HARTZ RANGE MINES PTY LTD

ACN: 084 999 413

EL 24358

Relinquishment Report

FOR THE PERIOD ENDING 15th March 2009

Submitted By

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Distribution

Department of Primary Industry, Fisheries and Mines (1)
Hartz Range Mines Pty Ltd (1)
Lagoon Creek Resources Pty Ltd (1)

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Date: 16th May 2008

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Northern Territory, Australia

ABSTRACT

Relinquishment of 50% (35 blocks) of EL24358 was carried out in February 2009. This report summarises the work carried out on the relinquished blocks by Hartz Range Mines Pty Ltd ("HRM") and Lagoon Creek Resources Pty Ltd ("LCR"). Extended wet seasons and cyclonic activity has largely prevented field access and field activity has been limited over this area.

The work over this tenement has comprised of an airborne geophysics survey, comprehensive helicopter-borne stream sediment sampling program of the tenement as part of an ongoing exploration targeting exercise for the area.

KEYWORDS: NT, McArthur Basin, Debbil Debbil Uranium Project, Branch Creek Diamond Project, copper, uranium, diamond, airborne geophysical survey, Landsat, SPOT.

TABLE of CONTENTS

LIST of FIGURES

LIST of Tables

LIST of APPENDICES

INTRODUCTION

Hartz Range Mines Pty Ltd ("HRM") holds three Exploration Licences, EL10335, EL22579, and EL24358 at Wollogorang Station on the Northern Territory/Queensland border. Collectively these are known as the Wollogorang Project. EL24358 is wholly covered by the Debbil Debbil JV. Under this Joint Venture agreement LCR are able to explore for uranium, base metals and gold. HRM retains the right to explore for diamonds within EL24358. Figure 1 shows the location of EL24358.

TENEMENT DETAILS

Relinquishment of 50% (35 blocks) was carried out in February 2009. Figure 2 shows the area relinquished.

LICENCE	APPLIED	GRANTED	EXPIRY	BLOCKS	AREA (km^2)
EL24358	5 Aug 2004	16 Mar 2005	15 Mar 2011	70	229.2

Block	Sub-Blocks
SE531364	BCDE GHJK MNOP RSTU WXYZ
SE531365	ABCDEFGHJKLMNOPQRSTUVWXYZ
SE531366	ABC FGH LMN QRS VWX
SE531436	BCDE
SE531437	ABCDE
SE531438	A

***Table 1** – Tenement Block Details*

	Relinquished Blocks
Block	Sub-Blocks
SE531364	BCDE GHJK MNOP RSTU WXYZ
SE531365	ABCDEF L Q V
SE531366	A
SE531436	BCDE
SE531437	A

***Table 2** – Relinquished Tenement Block Details*

Native Title

AAPA Authority Certificate C2006/107 was issued on the 30th October 2006 after amendment to include track and drill pad construction and drilling.

The JV area is affected by Native Title Claim DC02/11, Wollogorang South, made on behalf of the Gudidiwalia and Binanda Garawa People and accepted for registration by the National Native Title Tribunal on 19/07/2002.

The southern and south western boundary abuts Aboriginal Freehold Land (NT Portion 2006) administered by the Waanyi/Garawa Land Trust.

REGIONAL GEOLOGY

The project area is located within the Wearyan Shelf tectonic domain of the south eastern parts of the Pelaeoproterozoic McArthur Basin. The McArthur Basin is a succession of essentially unmetamorphosed sedimentary and lesser volcanic rocks, deposited largely in shallow marginal marine and lacustrine settings (see Figure 2).

The tenements cover a sequence of sediments and volcanics of the mid-Proterozoic Tawallah Group which flank the northern margin of the Lower Proterozoic Murphy Inlier. The Murphy Metamorphics are a sequence of isoclinally folded greenschist facies metasediments which are unconformably overlain by a felsic volcanic/pyroclastic sequence (Cliffdale Volcanics), intruded by granite/adamellite of the Nicholson Granite Complex. The Tawallah Group overlies the igneous and metamorphic complexes of the Murphy Inlier with angular unconformity and disconformity. The Tawallah Group is the oldest group of the McArthur Basin sequence. The Westmorland Conglomerate is the oldest unit of the Tawallah Group and consists of a thick sequence (up to 1800m) of fluvial arkosic conglomerate and quartz arenite. The Seigal Volcanics conformably overlie the Westmorland Conglomerate and occurs as a series of tholeiitic basaltic lavas and minor tuffaceous interbeds along the southern margin of the project area. The McDermott Formation conformably overlies the Seigal Volcanics along the southern margin and forms a narrow, poorly outcropping unit characterised by alternating beds of shallow-water marine arenites, shale and dolostone.
The carbonate rocks of the McDermott Formation are conformably overlain by the Sly Creek Sandstone sequence which grades upwards into glauconitic sandstone named the Aquarium Formation. The conformable units encompass the majority of the project area and are characterised by a series of open folds with north-east oriented axes.

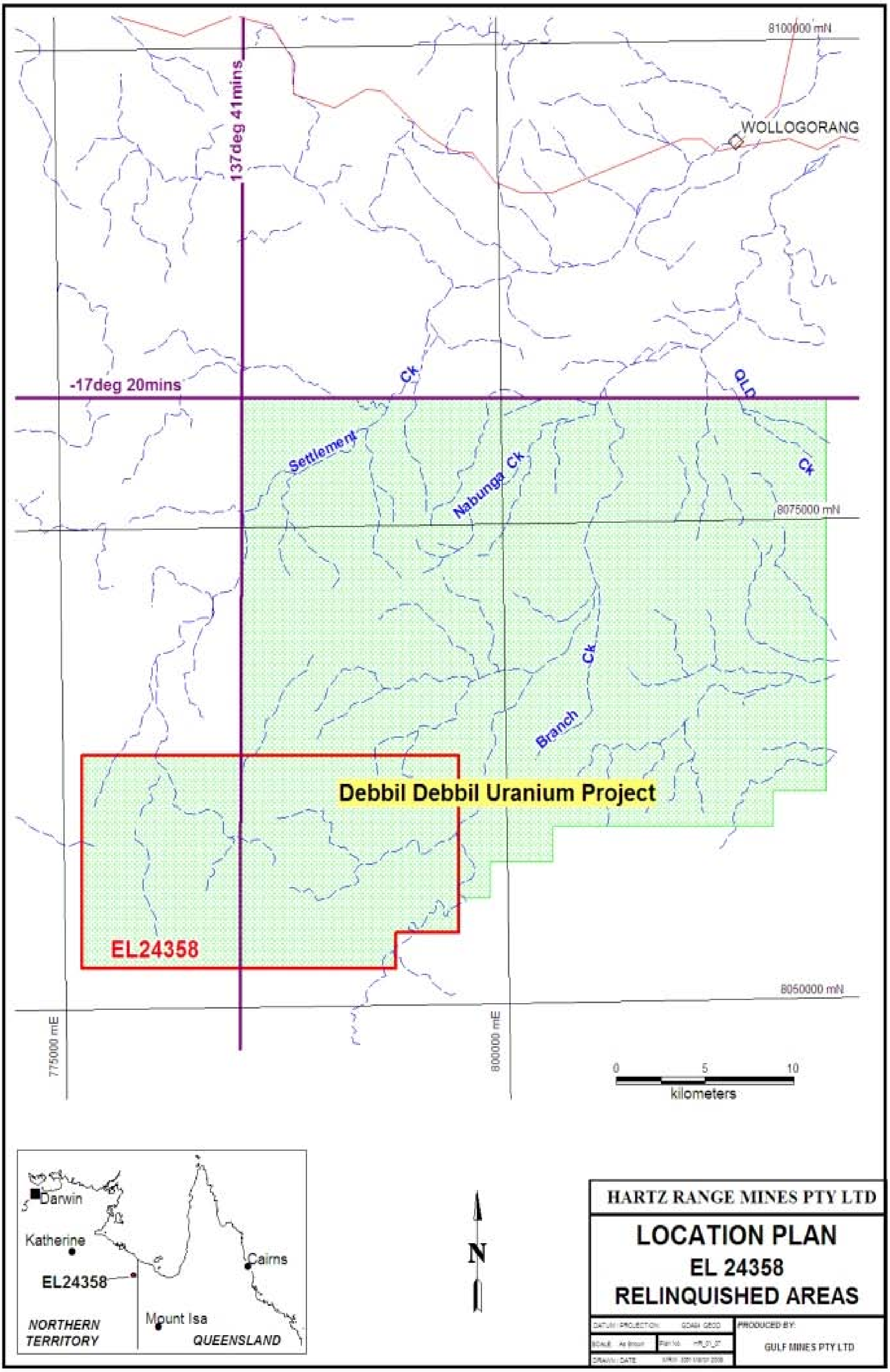

Figure 1. Location Map showing EL24358 and Debbil Debbil Uranium Project.

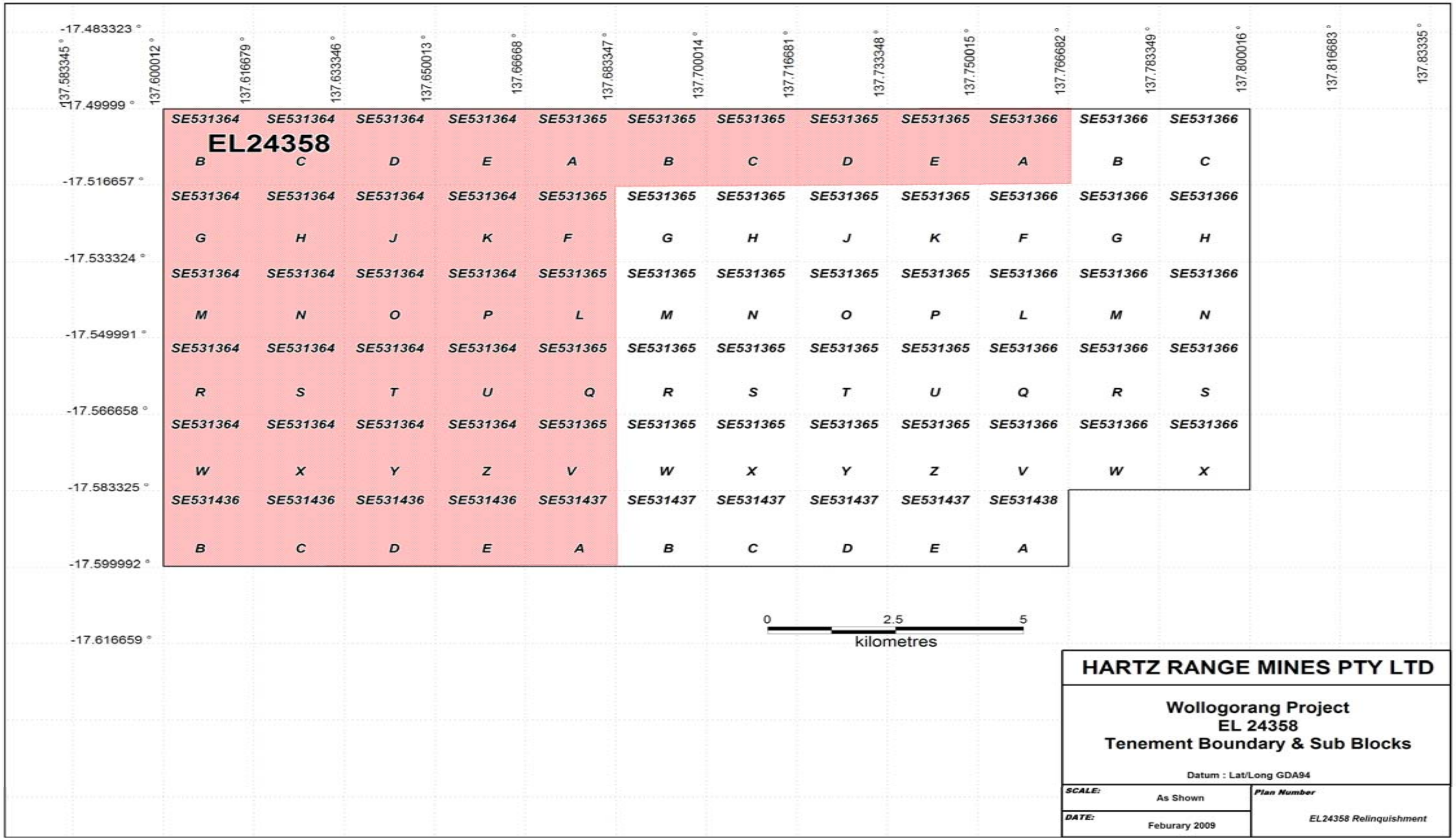

Figure 2 – EL24358 showing Relinquished Blocks

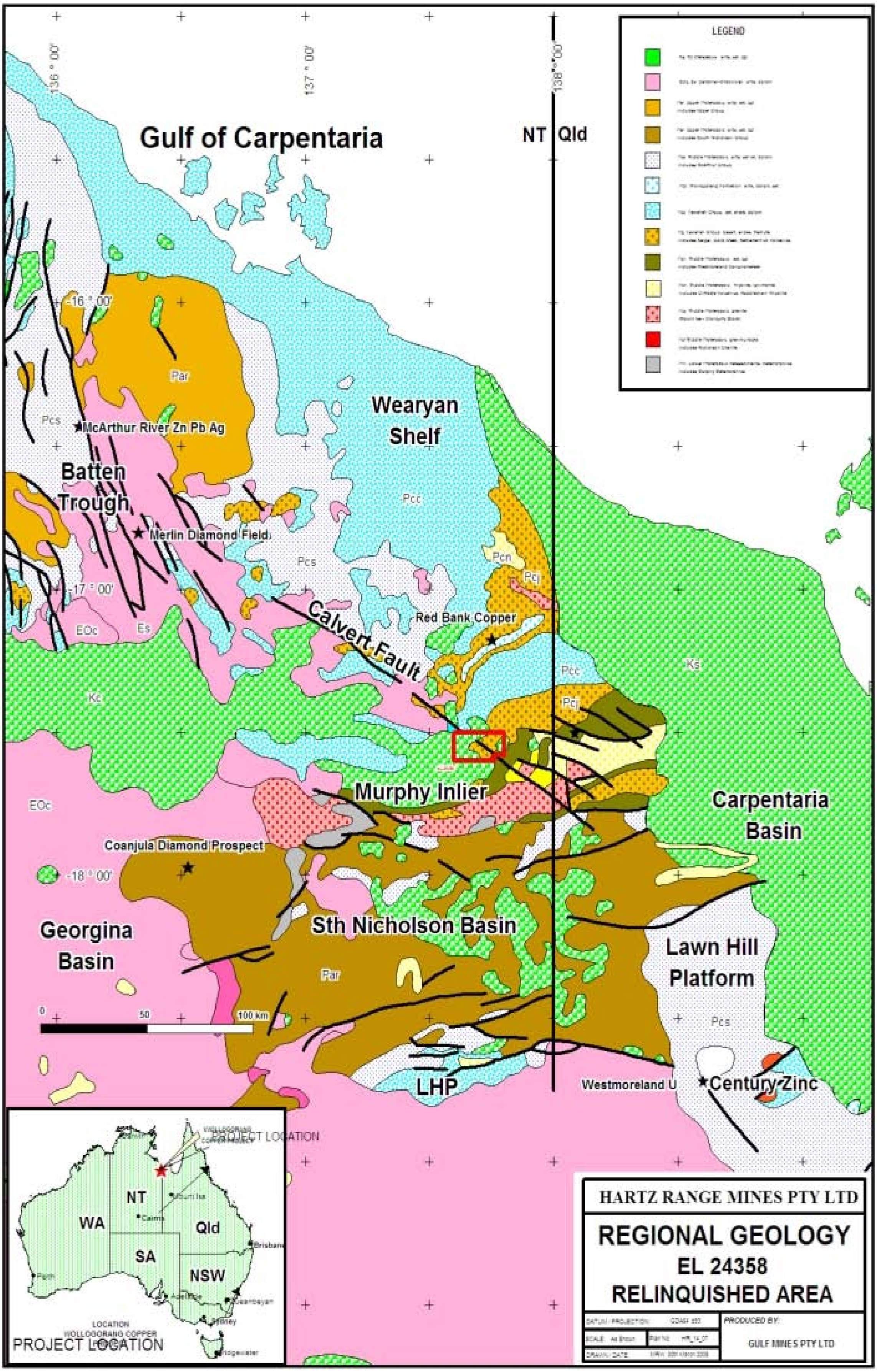

Figure 3. Regional Geological Setting

The continental Settlement Creek Volcanics conformably overlie the Aquarium Formation and consist of a series of basaltic lava flows, sills and siltstone interbeds. Exposure of the volcanics is limited and is obscured by recent alluvium denoting the Settlement Creek valley.

Minor siltstone and sandstone of the Early Cretaceous Mullaman Beds overlie the Tawallah Group sediments. Soils, alluvium and lateritic deposits of Tertiary and Quaternary age mask the underlying Proterozoic lithologies along the major watercourses. (after Jackson *et al*, 1987 and Ahmad & Wygralak, 1989)

EXPLORATION CONDUCTED

Airborne Geophysical Survey

During August and September 2006 an airborne magnetic and radiometric survey designed to join the UTS survey conducted in 2005 by LCR was completed by Fugro Airborne Surveys Pty Ltd. The survey initially planned for July was delayed substantially due to late wet season weather conditions and delays in completing other surveys. A total of 17,913 km were flown in north – south lines at 100 metre spacing with a nominal terrain clearance of 60 metres. Tie lines were flown east west at 1000 m spacing. Quality control and data interpretation for the survey have been provided by Steve Webster, an independent consulting geophysicist. A quality control report and radiometric calibration report for the Fugro survey and logistics reports for both surveys are appended. Digital airborne geophysics data captured over EL 24358 has been submitted. Images produced from the gridded data are shown in Figures 4, 5 and 6.

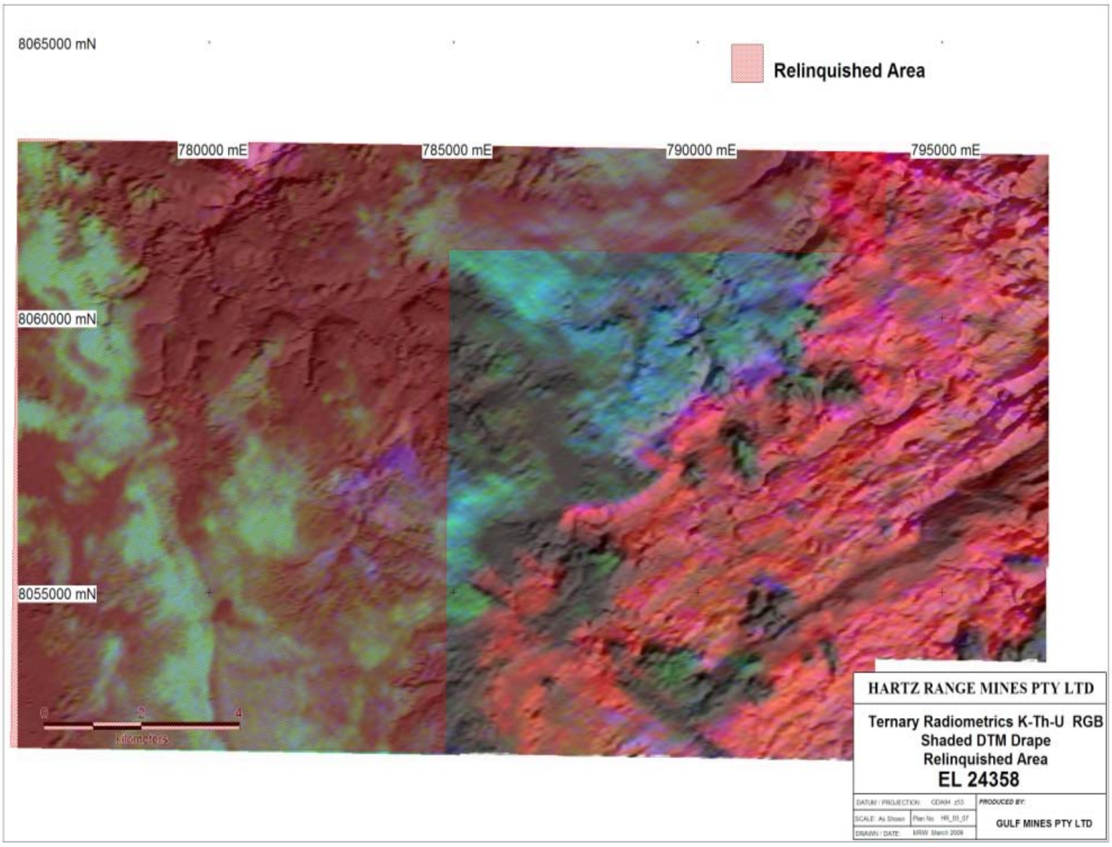

Figure 4 – Ternary Radiometrics K-Th-U RGB Shaded DTM Drape Relinquished Area EL24358.

Figure 5 – Landsat 7 Pseudo Natural Bands 1 2 3 and Pan in B G R Relinquished Area EL24358.

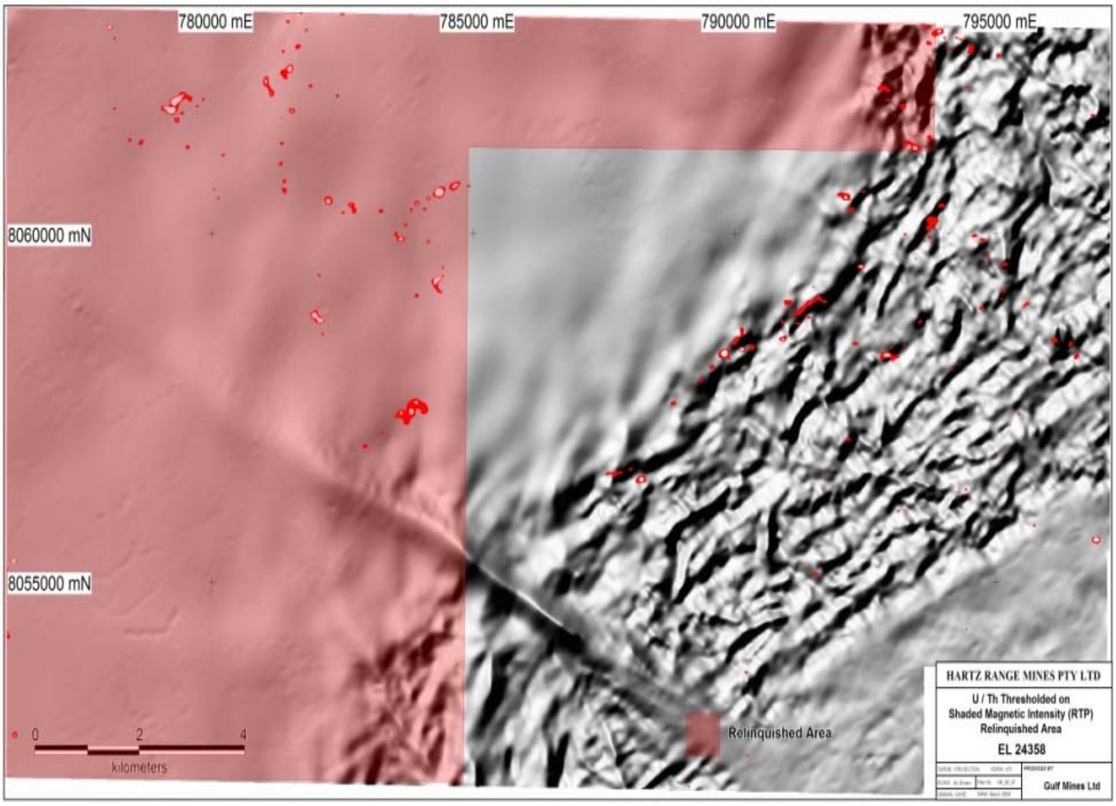

Figure 6 – U/Th Thresholded on Shaded Magnetic Intensity (RTP) Relinquished Area EL24358.

Helicopter-borne Regional Stream Sediment Survey.

Lagoon Creek Resources undertook a regional stream sediment geochemistry sampling programme over the JV portions of tenements EL24358, 10335 and 22579.

A total of 135 stream sites were surveyed within in tenement EL24358, with 3 samples being collected from each location. Each sample was sieved on site. One sample to -2mm was of around 5kg, this being used for a bulk cyanide leach. Two samples to -#80 mesh, were around 2kg each, one for multi element ICP analysis and the second duplicate should further assay be required. These duplicate samples are now in storage in Mount Isa.

The BCL and ICP samples were dispatched via courier to ALS in Townsville. Location and assay information can be found in Appendix 1.

Exploration by Lagoon Creek Resources on the Debbil Debbil JV covering EL24358 has been severely hampered by a combination of the record wet season and the current mineral boom presenting serious problems in the acquisition of contractors and field staff. Lagoon Creek Resources has completed its field camp construction. Hartz Range Mines have continued exploration under the same difficult conditions**.**

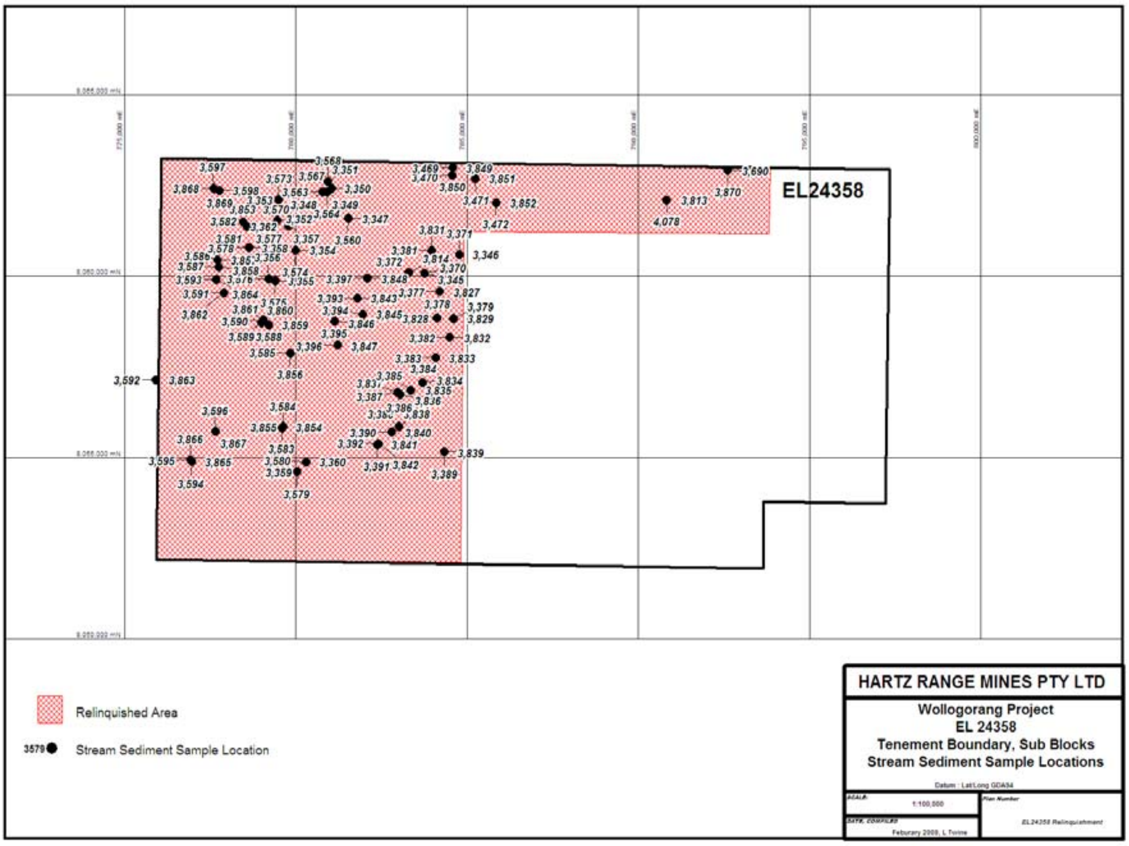

Figure 7. Stream Sediment Locations

REFERENCES

Ahmad M and Wygralak AS 1989, 1:250000 Metalogenic Map Series. Explanatory notes and mineral deposit data sheets. Calvert Hills SE 53-08, NT.

Jackson MJ, Muir MD and Plumb KA 1987, Geology of the southern McArthur Basin, Northern Territory, BMR Bulletin 220.

Appendix 1

Stream Sediment Sample Tables

Appendix 2

Airborne Geophysical Survey
Raw Data

Appendix 3

Airborne Geophysical Survey Logistics Report

Logistics Report

for a

DETAILED AIRBORNE MAGNETIC, RADIOMETRIC AND DIGITAL TERRAIN SURVEY

for the

WESTMORELAND PROJECT

carried out on behalf of

LAGOON CREEK RESOURCES PTY LTD

by

UTS GEOPHYSICS

(UTS Job #A719)

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TABLE OF CONTENTS

1 GENERAL SURVEY INFORMATION

UTS Geophysics conducted a low level airborne geophysical survey for the following company:

Lagoon Creek Resources Pty Ltd
67 St Pauls Terrace
Spring Hill, QLD 4000

Acquisition for this survey commenced on the 10th August 2005 and was completed on the 2nd October 2005. The base location used for operating the aircraft and performing in-field quality control was the Hell's Gate Roadhouse in the Northern Territory.

2 SURVEY SPECIFICATIONS

The area surveyed was approximately 27km southwest of Westmoreland in Queensland. The survey was flown using the AMG84 coordinate system (a Universal Transverse Mercator projection) derived from the Australian Geodetic Datum and was contained within zone 53 with a central meridian of 135 degrees. Details of the datum and projection system are provided in Appendix B of this report. Survey boundary coordinates are listed in Appendix C.

The survey data acquisition specifications for each area flown are specified in the following table:

PROJECT NAME	LINE SPACING	LINE DIRECTION	TIE LINE SPACING	TIE LINE DIRECTION	SENSOR HEIGHT	TOTAL LINE KM
Westmoreland	100m	000-180	1000m	090-270	60m	21,504
TOTAL						**21,504**

The specified sensor height for the magnetic samples is as stated in the above table. This sensor height may be varied where topographic relief or laws pertaining to built up areas do not allow this altitude to be maintained, or where the safety of the aircraft and equipment is endangered.

3 AIRCRAFT AND SURVEY EQUIPMENT

The UTS navigation flight control computer, data acquisition system and geophysical sensors were installed into a specialised geophysical survey aircraft.

The list of geophysical and navigation equipment used for the survey is as follows:

General Survey Equipment

- Cessna 210 fixed wing survey aircraft.
- UTS proprietory flight planning and survey navigation system.
- UTS proprietory high speed digital data acquisition system.
- Novatel 3951R, 12 channel precision navigation GPS.
- OMNILITE 132 real time differential GPS system.
- UTS LCD pilot navigation display and external track guidance display.
- UTS post mission data verification and processing system.
- Bendix King KRA-10 radar altimeter.

Magnetic Data Acquisition Equipment

- UTS tail stinger magnetometer installation.
- Scintrex Cesium Vapour CS-2 total field magnetometer.
- Fluxgate three component vector magnetometer.
- RMS Aeromagnetic Automatic Digital Compensator (AADC II).
- Diurnal monitoring magnetometer (Scintrex Envimag).

Radiometric Data Acquisition Equipment

- Exploranium GR-820 gamma ray spectrometer.
- Exploranium gamma ray detectors.
- Barometric altimeter (height and pressure measurements).
- Temperature and humidity sensor.

3.1 Survey Aircraft

The aircraft used for this survey was a Cessna 210 fixed wing survey aircraft, operated by UTS Geophysics, registration VH-KWW. The specifications are as follows:

Power Plant

• Engine Type	Continental, IO-520
• Brake Horse Power	285 bhp
• Fuel Type	AV-GAS

Performance

• Cruise speed	150 Kn
• Survey speed	130 Kn
• Stall speed	60 Kn
• Range	1185 Km
• Endurance (no reserves)	5.2 hours
• Fuel tank capacity	246 litres

3.2 Data Positioning and Flight Navigation

Survey data positioning and flight line navigation was derived using real-time differential GPS (Global Positioning System).

Navigation was performed using a UTS designed and built electronic pilot navigation system providing computer controlled digital navigation instrumentation mounted in the cockpit as well as an externally mounted track guidance system.

GPS derived positions were used to provide both aircraft navigation and survey data location information.

The GPS systems used for the survey were:

• Aircraft GPS Model	Novatel 3951R
• Sample rate	0.5 Seconds (2 Hz)
• GPS satellite tracking channels	12 parallel
• Typical differentially corrected accuracy	1-2 metres (horizontal) 3-5 metres (vertical)

3.3 UTS Data Acquisition System and Digital Recording

All geophysical sensor data and positional information measured during the survey was recorded using a UTS developed, high speed, precision data acquisition system. Survey data was downloaded onto magnetic tape on completion of each survey flight.

Instrument synchronisation times were measured and removed in real-time by the UTS data acquisition system.

3.4 Altitude Readings

Accurate survey heights above the terrain were measured using a King radar altimeter installed in the aircraft. The height of each survey data point was measured by the radar altimeter and stored by the UTS data acquisition system.

- Radar altimeter models King KRA-10
- Accuracy 0.3 metres
- Resolution 0.1 metres
- Range 0 - 500 metres
- Sample rate 0.1 Seconds (10Hz)

The digital terrain model is calculated by subtracting the terrain clearance (radar altimeter) from the GPS height (interpolated to 0.1 Hz), and as such the accuracy is constrained by the differentially corrected GPS position.

3.5 UTS Stinger Mounted Magnetometer System

The installation platform used for the acquisition of magnetic data was a tail mounted stinger. This proprietory stinger system was constructed of carbon fibre and designed for maximum rigidity and stability.

Both the total field magnetometer and three component vector magnetometer were located within the tail stinger.

3.6 Total Field Magnetometer

Total field magnetic data readings for the survey were made using a Scintrex Cesium Vapour CS-2 Magnetometer. This precision sensor has the following specifications:

- Model Scintrex Cesium Vapour CS-2 Magnetometer
- Sample Rate 0.1 seconds (10Hz)
- Resolution 0.001nT
- Operating Range 15,000nT to 100,000nT

3.7 Three Component Vector Magnetometer

Three component vector magnetic data readings for the survey were made using a Develco Fluxgate Magnetometer. This precision sensor has the following specifications:

- Model Develco Fluxgate Magnetometer
- Sample Rate 0.1 seconds (10Hz)
- Resolution 0.1nT
- Operating Range -100,000nT to 100,000nT

3.8 Aircraft Magnetic Compensation

At the start of the survey, the system was calibrated for reduction of magnetic heading error. The heading and manoeuvre effects of the aircraft on the magnetic data was removed using an RMS Automatic Airborne Digital Compensator (AADC II).

Calibration of the aircraft heading effects were measured by flying a series of pitch, roll and yaw manoeuvres at high altitude while monitoring changes in the three axis magnetometer and the effect on total field readings. A 26 term model of the aircraft magnetic noise covering permanent, induced and eddy current fields was determined. These coefficients were then applied to the data collected during the survey in real-time.

UTS static compensation techniques were also employed to reduce the initial magnetic effects of the aircraft upon the survey data.

3.9 Diurnal Monitoring Magnetometer

A base station magnetometer was located in a low gradient area beyond the region of influence of any man made interference to monitor diurnal variations during the survey.

The specifications for the magnetometer used are as follows:

• Model	Scintrex Envimag
• Resolution	0.1 nT
• Sample interval	5 seconds (0.2 Hz)
• Operating range	20,000nT to 90,000nT
• Temperature	-20°C to +50°C

3.10 Barometric Altitude

An Air DB barometric altimeter was installed in the aircraft so as to record and monitor barometric height and pressure. The data was recorded at 0.10 second intervals and is used for the reduction of the radiometric data.

• Model	Air DB barometric altimeter
• Accuracy	2 metres
• Height resolution	0.1 metres
• Height range	0 - 3500 metres
• Maximum operating pressure:	1,300 mb
• Pressure resolution:	0.01 mb
• Sample rate	10 Hz

3.11 Temperature and Humidity

Temperature and humidity measurements were made during the survey at a sample rate of 10Hz. Ambient temperature was measured with a resolution of 0.1 degree Celsius and ambient humidity to a resolution of 0.1 percent.

3.12 Radiometric Data Acquisition

The gamma ray spectrometer used for the survey was capable of recording 256 channels and was self stabilising in order to minimise spectral drift. The detectors used contain thallium activated sodium iodide crystals.

Thorium source measurements were made each survey day to monitor system resolution and sensitivity. A calibration line was also flown at the start and end of each survey day to monitor ground moisture levels and system performance

- Spectrometer model Exploranium GR820
- Detector volume 32 litres
- Sample rate 1 Hz

4 PROJECT MANAGEMENT

Lagoon Creek Resources Pty Ltd	Greg Duncan
UTS Geophysics Perth Office	Barrett Cameron

5 DATA PROCESSING PROCEDURES

5.1 Data Pre-processing

The raw survey data was loaded from the field tapes and the recorded data trimmed to the correct survey boundary extents. Any survey lines subsequently reflown were removed from the dataset.

At the commencement of each acquisition flight, all the instrumentation clocks were synchronized to local time, and the error and latency of each instrument in providing its data measurement calculated. The results of these latency measurements were recorded into a synchronisation file, and the results used to assign GPS positions to the magnetic, radiometric and elevation data. As a result of the physical separation of the sensors, a small residual offset still exists between instrument timings.

To compensate for this residual parallax error, an adjustment was made to the instrument clocks. The magnetic and radar altimeter data was adjusted by 0.600 seconds, and the radiometric data was adjusted by 1.375 seconds for each flight.

The synchronized, parallax corrected data was then exported as located ASCII data.

5.2 Magnetic Data Processing

The diurnal base station data was checked for spikes and steps, and suitably filtered prior to the removal of diurnal variations from the aircraft magnetic data.

The filtered diurnal measurements were subtracted from the diurnal base field and the residual corrections applied to the survey data by synchronising the diurnal data time and the aircraft survey time. The average diurnal base station value was added to the survey data.

The X and Y positioning of the data was then checked for spikes before applying the IGRF correction. Any spikes in the positions were manually edited. The updated IGRF 2000 correction was calculated at each data point (taking into account the height above sea level).

This regional magnetic gradient was subtracted from the survey data points.

Tie line levelling was applied to the data by least squares minimisation, using a polynomial fit of order 0, of the differences in magnetic values at the crossover points of the survey traverse and tie line data.

In order to remove any residual long wavelength variations in the tie line levelled data along the traverse lines, polynomial levelling was then applied.

Final micro-levelling techniques were then selectively applied to the tie line levelled data to remove minor residual variations in profile intensity

Located and gridded data were generated from the final processed magnetic data.

5.3 Radiometric Data Processing

Statistical noise reduction of the 256 channel data was performed using the Maximum Noise Fraction (MNF) method described by Dickson and Taylor (1998). This method constructs a noise covariance model from the survey data, which is then decorrelated and re-scaled so that the model has unit variance and no channel-to-channel correlation.

A principal component transformation of the noise-whitened data is performed, and the number of components to be saved is determined by ranking the eigenvectors by signal-to-noise ratio. The signal-rich components are retained, and the spectral data reconstructed without the noise fraction. Typically, 32-42 MNF components are retained during this process.

Channels 30-250 only are noise-cleaned, as these contain the regions of interest and are not dominated by the lower end of the Compton continuum. The energy spectrum between the potassium and thorium peaks was recalibrated from the noise-cleaned 256 channel measurements.

The aircraft background spectrum and the scaled unit cosmic spectrum were then subtracted from the 256 channel data. This 256 channel data was then windowed to the 5 primary channels of total count, potassium, uranium, thorium and low-energy uranium. Dead time corrections were then applied to the data. Radon background removal was performed using the Minty Spectral Ratio method (1992).

The radar altimeter data was corrected to standard temperature and pressure, and height corrected spectral stripping was then applied to the windowed data. Height attenuation corrections based on the STP radar altimeter were then performed to remove any altitude variation effects from the data.

The corrected count rate data was then converted to ground concentrations for potassium, uranium and thorium (sensitivity coefficients are supplied in Appendix F).

Final micro-levelling techniques were then selectively applied to the tie line levelled data to remove minor residual variations in profile intensities. Located and gridded data were generated from the final processed radiometric data.

5.4 Digital Terrain Model Data Processing

The radar altimeter data was subtracted from the GPS altimeter data. The separation distance between the GPS antenna and the radar altimeter of 1.4 metres was subtracted from the digital terrain data.

The digital terrain data thus derived was tie line levelled and gridded. Tie line levelled data was then examined and selectively microlevelled to produce a grid without line dependent artifacts.

For further information concerning the survey flown, please contact the following office:

Head Office Address:

UTS Geophysics
Fauntleroy Avenue, Perth Airport
REDCLIFFE WA 6104

Tel: +61 8 9479 4232
Fax: +61 8 9479 7361

Postal Address:

UTS Geophysics
P.O. Box 126
BELMONT WA 6984

Quoting reference number: A719

APPENDIX A - LOCATED DATA FORMATS

MAGNETIC LOCATED DATA

FIELD	FORMAT	DESCRIPTION	UNITS
1	I8	LINE NUMBER	
2	I4	FLIGHT/AREA NUMBER	AAFF (Area/Flight)
3	I9	DATE	YYMMDD
4	F10.1	TIME	sec
5	I8	FIDUCIAL NUMBER	
6	I4	UTM/AMG ZONE	
7	F12.2	EASTING (AMG84)	metres
8	F12.2	NORTHING (AMG84)	metres
9	F12.6	LATITUDE (WGS84)	degrees
10	F12.6	LONGITUDE (WGS84)	degrees
11	F12.2	EASTING (MGA94)	metres
12	F12.2	NORTHING (MGA94)	metres
13	F8.1	RADAR ALTIMETER HEIGHT	metres
14	F8.1	GPS HEIGHT (WGS84)	metres
15	F8.1	TERRAIN HEIGHT (WGS84)	metres
16	F10.2	RAW MAGNETIC INTENSITY	nT
17	F10.2	DIURNAL CORRECTION	nT
18	F10.2	IGRF CORRECTION	nT
19	F10.2	DRN AND IGRF CORRECTED TMI	nT
20	F10.2	FINAL TOTAL MAGNETIC INTENSITY	nT

RADIOMETRIC LOCATED DATA

FIELD	FORMAT	DESCRIPTION	UNITS
1	I8	LINE NUMBER	
2	I4	FLIGHT/AREA NUMBER	AAFF (Area/Flight)
3	I9	DATE	YYMMDD
4	F10.1	TIME	sec
5	I8	FIDUCIAL NUMBER	
6	I4	UTM/AMG ZONE	
7	F12.2	EASTING (AMG84)	metres
8	F12.2	NORTHING (AMG84)	metres
9	F12.6	LATITUDE (WGS84)	degrees
10	F12.6	LONGITUDE (WGS84)	degrees
11	F12.2	EASTING (MGA94)	metres
12	F12.2	NORTHING (MGA94)	metres
13	F8.1	RADAR ALTIMETER HEIGHT	metres
14	F8.1	GPS HEIGHT (WGS84)	metres
15	I5	LIVE TIME	milli sec
16	F8.1	PRESSURE	hPa
17	F6.1	TEMPERATURE	Degrees Celcius
18	F6.1	HUMIDITY	percent
19	I6	TOTAL COUNT (RAW)	Counts/sec
20	I6	POTASSIUM (RAW)	Counts/sec
21	I6	URANIUM (RAW)	Counts/sec
22	I6	THORIUM (RAW)	Counts/sec
23	I6	COSMIC (RAW)	Counts/sec
24	F8.1	TOTAL COUNT (CORRECTED)	Counts/sec
25	F8.1	POTASSIUM (CORRECTED)	Counts/sec
26	F8.1	URANIUM (CORRECTED)	Counts/sec
27	F8.1	THORIUM (CORRECTED)	Counts/sec
28	F9.4	DOSE RATE	nGy/hr
29	F9.4	POTASSIUM GRND CONCENTRATION	%
30	F9.4	URANIUM GRND CONCENTRATION	ppm
31	F9.4	THORIUM GRND CONCENTRATION	ppm

GRIDDED DATASET FORMATS

Gridding was performed using a bicubic spline algorithm.

The following grid formats have been provided:

- ER-Mapper format

LINE NUMBER FORMATS

Line numbers are identified with a six digit composite line number and have the following format - ALLLLB, where:

A	Survey area number
LLLL	Survey line number 0001-8999 reserved for traverse lines 9001-9999 reserved for tie lines
B	Line attempt number, 0 is attempt 1, 1 is attempt 2 etc..

UTS FILE NAMING FORMATS

Located and gridded data provided by UTS Geophysics uses the following 8 character file naming convention to be compatible with PC DOS based systems.

File names have the following general format - JJJJAABB.EEE, where:

JJJJ	UTS Job number	
AA	Area number if the survey is broken into blocks	
BB	M	Magnetic data
	R	Radiometric data
	TC	Total count data
	K	Potassium counts
	U	Uranium counts
	Th	Thorium counts
	DT	Digital terrain data
EEE	File name extension	
	LDT	Located digital data file
	FMT	Located data format definition file
	ERS	Ermapper gridded data header file
		Ermapper data portion has no extension
	GRD	Geosoft gridded data file

APPENDIX B - COORDINATE SYSTEM DETAILS

Locations for the survey data are provided in both geographical latitude and longitude and Universal Transverse Mercator metric projection coordinate systems.

AMG84	Australian Map Grid 1984
Coordinate Type	Universal Transverse Mercator Projection Grid
Geodetic datum	Australian Geodetic Datum
Semi Major Axis	6378160m
Flattening	1/298.25

WGS84	World Geodetic System 1984
Coordinate Type	Geographical
Semi Major Axis	6378137m
Flattening	1/298.257223563

MGA94	Map Grid of Australia 1994
Coordinate type	Universal Transverse Mercator Projection Grid
Geodetic datum	Geocentric Datum of Australia
Semi major axis	6378137m
Flattening	1/298.257222101

APPENDIX C - SURVEY BOUNDARY DETAILS

COORDINATES REPORT

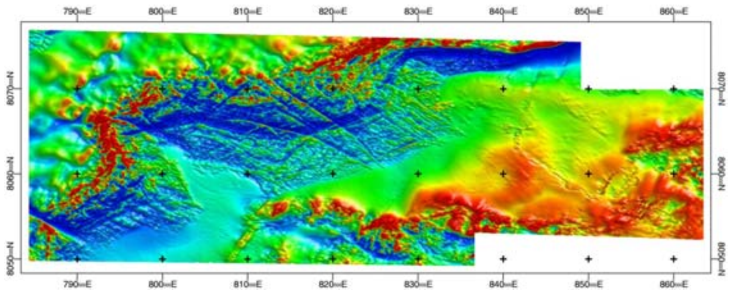
Job ID code: A7190101
Client: Lagoon Creek Resources
Job: Westmoreland
Coordinates AMG84 Grid Zone: 53
Include Point: 0.0 0.00

Surround

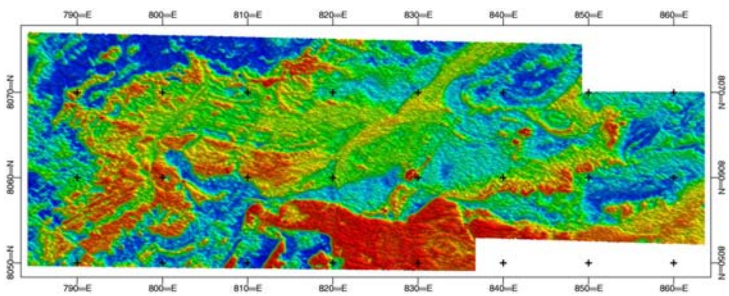
784300.000	8049800.000
784300.000	8076900.000
849100.000	8075500.000
849100.000	8069900.000
863500.000	8069900.000
863500.000	8052300.000
836600.000	8053100.000
836600.000	8049200.000

APPENDIX D - PROJECT DATA OVERVIEW

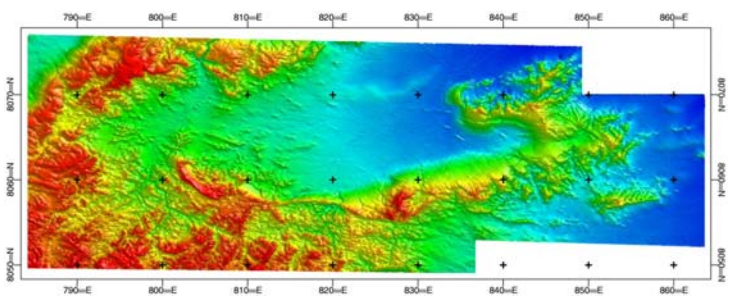
Westmoreland Project



Total Magnetic Intensity



Radiometric Total Count



Digital Terrain Model

APPENDIX E – ACQUISITION AND PROCESSING PARAMETERS

Magnetic Processing Parameters

IGRF date	- 2005.66
IGRF mean value	- 49019
Magnetic inclination	- -47.0
Magnetic declination	- 5.4
Diurnal base value	- 48950

Radiometric Processing Parameters

Height Attenuation Coefficients

Total Count:	-0.0061869
Potassium:	-0.0074044
Uranium:	-0.0069523
Thorium:	-0.0061239

Aircraft Background Coefficients

Total Count:	33.69
Potassium:	9.27
Uranium:	0.59
Thorium:	0.05

Cosmic Correction Coefficients

Total Count:	1.615
Potassium:	0.092
Uranium:	0.087
Thorium:	0.051

Sensitivity Coefficients

Total Count:	34.377 cps/dose rate
Potassium:	133.795 cps/%k
Uranium:	16.129 cps/ppm
Thorium:	7.276 cps/ppm

Final Reduction - All data reduced to STP height datum 60m

Appendix 4

Airborne Geophysical Survey Acquisition and Processing Report

Wollogorang, Northern Territory Airborne Magnetic and Radiometric Geophysical Survey

Acquisition and Processing Report

for

Gulf Mines Limited

Prepared by :	P. Evans	…………………………..
	L. Stenning	…………………………..
Authorised for release by :		…………………………..
		…………………………..

Survey flown: August - September 2006

by

Fugro Airborne Surveys
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Tel: (61-8) 9273 6400 Fax: (61-8) 9273 6466

FAS JOB # 1777

CONTENTS

LIST OF TABLES

1. SURVEY OPERATIONS AND LOGISTICS

1.1 Introduction

Between the 14th of August 2006 and the 8th of September 2006, Fugro Airborne Surveys Pty. Ltd. (FAS) undertook an airborne magnetic and radiometric survey for Gulf Mines Limited, over the Wollogorang Project area, in the Northern Territory. The survey consisted of one area, flown in 28 flights. Total coverage of the survey area amounted to 18478.7 line kilometres. The survey was flown using an Aerocommander Shrike 500-S aircraft, registration VH-WAM owned and operated by FAS. This report summarises the procedures and equipment used by FAS in the acquisition, verification and processing of the airborne geophysical data.

1.2 Survey Base

The survey was based out of Wollogorang, Northern Territory. The survey aircraft was operated from the Wollogorang Station airstrip with the aircraft fuel available on site. A temporary office was set up at the Wollogorang Station, where all survey operations were run and the post-flight data verification was performed.

1.3 Survey Personnel

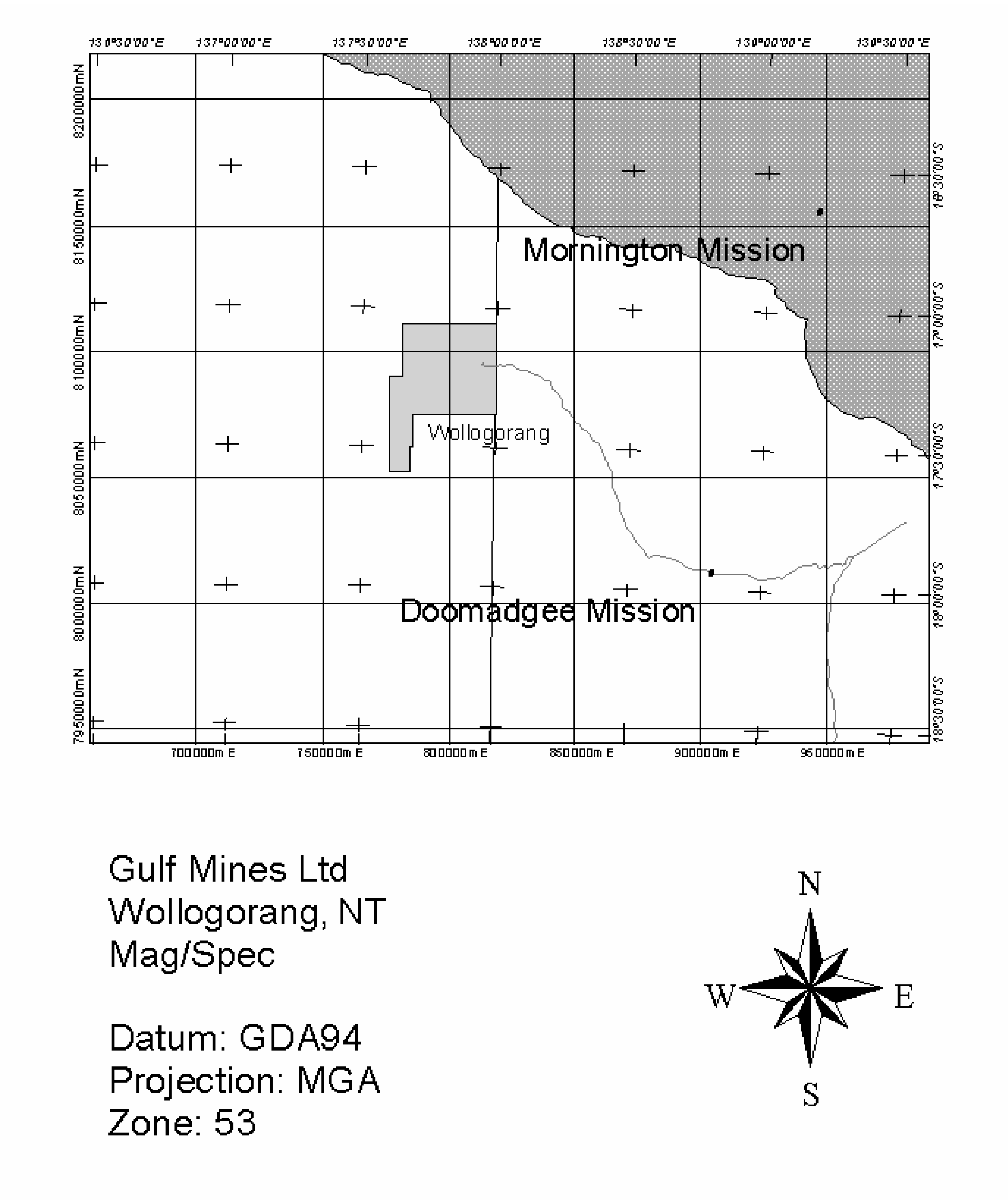
The following personnel were involved in this project:

Project Supervision	- Acquisition	Rod Pullin
	- Processing	Kathlene Oliver
On-site Crew Leader		Rob Doepel
Pilot/s		Dane Hughes / Andrew Jamieson
System Operator/s		Rob Doepel
Field Data Processing		Rob Doepel
Data Processing		Paul Evans

1.4 Survey Equipment

Survey Platform	-	Aerocommander Shrike 500-S VH-WAM
Data Acquisition System	-	FAS digital acquisition system
Total Field Magnetometer	-	Geometrics G-822A Caesium vapour
Vector Magnetometer	-	Billingsley TFM100-1E 3-axis
Magnetometer Compensator	-	Fugro FASDAS Mag Decoupler Unit Aeromagnetic Digital
Gamma-ray Spectrometer	-	Exploranium GR820 256 Channels
Gamma-ray Detector	-	8 NaI(Tl) crystals; 33.56 L down
Navigation System GPS	-	Fugro Omnistar in VBS (Virtual Base Station) mode, Novatel OEM4 GPS receiver
Base Station Magnetometers	-	2 x Scintrex Envi Mag
Altimeter	-	Sperry Stars RT-220 radio altimeter
Barometer	-	Paroscientific Digibaro ailimeter
Thermometer	-	Vaisala HMY 133 temperature and humidity sensor

1.5 Area Map


Mornington Mission
Wollogorang
Doomadgee Mission
Gulf Mines Ltd
Wollogorang, NT
Mag/Spec
Datum: GDA94
Projection: MGA
Zone: 53
N
W
E
S

2. SURVEY SPECIFICATIONS AND PARAMETERS

2.1 Area Co-ordinates

The survey area was located within UTM Zone 53S, Central Meridian = 135
(Note - Co-ordinates in WGS84 Zone 53)

Easting	Northing
782000	8111000
819000	8111000
819000	8074800
786000	8074800
786000	8062000
785000	8062000
785000	8052000
776000	8052000
776000	8090000
782000	8090000

2.2 Survey Area Parameters

Job Number	-	1777
Survey Company	-	Fugro Airborne Surveys Pty Ltd
Date Flown	-	14th August 2006 – 8th September 2006
Client	-	Gulf Mines Limited
Area Name	-	Wollogorang, Northern Territory
Nominal Terrain Clearance	-	50 m
Traverse Line Spacing	-	100 m
Traverse Line Direction	-	000 – 180 deg
Traverse Lines	-	20001 – 20433
Tie Line Spacing	-	1000 m
Tie Line Direction	-	090 – 270 deg
Tie Lines	-	29001 – 29059
Total Line Kilometres	-	18478.7 km

2.3 Data Sample Intervals

Nominal data sample intervals.

Magnetometer	-	7 m (@10 Hz)
Radar Altimeter	-	7 m (@10 Hz)
Temperature	-	7 m (@10 Hz)
Pressure	-	7 m (@10 Hz)
GPS	-	70 m (@1 Hz)
Spectrometer	-	70 m (@1 Hz)
Magnetic Base Station (Envi Mag)	-	5 s

2.4 Survey Tolerances

As specified in the contract the following tolerances were used:

Traverse line deviation	-	+/- 50% of nominated line spacing over 1 km or more
Tie line deviation	-	+/- 50% of nominated tie line spacing over 1 km or more
Total magnetometer system noise	-	More than 0.1 nT continuously for more than 1 km
Magnetic diurnal variation	-	More than 5 nT in 5 minutes non-linear either on flight lines or tie lines.

3. AIRCRAFT EQUIPMENT AND SPECIFICATIONS

3.1 Aircraft

Manufacturer	-	Aerocommander
Model	-	Shrike 500S
Registration	-	VH-WAM
Ownership	-	Fugro Airborne Surveys Pty Ltd

3.2 Navigation System

The GPS receiver was integrated as part of the acquisition system. Navigation displays were generated by the acquisition system software that displayed to the pilot a graphical representation of the line being flown. A pre-defined flight plan, with area boundaries and the start and end of the line co-ordinates, was loaded into memory and used for real-time navigation information. Position co-ordinates and other relevant GPS information were output and recorded by the acquisition computer.

3.3 Aircraft Magnetometers

The survey was flown using a Geometrics G822-A ultra-high sensitivity Caesium vapour magnetometer sensor with the sensor mounted in the tail stinger of the aircraft. The sensor provides a Larmor signal that is processed by high precision counters embedded within the FASDAS to provide an operating range of 20,000 to 100,000 nT.

Specifications

Nominal Sensitivity:	-	0.001 nT
Still Air RMS Noise:	-	0.05 nT
Digital Recording Resolution:	-	0.001 nT
Magnetic Gradient Tolerance	-	>20,000 nT/m

3.4 Automatic Compensator

The magnetometer data, together with data from the 3-axis fluxgate, was integrated in the acquisition system to produce real time compensation for the effects of the aircraft's motion, i.e. from changes in attitude and heading. The compensation coefficients were calculated from compensation flights carried out before the survey commenced. The compensated output data, with a resolution and sensitivity of 0.001 nT at a sampling rate of 10 times per second, were recorded digitally.

3.5 Gamma Ray Spectrometer System

The radiometric acquisition system consisted of a 256 channel gamma-ray spectrometer and detector system with the following specifications:

Manufacturer:	Exploranium Inc.	
Model:	GR-820	
Number of channels:	256	
Crystal Volume:	33.56 L downward looking (thermally insulated)	
Sampling interval:	1 s	
Windows (keV):	Potassium:	1370 to 1570
	Uranium:	1660 to 1860
	Thorium:	2410 to 2810
	Total Count:	410 to 2810
	Cosmic:	4000 to >6000

Data checking in the survey system was carried out by the use of resolution procedures using known radiometric sources. To verify the system, real time display of individual crystal resolutions and system resolutions, real time display peak channel tracking information, real time display of the energy spectrum showing counts, cosmic level and system deadtime was available. The survey system displayed to the operator any errors encountered in the spectrometer system.

3.6 Radar Altimeter

A Sperry Stars RT-220 radio altimeter system was used to measure ground clearance. The radio altimeter indicator provides an absolute altitude display from 0 - 750 metres (0 - 2,500 feet) with a sensitivity of 4 mV/ft. Radar altimeter data were digitally recorded every 0.1 seconds.

Specifications

Range:	-	0 - 2500 ft
Accuracy:	-	1%
Resolution:	-	4 mV/ft

3.7 Barometric Altimeter

The output of the Paroscientific pressure transducer was used for calculating the barometric altitude of the aircraft. The atmospheric pressure was taken from a probe and fed to the transducer. The transducer uses a precise quartz crystal resonator whose frequency of oscillation varies with pressure induced stress. The temperature of the pressure sensor was also recorded. In conjunction with the area QNH pressure and ambient temperature, the barometric altitude was calculated.

Specifications

Range:	-	sea level to 10,000 ft
Accuracy:	-	5 ft
Resolution:	-	1 mV/ft

3.8 Flight Data Recording

All data recorded by the data acquisition system were stored in a digital format on the removable media drive located in the DAS. This data were then transferred to the field office computers for post-flight quality control examination.

3.9 Flight Following

An integral part of the Safety Management System provides for the installation of a Flight Following System that transmits a position via satellite at pre determined intervals. The Fugro Omnistar Flight Following System was fitted to the aircraft and for this survey, position information was transmitted every 2 minutes to Fugro's premises in Perth. This information can be monitored by accessing the Fugro web page where the updated flight path is displayed. The aircraft was also fitted with an emergency switch and activation of this by the pilot or crew will notify the Omnistar Network control centre immediately. They in turn will contact FAS personnel as per the Emergency Response plan.

Aircraft are also fitted with Thrane & Thrane Inmarsat C reporting units which report every 5 minutes directly to the FAS office. A similar Emergency alarm system is in place.

4. GROUND DATA ACQUISITION EQUIPMENT AND SPECIFICATIONS

4.1 Magnetic Base Station

Two Scintrex Envi Mag magnetometers were used to measure the daily variations of the Earth's magnetic field. The base stations were established in an area of low gradient, away from cultural influences. The base stations were run continuously throughout the survey flying period with a sampling interval of 5 seconds at a sensitivity of 0.01 nT. The base station data were closely examined after each day's production flying to determine if any data had been acquired during periods of out-of-specification diurnal variation. The base stations were located at the Wollogorang Station airstrip, approximately 300 metres south west of the aircraft parking area and were set up approximately 100 m apart.

4.2 GPS Base Station

A GPS base logging station was set up at the Wollogorang Station. The GPS antenna was positioned on the roof of the unit 4.

The GPS base system was comprised of a GPS receiver, a logging computer, an antenna and a power supply. Data was logged and displayed in real time on the logging computer screen. The logged base data was processed with the airborne GPS data to calculate the differentially post-processed position of the aircraft.

The GPS base station position was calculated by logging data continuously at the base position over a period of approximately 24 hours. These data were then statistically averaged to obtain the position of the base station.

The calculated GPS base position was (in WGS84):

17° 12' 41.37215" S
137° 56' 50.68029" E
107.875 m.

5. EQUIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS

5.1 Survey Calibrations

A series of calibrations were performed as follows:

5.1.1 Dynamic Magnetometer Compensation

Carrying a magnetometer through a varying field in a non-uniform orientation produces manoeuvre noise. To compensate for this manoeuvre noise a standard compensation test flight called a "comp box" was flown. The compensation file produced also removed the majority of the heading error. Aircraft compensation tests were flown on the 4 survey line headings and also at +/- 7½ and 15^{o} to the line headings (to accommodate for cross wind flying conditions). The data for each heading consists of a series of aircraft manoeuvres with large angular excursions: specifically pitches, rolls and yaws. This was done to artificially create the worst possible attitudes and rates of attitudinal change likely to be encountered while on line and compensate for any magnetic noise created by the aircraft's motion within the earth's magnetic field. The data was processed to obtain the real-time compensation terms. These coefficients were applied in real-time or later during post-processing if required. Note that this form of compensation will only remove those noise effects modelled in the manoeuvre test flight. Random motions of the stinger with respect to the aircraft airframe generally establish the noise floor for this type of installation. Details of the comp boxes flown for this survey are shown in the table below.

Flown	Flights covered
14/8/2006	1 – 16
30/8/2006	17 – 22
6/9/2006	23 – 28

***Table 1**: Magnetometer Compensation Details*

5.1.2 Parallax

Parallax error is caused by the physical difference in distance between the various sensors, the electronic delay and software timing in the acquisition system. Hence all variables are subjected to a displacement from the GPS co-ordinates. If these variables are processed without a position offset a parallax error will usually occur. The most suitable way to treat this problem is to use the 1 second radiometric data as a base with a zero correction. This will prevent interpolation of important variables (a filtering process). The co-ordinates were moved by linear interpolation and other data variables were displaced onto the radiometric data, without change.

Data	Parallax
Radiometrics	0 second
GPS	-0.6 second
Magnetics	0.52 second
Radar Altitude	0.3 second
Barometer	2.1 second
Temperature	2.1 second

***Table 2**: Parallax Values*

5.1.3 Pad Calibrations

A series of tests were taken using a set of radiometric pads of known concentrations of Potassium, Uranium and Thorium. Each crystal pack was tested individually, with data accumulated for 15 minutes. The pad calibration data were processed to determine the radiometric stripping coefficients for each crystal pack. Where aircraft had more that one crystal pack installed, the average of the stripping coefficients were used in final data processing.

5.1.4 Background and Cosmic Calibration Stacks

High-level stacks were flown over the ocean away form the effects of any land based radon. Data were collected for ten minutes at altitudes starting at 1000 feet above sea level and incrementing to 10000 feet above sea level. The high-level stack data were processed to determine the cosmic and aircraft background coefficients.

5.1.5 Height Attenuation Calibrations

Low-level stacks were flown over the Carnamah Dynamic Test Range, Western Australia. Data were collected at altitudes of 130 feet above sea level (asl), 200 ft asl, 260 ft asl, 330 ft asl, 400 ft asl and 650 ft asl. The neighbouring salt lake was flown at the same altitudes, and the data were used as a radon test. A ground survey was carried out on the same day using a calibrated gamma-ray spectrometer.

The airborne and ground data were processed to determine radioelement sensitivity and height attenuation coefficients.

5.1.6 Daily Calibrations

A set of calibrations were performed each survey day as follows:

Magnetic base station time check
Spectrometer resolution test
Spectrometer button test
Low level test line

5.1.6.1 Magnetic Base Station Time Check

Prior to each day's survey all magnetic base stations were time checked and synchronised with the time on the aircraft survey system GPS receiver.

5.1.6.2 Spectrometer Resolution Test

Once the spectrometer had stabilised a Thorium source resolution check was carried out by placing the source in a cradle specially designed to ensure precisely repeatable locations.

5.1.6.3 Spectrometer Button Test

Thorium sample checks were performed on the spectrometer before and after each day's survey acquisition. Each sample was placed in a predetermined location and data recorded for 180 sec. Relative count rates above background were within +/- 5% of the average sample checks for the duration of the survey.

5.1.6.4 Low Level Test line

To monitor the effects of soil moisture and radon and to verify the system was functioning correctly a low level test line was flown at survey altitude prior to and after each day's production. The collected data were checked by the operator to ensure the Thorium for the low level test line was within +/- 10% of the initial average. The location of the low level test line is below.

The calculated test line location was (in WGS84 Zone 53):

Point A	180175 E	8120772 N
Point B	180161 E	8106824 N

6. DATA VERIFICATION AND FIELD PROCESSING

All data verification was conducted at the field office in Wollogorang for the duration of the survey. At the conclusion of each days survey all magnetic, radiometric, altimeter, flight path and diurnal data were downloaded onto the field office computer for preliminary verification. All raw aircraft data were backed up at the end of each day's survey. One copy was sent to the FAS office in Perth, the other copy remaining at the field office.

6.1 Magnetic Diurnal Data

Diurnal data recorded from the primary base station was downloaded onto the field office computer. The data was checked for spikes and erroneous readings. If invalid diurnal data occurred whilst survey data was being acquired the affected section was re-flown. The diurnal data was also checked to see that the change in diurnal readings during the course of the survey did not exceed the specified tolerances. When this occurred the affected part of the survey line was re-flown. The diurnal data was merged with the aircraft data and used in the verification of the magnetic data. Diurnal data recorded on the secondary base station was also downloaded onto the field office computer.

6.2 Height Data

Radar altimeter, barometric altimeter and GPS height data from the aircraft was transferred onto the field office computer.

6.2.1 Radar Altimeter Data

The radar altimeter data was verified to check that a reasonably constant height above the terrain was flown, readings during the course of the survey did not exceed the specified tolerances and for equipment reliability.

6.2.2 GPS Height Data

The aircraft's height above the WGS84 ellipsoid each second was determined by differentially post-processing the synchronised GPS data from the aircraft and GPS base station data. The GPS height of the aircraft was verified to check for data masking and for equipment reliability.

6.2.3 Barometric Altimeter Data

As a backup to the aircraft's GPS height, barometric height was also recorded. The barometric height of the aircraft was verified to check for equipment reliability. The barometric data were also used in the processing of the radiometric data.

6.2.4 Topographical Data

After verification parallax corrections were applied, the radar altitude was subtracted from the GPS height to give the elevation of the terrain above the WGS84 ellipsoid. It was not considered necessary to make any further corrections as this data was for verification purposes only.

6.2.5 Gridding and Inspection

The topographical data was gridded and grid image enhancements were computed and displayed on screen. These were inspected for inconsistencies and errors.

6.3 Flight Path Data

The flight path data from the aircraft and the GPS base station were transferred onto the field office computer. The aircraft's precise location each second was determined by differentially post-processing the synchronised GPS data from the aircraft and GPS base station data. The flight path was recovered and plotted daily to ensure it was within specification. Any data not within specification was re-flown. The flight path data was then merged with the rest of the aircraft and diurnal data. Both the aircraft and GPS base station recorded the data in the WGS84 datum.

6.4 Magnetic Data

The real-time compensated and uncompensated magnetic data from the aircraft recorded every 0.1 second were transferred onto the field office computer. The raw magnetic data was checked to identify noise and spikes. If the noise exceeded the specified tolerances the part of the line affected was re-flown. After the magnetic data were merged with the digital flight path the following sequence of operations were carried out to allow inspection and verification of the data:

6.4.1 Diurnal Correction

The synchronised digital diurnal data collected by the base station was first subtracted from the corresponding airborne magnetic readings to calculate a difference. The resultant difference was then subtracted from the base value to produce diurnally corrected magnetic data.

6.4.2 Parallax Correction

The diurnally corrected magnetic data was corrected for system parallax using the calculated value.

6.4.3 Preliminary Gridding and Inspection

The magnetic data were gridded and grid image enhancements were computed and displayed on screen. These were inspected for inconsistencies and errors.

6.5 Spectrometer Data

Spectrometer data from the aircraft were transferred onto the field office computer. The data was verified to check that readings during the course of the survey did not exceed the specified tolerances and for equipment reliability.

6.5.1 Parallax Correction

The raw window data were corrected for system parallax using the calculated value.

6.5.2 Preliminary Gridding and Inspection

The spectrometer data were gridded and grid image enhancements were computed and displayed on screen. These were inspected for inconsistencies and errors.

7. FINAL DATA PROCESSING

7.1 Aircraft Location

The aircraft's location each second was determined by differentially post-processing the synchronised GPS data recorded on both the aircraft and GPS base station. This data is recorded in the WGS84 datum.

7.2 Magnetic Data Processing

The processing procedures applied to the magnetic data are summarised below:

a) Apply any spike corrections to the compensated magnetic variables.
b) Interpolate undefined magnetic values.
c) Co-ordinate the data with post-processed GPS data.
d) Filter diurnal values and subtract them from individual compensated magnetic readings.

Area	Base Value
Wollogorang	48786.6 nT

***Table 3**: Diurnal Base Values*

e) Apply parallax correction.
f) Correct for regional effects of the earth's magnetic field by calculating the IGRF value at each fiducial using IGRF model 2005 and secular variation model. A base value was added back.

Area	IGRF Model	Base Value
Wollogorang	2006.8	48863.7 nT

***Table 4**: IGRF Base Values*

g) Using the tie lines (flown at 90 degrees to the traverse lines) a set of miss-tie values were determined. These miss-tie values reflected the differences in the magnetic value between the tie lines and traverse lines over the same geographical point. Using a least squares fit algorithm, which also takes into account the statistical variation inherent in DGPS positioning, a series of corrections were applied to the traverse line data. These allowed the data to be levelled to the same base value.
h) Following this, a FAS proprietary microlevelling process was applied in order to more subtly level the data.

7.2.1 Gridding

The final levelled magnetic data were gridded using a bi-directional spline algorithm. The data was gridded with a cell size of 20 m.

7.3 Radiometric Data Processing

The radiometric data was processed using the standard IAEA window processing technique as summarised below.

a) Co-ordinate the data with post-processed GPS data.
b) Apply spike corrections to the radar altimeter, temperature and pressure values.
c) Apply parallax corrections to altimeter, temperature and pressure values.
d) Apply NASVD filtering to the 256 channel radiometric data.
e) Apply energy recalibration to the 256 channel radiometric data.
f) Correct for dead time.
g) Calculate the equivalent terrain clearance at STP (standard temperature and pressure).
h) Remove aircraft background.
i) Remove cosmic background.
j) Window the 256 channel data using the IAEA standard energy windows.
k) Remove radon background.
l) Apply stripping ratios.
m) Apply height corrections.
n) Using the tie lines (flown at 90 degrees to the traverse lines) a set of miss-tie values were determined. These miss-tie values reflected the differences in the value between the tie lines

and traverse lines over the same geographical point. Using a least squares fit algorithm, which also takes into account the statistical variation inherent in DGPS positioning, a series of corrections were applied to the traverse line data. These allowed the data to be levelled to the same base value.

o) Following this, a Fugro proprietary micro-levelling process was applied in order to more subtly level the data.

7.3.1 Energy Recalibration

The spectral drift was checked by monitoring the position of the Potassium, Uranium and Thorium peaks on average spectra along flight lines. The peak positions were determined by using a Gaussian fitting method. Energy recalibration was applied to the spectra using a linear regression (LSQ fit) to determine the slope and intercept.

7.3.2 NASVD Filtering

The radiometrics were produced with NASVD smoothing. Using the NASVD technique, the raw spectra were first smoothed using 6 principal components. Eigenvectors and statistics on the NASVD processing results were used for analysis.

7.3.3 Dead Time

Gamma-ray spectrometers require a finite time to process each pulse from the detectors. While one pulse is being processed, any other pulse that arrives will be rejected. Consequently the ‘live time’ of a spectrometer is reduced by the time taken to process all pulses reaching the spectrometer. The spectra are normalised to counts per second by dividing by the live time.

7.3.4 STP Altitude

The radar altimeter data was converted to effective height at standard temperature and pressure using the expression:

STPAlt = RAlt * (P/103) * (273 / (T+273))
where:

RAlt = the observed radar altitude in m
T = the measured air temperature in deg C
P = the barometric pressure in hPa

7.3.5 Cosmic and Aircraft Background Removal

The 256 channel aircraft and cosmic spectra for the aircraft were calculated from the high-level test data with the aircraft and cosmic backgrounds derived using least squares fitting applied on a channel by channel basis.

The aircraft background was removed by subtracting the computed aircraft background spectra from the dead time corrected spectra. The 256 channel cosmic background spectrum that is removed is calculated by multiplying the 256 channel cosmic factor values by the cosmic counts recorded. The effect of cosmic radiation is removed from the spectra by subtracting the resultant cosmic spectrum.

Window	Aircraft Background	Cosmic Stripping Ratio
Total Count	57.8	0.8700
Potassium	9.1	0.0510
Uranium	2.6	0.4010
Thorium	0.6	0.0530

***Table 5**: Aircraft Background and Cosmic Stripping Ratios*

7.3.6 Window Definitions

The 256 channel data were summed into the standard IAEA windows.

Window	Peak Energy (keV)	Energy Window (keV)			GR-820 Channel Window		
Total Count	-	410	-	2810	34	-	234
Potassium	1460	1370	-	1570	115	-	131
Uranium	1765	1660	-	1860	139	-	155
Thorium	2614	2410	-	2810	201	-	234
Cosmic	-	4000	-	6000		-	

***Table 6**: IAEA Window Definitions*

7.3.7 Radon Correction

Radon corrections were applied using the spectral ratio method.

Stripping	Value
Total Count	13.15
Potassium	0.782
Thorium	0.061
Radon	1.88
Ground	0.4

***Table 7**: Radon Stripping Values*

7.3.8 Spectral Stripping

Spectral stripping was applied to the Potassium, Uranium and Thorium windows. The stripping coefficients were corrected for STP altitude.

Stripping	Value	STP adjustment (/m)
Alpha	0.2657	0.00049
Beta	0.4192	0.00065
Gamma	0.7963	0.00069
A	0.0621	0
B	0.0016	0
G	-0.0166	0

***Table 8**: Spectral Stripping Ratios*

7.3.9 Height Correction

The background corrected and stripped window data were corrected for variations in the density altitude of the detector.

Window	Attenuation coefficient (m^{-1})
Total Count	-0.00700
Potassium	-0.00900
Uranium	-0.00990
Thorium	-0.00750

***Table 9**: STP Altitude Coefficients*

7.3.10 Gridding

The final radiometric data were gridded using a minimum curvature algorithm. A grid cell size of 20 m was used.

7.4 Digital Elevation Model

The processing procedures applied to the terrain data are summarised below:

a) Apply any spike corrections to the raw radar altimeter data.
b) Interpolate undefined values.
c) Co-ordinate the data with post-processed GPS data.
d) Apply parallax corrections.
e) Subtract the aircraft's height above ground from the aircraft's height above the WGS84 ellipsoid and correct for radar altimeter/GPS sensor separation.
f) Derive surface topography values with respect to mean sea level (referenced to the geoid) by correcting the WGS84 ellipsoid values with geoid-ellipsoid separation values.
g) Using the tie lines (flown at 90 degrees to the traverse lines) a set of miss-tie values were determined. These miss-tie values reflected the differences in the value between the tie lines and the traverse lines over the same geographical point. Using a least squares fit algorithm, which also takes into account the statistical variation inherent in DGPS positioning, a series of corrections were applied to the traverse line data. These allowed the data to be levelled to the same base value.
h) Following this, a FAS proprietary micro-levelling process was applied in order to more subtly level the data.

7.4.1 Gridding

The final levelled elevation data were gridded using a bi-directional spline algorithm. A grid cell size of 20 m was used.

The accuracy of the elevation calculation is directly dependent on the accuracy of the two input parameters, radar altitude and GPS altitude. The radar altitude value may be erroneous in areas of heavy tree cover, where the altimeter reflects the distance to the tree canopy rather than the ground. The GPS altitude value is primarily dependent on the number of available satellites. Although post-processing of GPS data will yield X and Y accuracies in the order of 1-2 metres, the accuracy of the altitude value is usually much less, sometimes in the ±5 metre range. Further inaccuracies may be introduced during the interpolation and gridding process.

Because of the inherent inaccuracies of this method, no guarantee is made or implied that the information displayed is a true representation of the height above sea level. Although this product may be of some use as a general reference, THIS PRODUCT MUST NOT BE USED FOR NAVIGATION PURPOSES.

APPENDIX I – Weekly Operations Report

Week Commencing: **Monday 14-Aug-06**	Aircraft: VH-WAM	Operators: Rob Doepel	Pilots: D. Hughes , A. Jamieson
Job Number: 1777	Base: Wollogorang	Data Proc: Rob Doepel	Techs:
Total km: 25438.0	Country: Australia	Crew Leader: Rob Doepel	Client: Gulf Mines
	Area Name: Wollogorang	Accom: Wollogorang Station	Contact #: Steve Webster

Date		Flight	Crew		Time		M/R	Oil		Fuel	This Flight		To Date		Standby	Comments
		Number	Plt(s)	Op	T/O	Land	Hrs	L	R	Added	Prod	Refly	Prod	Refly	(0, 0.5, 1)	
Monday	14-Aug-06	1	TM	RD	10:00	11:54	1.9									Comp Flight and testline OK
Julian	13-Aug-00															No PM Flight due to boost pump failure
Day	1				Hours Today		1.9				0.0	0.0	0.0	0.0		
Tuesday	15-Aug-06															
																Boost pump failure
Julian	227															
Day	2				Hours Today		0.0				0.0	0.0	0.0	0.0		
Wednesday	16-Aug-06															
																Boost pump failure
Julian	228															
Day	3				Hours Today		0.0				0.0	0.0	0.0	0.0		
Thursday	17-Aug-06															
			TM		15:30	17:00	1.5	1								Boost pump repaired. WAM to Mt Isa to collect operator
Julian	229															
Day	4				Hours Today		1.5				0.0	0.0	0.0	0.0		
Friday	18-Aug-06		RD		11:30	12:54	1.4									Ferry Isa To Wollogorang
Julian	230	2	DH		14:54	17:30	2.6				458.0					PM Flight OK
Day	5				Hours Today		4.0				458.0	0.0	458.0	0.0		
Saturday	19-Aug-06	3	DH		6:55	12:04	5.2	2	1		1071.0					AM Flight OK
Julian	231	4	TM		12:40	17:46	5.1	3	1		981.0					PM Flight OK
Day	6				Hours Today		10.3				2052.0	0.0	2510.0	0.0		
Sunday	20-Aug-06	5	TM		6:45	11:34	4.8				940.6					Flight returned due to FASDAS Lockup
Julian	232	6	DH		12:20	18:02	5.7				1209.0					PM Flight OK. Some diurnal activity
Day	7				Hours Today		10.5				2149.6	0.0	4659.6	0.0		
Total Job Hours		31.9	Weekly Totals				28.2	6	2	0	4659.6	0.0			0.0	
			Total Aircraft Hours					Ltrs/Hr		0			Total Standby		0.0	
			Hours to Next Periodic					Running Avg			665.7 km/day		% Complete		18.3 %	
			Anticipated Hours Next week								165.4 km/hr		km Remaining		20778.4 km	

Survey Equipment Problems: ______________________________

Week Commencing: **Monday 21-Aug-06**
Job Number: 1777
Total km: 25438

Aircraft: VH-WAM
Base: Wollogorang
Country: Australia
Area Name: Wollogorang

Operators: Rob Doepel
Data Proc: Rob Doepel
Crew Leader: Rob Doepel
Accom: Wollogorang Station

Pilots: D. Hughes , A. Jamieson
Techs: 0
Client: Gulf Mines
Contact #: Steve Webster

Date		Flight	Crew		Time		M/R	Oil		Fuel	This Flight		To Date		Standby	Comments
		Number	Plt(s)	Op	T/O	Land	Hrs	L	R	Added	Prod	Refly	Prod	Refly	(0, 0.5, 1)	
Monday	21-Aug-06	7	DH		6:35	12:47	6.2	2	1		1300.0					AM Flight OK
Julian	233	8	TM		13:50	18:02	4.2	2	1		804.0					PM Flight OK
Day	8				Hours Today		10.4				2104.0	0.0	6763.6	0.0		
Tuesday	22-Aug-06	9	DH		7:40	10:52	3.2				111.0	464.0				AM Flight OK
Julian	234	10	AJ	DH	13:50	17:38	3.8	2	1		110.0					ICUS for A. Jamieson
Day	9				Hours Today		7.0				221.0	464.0	6984.6	464.0		
Wednesday	23-Aug-06	11	AJ	DH	8:00	13:36	5.6	2	1		1023.0					ICUS for A. Jamieson
Julian	235	12	DH		15:30	18:00	2.5	2	1		440.0					PM Flight OK
Day	10				Hours Today		8.1				1463.0	0.0	8447.6	464.0		
Thursday	24-Aug-06	13	AJ		6:45	10:15	3.5				548.0					A. Jamieson solo flight OK
			AJ	DH	10:50	12:20	1.5	1	1							D. Hughes RDO
Julian	236		AJ	DH	16:30	18:00	1.5									WAM Flown to Mt Isa for 50 Hourly oil change and spar inspection.
Day	11				Hours Today		6.5				548.0	0.0	8995.6	464.0		
Friday	25-Aug-06	14	AJ		6:45	12:21	5.6				1095.0					AM Flight OK
Julian	237	15	DH		13:00	17:42	4.7	2	1		912.0					PM Flight OK
Day	12				Hours Today		10.3				2007.0	0.0	11002.6	464.0		
Saturday	26-Aug-06															
		16	DH		6:45	9:33	2.8									AM Flight aborted due to Hydraulic failure
Julian	238															WAM diverted to Mt Isa
Day	13				Hours Today		2.8				0.0	0.0	11002.6	464.0		
Sunday	27-Aug-06															
																WAM grounded in Mt Isa due to no Hydraulics
Julian	239															
Day	14				Hours Today		0.0				0.0	0.0	11002.6	464.0		
Total Job Hours		77.0	Weekly Totals				45.1	13	7	0	6343.0	464.0			0.0	

Total Aircraft Hours:
Ltrs/Hr: 0
Total Standby: 0.0
Hours to Next Periodic:
Running Avg: 906.1 km/day, 140.6 km/hr
% Complete: 43.3 %
Anticipated Hours Next week:
km Remaining: 14435.4 km

Survey Equipment Problems:

Week Commencing: **Monday 28-Aug-06**
Job Number: 1777
Total km: 25438

Aircraft: VH-WAM
Base: Wollogorang
Country: Australia
Area Name: Wollogorang

Operators: Rob Doepel
Data Proc: Rob Doepel
Crew Leader: Rob Doepel
Accom: Wollogorang Station

Pilots: D. Hughes , A. Jamieson
Techs: 0
Client: Gulf Mines
Contact #: Steve Webster

Date		Flight	Crew		Time		M/R	Oil		Fuel	This Flight		To Date		Standby	Comments
		Number	Plt(s)	Op	T/O	Land	Hrs	L	R	Added	Prod	Refly	Prod	Refly	(0, 0.5, 1)	
Monday	28-Aug-06															
																WAM in Mt Isa for repairs
Julian	240															
Day	15				Hours Today		0.0				0.0	0.0	11002.6	464.0		
Tuesday	29-Aug-06															
																WAM in Mt Isa ror repairs
Julian	241															
Day	16				Hours Today		0.0				0.0	0.0	11002.6	464.0		
Wednesday	30-Aug-06		DH		11:00	12:06	1.1									Test Flight in Mt Isa
			DH		13:30	15:00	1.5	1	2							WAM returned to Wollogorang
Julian	242	17	AJ		16:10	17:16	1.1									COMP Flight done
Day	17				Hours Today		3.7				0.0	0.0	11002.6	464.0		
Thursday	31-Aug-06	18	AJ		6:45	12:15	5.5	2	1		1058.0					AM Flight OK
Julian	243	19	DH		13:00	17:50	4.8				902.0					PM Flight OK. Some diurnal
Day	18				Hours Today		10.3				1960.0	0.0	12962.6	464.0		
Friday	1-Sep-06	20	DH		7:10	11:46	4.6				810.0	62.0				AM Flight OK
																A. Jamieson departed Doomagee.
Julian	244	21	DH		14:00	16:24	2.4				438.0					PM Flight OK
Day	19				Hours Today		7.0				1248.0	62.0	14210.6	526.0		
Saturday	2-Sep-06	22	DH		7:10	10:10	3.0				511.0					AM Flight OK
					11:30	13:00	1.5									Ferry WAM to Isa for Sheduled maintainance
Julian	245															
Day	20				Hours Today		4.5				511.0	0.0	14721.6	526.0		
Sunday	3-Sep-06															
																WAM in service.
Julian	246															
Day	21				Hours Today		0.0				0.0	0.0	14721.6	526.0		
Total Job Hours		102.5	Weekly Totals				25.5	3	3	0	3719.0	62.0			0.0	
			Total Aircraft Hours					Ltrs/Hr		0			Total Standby		0.0	
			Hours to Next Periodic					Running Avg			531.3 km/day		% Complete		57.9 %	
			Anticipated Hours Next week								145.7 km/hr		km Remaining		10716.4 km	

Survey Equipment Problems: ______

Week Commencing: **Monday 4-Sep-06**
Job Number: 1777
Total km: 18478

Aircraft: VH-WAM
Base: Wollogorang
Country: Australia
Area Name: Wollogorang

Operators: Rob Doepel
Data Proc: Rob Doepel
Crew Leader: Rob Doepel
Accom: Wollogorang Station

Pilots: D. Hughes , A. Jamieson
Techs: 0
Client: Gulf Mines
Contact #: Steve Webster

Date		Flight	Crew		Time		M/R	Oil		Fuel	This Flight		To Date		Standby	Comments
		Number	Plt(s)	Op	T/O	Land	Hrs	L	R	Added	Prod	Refly	Prod	Refly	(0, 0.5, 1)	
Monday	4-Sep-06															
																WAM in service.
Julian	247															
Day	22				Hours Today		0.0				0.0	0.0	14721.6	526.0		
Tuesday	5-Sep-06															
																WAM in service.
Julian	248															
Day	23				Hours Today		0.0				0.0	0.0	14721.6	526.0		
Wednesday	6-Sep-06		DH		11:00	12:30	1.5									WAM returned to Wollogorang. Late departure due to fuel guage fault.
		23	AJ	RD	13:30	15:06	1.6									COMP flight OK
Julian	249	24	AJ		15:50	18:20	2.5				401.0					PM Flight OK
Day	24				Hours Today		5.6				401.0	0.0	15122.6	526.0		
Thursday	7-Sep-06	25	AJ		6:45	12:15	5.5				1022.0					AM Flight OK
Julian	250	26	DH		12:54	18:06	5.2				1095.0					PM Flight OK
Day	25				Hours Today		10.7				2117.0	0.0	17239.6	526.0		
Friday	8-Sep-06	27	DH		6:35	12:15	5.7				1246.4					AM Flight OK
		28	AJ	RD	13:00	14:00	1.0									FOM Done
Julian	251															Block 2 Completed
Day	26				Hours Today		6.7				1246.4	0.0	18486.0	526.0		
Saturday	9-Sep-06															
Julian	252															
Day	27				Hours Today		0.0				0.0	0.0	18486.0	526.0		
Sunday	10-Sep-06															
Julian	253															
Day	28				Hours Today		0.0				0.0	0.0	18486.0	526.0		
Total Job Hours		125.5	Weekly Totals				23.0	0	0	0	3764.4	0.0			0.0	

Total Aircraft Hours
Hours to Next Periodic
Anticipated Hours Next week

Ltrs/Hr 0
Running Avg 537.8 km/day
163.9 km/hr

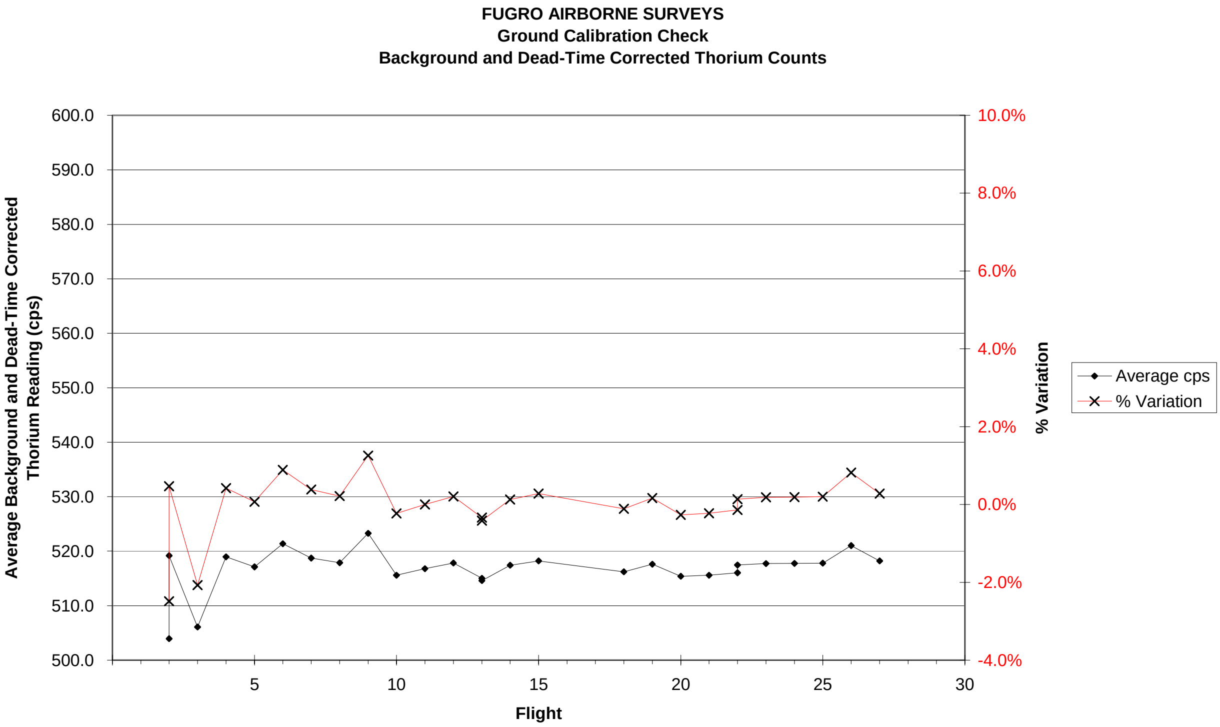
Total Standby 0.0
% Complete 100.0 %
km Remaining -8.0 km

Survey Equipment Problems:

APPENDIX II – Button Calibration Data

AIRCRAFT VH-WAM

Flt#	Peak Posn	Raw (cps)	B/G (cps)	Normalised (cps)	FHTM/ FHHM	Readings	Running average	% Change
2	217.8517	608.2935	104.36570	503.928	1.836620	222	503.92770	-2.5%
2	218.0375	623.8789	104.68650	519.192	1.840609	278	511.56000	0.5%
3	218.0445	611.1468	105.07650	506.070	1.834274	228	509.73007	-2.1%
4	218.1919	622.1989	103.24500	518.954	1.829468	254	512.03598	0.4%
5	217.9821	623.6502	106.51040	517.140	1.815573	189	513.05676	0.1%
6	217.7953	626.2922	104.92960	521.363	1.833635	189	514.44107	0.9%
7	218.0718	625.0996	106.34650	518.753	1.795094	194	515.05707	0.4%
8	217.9781	623.5843	105.69690	517.888	1.866964	206	515.41088	0.2%
9	217.9973	627.7265	104.45230	523.274	1.792605	207	516.28458	1.3%
10	217.9465	620.9003	105.32650	515.574	1.828380	187	516.21349	-0.2%
11	217.9575	624.7953	108.02330	516.772	1.821145	198	516.26426	0.0%
12	218.0102	621.7661	103.92120	517.845	1.826817	180	516.39599	0.2%
13	218.1067	621.7387	106.70860	515.030	1.798344	192	516.29092	-0.3%
13	217.9960	620.0485	105.42990	514.619	1.810681	175	516.17147	-0.4%
14	218.1066	623.0435	105.61900	517.424	1.810084	183	516.25500	0.1%
15	217.9474	621.5491	103.32620	518.223	1.821239	193	516.37801	0.3%
18	218.0645	618.6035	102.39690	516.207	1.855405	187	516.36793	-0.1%
19	218.0020	622.4600	104.85290	517.607	1.804448	186	516.43677	0.2%
20	218.0467	621.6931	106.31540	515.378	1.867369	215	516.38103	-0.3%
21	217.9480	621.9964	106.39990	515.597	1.824158	190	516.34181	-0.2%
22	218.0721	623.7917	107.75470	516.037	1.818345	261	516.32730	-0.1%
22	217.9880	622.8787	105.40120	517.478	1.820608	189	516.37958	0.1%
23	218.0361	621.5061	103.79000	517.716	1.863264	190	516.43770	0.2%
24	217.9092	623.2391	105.49320	517.746	1.822449	178	516.49221	0.2%
25	218.0596	622.5939	104.78640	517.807	1.833476	196	516.54482	0.2%
26	217.9196	627.7108	106.68500	521.026	1.836170	209	516.71716	0.8%
27	217.9708	622.4544	104.23640	518.218	1.795974	196	516.77275	0.3%



APPENDIX III – Final Located Data Formats

Headers for final data files

Description File for 0.1 sec Magnetics and Elevation Data

```
COMM JOB NUMBER:                                                    1777
COMM AREA NUMBER:                                                     02
COMM SURVEY COMPANY:                              Fugro Airborne Surveys
COMM CLIENT:                                          Gulf Mines Limited
COMM SURVEY TYPE:                               Magnetic and Radiometric
COMM AREA NAME:                                              Wollogorang
COMM STATE:                                                           NT
COMM COUNTRY:                                                  Australia
COMM SURVEY FLOWN:                             August to September 2006
COMM LOCATED DATA CREATED:                                  October 2006
COMM
COMM DATUM:                                                        GDA94
COMM PROJECTION:                                                     MGA
COMM ZONE:                                                            53
COMM
COMM SURVEY SPECIFICATIONS
COMM
COMM TRAVERSE LINE SPACING:                                        100 m
COMM TRAVERSE LINE DIRECTION:                              000 - 180 deg
COMM TIE LINE SPACING:                                            1000 m
COMM TIE LINE DIRECTION:                                   090 - 270 deg
COMM NOMINAL TERRAIN CLEARANCE:                                     50 m
COMM FINAL LINE KILOMETRES:                                   18478.7 km
COMM
COMM LINE NUMBERING
COMM
COMM TRAVERSE LINE NUMBERS:                                20001 - 20433
COMM TIE LINE NUMBERS:                                     29001 - 29059
COMM
COMM AREA BOUNDARY
COMM
COMM    easting   northing
COMM    782000    8111000
COMM    819000    8111000
COMM    819000    8074800
COMM    786000    8074800
COMM    786000    8062000
COMM    785000    8062000
COMM    785000    8052000
COMM    776000    8052000
COMM    776000    8090000
COMM    782000    8090000
COMM
COMM SURVEY EQUIPMENT
COMM
COMM AIRCRAFT:                        VH-WAM Aerocommander Shrike 500S
COMM
COMM MAGNETOMETER:                                Geometrics G-822A CV
COMM INSTALLATION:                                             Stinger
COMM RESOLUTION:                                              0.001 nT
COMM RECORDING INTERVAL:                                         0.1 s
COMM
COMM RADAR ALTIMETER:                                      Sperry RT220
COMM RECORDING INTERVAL:                                         0.1 s
COMM
```

```
COMM NAVIGATION:                                        real-time differential GPS
COMM RECORDING INTERVAL:                                                     1.0 s
COMM
COMM ACQUISITION SYSTEM:                                                 Fugro DAS
COMM
COMM BASE MAGNETOMETER:                                           Scintrex Envi-mag
COMM RECORDING INTERVAL:                                                       5 s
COMM
COMM DATA PROCESSING
COMM
COMM CO-ORDINATES
COMM PARALLAX CORRECTION APPLIED                                            -0.6 s
COMM
COMM MAGNETIC DATA
COMM DIURNAL CORRECTION APPLIED                        base value 48786.6 nT
COMM PARALLAX CORRECTION APPLIED                                            0.52 s
COMM IGRF CORRECTION APPLIED                           base value 48863.7 nT
COMM IGRF MODEL 2005 extrapolated to                                   August 2006
COMM DATA HAVE BEEN TIE LINE LEVELLED
COMM DATA HAVE BEEN MICROLEVELLED
COMM
COMM RADAR ALTITUDE DATA
COMM PARALLAX CORRECTION APPLIED                                             0.3 s
COMM
COMM GPS ALTITUDE DATA
COMM PARALLAX CORRECTION APPLIED                                            -0.6 s
COMM
COMM DIGITAL TERRAIN DATA
COMM DTM CALCULATED [DTM = GPS ALTITUDE - (RADAR ALTITUDE + SENSOR
SEPARATION)]
COMM DATA CORRECTED TO AUSTRALIAN HEIGHT DATUM
COMM DATA HAVE BEEN TIE LINE LEVELLED
COMM DATA HAVE BEEN MICROLEVELLED
COMM ---------------------------------------------------------------------------
COMM The accuracy of the elevation calculation is directly dependent on
COMM the accuracy of the two input parameters, radar altitude and GPS
COMM altitude.  The radar altitude value may be erroneous in areas of heavy
COMM tree cover, where the altimeter reflects the distance to the tree
COMM canopy rather than the ground.  The GPS altitude value is primarily
COMM dependent on the number of available satellites. Although
COMM post-processing of GPS data will yield X and Y accuracies in the
COMM order of 1-2 metres, the accuracy of the altitude value is usually
COMM much less, sometimes in the ±5 metre range.  Further inaccuracies
COMM may be introduced during the interpolation and gridding process.
COMM Because of the inherent inaccuracies of this method, no guarantee is
COMM made or implied that the information displayed is a true
COMM representation of the height above sea level.  Although this product
COMM may be of some use as a general reference,
COMM THIS PRODUCT MUST NOT BE USED FOR NAVIGATION PURPOSES.
COMM ---------------------------------------------------------------------------
COMM
COMM
COMM LINE DATA FORMAT
COMM A space is left between fixed fields so that a field of, for example,
COMM A8 should only ever have a maximum of 7 characters in it, even when it
COMM is a null, thus:
COMM
COMM FIELD                      UNITS            NULL                 FORMAT
COMM Line Number                                 -9999                I5
COMM Flight Number                               -99                  I4
COMM Date (yyyymmdd)                             -99999               I9
COMM Fiducial Number                             -999999              I8
COMM Time (local,UTC)            s               -9999.9              F8.1
COMM Easting                     m               -99999.99            F10.2
```

```
COMM Northing                 m           -999999.99         F11.2
COMM Longitude                deg         -999.9999999       F13.7
COMM Latitude                 deg         -99.9999999        F12.7
COMM GPS Altitude             m           -999.99            F8.2
COMM Radar Altitude           m           -999.99            F8.2
COMM Compensated TMI          nT          -99999.99          F10.2
COMM Diurnal                  nT          -99999.99          F9.2
COMM Final TMI                nT          -99999.99          F10.2
COMM Digital Terrain Model    m           -99.99             F8.2
```

Description File for 1.0 sec Windowed Radiometrics Data

```
COMM JOB NUMBER:                                              1777
COMM AREA NUMBER:                                               02
COMM SURVEY COMPANY:                        Fugro Airborne Surveys
COMM CLIENT:                                    Gulf Mines Limited
COMM SURVEY TYPE:                         Magnetic and Radiometric
COMM AREA NAME:                                        Wollogorang
COMM STATE:                                                     NT
COMM COUNTRY:                                            Australia
COMM SURVEY FLOWN:                        August to September 2006
COMM LOCATED DATA CREATED:                            October 2006
COMM
COMM DATUM:                                                  GDA94
COMM PROJECTION:                                               MGA
COMM ZONE:                                                      53
COMM
COMM SURVEY SPECIFICATIONS
COMM
COMM TRAVERSE LINE SPACING:                                 100 m
COMM TRAVERSE LINE DIRECTION:                       000 - 180 deg
COMM TIE LINE SPACING:                                     1000 m
COMM TIE LINE DIRECTION:                            090 - 270 deg
COMM NOMINAL TERRAIN CLEARANCE:                              50 m
COMM FINAL LINE KILOMETRES:                            18478.7 km
COMM
COMM LINE NUMBERING
COMM
COMM TRAVERSE LINE NUMBERS:                         20001 - 20433
COMM TIE LINE NUMBERS:                              29001 - 29059
COMM
COMM AREA BOUNDARY
COMM
COMM    easting   northing
COMM    782000    8111000
COMM    819000    8111000
COMM    819000    8074800
COMM    786000    8074800
COMM    786000    8062000
COMM    785000    8062000
COMM    785000    8052000
COMM    776000    8052000
COMM    776000    8090000
COMM    782000    8090000
COMM
COMM SURVEY EQUIPMENT
COMM
COMM AIRCRAFT:                   VH-WAM Aerocommander Shrike 500S
COMM
COMM SPECTROMETER:                  256 Channel Exploranium GR820
COMM CRYSTAL VOLUME:                                      33.56 L
COMM RECORDING INTERVAL:                                      1 s
COMM
```

```
COMM RADAR ALTIMETER:                                      Sperry RT220
COMM RECORDING INTERVAL:                                          0.1 s
COMM
COMM NAVIGATION:                             real-time differential GPS
COMM RECORDING INTERVAL:                                          1.0 s
COMM
COMM ACQUISITION SYSTEM:                                      Fugro DAS
COMM
COMM DATA PROCESSING
COMM
COMM CO-ORDINATES
COMM PARALLAX CORRECTION APPLIED                                 -0.6 s
COMM
COMM RADAR ALTITUDE DATA
COMM PARALLAX CORRECTION APPLIED                                  0.3 s
COMM
COMM GPS ALTITUDE DATA
COMM PARALLAX CORRECTION APPLIED                                 -0.6 s
COMM
COMM BAROMETRIC DATA
COMM PARALLAX CORRECTION APPLIED                                  2.1 s
COMM
COMM TEMPERATURE DATA
COMM PARALLAX CORRECTION APPLIED                                  2.1 s
COMM
COMM
COMM RADIOMETRIC DATA
COMM NASVD FILTERING APPLIED TO 256 CHANNEL DATA
COMM WINDOW DATA EXTRACTED USING IAEA STANDARD WINDOWS
COMM PARALLAX CORRECTION APPLIED                                    0 s
COMM COSMIC, AIRCRAFT AND RADON BACKGROUNDS REMOVED
COMM STRIPPING CORRECTIONS APPLIED
COMM HEIGHT CORRECTED TO                                       50 m AGL
COMM DATA HAVE BEEN TIE LINE LEVELLED
COMM DATA HAVE BEEN MICROLEVELLED
COMM AIRCRAFT BACKGROUND COEFFICIENTS
COMM TOTAL COUNT                                                   57.8
COMM POTASSIUM                                                      9.1
COMM URANIUM                                                        2.6
COMM THORIUM                                                        0.6
COMM COSMIC COEFFICIENTS
COMM TOTAL COUNT                                                 0.8700
COMM POTASSIUM                                                   0.0510
COMM URANIUM                                                     0.0401
COMM THORIUM                                                     0.0530
COMM STRIPPING COEFFICIENTS
COMM ALPHA                                                       0.2657
COMM BETA                                                        0.4192
COMM GAMMA                                                       0.7963
COMM a                                                           0.0621
COMM b                                                           0.0016
COMM g                                                          -0.0166
COMM STRIPPING HEIGHT ATTENUATION COEFFICIENTS
COMM ALPHA                                                      0.00049
COMM BETA                                                       0.00065
COMM GAMMA                                                      0.00069
COMM RADON STRIPPING COEFFICIENTS
COMM TOTAL COUNT                                                 13.150
COMM POTASSIUM                                                    0.782
COMM THORIUM                                                      0.061
COMM SPECTRAL RATIOS
COMM RADON (C1)                                                 1.87540
COMM GROUND (C2)                                                    0.4
COMM ALTITUDE COEFFICIENTS
```

```
COMM TOTAL COUNT                                                 -0.0070
COMM POTASSIUM                                                   -0.0090
COMM URANIUM                                                     -0.0099
COMM THORIUM                                                     -0.0075
COMM SENSITIVITY COEFFICIENTS AT 60 m
COMM TOTAL COUNT                                      33.84 (cps/(nGy/h))
COMM POTASSIUM                                             129.72 (cps/%)
COMM URANIUM                                                 8.15 (cps/ppm)
COMM THORIUM                                                 7.64 (cps/ppm)
COMM
COMM LINE DATA FORMAT
COMM A space is left between fixed fields so that a field of, for example,
COMM A8 should only ever have a maximum of 7 characters in it, even when it
COMM is a null, thus:
COMM
COMM FIELD                       UNITS            NULL                FORMAT
COMM Line Number                                  -9999               I5
COMM Flight Number                                -99                 I4
COMM Date (yyyymmdd)                              -9999999            I9
COMM Fiducial Number                              -999999             I8
COMM Time (local, UTC)              s             -9999.9             F8.1
COMM Easting                        m             -99999.99           F10.2
COMM Northing                       m             -999999.99          F11.2
COMM Longitude                      deg           -999.9999999        F13.7
COMM Latitude                       deg           -99.9999999         F12.7
COMM GPS Altitude                   m             -999.99             F8.2
COMM Radar Altitude                 m             -999.99             F8.2
COMM Raw Cosmic                     cps           -99                 I4
COMM Barometric Pressure            hPa           -999.99             F8.2
COMM Temperature                    deg C         -9.9                F5.1
COMM Livetime                       s             -9.999              F7.3
COMM Uncorrected Total Count        cps           -9999.9             F8.1
COMM Uncorrected Potassium          cps           -999.9              F7.1
COMM Uncorrected Uranium            cps           -999.9              F7.1
COMM Uncorrected Thorium            cps           -999.9              F7.1
COMM Final Total Count              cps           -9999.9             F8.1
COMM Final Potassium                cps           -999.9              F7.1
COMM Final Uranium                  cps           -999.9              F7.1
COMM Final Thorium                  cps           -999.9              F7.1
COMM Raw 256 Channel Radiometrics counts          -999                256I5
```

APPENDIX IV – List Of All Supplied Data

Final Located Data

- 0.1 second magnetics and digital elevation data
- 1.0 second windowed radiometrics & 256 channel data

Final located data is in Geosoft database format. Contents of each are shown in Appendix III.

Preliminary Gridded Data

Preliminary gridded data was produced in ERMapper format in GDA94/MGA543

- Total magnetic intensity
- Total count
- Potassium count
- Uranium count
- Thorium count
- Digital elevation model

Final Gridded Data

Final gridded data was produced in ERMapper format in GDA94/MGA53
Merged grids of Wollogorang and previously flown (UTS) Hartz Range survey.

- Total magnetic intensity
- Total count
- Potassium count
- Uranium count
- Thorium count
- Digital elevation model

Final Map Products

- Flight Path
- Image of Total Magnetic Imtensity (TMI) or first or second vertical derivative (1VD or 2VD)
- Image of Ternary radiometrics
- Image of contours of Ditital Elevation Model (DEM)

Appendix 5

Airborne Geophysical Survey
QC Report

Gulf Mines Pty. Ltd.

Airborne geophysical Survey
Wollogorang area
Northern Territory

by
Fugro Airborne Surveys

Quality Control Report
by
Steve Webster P/L

November, 2006

Contents

1 Introduction

An airborne magnetic and radiometric survey was conducted over the Wollogorang area in the Northern Territory during August - September, 2006. The survey, contracted by Gulf Mines P/L to **Fugro Airborne Surveys** (FAS), was based out of the Wollogorang cattle property. One requirement of the Contract was to merge the survey data with equivalent data from the Hartz Range survey, to the south-east, flown in 2005. The contract was prepared and supervised with quality control by Steve Webster P/L.

A separate **Operations and Processing Report** has been prepared by FAS to outline the procedures taken to complete the project.

This report, by Steve Webster P/L, provides additional technical information on:
i) equipment calibration, operations and contract performance
ii) certain processing procedures needed to enhance the data and map presentation

2 Survey progress

The survey area is located in the east of the Northern Territory and the survey flight plan is shown in figure 1, with North - South flight lines spaced 100m apart and East - West tie lines spaced 1,000m apart for a total of 17,913 km.

The boundaries of the Wollogorang survey area as defined in the Contract were:

Table 1

GDA94	Zone53
East	North
782,000	8,111,000
819,000	8,111,000
819,000	8,076,000
785,000	8,076,000
785,000	8,052,000
776,000	8,052,000
776,000	8,090,000
782,000	8,090,000

The aircraft and crew based at Wollogorang station during August and September, 2006. The survey statistics, as itemised in the accompanying table 2, show that the progress of the survey included 14 production days (2 x 5hour flights/day) and 8 days were lost due to aircraft maintenance or repairs. Thus in operation mode the survey averaged 1,321 km per production day but the survey duration was protracted.

Table 2

Vollogorang Project: Fugro daily production chart

Date	18-Aug	19-Aug	20-Aug	21-Aug	22-Aug	23-Aug	24-Aug	25-Aug	26-Aug	27-Aug	28-Aug	29-Aug	30-Aug	31-Aug
am		1071	941	1300	111	1023	548	1095	0	0	0	0	0	1058
pm	458	981	1209	804	111	440	service	912	0	Hydraul	0	0	0	902
production	458	2052	2150	2104	222	1463	548	2007	0	0	0	0	0	1960
Running Tota	458	2510	4660	6764	6986	8449	8997	11002	11002	11002	11002	11002	11002	12963
					reflights									reflghts
					464									62

Date	1-Sep	2-Sep	3-Sep	4-Sep	5-Sep	6-Sep	7-Sep	8-Sep	total
am	810	511	0	0	0	0	1022	1246	
pm	438	0	service	0	0	401	1095	Finish	
production	1248	511	0	0	0	401	2117	1246	
Running Tota	14211	14722	14722	14722	14722	15123	17240	18486	18486

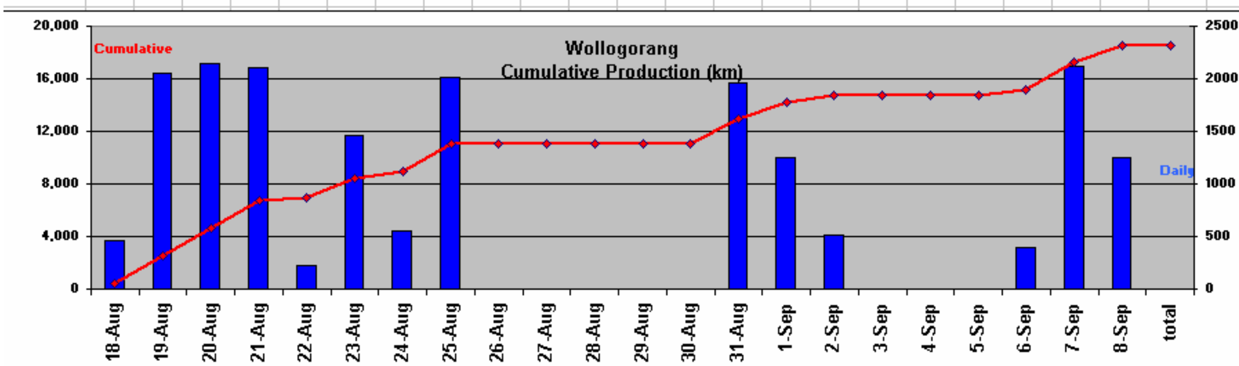


Figure 2a. **Graph of daily and cumulative flight production**

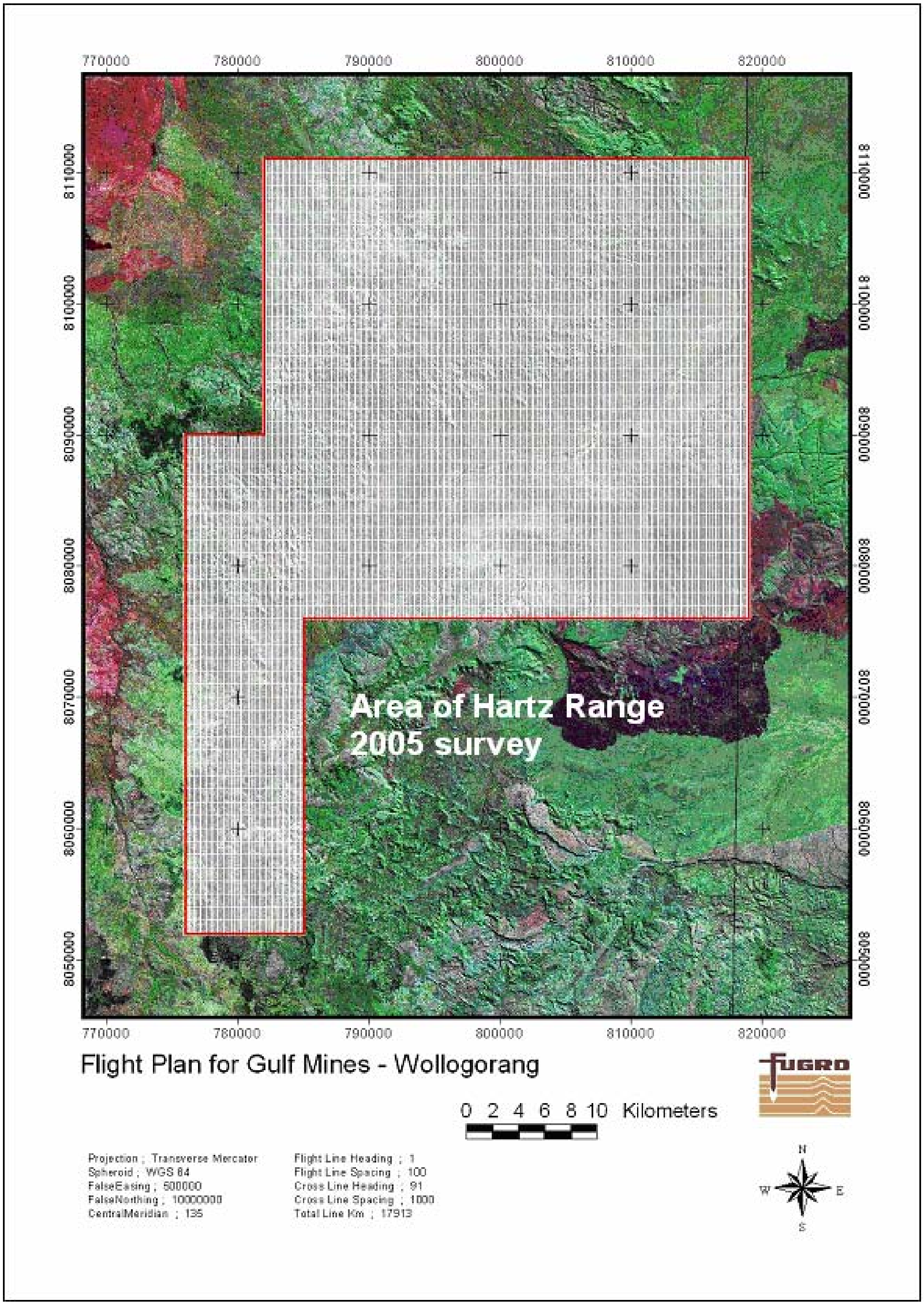


Figure 1. Proposed flight plan of Wollogorang airborne geophysical survey

3 Survey Equipment and basic data processing

The survey equipment was installed in Perth on a Shrike Aero-commander aircraft (VH -WAM) and radiometric calibrations were carried out over the standard calibration range. A separate report by Fugro discussing the results of this calibration and including the correction coefficients for height, cosmic, aircraft background and stripping ratios is included as the Appendix and will not be included here.

The magnetometer was in mounted in a stinger (as shown in accompanying photographs) located at the rear of the aircraft to remove it as much as possible from the magnetic effects of the aircraft. These effects were further reduced by on-site calibrations that allow real-time computations of the magnetic effects of aircraft maneuvers—described in the following section 4. Two identical base station magnetometers were setup near the base landing strip, as shown in figure 3b, to observe diurnal variation as required in the Contract.

The various instruments, data processing and acquisition units are incorporated into a system rack, as shown in figure 3c, that is mounted behind the pilot's seat. The 33 litres of radiometric detectors are mounted behind the acquisition rack.

Basic data processing and leveling are similar to produce the main products of Total Magnetic Intensity (TMI), four channels of radiometric data (Total Count, Potassium, Uranium and Thorium) and digital terrain model (DTM) once each had had individual corrections applied. These include:

Magnetics:	compensation for aircraft maneuvers Correction for system parallax, spike removal and diurnal correction IGRF computation for each value
Radiometric:	noise filtering using the NASVD method, background removal, cosmic correction, spectral stripping and Radon removal by the spectral ratio technique. Height correction and conversion to equivalent concentrations.
DTM:	post processing of GPS altitude, correction of radar altimeter

For all products, the corrected data are tie-line leveled using least-square procedures until errors are minimized then micro-levelling techniques are applied to remove residual errors. The data are gridded and preliminary grids examined for errors by the quality control nominee to ensure that the processing has not introduced artifacts. The survey data were merged with the data from the Hartz Range airborne geophysical survey flown in 2005 and final product maps produced, as shown in the attached sample maps.

An example of the quality control is provided by examination the radiometric test line which was flown on each flight to monitor daily variation (which can be seen in the attached graph, figure3) where radon contamination can be observed in three channels while the thorium channel (green line) is constant within set standards. Data processing can compensate the data for these daily variations.

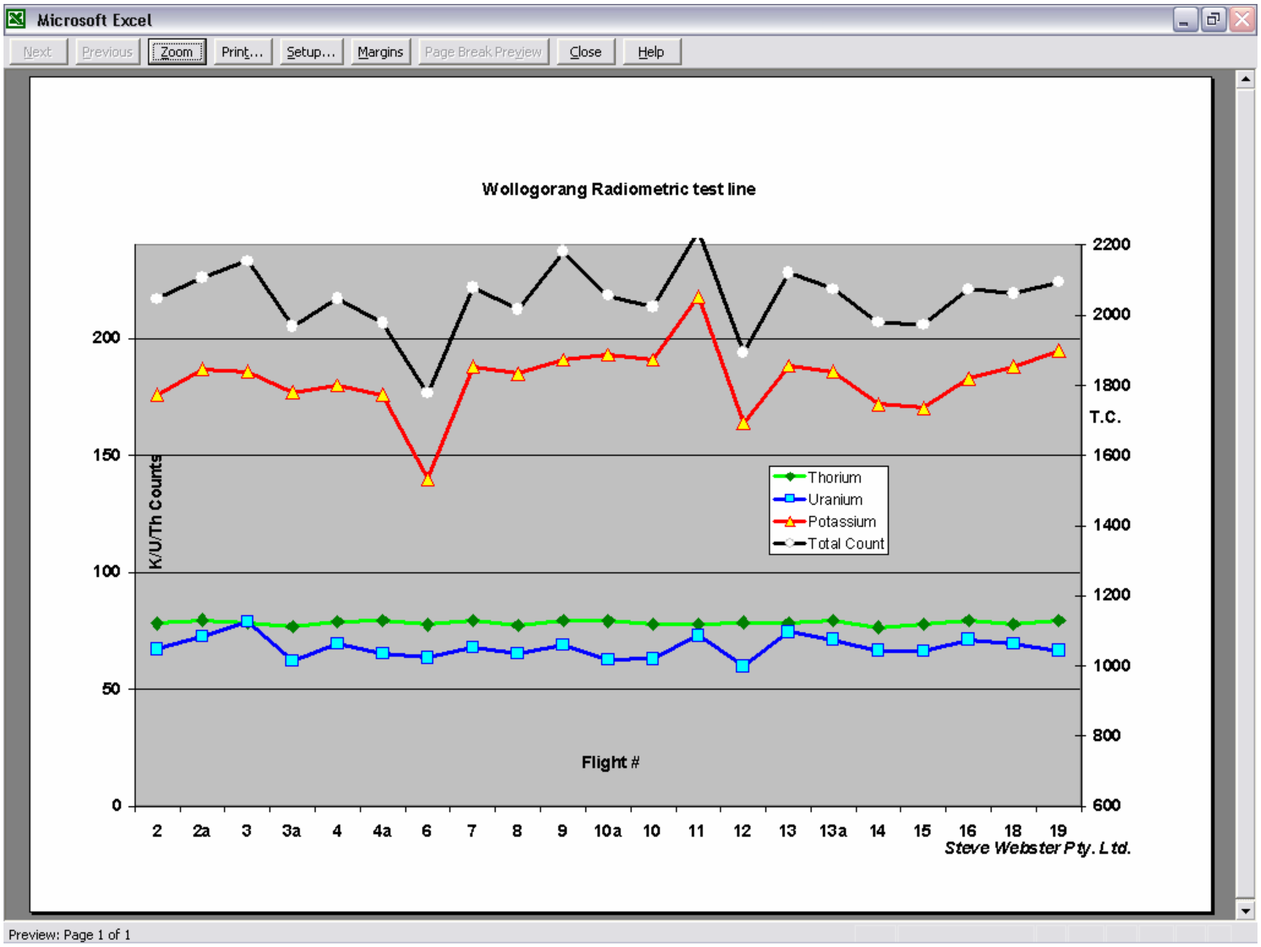


Figure 3 Graph of daily variation recorded along radiometric test line

Figure 3a **Aircraft with rear stinger instrument mount**

Figure 3b **Base station magnetometer**

Figure 3c Fugro data acquisition unit

4 QUALITY CONTROL

4a Airborne magnetic survey Figure of Merit

The only quantitative parameter utilised in airborne magnetic surveys as an estimate of survey data quality is the Figure of Merit (**FOM**). This parameter is an estimate of the compensation required to correct the airborne magnetic measurement for the effects induced by the aircraft manoeuvres as it acquires data.

Modern surveys for mineral exploration are designed to measure a wide range of responses from shallow sources through to basement responses and a new relationship needs to be used to quantify the compensation of high frequency anomalies. The standard compensation data can be analysed to derive the high frequency component of the manoeuvre noise and the reduction obtained by mathematical computation. The data are high-pass filtered to remove the geology derived signal and the noise level is then computed by Standard Deviation analysis.

Fugro AS has a standard procedure, termed a '*compensation box*", to estimate a ***FOM*** parameter and this requires the aircraft to be put through a set of 5 pitches (of 10° to 20°), 5 rolls (up to 10°) and 5 yaws along line and 5° and 10° from both sides of line direction. Thus five sets of readings are averaged for each manoeuvre in the four principal directions. For the **Gulf Mines Wollogorang** project, the FOM determination was made at the start of the flying programme and the FOM parameter was of the order of 5 times noise reduction to a level of +/- 0.02nT.

4b Wollogorang magnetic Comp-box

The compensation flights (Comp-box) were flown, at altitude, in two large circles to determine the compensation parameters then in cardinal directions with two segments of 8 – 10 seconds each, as shown in the attached figure 4a. The data profiles for the 8 segments are shown as green lines for uncompensated data and red lines for compensated data plus the (4th difference) filtered data spread (reflecting instrumental noise which should be the same in all directions) which is basically reduced to zero.

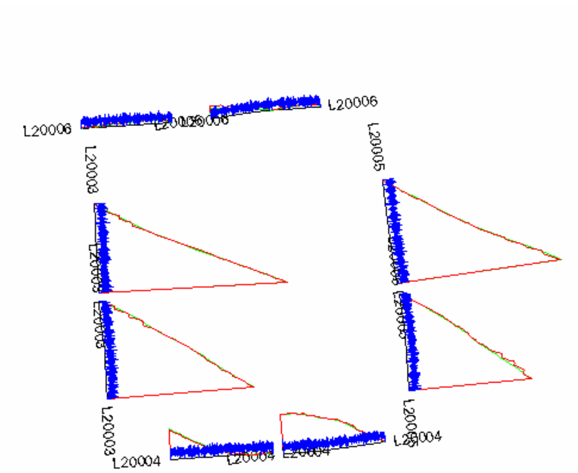


Figure 4a. Flight path of lines flown in cardinal directions for FOM comp-box.

The eight data sets were analysed to determine the standard deviation of high-pass filtered magnetic residuals—required as the magnetic variation is different in each direction with maximum change in the N-S or S-N direction and much less change in E-W or W-E direction.

Direction	Line#	# samples	S.D.(Uncomp)	S.D.(Comp)	Ratio
N-S	3.1	680	0.1758	0.0227	7.7445
	3.2	760	0.1560	0.0233	6.6953
W-E	4.1	790	0.0390	0.0176	2.2159
	4.2	770	0.0524	0.0189	2.7725
S-N	5.1	700	0.1495	0.0238	6.2815
	5.2	740	0.1256	0.0235	5.3447
E-W	6.1	770	0.0855	0.0193	4.4301
	6.2	640	0.0708	0.0192	3.6875
			0.1068	**0.0210**	**4.8965**

The data table shows a residual uncompensated data range from 0.039nT to 0.176nT, depending on direction, with a standard deviation of 0.107nT. The compensated data range is from 0.018nT to 0.023nT with a standard deviation of 0.021nT, which is a 5.1 times reduction in noise to an acceptable level. Figure 4b shows the data for one of the S-N flights with magnetic intensity increasing by more than 30nT to the north and the effects of the maneuvers as an oscillating wave (central plot of high pass filtered data). The bottom plot shows the uncompensated filtered data with the effects of the various maneuvers clearly evident (green line) and the filtered compensated data (red line) showing a reduction in noise to less than +/- 0.1nT.

For the Wologorang survey data, the averaged 'raw' SD value is 0.11nT and compensated (average) SD is 0.021nT. The absolute value of 'raw' SD of 0.1nT is encouraging, but the noise reduction factor of 5 times reduction to the order of 0.02nT is significant. To maintain this accuracy, for final corrected data, requires low noise levels in the raw magnetic data and high compensation parameters to reduce the noise to much less than the nominated minimal noise signal.

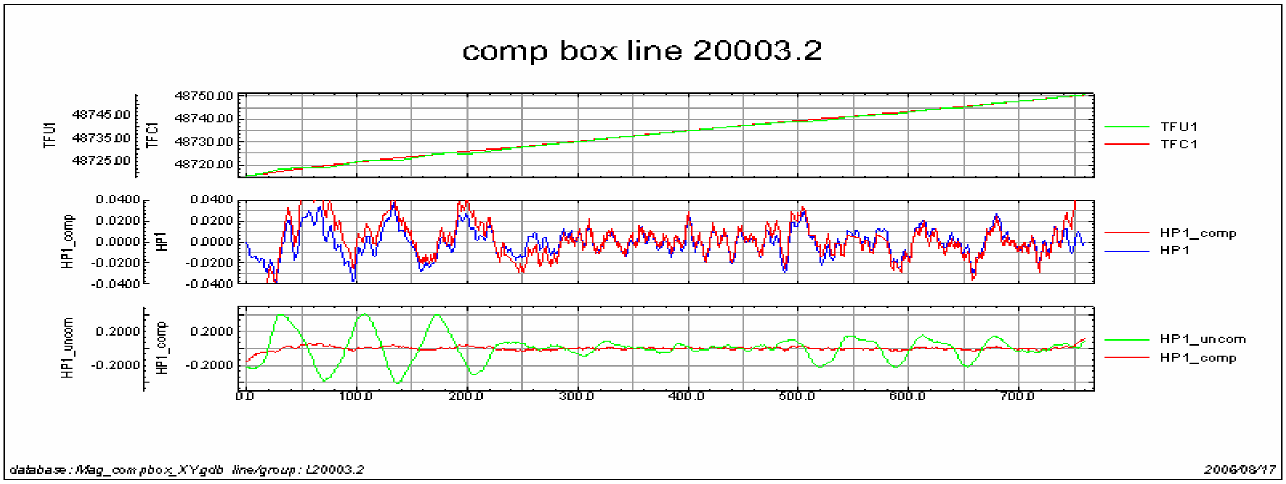


Figure 4b. **Plot of uncompensated and compensated magnetic data, Wollogorang FOM**

4c Diurnal variation in magnetic field

As mentioned above, the daily variation in the magnetic field was observed using two identical magnetometers (one as backup) recording magnetic field strength at 5 second intervals to 0.1nT resolution. The two magnetometers were synchronized daily with the aircraft acquisition system. The monitoring software allows in-field checking of the magnetic field to detect magnetic storms that produce field variations outside of Contract specifications (5nT in 5 minutes). The attached figure 4c shows the magnetic field variation (lower graph) with the time interval of various flights superimposed so that the impact of abnormal disturbances can be recognized. Also shown is the rate of change (upper curve) that rapidly identifies the segments that are above specifications. Flight lines that are impacted by these problems are then scheduled for re-flying, however, for the Wollogorang survey there was little magnetic storm activity and few re-flights were required.

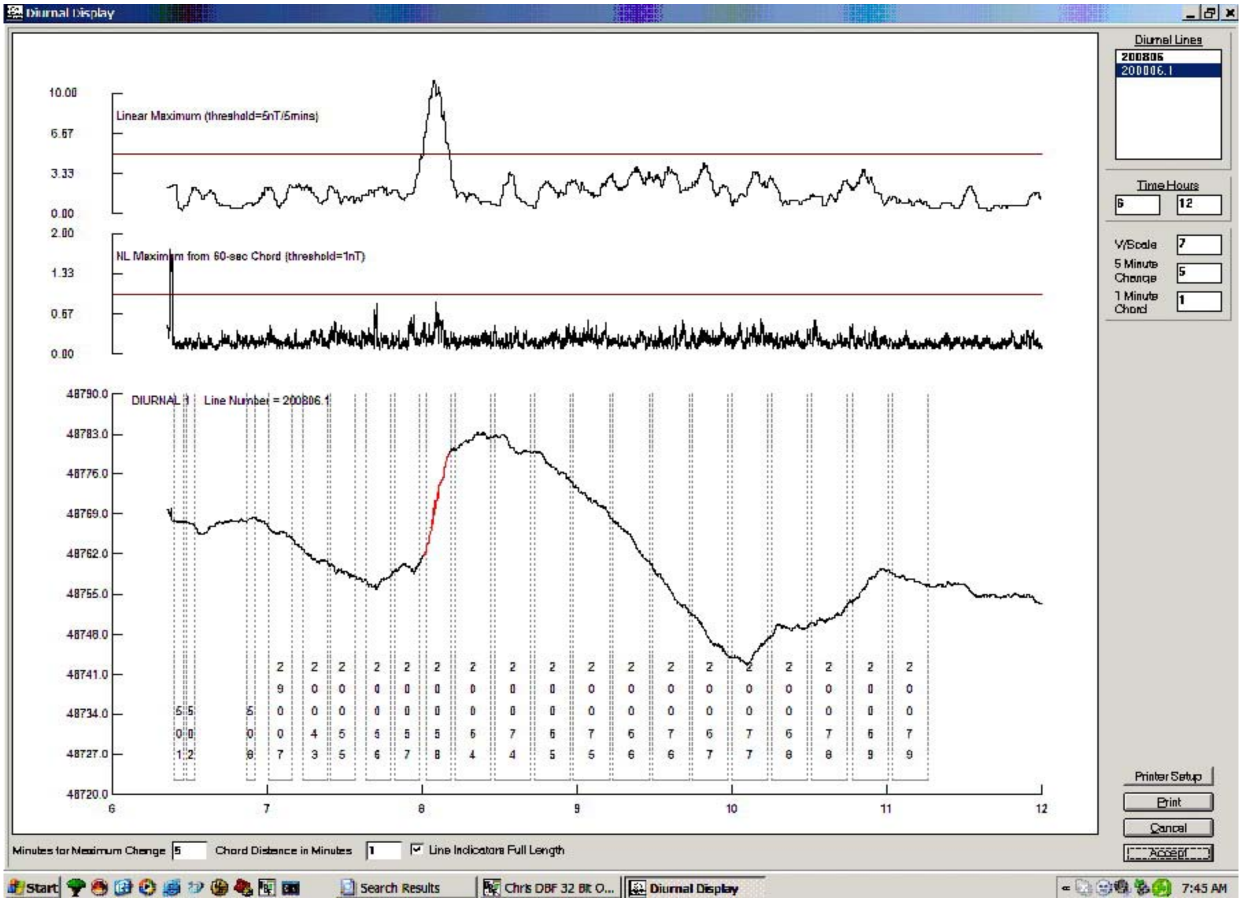


Figure 4c. Example of magnetic diurnal check plot

5 Additional Processing--Reduction to Pole

Magnetic anomalies can vary considerably in pattern depending on several factors, including:
i) inclination of the inducing Magnetic Field vector, which changes with latitude
ii) the presence and attitude of any **magnetic Remanence** component
iii) strike and dip of the magnetic source material.

The inclination of the earth's magnetic field varies from vertical at the poles to horizontal at the equator. As shown in the sketch, the lines of (Primary Field) force may be assumed to intersect the susceptible body at the angle of inclination and polarise the source to generate a secondary magnetic field. This secondary field will either add to or subtract from the Primary Field producing an anomaly that is measured by the magnetometer in the aircraft.

The resulting anomaly patterns for a symmetrical body may be grouped into three types, as shown in the accompanying sketch:

Polar: with vertical inclination, the secondary field will be adding to the primary field over the source and subtracting from the primary only at some distance from the source. Thus the pattern is for a strong ***positive anomaly over the source*** with a weak flanking negative aureole.

Equatorial: with a horizontal primary field the pattern will be reversed as the secondary field will add to the primary ***over the source giving a negative anomaly*** with a flanking positive aureole.

Mid-latitude: for other latitudes the primary field will be intersecting the polarisable body at an angle giving rise to an asymmetric secondary field that will be mainly positive at steep inclinations and mainly negative at shallow inclinations. The positive and negative pattern is termed a dipolar anomaly.

The *reduction to pole* technique is a filtering procedure that recomputes the observed data set to that which would have been observed if the inclination were vertical, ie at the pole. The result is to remove the negative component of the anomaly and re-locate the positive peak to a position over the source with a symmetrical shape. The RTP data set should be easier to interpret as the patterns are less complicated and superimposed anomaly patterns, ie shallow upon deep sources, more easily separated. Also, if there is a remanent component in the magnetic anomaly pattern then the RTP process will not totally remove the dipole pattern and an asymmetric anomaly will still be evident.

In the attached figure 4, showing part of the TMI and RTP data for the Wollogorang (**inclination = -47° S**), there are several anomaly patterns that illustrate the benefit of the procedure by shifting the anomaly lows to enhance the boundaries of sub-blocks and giving a uniform colour distribution throughout the block.

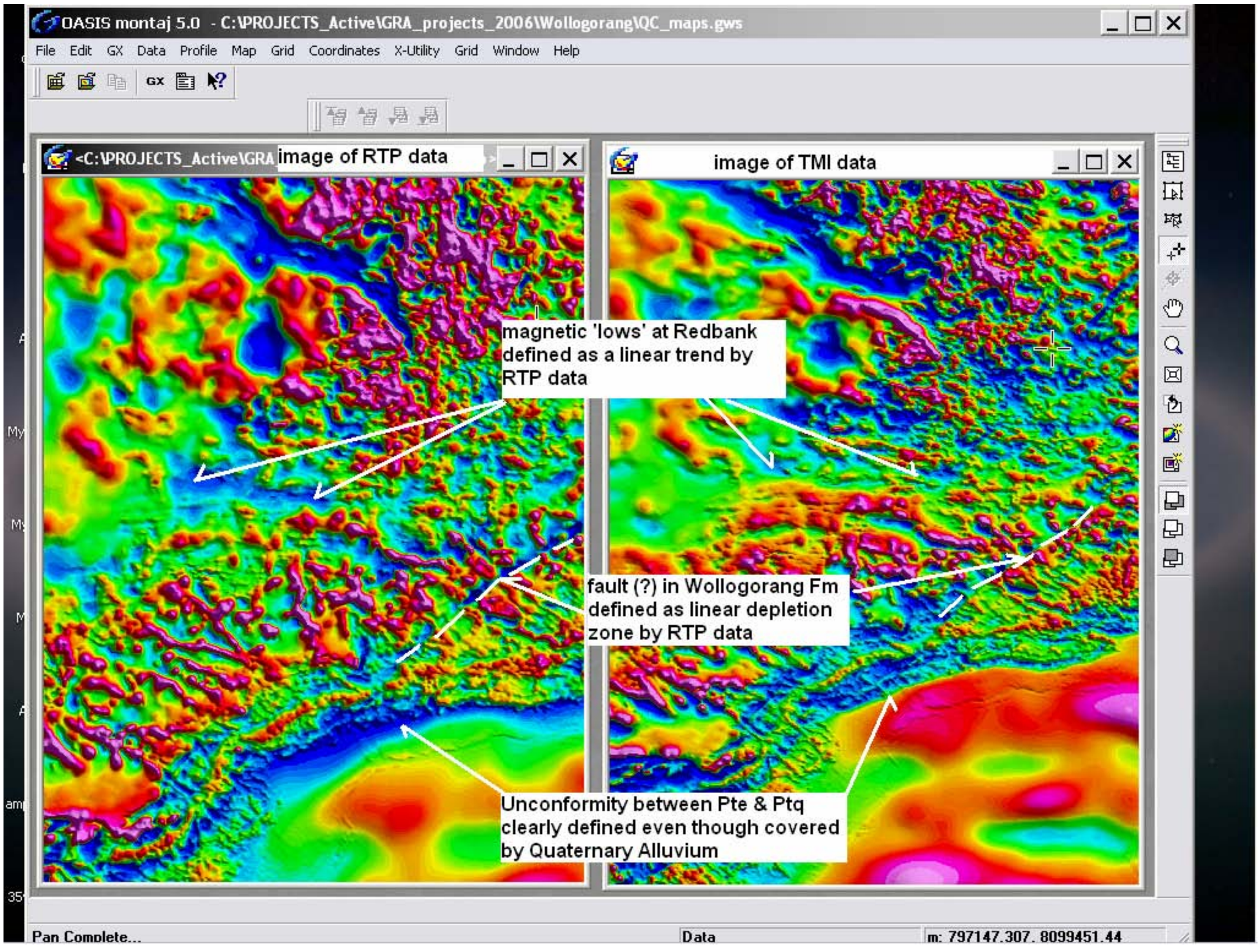


Figure 5. Comparison between Total Magnetic Intensity (TMI) and Reduced to Pole (RTP) magnetic images for the Wollogorang survey area, illustrating the extent of changes in anomaly shape with RTP conversion.

6 Delivered final products by FAS

Maps at 1:100,000 scale of:

- Reduced to Pole magnetic intensity
- Digital Terrain model
- Ternary radiometrics
- First vertical derivative of Total Magnetic Intensity

Grids in ERMapper format of TMI, RTP, 1VD, DTM Total Count, Potassium, Uranium, Thorium and Analytic Signal.

Operations and processing report

7 Conclusions

The Wollogorang airborne magnetic and radiometric survey was carried out by Fugro Airborne Surveys during August - September, 2006 with some aircraft maintenance problems, however, the data are of high quality and the high resolution acquired should allow Gulf MinesP/L to achieve their exploration objectives for the area.

Appendix 6

Airborne Geophysical Survey
Rad Calib Report

Radiometric Calibration Report

for

VH-WAM

Prepared by : J. Doedens …………………………..

P Chambers …………………………..

Authorised for release by : …………………………..

…………………………..

July 2006

by

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CONTENTS

1. INTRODUCTION

This report provides details and results of radiometric calibrations conducted by flying offshore tests, and the Carnamah test strip in Western Australia, as well as pad tests at Jandakot airport, from July 2006.

Data acquisition was by Fugro Airborne Surveys Pty Ltd, using a Rockwell Shrike Aerocommander 500S, VH-WAM. Total crystal volume was 33.56 L.

The calibration methods are generally as described by Grasty and Minty (1995).

A summary of all results is shown in Table 1.

VH-WAM	Date	Window	
Aircraft Background	11 July 2006	TC	57.80
		K	9.1
		U	2.7
		Th	0.55
Cosmic Background	11 July 2006	TC	0.8700
		K	0.0510
		U	0.401
		Th	0.0530
Stripping	5 Jan 2006	α	0.2657
		β	0.4192
		γ	0.7963
		a	0.0621
		b	0.0016
		c	-0.0166
Height Attenuation	7 July 2006	TC	-0.0070
		K	-0.0090
		U	-0.0099
		Th	-0.0075
Air/Ground @ 60 m	7 July 2006	Dose	33.84
		K	129.72
		U	8.15
		Th	7.64
Air/Ground @ 80 m	7 July 2006	Dose	29.42
		K	108.35
		U	6.68
		Th	6.57

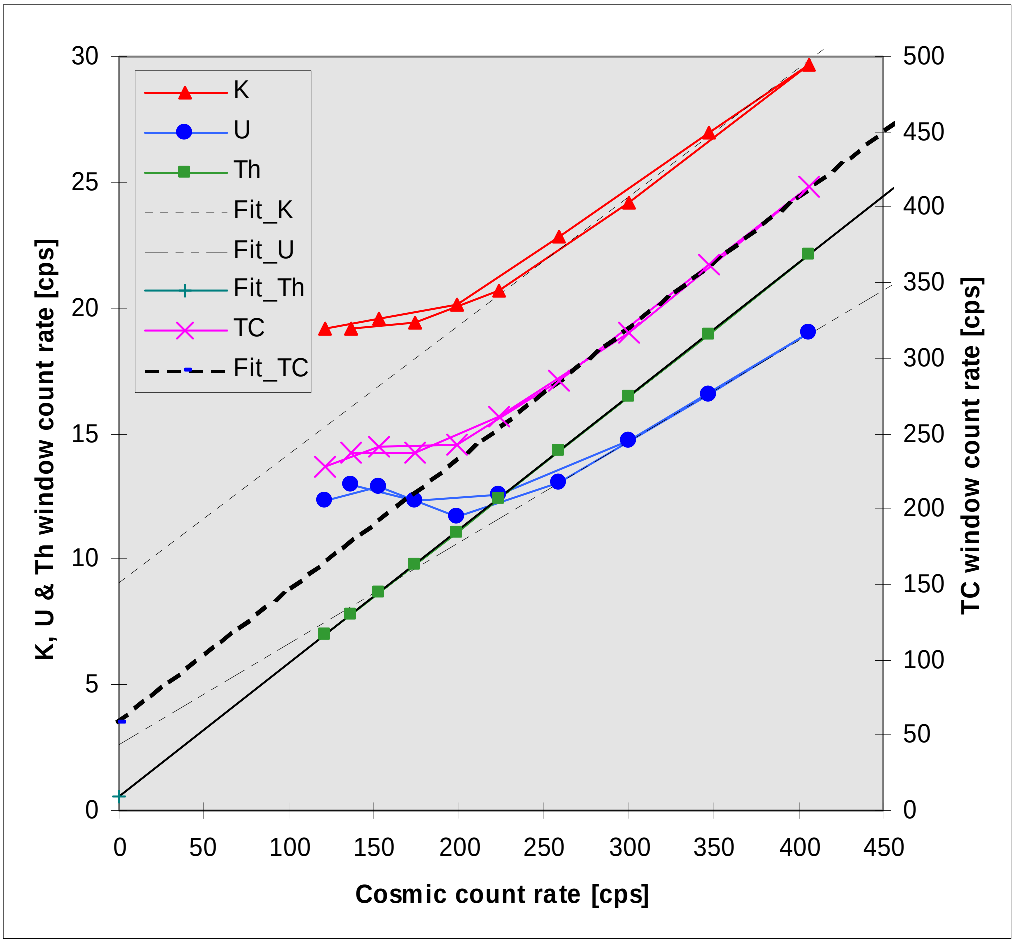
Table 1: VH-WAM Radiometric Coefficients

2. VH-WAM

2.1 COSMIC AND AIRCRAFT BACKGROUND COEFFICIENTS

Cosmic and aircraft background coefficients were obtained from a multi-level level flight over the ocean, flown on the 11th July 2006.

	Cosmic	Aircraft
TC	0.8700	57.80
K	0.0510	9.1
U	0.401	2.65
Th	0.0530	0.55



2.2 STRIPPING COEFFICIENTS

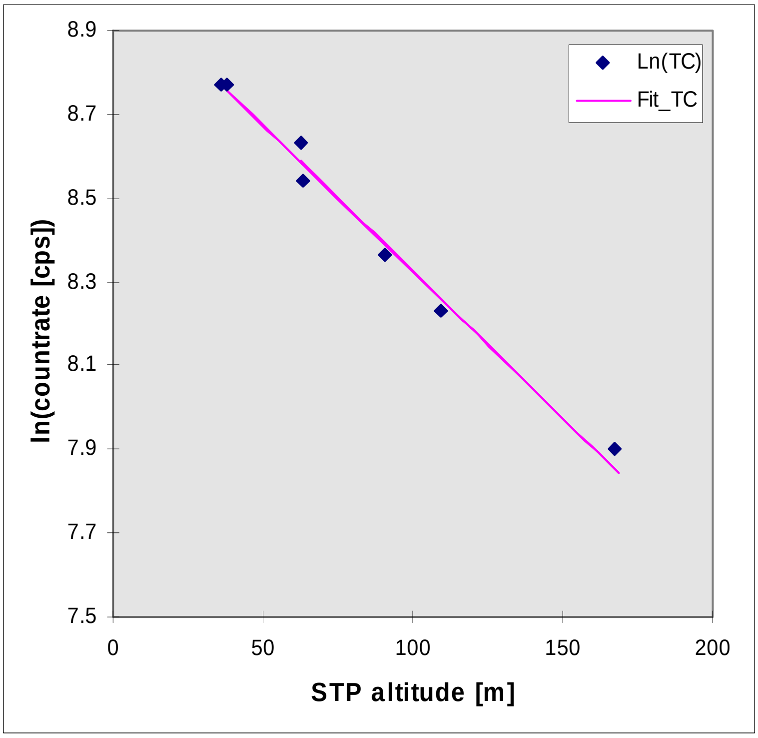
Stripping coefficients were obtained from pad tests carried out at Jandakot Airport, Western Australia, on the 5th January 2006.

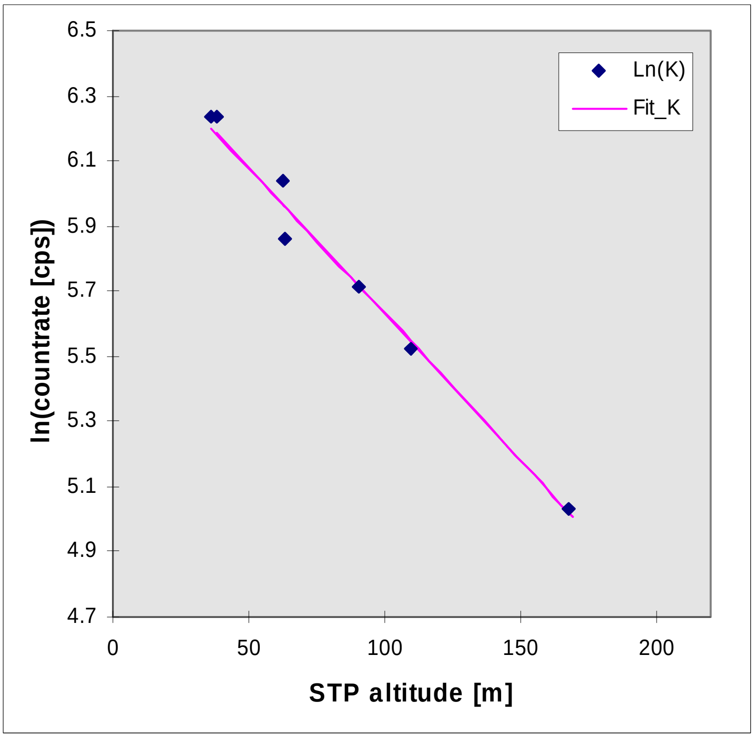
	Stripping
α (Th to U)	0.2657
β (Th to K)	0.4192
γ (U to K)	0.7963
A (U to Th)	0.0621
B (K to Th)	0.0016
C (K to U)	-0.0166

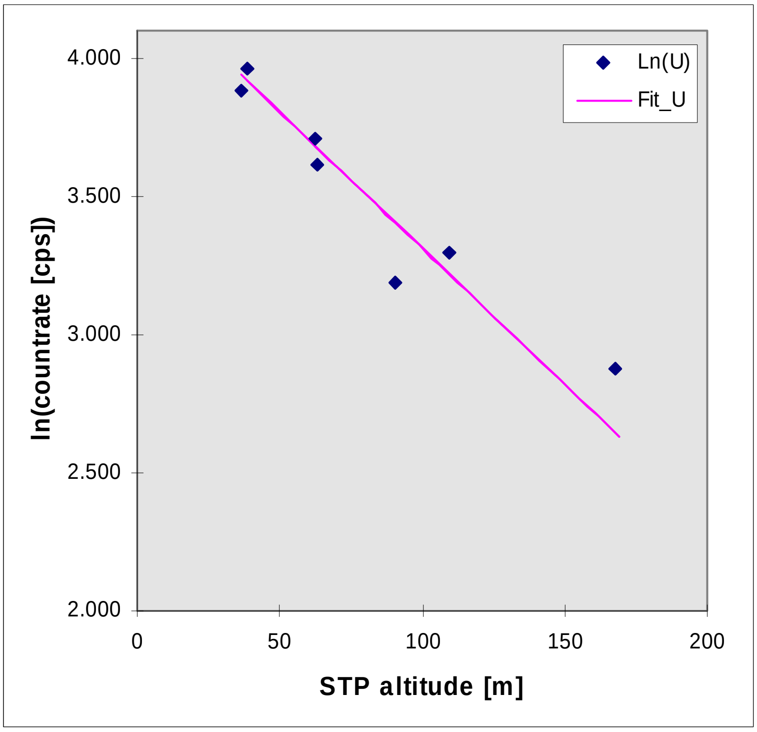
2.3 HEIGHT ATTENUATION COEFFICIENTS

Height attenuation coefficients were obtained from a low-level height stack over the Carnamah dynamic test range, Western Australia, flown on the 7th of July 2006.

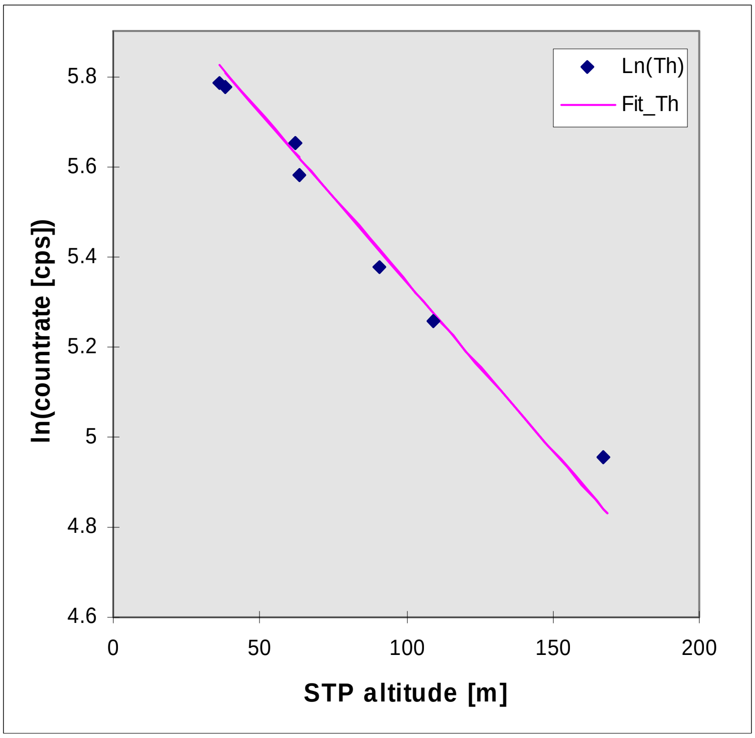
	Height Atten
TC	-0.0070
K	-0.009
U	-0.0099
Th	-0.0075







4.000
3.500
3.000
2.500
2.000
0
50
100
150
200
ln(countrate [cps])
STP altitude [m]
Ln(U)
Fit_U



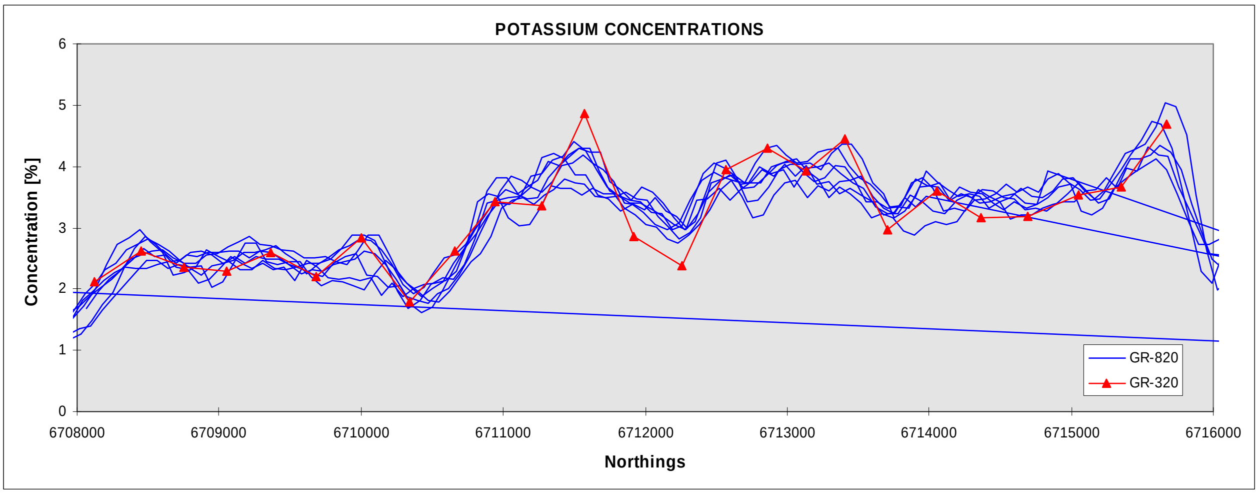
5.8
5.6
5.4
5.2
5
4.8
4.6
0
50
100
150
200
ln(countrate [cps])
STP altitude [m]
Ln(Th)
Fit_Th

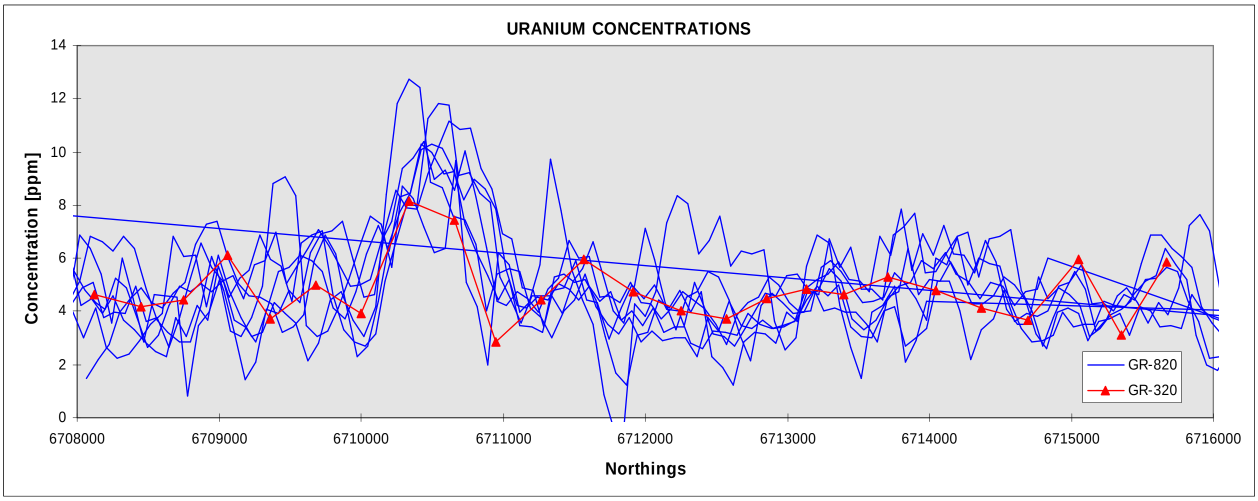
2.4 AIR TO GROUND RADIOELEMENT CONCENTRATIONS CONVERSION

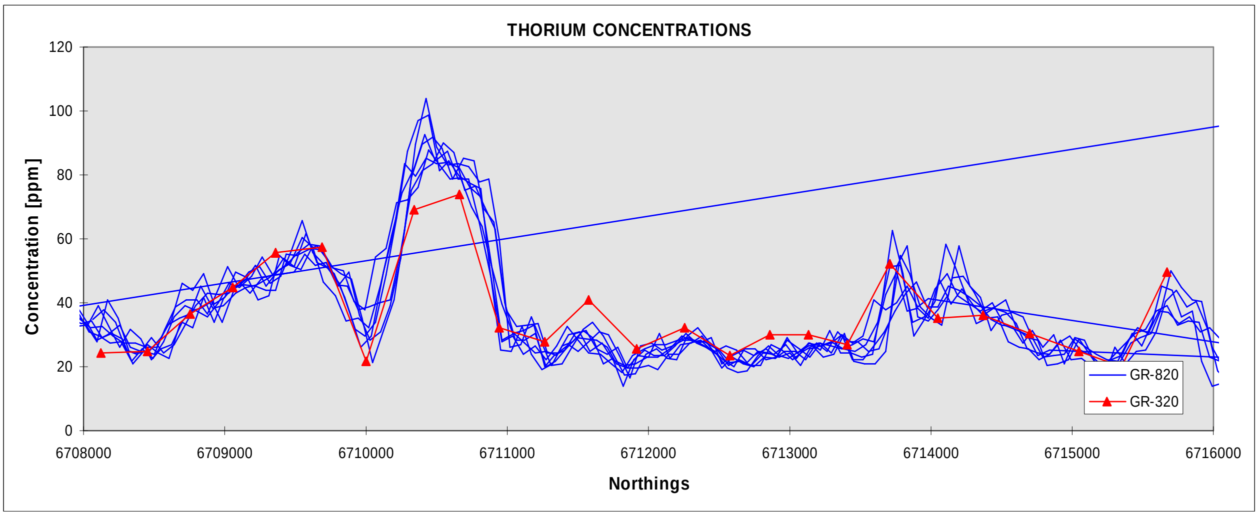
Air to ground conversion factors were determined by comparison of the airborne and ground radiometric data acquired along the central line of the Carnamah dynamic test range, Western Australia, on the 7th July 2006.

The airborne data were corrected and clipped to the same length as the ground traverse. Ratios of the averages of the airborne window data, corrected to altitudes of 60 m and 80 m, and the ground traverse were then calculated.

	K	U	Th
Ground (%, ppm, ppm)	3.19	4.80	37.01
Airborne (cps) @ 60 m	413.9	39.1	282.7
Air/Ground @ 60 m	129.72	8.15	7.64
Airborne (cps) @ 80 m	345.7	32.0	243.3
Air/Ground @ 80 m	108.35	6.68	6.57







2.5 CONVERSION OF TOTAL COUNT TO DOSE RATE

An estimate of the air-absorbed dose rate (in nGy/h ie nanograys per hour) at ground level was determined from natural sources of radiation from the total count rate using the expression:

D = N / F

Where D = the air absorbed dose rate in nanograys per hour
F = the conversion factor determined experimentally from flights over the Carnamah test range; and
N = the fully corrected total count rate

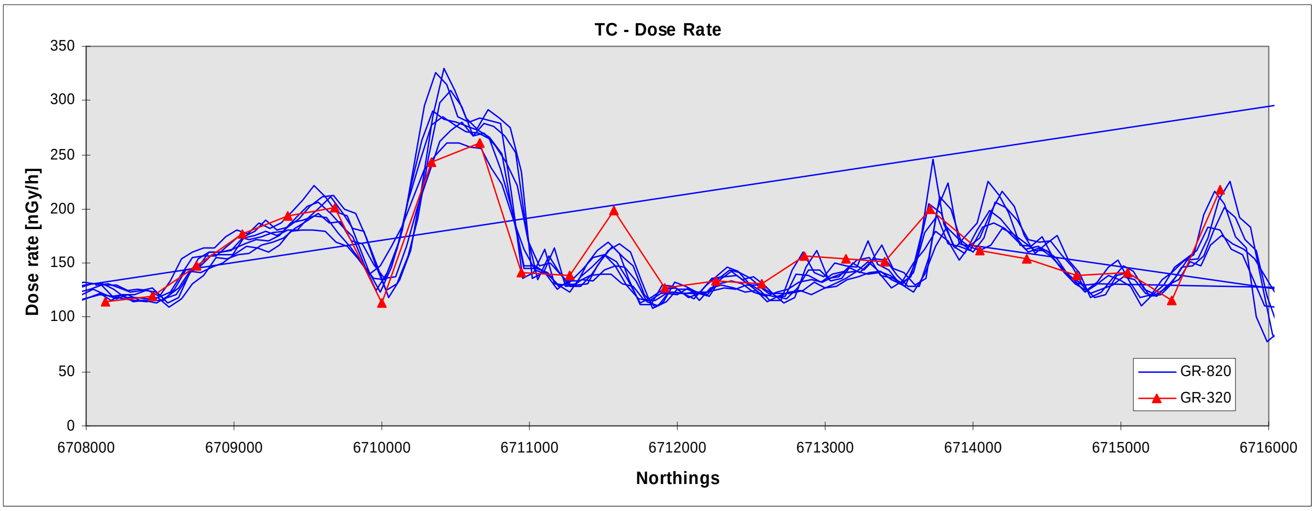
The average air-absorbed dose rate in nGy/h along the calibration range was calculated from the ground concentrations of K, U and Th using the relationship:

A = 13.078 x K + 5.675 x U + 2.494 x Th

(Grasty and Minty, AGSO Record 1995/60)

The ratio of the averages of the airborne window data, corrected to altitudes of 60 m and 80 m, and the ground traverse were then calculated.

	TC
Ground (nGy/h)	161.24
Airborne (cps) @ 60 m	5456.7
Air/Ground @ 60 m	33.84
Airborne (cps) @ 80 m	4743.9
Air/Ground @ 80 m	29.42



3. REFERENCES

Grasty, R.L. and Minty, B.R.S., 1995,
A guide to the technical specifications for airborne gamma-ray surveys.
Australian Geological Survey Organisation, Record 1995/60.