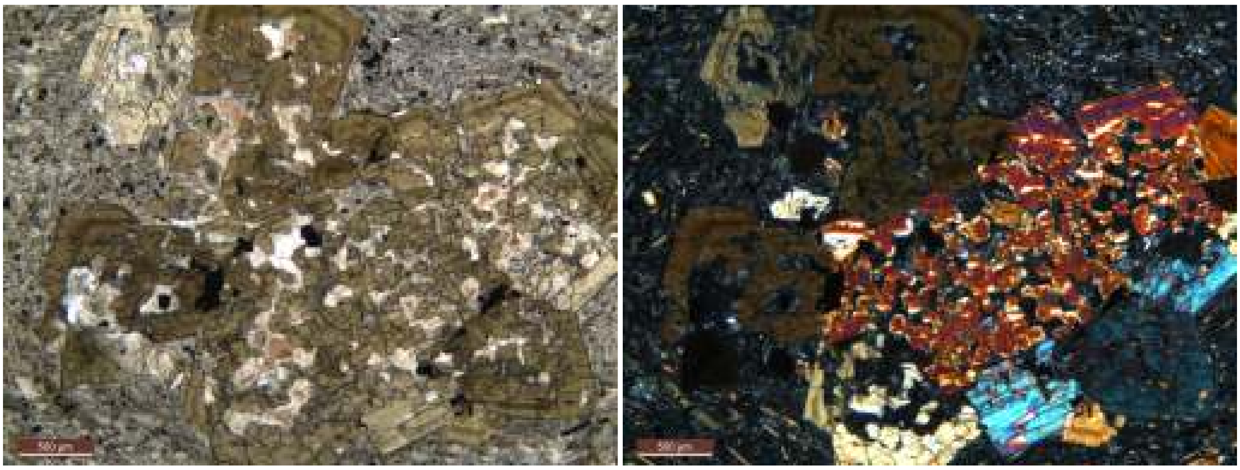
Figures 89 & 90. PPL & XP views. *Cataclastic contact/zone with brecciated granitoid. Scale bar = 0.5 mm.*

VSAC 41 11-12

Petrographic name: Dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of 18 chips (average size ~10 mm; range =3-23 mm) comprising dacitic-andesitic hornblende lamprophyre with superb euhedral hornblende phenocrysts and trachytic-textured groundmasses.

Hornblende phenocrysts range up to 3 mm in size. In some places they occur in glomeroporphyritic clusters (Figs 91-92). Some phenocrysts show euhedral zoning and some are intergrown with alkali feldspar (Figs 91-92) and/or the felsitic groundmass material (Fig. 93).



Figures 91 & 92. PPL & XP views. *Glomeroporphyritic hornblende, showing euhedralism, zoning and intergrowth with alkali feldspar (and, in places, groundmass). Scale bar = 0.5 mm.*

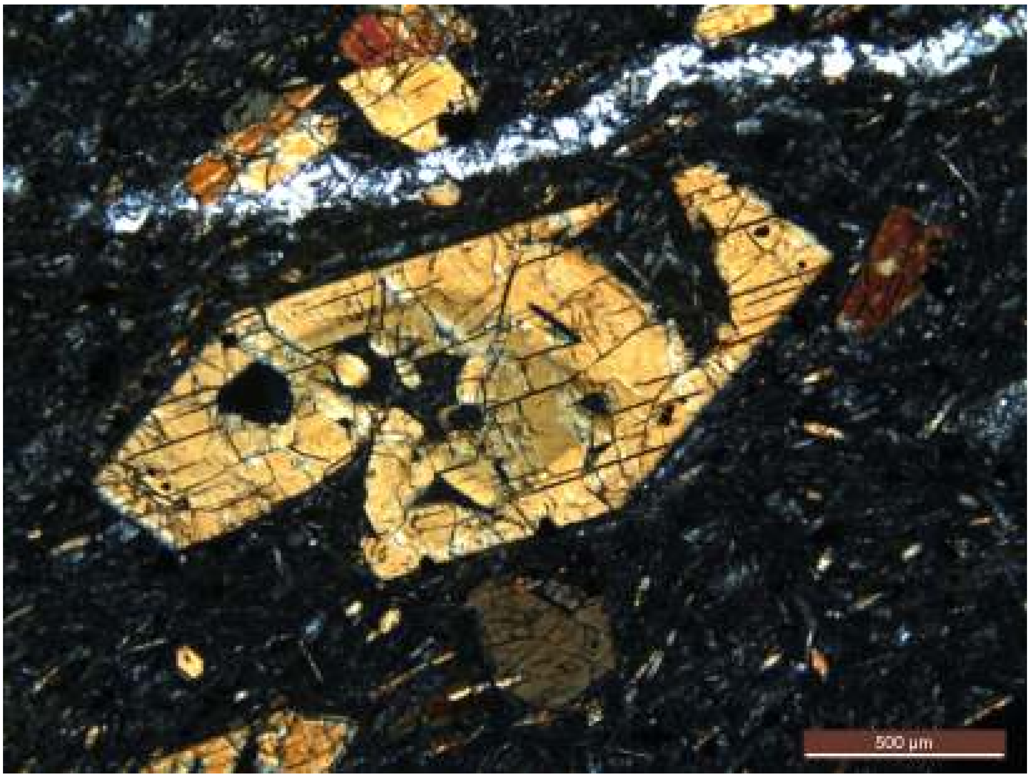
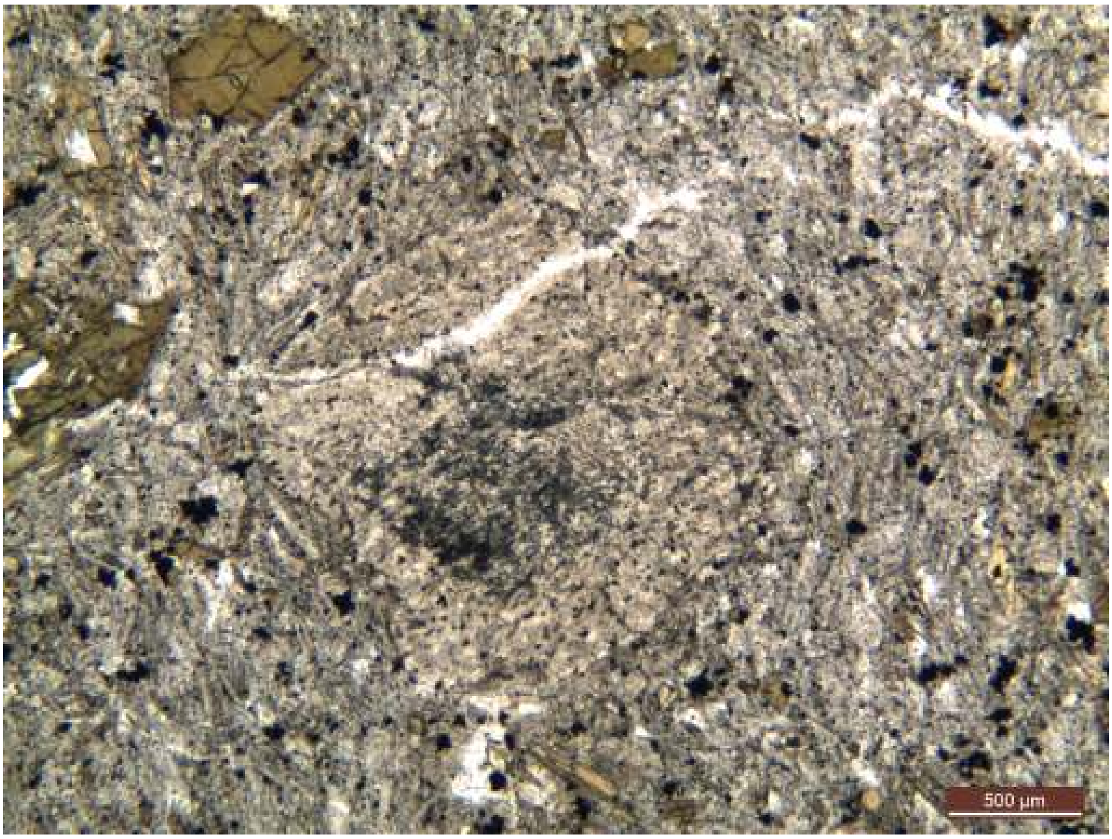
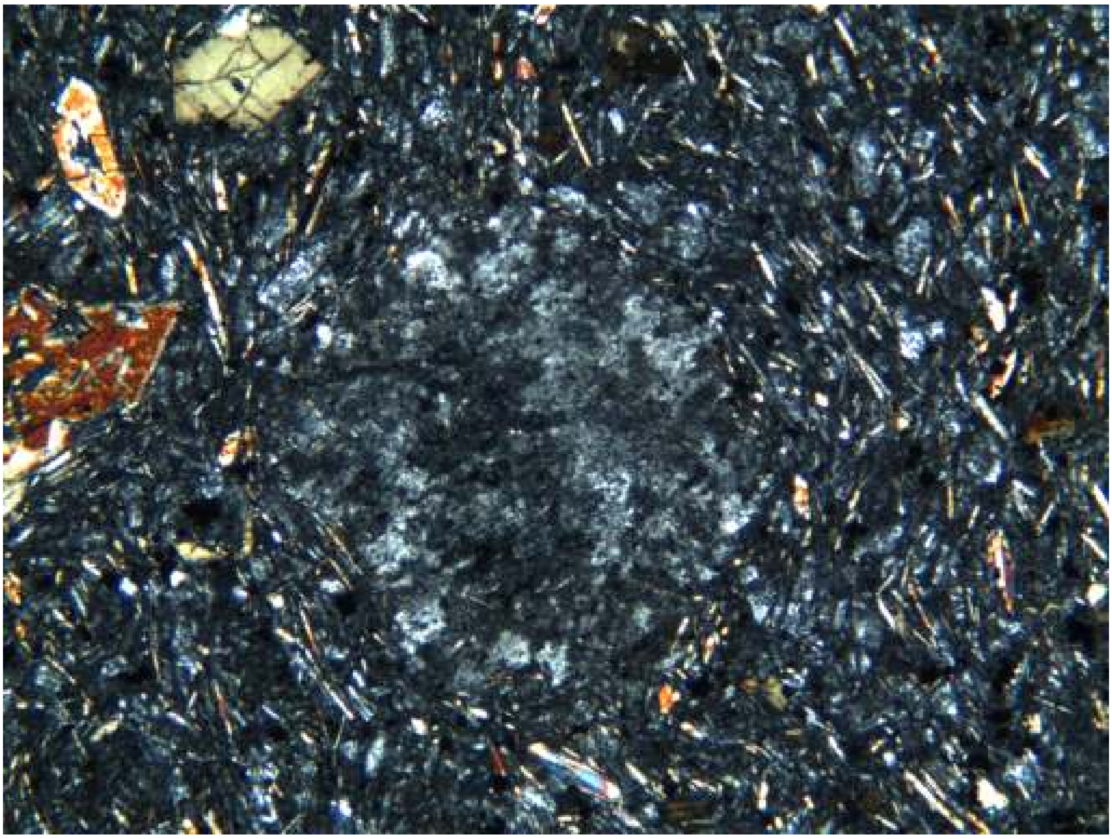


Figure 93. XP. *Hornblende phenocryst embayed by felsitic groundmass material. Note zoning in the hornblende phenocryst and the presence of a thin alkali feldspar vein. Scale bar = 0.5 mm.*

Locally, minor feldspar xenocrysts, strongly recrystallised, are present (Figs.94-95).





Figures 94 & 95. PPL & XP views. *Recrystallised feldspar xenocryst in hornblende lamprophyre. Scale bar = 0.5 mm.*

VSAC 41 18-19

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of ~42 chips (average size ~8 mm; range = 1-16 mm) comprising dacitic-andesitic hornblende lamprophyre in all degrees of alteration by kaolinite/saussurite, alkali feldspar and carbonate.

Many good examples of “late-stage” penetration of alkali feldspar into the rock are present.

VSAC 41 19-20

Petrographic name: Dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of 24 chips (average size ~12 mm; range = 3-18 mm) comprising dacitic-andesitic hornblende lamprophyre. There are many classic textures, including euhedral zoning in the hornblende.

Several chips are dominated by secondary alkali feldspar. Carbonate is abundant in one of them.

VSAC 43 12-13

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre (intrusive into biotite granitoid)

The polished thin section consists of 29 chips (average size ~10 mm; range = 2-20 mm) comprising moderately to strongly altered, partly medium-grained crystalloblastic devitrified, dacitic-andesitic hornblende lamprophyre. One chip contains a classic intrusive contact between the lamprophyre (very fine-grained) and biotite granitoid (Fig 96).

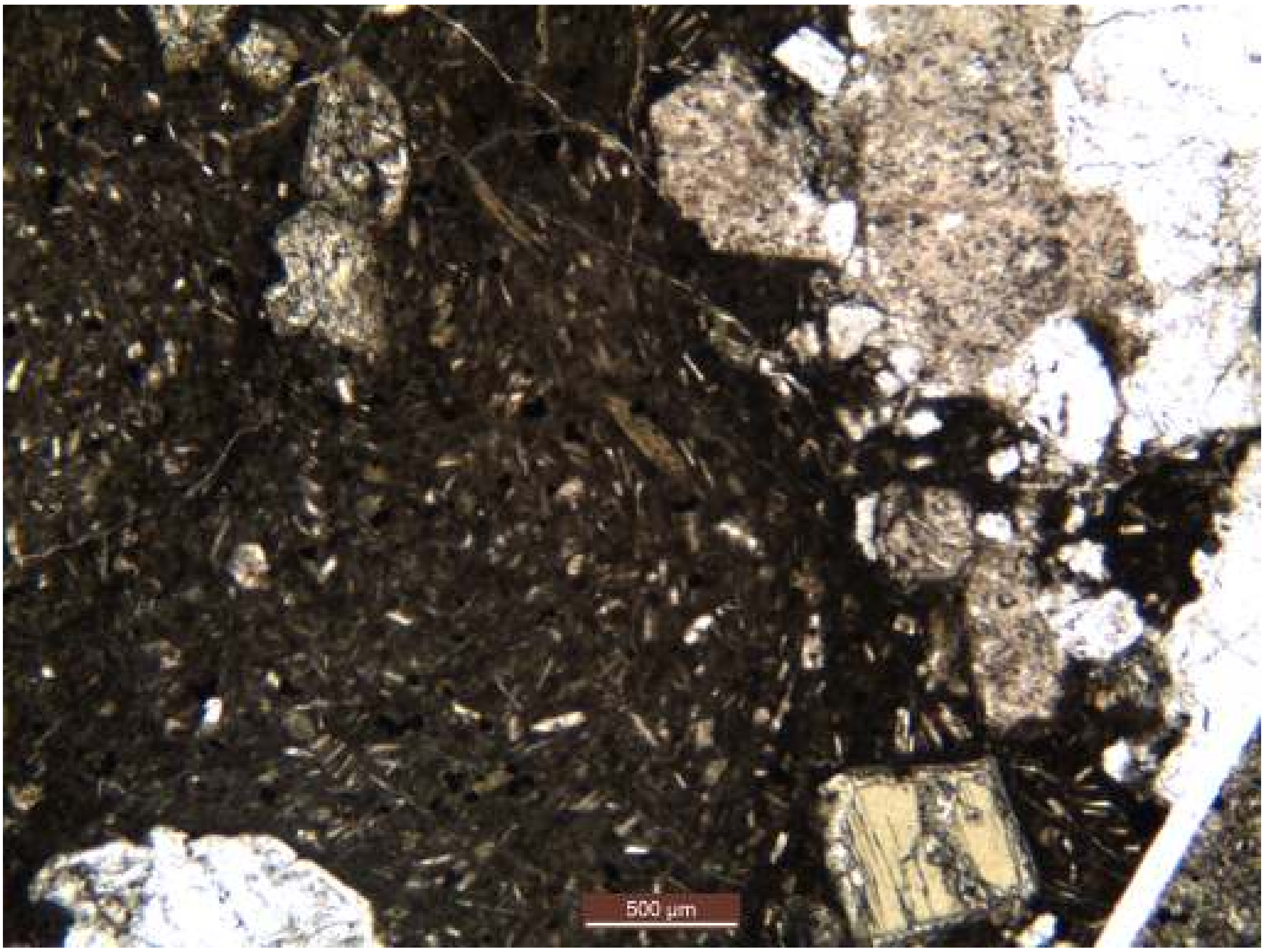


Figure 96. PPL. *Intrusive contact between hornblende lamprophyre and granitoid. Note hornblende phenocrysts (partially to completely altered), glassy nature of the matrix and the flaking off of granitoid pieces. At the SE corner of the photograph the edge of an adjacent chip is visible. Scale bar = 0.5 mm.*

Hornblende phenocrysts are partially to completely altered (Figs 97-98), principally to two main types of colourless phyllosilicates. One very fine-grained, the other is more-or-less cryptocrystalline. The first type has a moderate birefringence and in some ways looks slightly like talc pseudomorphing olivine, hence the incorrect, earlier interpretations (e.g. see VSAC 02 17-18, Fig. 12). The evidence in this sample clearly shows that pseudomorphs that look like olivine are in fact after hornblende (Figs 97-98).

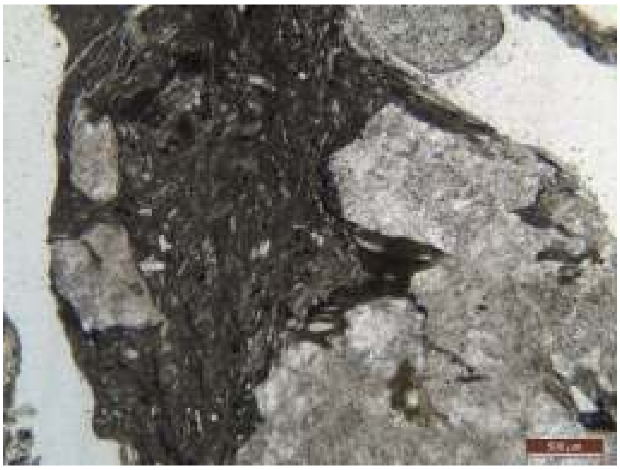
Figures 97 & 98. PPL & XP views. *Partially altered hornblende phenocryst with a morphology that mimics olivine. Alteration products comprise mainly very fine-grained and cryptocrystalline varieties of ±colourless phyllosilicates. Scale bar = 0.2 mm.*

Many of the chips show fine- to medium-grained crystalloblastic devitrification textures.

VSAC 43 25-26

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre (intrusive into biotite granitoid)

The polished thin-section consists of 16 chips (average size ~10 mm; average = 2-24 mm) comprising moderately to strongly altered dacitic-andesitic hornblende lamprophyre. Three chips contain classic intrusive contacts with biotite granitoid (Figs 99-100).

Figures 99 & 100. PPL views. *Two views of the intrusive contact between glassy lamprophyre and biotite granitoid. Note that the lamprophyre has flaked off pieces of the granitoid and intruded into fractures in the granitoid. Scale bar = 0.5 mm.*

The rock chips in the polished thin-section are similar to above (VSAC 43 12-13).

Zoned hornblende and medium- to coarse-grained devitrification textures are present in places.

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