



# MAGSPEC

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Airborne Geophysical Survey

Survey Report

**GEOSCIENCE AUSTRALIA**  
**Tasmanian Tiers, Tas**

Airborne Magnetic, Radiometric and Digital Elevation Survey

Contract Number: 005474

Project Number: P5003

Prepared by

**MAGSPEC Airborne Surveys Pty Ltd**

Reference Number: 1181

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## 1. GENERAL PROJECT INFORMATION

<b>Project Details</b>				
<b>Project Number</b>	5003			
<b>Contract Number</b>	005474			
<b>MAGSPEC Project Number</b>	1181			
<b>Client</b>	Geoscience Australia			
<b>Survey Area Name</b>	Tasmanian Tiers			
<b>Survey Size (line kms)</b>	32,951			
<b>Survey Type</b>	Airborne Magnetics, Radiometrics, Digital Elevation			
<b>Aircraft</b>				
<b>Aircraft Location</b>	Launceston	Campbell Town	Longford	Bicheno
<b>Aircraft Make/Model</b>	Cessna 210	AS350B2	AS350B2	AS350B2
<b>Aircraft Registration</b>	VH-HHJ	VH-SRB	VH-SRB	VH-SRB
<b>Personnel</b>				
<b>Field Crew</b>	<b>Name</b>	<b>Position</b>		
	Daniel Wright	Pilot (fixed wing)		
	Roger Spinks	Pilot (fixed wing)		
	Bryan Patterson	Pilot (Helicopter)		
	David Lomas	Pilot (Helicopter)		
	David Paynton	Pilot (Helicopter)		
	William Bennett	Operator		
<b>Project Management</b>	Peter Spencer	Operations Manager		
<b>QA/QC</b>	Andrew Taylor	Quality Control / Technical Support		
<b>Final Data Processing</b>	Cameron Johnston	Data Processing Manager		
<b>Reporting</b>	Michael Lees	Sales Manager		
<b>Technical Support</b>	Peter McMullen	Consultant Technician		

## 1.1 Survey Acquisition Summary

The field crew and survey aircraft (Cessna 210 registration VH-HHJ) initially mobilised to the base of Operations at Launceston, Tasmania on 7<sup>th</sup> February 2021.

An on-site safety meeting was completed by the crew, base stations were set up, a reconnaissance and compensation flight was carried out and a radiometric test line was established. The first production flight was flown on 10<sup>th</sup> February 2021 and data acquisition of the fixed wing Central Block 1 was completed on 19<sup>th</sup> February 2021. Weather conditions were variable throughout the survey period, generally fine, with some rain, fog and overcast conditions causing standby.

The crew relocated to Campbell Town on 22<sup>nd</sup> February 2021, following installation of the geophysical equipment into the helicopter (AS350B2 registration VH-SRB) and subsequent testing and calibrations.

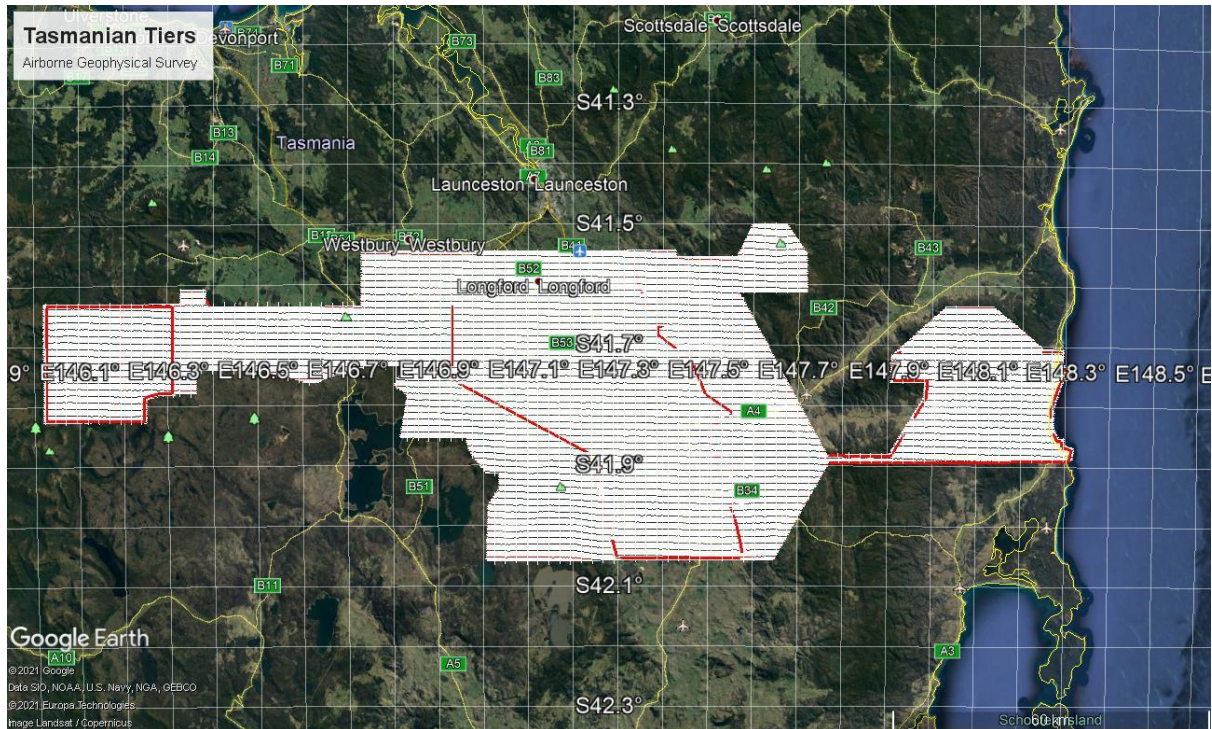
On 24<sup>th</sup> February 2021, ground calibrations of the radiometric system were undertaken at a prescribed hover range near Meander.

Helicopter production commenced on 26<sup>th</sup> February and consisted of the Western Block 2 and Eastern Block 3, followed by extensions to both these blocks (Block 4 and Block 5). Bases for these extensions were at Longford and Bicheno respectively. Block 5 flying was curtailed prior to completion of the area, due to increasing standby days due to weather at the end of the program.

Data acquisition was completed on 2<sup>nd</sup> April 2021.

## 1.2 Survey Area and Flight Specifications

The Tasmanian Tiers survey area is located in Central Tasmania, as indicated in the following diagram, showing the flightpath and Block locations: -



Tasmanian Tiers (Google Earth)

Boundary Coordinates - MGA55

Central – Block 1	
Easting (m)	Northing (m)
527100	5400300
530100	5390600
530600	5390600
533100	5386700
532200	5386700
532200	5385300
538500	5380500
541100	5374200
546200	5370800
542800	5368600
541600	5366200
543000	5362700
546200	5362000
546200	5358900
547900	5354700
545500	5354100
546700	5350500
548000	5344100
524700	5344100
522300	5352900
519500	5363400
494200	5377000
494200	5394500
477900	5394500
477900	5400300

Western – Block 2	
Easting (m)	Northing (m)
444900	5391100
444900	5393700
445400	5393700
449600	5390700
477900	5390700
477900	5395100
494250	5395100
494250	5377000
519600	5363500
524800	5343700
501000	5343700
501400	5354200
503400	5357100
503400	5359900
501000	5359900
497900	5364000
497400	5365600
497400	5366300
485200	5366300
486500	5374200
484100	5376000
485900	5379500
477900	5379500
468400	5376500
461700	5378200
459000	5378700
446500	5378700
446500	5374500
442800	5374500
442800	5391100

Eastern – Block 3	
Easting (m)	Northing (m)
559300	5400000
559300	5393300
547000	5393300
547000	5392600
563500	5362100
553200	5344100
547900	5344100
546600	5350500
545400	5354100
547800	5354800
546100	5358900
546100	5362000
542900	5362600
541500	5366200
542700	5368600
546000	5370800
541000	5374200
538400	5380400
532100	5385300
532100	5386800
533000	5386800
530500	5390500
530000	5390500
527000	5400300
535200	5400300
535200	5399100
547300	5399100
550200	5405100
555800	5405100



Western Extension – Block 4	
Easting (m)	Northing (m)
418998	5390576
442540	5390500
442505	5374498
439998	5374503
437406	5373800
437411	5369400
418998	5369400

Eastern Extension – Block 5	
Easting (m)	Northing (m)
562101	5361410
562956	5362961
575227	5362705
581972	5373465
582084	5376727
575724	5376733
575902	5381016
585896	5389761
594105	5389939
603742	5381908
607225	5381816
607067	5379786
607627	5378604
608555	5378333
608582	5376869
607244	5376862
605366	5371441
605313	5367774
606376	5365347
607208	5365347
607261	5364319
609033	5363663
608576	5361410

Area Name	Traverse Line spacing (m)	Traverse Line Direction	Tie Line Spacing (m)	Tie Line Direction	Sensor Height (m)	Line Kilometres
Central – Block 1	200	090-270	2,000	000-180	80	11,367
Western – Block 2	200	090-270	2,000	000-180	80	8,171
Eastern – Block 3	200	090-270	2,000	000-180	80	6,033
Western Extension – Block 4	200	090-270	2,000	000-180	80	2,864
Eastern Extension – Block 5	200	090-270	2,000	000-180	80	4,516
<b>Total</b>						<b>32,951</b>

## 2. SURVEY EQUIPMENT

### 2.1 Aircraft

The aircraft used for the survey were a single-engine, fixed-wing Cessna 210 and AS350B2 helicopter, specially modified for geophysical survey. The fixed wing aircraft conducted the central section of the survey area (Block 1), with the helicopter used for the more rugged terrain areas to the west and east (Blocks 2-5).

Aircraft Registration - VH-HHJ / VH-SRB



Survey Aircraft

## 2.2 Data Acquisition System

High speed digital data acquisition system.

- Sample rates up to 20 Hz
- Integrated Novatel OEM GPS receiver providing positional information that is used to tag incoming data streams in addition to providing pilot navigation guidance
- High precision Caesium vapour magnetometer
- Visual real time on-screen system monitoring / error messages to limit re-flights due to equipment failure

## 2.3 Magnetometer

The aircraft were equipped with a sensor mounted on the tail (fixed-wing) and boom (helicopter).

- Model / Type - G-823a Cesium vapour magnetometer
- Resolution - 0.001 nT resolution
- Sensitivity - 0.01 nT sensitivity
- Sample Rate - 20 Hz
- Compensation - 3-axis fluxgate magnetometer
- Magnetometer Counter - Kroum KMAG4

## 2.4 Gamma-ray Spectrometer

An RSI RS-500 gamma-ray spectrometer was used, incorporating 2x RSX-4 detector packs.

- Total Crystal Volume - 32 L (downward looking)
- Recorded Channels - 256
- Sample Rate - 1 Hz
- Stabilisation - Multi-peak automatic gain

## 2.5 Altimeters / Ancillaries

A Bendix/King KRA 405 radar altimeter was used.

- Resolution - 0.3 m
- Sample Rate - 20 Hz
- Range - 0-760 m

A Renishaw ILM-500-R laser altimeter was used.

- Resolution - 0.1 m
- Sample Rate - up to 20 Hz
- Range - 0-500 m

Barometric pressure sensor: -

- Accuracy - RSS  $\pm 0.25\%$  FS (at constant temp)
- Range - 600-1100 hPa

## 2.6 Magnetic Base Stations

GEM GSM19 Overhauser and Scintrex Envimag proton precession base station magnetometer.

- Resolution - 0.01 / 0.1 nT
- Accuracy - 0.1 / 0.5 nT
- Sample Rate - 1.0 / 0.5 Hz

## 2.7 Navigation and Flight Path Recovery

Integrated Novatel OEM719 DGPS receiver:

- Bands - L1/L2 + GLONASS Multi Frequency
- Channels - 555
- Sample Rate - 2 Hz

Navigation information is supplied to the pilot via an LCD steering indicator. All data were synchronised to the GPS time.

### **3. CALIBRATIONS AND CHECKS**

Full system calibrations and checks were conducted on the fixed wing aircraft and helicopter, in accordance with Geoscience Australia specifications. Refer to the following separate documents for details: -

- 1) *P5003\_Calibration Report\_MAGSPEC.pdf*
- 2) *P5003\_Calibration Report\_MAGSPEC\_Heli.pdf*

### **4. QUALITY CONTROL**

#### **4.1 During Flight**

During survey, the pilot was notified of any deviation in system health by prompts on the navigation screen. Whenever any errors occurred, the flight was aborted, and the survey did not recommence until system errors were resolved.

The diurnal base stations were monitored by the ground crew.

#### **4.2 Post Flight**

Upon completion of each flight all survey data were transferred from the acquisition system to the infield data processing computer. Using customised techniques, the data were checked for any errors and compliance with specifications.

All profiles were visually checked. The flight path was plotted with colour-coded indicators of any out of specification height or cross-track. The data were gridded and visually inspected for errors and compared for continuity with previous flights.

The summed 256-channel spectra were plotted and inspected. The test line and pre- and post-flight ground calibration data were tabulated and reviewed.

## 5. DATA PROCESSING

### 5.1 Magnetics

The following steps were performed during the magnetics processing:

- Review or application of compensation
- Parallax correction
- Diurnal filtering and subtraction
- IGRF correction using the updated current IGRF model
- Tie line levelling
- Micro levelling

Compensation of the magnetometer data was applied using the recorded XYZ fluxgate data using Geometrics MagComp Airborne compensation software. A suitable compensation flight (comp box) was processed to obtain the optimum compensation solution which was then applied to all survey data.

The base station magnetometer data were reviewed, de-spiked if necessary and filtered with an 11-point non-linear filter. These data were then subtracted from the measured aircraft data using time that was synchronised to both the acquisition system and the base mag unit.

The IGRF correction was applied using the updated IGRF 2020 model adjusted for height of the aircraft. This correction was calculated and applied at each point.

Tieline levelling was applied by way of a least-squares minimisation procedure using a polynomial fit of order 0 over the cross over errors calculated between the traverse and tie line intersections. A fit to ties process was selectively applied and constrained by several parameters such as cross over height differences and maximum and minimum allowable corrections.

Using MAGPSEC Airborne Surveys' proprietary micro levelling techniques, some selective micro levelling was carefully applied; and the resulting channel was then considered final.

At all stages of processing the data were stringently checked against and compared to the previous processing stage to ensure the integrity of the data were protected and no detail was removed or altered. The data were gridded using a bi-cubic spline algorithm and delivered with both geodetic and projected coordinates.

### 5.2 Radiometrics

Radiometric processing consisted of the following steps:

- 256-channel spectral noise reduction in the form of NASVD on a per-flight basis
- Dead time, cosmic and background radiation corrections

- Energy recalibration
- Channel interaction correction (stripping) and extraction of ROIs
- Height corrections using STP altitude to the nominal survey height
- Radon removal using the Spectral Ratio method
- Levelling

### Gamma-ray Spectrometric Data Processing

The raw spectra were first smoothed using the Noise Adjusted Singular Value Decomposition (NASVD) method, on a flight-by flight basis (Hovgaard and Grasty, 1997).

For the NASVD process twenty (20) principal components were generated. These components were visually inspected and the final number of components for reconstructing the spectra were determined. Eight (8) components were used to reconstruct the spectra, following consultation with the Client.

For all spectrometers, spectral drift was checked, by monitoring the potassium and thorium channel positions from average spectra along flight lines. The procedure for determining peak positions was the same as used during calibration. If the thorium peak is found to move more than 1 channel or the potassium peak by more than 0.5 channel, energy calibration is performed to determine the count rates in the standard windows.

Both the aircraft 256-channel background spectra and the scaled 256-channel cosmic spectra were subtracted from the 256-channel data.

Deadtime corrections were applied to each spectrum channel or window.

Radon background removal was performed using the Minty Spectral Ratio method (1992).

In areas of significant topographic variation, the altimeter data were first lightly filtered to smooth sudden jumps that can arise when flying over steep terrain (which cause problems when height-correcting the data). These data were then converted to effective height ( $h_e$ ) at standard temperature and pressure (STP).

The background-corrected count rates in the 3 windows were stripped to give the counts in the potassium, uranium and thorium windows that originate solely from the potassium, uranium and thorium decay series. The window stripping ratios  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $a$  and  $g$  were estimated from measurements over calibration pads, where:

$\alpha$  - is the thorium into uranium stripping ratio, (equal to the ratio of counts detected in the uranium window to those detected in the thorium window from a pure thorium source);

$\beta$  - is the thorium into potassium stripping ratio for a pure thorium source;

$\gamma$  - is the uranium into potassium stripping ratio for a pure uranium source;



$\alpha$  - is the reversed stripping ratio, uranium into thorium, (equal to the ratio of counts detected in the thorium window to those detected in the uranium window from a pure source of uranium);

$g$  - is the reverse stripping ratio, potassium into uranium for a pure potassium source.

The 3 principal stripping ratios ( $\alpha$ ,  $\beta$  and  $\gamma$ ) increase with altitude above the ground as shown in the Table 1.1.

Table 1.1. Stripping ratio increase with Aircraft altitude at STP.

Stripping Ratio	Increase per metre
$\alpha$	0.00049
$\beta$	0.00065
$\gamma$	0.00069

Each of the 3 main stripping ratios were adjusted for altitude before stripping was carried out. If 5 stripping ratios are used, then the stripped count rates in the potassium, uranium and thorium channels ( $N_K$ ,  $N_U$ ,  $N_{Th}$ ) are given by:

$$N_K = \frac{[n_{Th}(\alpha\gamma - \beta) + n_U(a\beta - \gamma) + n_K(1 - a\alpha)]}{A}, \quad (A5)$$

$$N_U = \frac{[n_{Th}(g\beta - \alpha) + n_U - n_Kg]}{A}, \quad (A6)$$

$$N_{Th} = \frac{[n_{Th}(1 - g\gamma) - n_Ua + n_Kag]}{A}, \quad (A7)$$

Where: -

$$A = 1 - g\gamma - a(\alpha - g\beta). \quad (A8)$$

The background-corrected and stripped count rates were corrected for variations in the altitude of the detector using the equation:

$$N_{corr} = N_{obs} e^{-\mu(h_0 - h)}, \quad (A9)$$

where: -

- $N_{corr}$  = the count rate normalized to the nominal Survey altitude,  $h_0$ ;
- $N_{obs}$  = the background corrected, stripped count rate at STP height  $h$ ;
- $\mu$  = the attenuation coefficient for that window.

Where the STP height above ground level exceeds 300 m, a value of  $h = 300$  is used in equation A9.

The resulting potassium, uranium, thorium and total count (cps) were converted to concentrations using the coefficients derived from the Carnamah (WA) radiometric test range and Meander (Tas) hover range.

Where required, tieline levelling was applied to the Total Count and Uranium channels to remove any effects caused by residual radon background. A least-squares/median filter procedure over the calculated cross over errors at each intersection of the flight and tie lines generated a correction value. A new tie-line levelled channel was then output by application of this correction value to the original channel.

Where required, using MAGSPEC Airborne Surveys' proprietary micro levelling techniques, some selective micro levelling was carefully applied; and the resulting channel was then considered final. At all stages of processing the data were stringently checked against and compared to the previous processing stage to ensure the integrity of the data was protected and no detail was removed or altered. The data were gridded using a minimum curvature algorithm and delivered with both geodetic and projected coordinates.

### 5.3 Digital Elevation Model

DEM processing consisted of the following steps:

- Inspection of height channels
- Parallax correction of radar and laser altimeters
- Subtraction of radar and laser altimeters from GPS height
- Tie line and micro levelling

The GPS, radar and laser heights were visually inspected for errors and any spikes were carefully corrected. The GPS ellipsoid height was converted to the geoid height using values from the Australian Vertical Working Surface (AVWS). The altimeter data were subtracted from the GPS height to create the Digital Elevation channels (laser and radar).

Tieline levelling was applied by way of a least-squares minimisation procedure using a polynomial fit of order 0 over the cross over errors calculated between the traverse and tie line intersections. Using MAGSPEC Airborne Surveys' proprietary micro levelling techniques, some selective micro levelling was carefully applied; and the resulting channel was then considered final. At all stages of processing the data were stringently checked against and compared to the previous processing stage to ensure the integrity of the data was protected and no detail was removed or altered. The data were gridded using a minimum curvature algorithm and delivered with both geodetic and projected coordinates.

## APPENDIX 1 FIELD OPERATIONS AND PROJECT MANAGEMENT

### Operational Bases

The aircraft and crew were based in various locations in Tasmania, commencing in Launceston for the fixed wing section (Block 1), before moving to Campbell Town, Longford and Bicheno for the helicopter sections (Block 2-5).

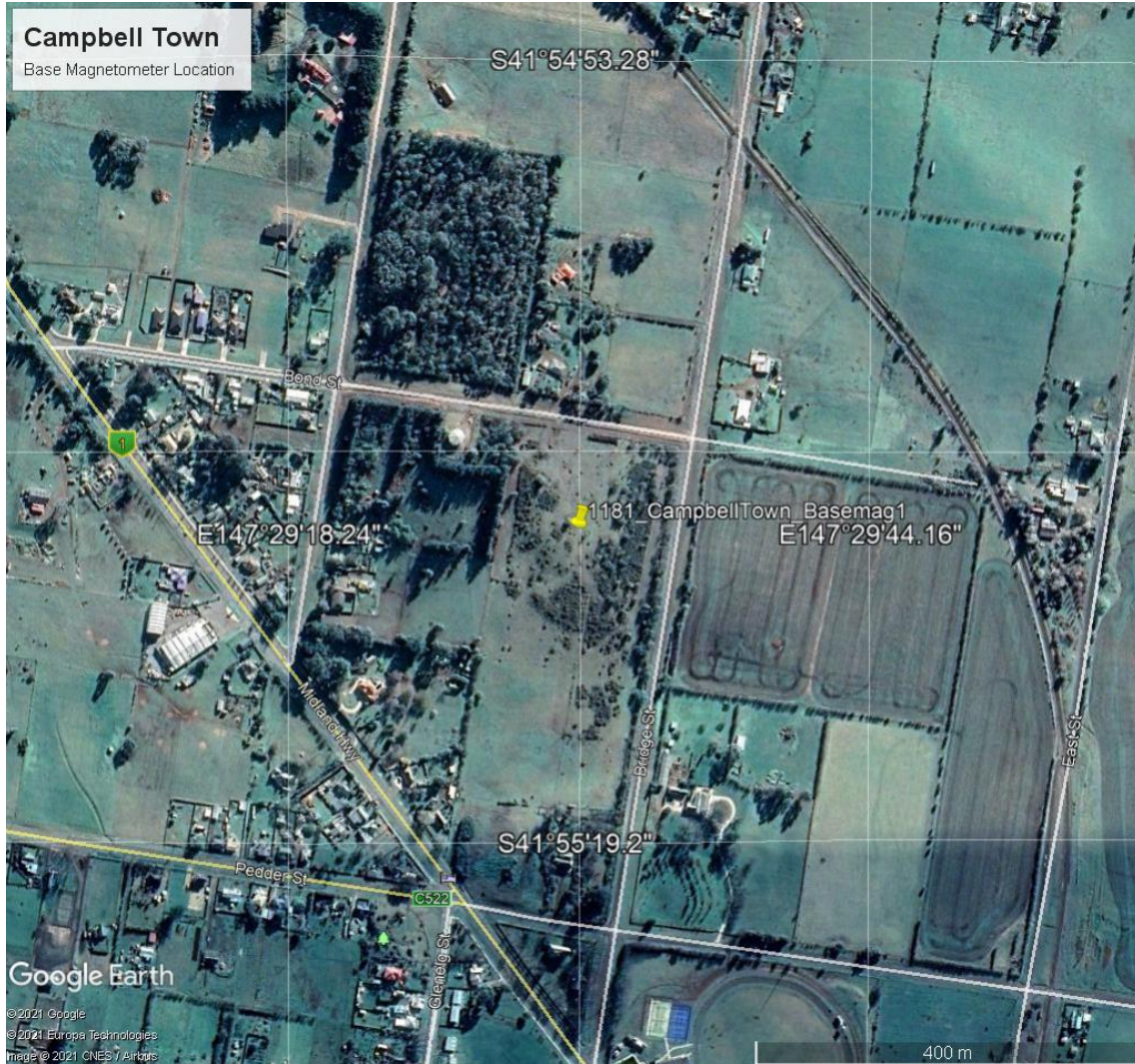
### Base Station Magnetometers

The base station magnetometers were positioned near various airstrips and locations as shown below: -



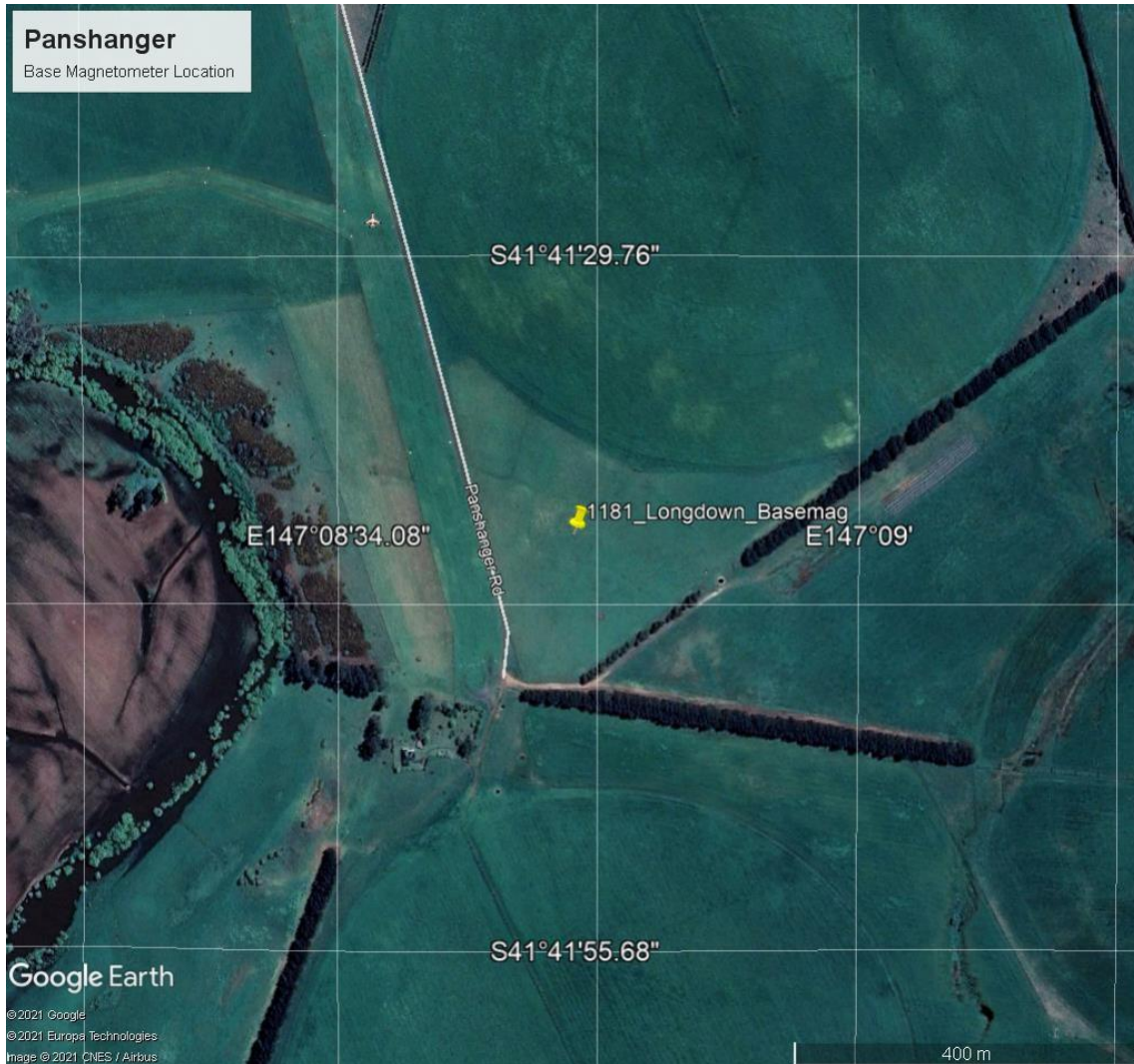
Launceston Base Magnetometer Location (8–19 Feb2021)

Base station 1 (GSM-19) location co-ordinates (GDA2020): -41.5396187 S, 147.2028955 E



Campbell Town Base Magnetometer Location (23 Feb – 8 March 2021)

Base station 1 (GSM-19) location co-ordinates (GDA2020): -41.919167 S, 147.491931 E



Panshanger (Longford) Base Magnetometer Location (9-17 March 2021)

Base station 1 (GSM-19) location co-ordinates (GDA2020): -41.6944870 S, 147.1460670 E



Mole Creek Base Magnetometer Location (19-23 March 2021)

Base station 1 (GSM-19) location co-ordinates (GDA2020): -41.5574464 S, 146.4007451 E



Friendly Beaches Base Magnetometer Location (26 March – 2 April 2021)

Base station 1 (GSM-19) location co-ordinates (GDA2020): -42.0012010 S, 148.2624099 E

## APPENDIX 2 DAILY CALIBRATIONS

### Thorium Source Ground Calibration Checks

During the survey, pre- and post- flight thorium source calibration checks were undertaken with the aircraft stationary at the same location at each base of operation, to confirm the health of the radiometric system.

The tabulated results of the daily thorium checks are shown below: -

#### Fixed Wing

Date	Test	Flight #	Thorium Peak Ch #	Th Peak Resolution	Raw Th Count (cps)	Background Count (cps)	Background corrected (BC) Th (cps)	BC running average Th (cps)	% change in BC Th average
10/02/2019	pre	1	217.48	4.69	336.66	52.22	284.44	284.44	-0.20
	post	2	217.59	4.64	339.57	53.10	286.47	285.45	0.51
11/02/2019	pre	3	217.32	4.80	338.80	52.35	286.45	285.79	0.51
	post	3	217.50	4.71	336.16	52.37	283.79	285.29	-0.43
13/02/2019	pre	5	217.47	4.80	333.08	51.32	281.75	284.58	-1.15
	post	7	217.61	4.74	338.29	52.76	285.54	284.74	0.19
14/02/2019	pre	8	217.26	4.76	339.60	51.90	287.70	285.16	0.94
	post	9	217.61	4.65	340.66	52.17	288.49	285.58	1.21
16/02/2019	pre	10	217.44	4.75	340.98	52.17	288.81	285.94	1.32
	post	11	217.75	4.61	337.34	51.56	285.78	285.92	0.27
17/02/2019	pre	12	217.46	4.78	337.30	50.55	286.75	286.00	0.61
	post	13	217.62	4.63	335.44	52.15	283.28	285.77	-0.61
18/02/2019	pre	14	217.32	4.65	336.81	51.53	285.28	285.73	0.10
	post	15	217.64	4.68	337.76	52.45	285.31	285.70	0.11
19/02/2019	pre	16	217.54	4.76	336.04	51.98	284.05	285.59	-0.33
	post	16	217.43	4.77	333.88	52.46	281.42	285.33	-1.27

#### Helicopter

Date	Test	Flight #	Thorium Peak Ch #	Th Peak Resolution	Raw Th Count (cps)	Background Count (cps)	Background corrected (BC) Th (cps)	BC running average Th (cps)	% change in BC Th average
23/02/2019	pre	17	217.46	4.78	484.24	31.58	452.65	452.65	-0.41
	post	18	217.49	4.63	483.74	31.99	451.75	452.20	-0.61
24/02/2019	pre	19	217.34	4.81	482.60	30.46	452.14	452.18	-0.52
	post	20	217.41	4.58	485.28	31.16	454.13	452.67	-0.08
26/02/2019	pre	21	217.48	4.77	486.29	30.15	456.14	453.36	0.36
	post	22	217.46	4.64	488.90	30.82	458.08	454.15	0.78
27/02/2019	pre	23	217.39	4.81	489.04	30.40	458.63	454.79	0.90
	post	24	217.49	4.64	482.48	30.26	452.22	454.47	-0.51
28/02/2019	pre	25	217.39	4.75	485.84	30.88	454.96	454.52	0.10

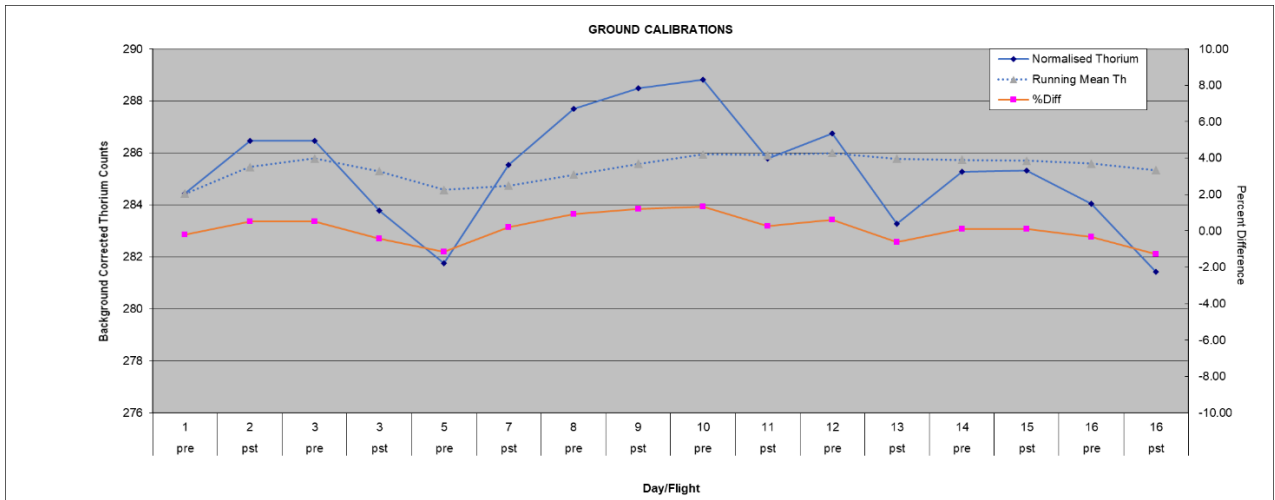


	post	26	217.50	4.60	487.48	31.94	455.53	454.62	0.23
3/03/2019	pre	27	217.31	4.68	483.77	30.27	453.51	454.52	-0.22
	post	28	217.50	4.67	483.12	31.06	452.06	454.32	-0.54
4/03/2019	pre	29	217.29	4.68	483.38	30.67	452.72	454.19	-0.39
	post	30	217.48	4.66	477.98	31.08	446.90	453.67	-1.70
6/03/2019	pre	31	217.40	4.72	479.56	30.78	448.78	453.35	-1.27
	post	32	217.47	4.64	484.97	30.81	454.16	453.40	-0.08
7/03/2019	pre	33	217.40	4.74	479.34	31.07	448.27	453.10	-1.39
	post	34	217.50	4.61	483.93	30.61	453.32	453.11	-0.26
9/03/2019	pre	35	217.29	4.74	482.96	30.32	452.64	453.08	-0.41
	post	36	217.42	4.65	541.79	89.80	451.99	453.03	-0.56
10/03/2019	pre	37	217.42	4.80	538.68	88.72	449.95	452.88	-1.01
	post	39	217.40	4.61	542.72	90.42	452.30	452.86	-0.49
11/03/2019	pre	40	217.31	4.73	544.29	90.26	454.03	452.91	-0.10
	post	42	217.58	4.64	536.96	90.88	446.07	452.62	-1.89
12/03/2019	pre	43	217.39	4.77	537.12	90.26	446.86	452.39	-1.71
	post	44	217.52	4.66	541.16	90.83	450.34	452.31	-0.92
14/03/2019	pre	45	217.24	4.72	538.95	86.52	452.43	452.32	-0.46
	post	46	217.52	4.63	542.20	87.05	455.15	452.42	0.14
15/03/2019	pre	47	217.24	4.72	540.40	86.75	453.65	452.46	-0.19
	post	49	217.52	4.68	539.78	89.46	450.32	452.39	-0.93
16/03/2019	pre	50	217.40	4.84	537.96	87.65	450.31	452.32	-0.93
	post	51	217.49	4.61	543.97	89.35	454.62	452.39	0.03
17/03/2019	pre	52	217.44	4.74	541.92	91.07	450.85	452.35	-0.81
	post	52	217.42	4.63	542.52	88.63	453.89	452.39	-0.13
19/03/2019	pre	53	217.40	4.64	558.54	109.69	448.84	452.29	-1.26
	post	53	217.51	4.68	563.05	109.32	453.72	452.33	-0.17
20/03/2019	pre	54	217.41	4.80	559.49	110.61	448.88	452.24	-1.25
	post	56	217.47	4.63	557.57	106.53	451.04	452.21	-0.77
21/03/2019	pre	57	217.43	4.76	557.73	106.13	451.61	452.19	-0.64
	post	59	217.57	4.58	556.40	103.72	452.68	452.20	-0.40
22/03/2019	pre	60	217.33	4.82	555.52	103.28	452.24	452.20	-0.50
	post	60	217.48	4.71	560.10	105.34	454.76	452.27	0.06
23/03/2019	pre	61	217.36	4.81	557.17	104.74	452.43	452.27	-0.46
	post	62	217.48	4.69	561.62	107.10	454.53	452.32	0.01
26/03/2019	pre	63	217.47	4.78	487.81	35.37	452.44	452.32	-0.46
	post	64	217.47	4.65	491.46	35.31	456.15	452.41	0.36
27/03/2019	pre	65	217.47	4.73	491.71	34.50	457.20	452.51	0.59
	post	65	217.53	4.64	490.20	35.70	454.51	452.55	0.00
28/03/2019	pre	66	217.42	4.69	487.25	34.66	452.59	452.55	-0.42
	post	67	217.51	4.71	487.53	35.61	451.92	452.54	-0.57
29/03/2019	pre	68	217.36	4.76	480.09	35.01	445.08	452.39	-2.12
	post	68	217.52	4.67	485.67	35.40	450.27	452.35	-0.94
30/03/2019	pre	69	217.52	4.74	490.43	36.22	454.21	452.39	-0.06
	post	71	217.51	4.62	486.90	35.77	451.14	452.36	-0.75
31/03/2019	pre	72	217.51	4.82	487.67	35.12	452.55	452.37	-0.43

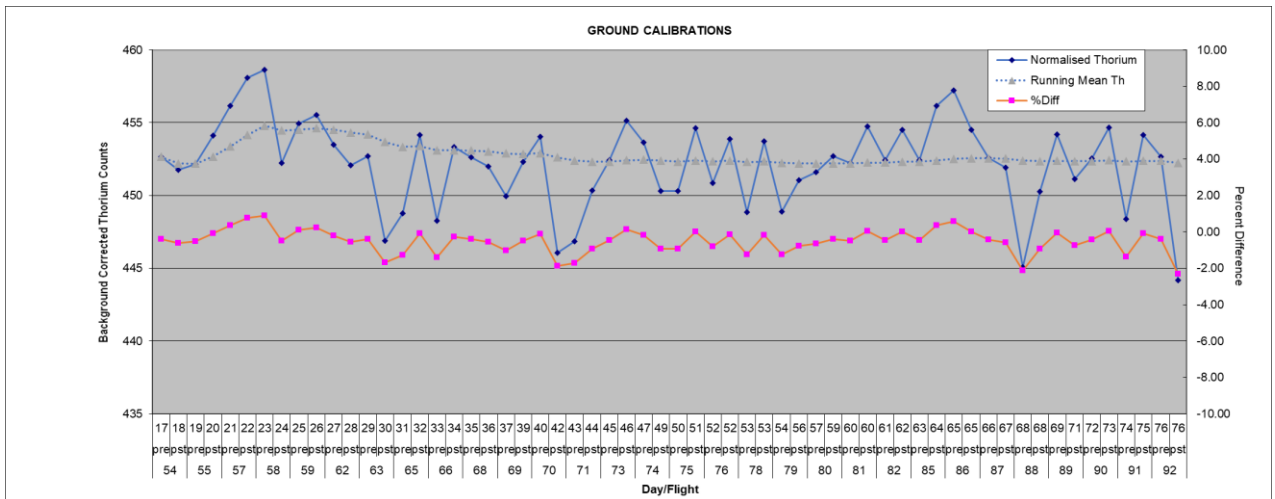
	post	73	217.54	4.69	488.86	34.20	454.66	452.41	0.03
1/04/2019	pre	74	217.26	4.79	483.81	35.44	448.37	452.34	-1.37
	post	75	217.38	4.66	489.66	35.51	454.15	452.37	-0.08
2/04/2019	pre	76	217.39	4.70	487.06	34.41	452.65	452.37	-0.41
	post	76	217.54	4.75	479.88	35.70	444.18	452.24	-2.32

Summary plots of the thorium ground calibration checks are shown below: -

Fixed Wing



Helicopter



### GPS Accuracy - Static Positions

The GPS position (XYZ) of the aircraft was recorded during the daily ground calibrations at the base of operations and are tabled below: -

#### **Fixed Wing Aircraft - VH-HHJ (Launceston)**

<b>Date</b>	<b>Average Easting (MGA55)</b>	<b>Average Northing (MGA55)</b>	<b>Average Height (m)</b>
210210	517760.53	5400091.36	171.94
210210	517759.51	5400091.48	171.91
210211	517759.90	5400091.61	171.84
210211	517760.25	5400091.04	171.98
210213	517760.41	5400091.03	172.05
210213	517760.45	5400091.05	172.04
210213	517760.85	5400090.24	171.65
210214	517760.86	5400090.12	172.29
210214	517760.07	5400091.36	171.54
210216	517760.01	5400091.12	171.57
210216	517759.99	5400091.49	171.71
210217	517761.78	5400090.97	172.66
210217	517761.38	5400090.27	172.41
210218	517760.73	5400090.21	171.95
210218	517760.36	5400089.93	171.75
210219	517761.71	5400090.77	172.39
210219	517761.03	5400090.54	171.93

#### **Helicopter - VH-SRB (Campbell Town)**

<b>Date</b>	<b>Average Easting (MGA55)</b>	<b>Average Northing (MGA55)</b>	<b>Average Height (m)</b>
210223	540134.98	5359111.28	209.87
210223	540134.33	5359111.38	211.13
210224	540133.50	5359111.25	211.40
210224	540132.99	5359111.06	211.64
210226	540133.10	5359109.19	211.12
210226	540132.37	5359109.11	211.78
210227	540132.19	5359109.69	209.62
210227	540132.20	5359109.74	209.55

210228	540132.92	5359111.17	209.10
210228	540132.86	5359111.10	209.10
210303	540133.31	5359110.20	210.68
210303	540133.73	5359110.84	210.82
210304	540132.88	5359109.87	210.06
210304	540132.99	5359110.38	211.73
210306	540132.43	5359110.58	211.20
210306	540133.23	5359110.44	211.42
210307	540131.81	5359109.57	208.35
210307	540131.77	5359109.57	208.41

**Helicopter - VH-SRB (Panshanger)**

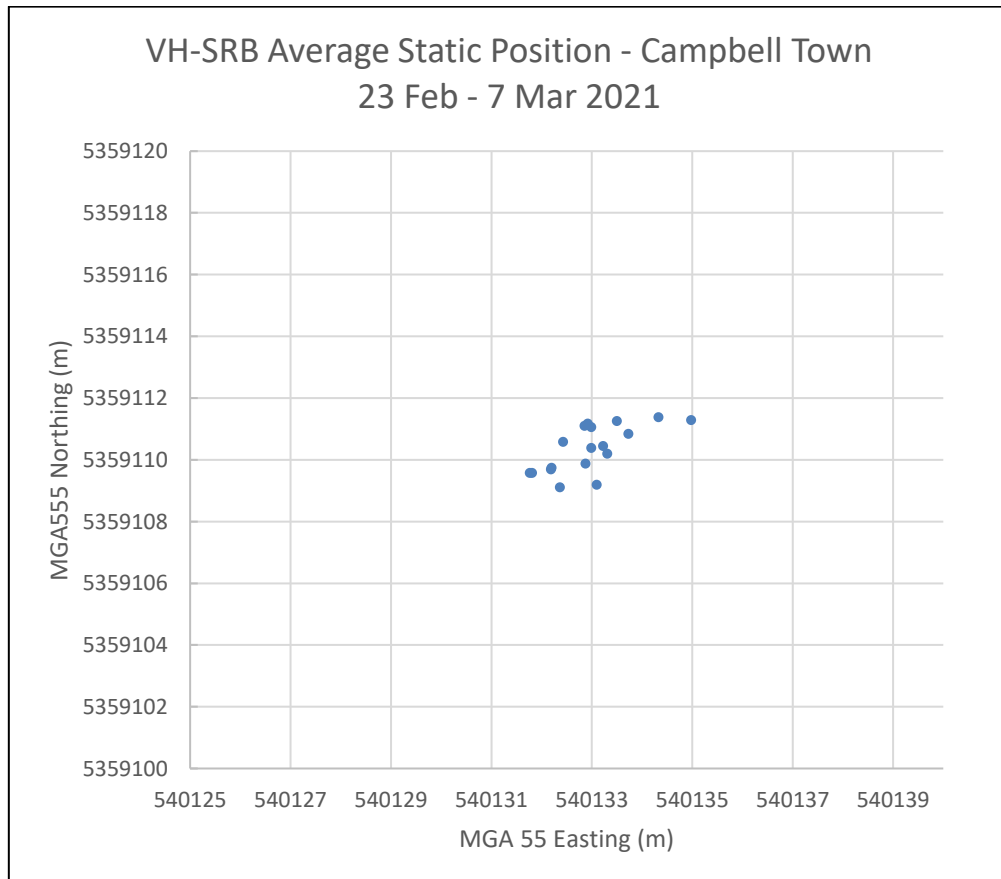
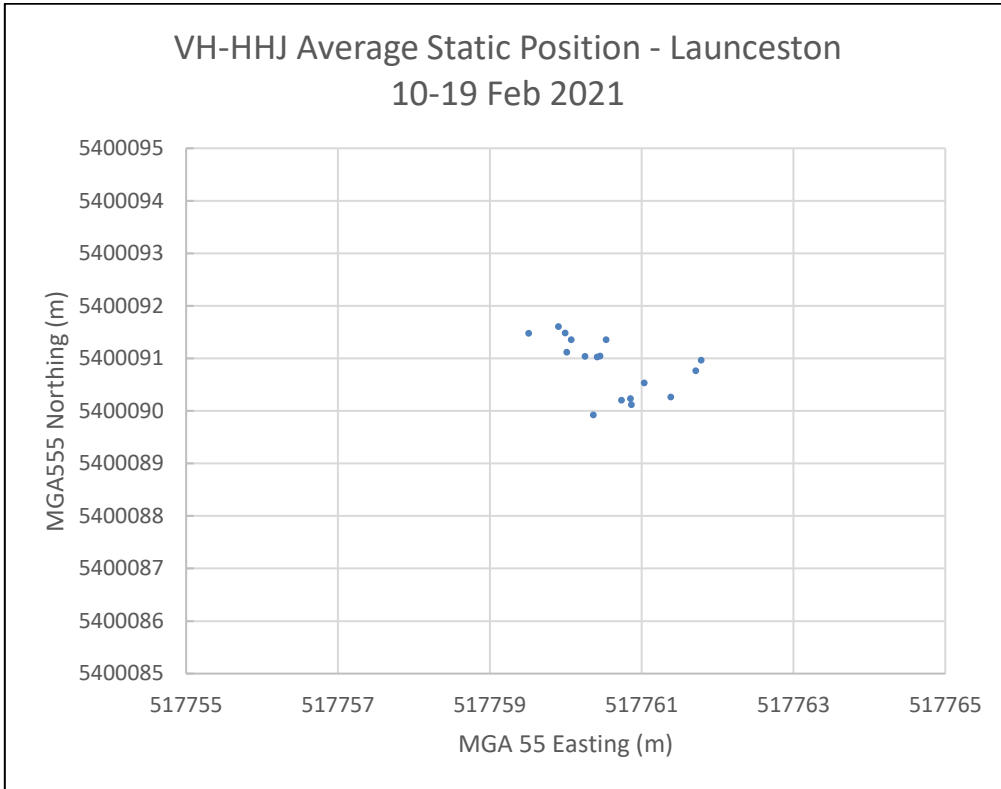
<b>Date</b>	<b>Average Easting (MGA55)</b>	<b>Average Northing (MGA55)</b>	<b>Average Height (m)</b>
210309	512044.58	5383972.37	162.22
210309	512044.57	5383972.31	162.29
210310	512044.43	5383971.89	158.95
210310	512044.40	5383971.94	158.96
210311	512043.91	5383971.99	162.77
210311	512043.44	5383971.87	161.99
210312	512046.08	5383973.57	161.85
210312	512045.69	5383973.21	162.06
210314	512043.08	5383971.10	159.54
210314	512043.14	5383971.07	159.37
210315	512045.52	5383970.89	161.59
210315	512045.72	5383971.53	162.37
210316	512044.42	5383973.96	158.86
210316	512044.41	5383973.95	158.72
210317	512044.34	5383973.96	162.55
210317	512044.16	5383973.86	162.45

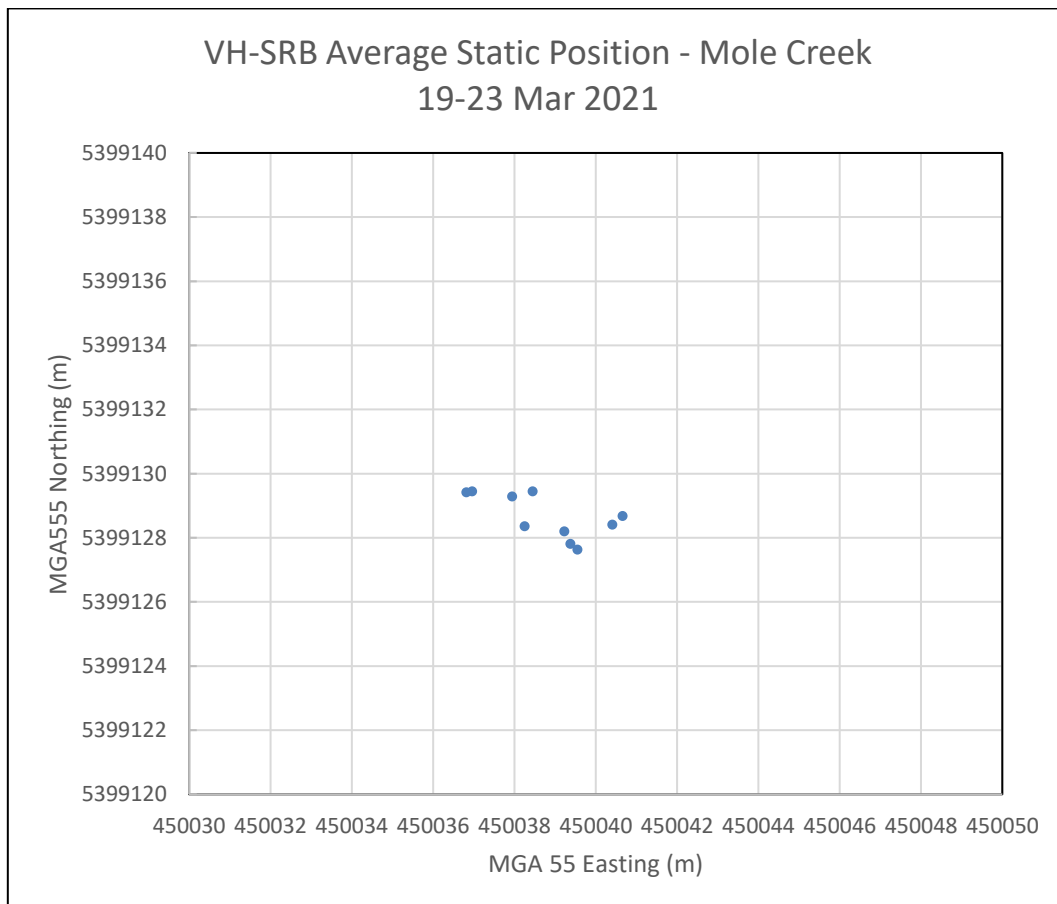
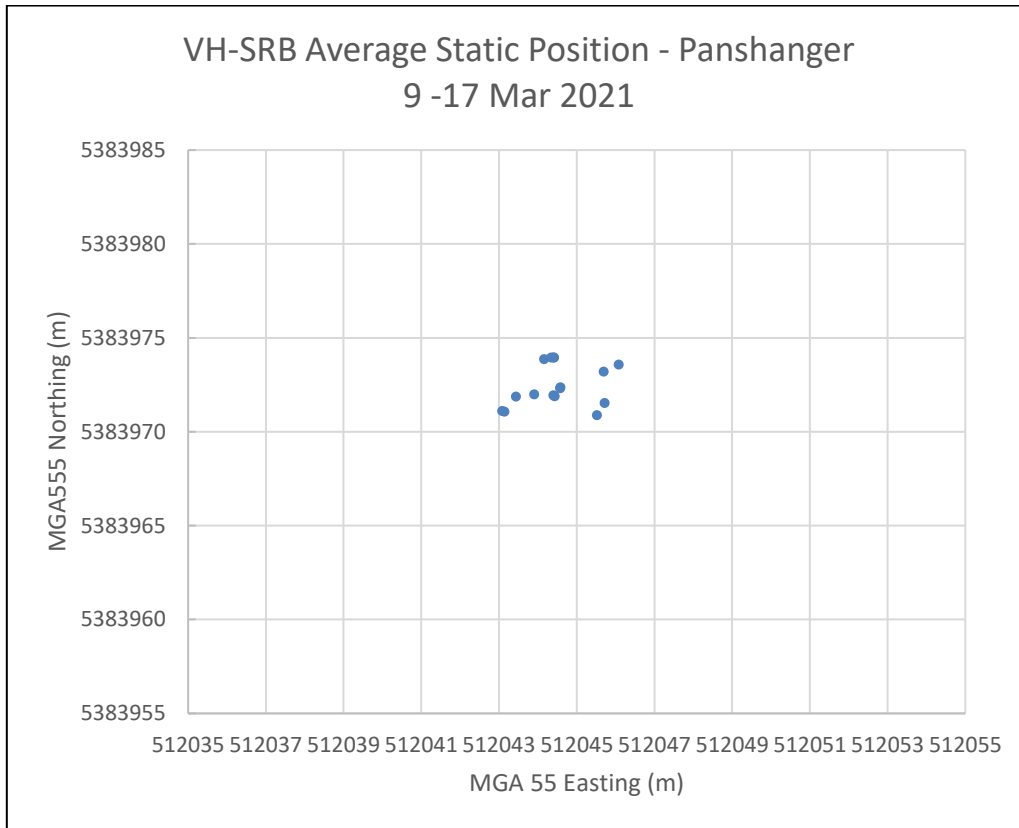
**Helicopter - VH-SRB (Mole Creek)**

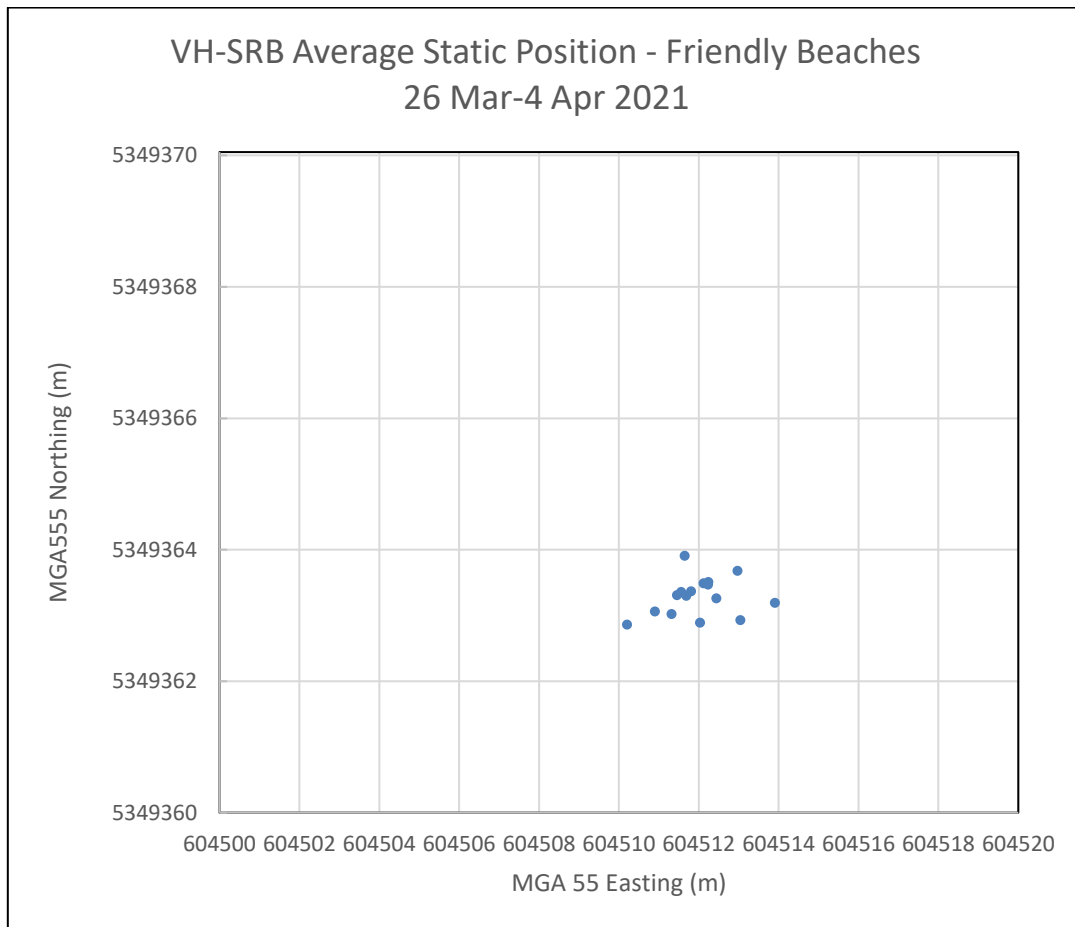
<b>Date</b>	<b>Average Easting (MGA55)</b>	<b>Average Northing (MGA55)</b>	<b>Average Height (m)</b>
210319	450039.55	5399127.63	245.19
210319	450039.38	5399127.81	244.85
210320	450040.66	5399128.68	244.97
210320	450040.41	5399128.41	245.16
210321	450039.23	5399128.20	244.35
210321	450038.25	5399128.36	245.06
210322	450036.96	5399129.45	243.61
210322	450036.82	5399129.42	244.96
210323	450037.95	5399129.29	245.32
210323	450038.45	5399129.45	244.25

**Helicopter - VH-SRB (Friendly Beaches)**

<b>Date</b>	<b>Average Easting (MGA55)</b>	<b>Average Northing (MGA55)</b>	<b>Average Height (m)</b>
210326	604513.91	5349363.19	13.49
210326	604513.04	5349362.93	13.03
210327	604512.23	5349363.47	13.60
210327	604512.24	5349363.51	13.70
210328	604512.97	5349363.68	14.66
210328	604511.65	5349363.91	13.33
210329	604510.21	5349362.86	12.16
210329	604510.90	5349363.06	13.11
210330	604511.56	5349363.36	12.01
210330	604511.32	5349363.02	13.64
210331	604511.69	5349363.30	10.90
210331	604511.46	5349363.31	11.11
210401	604512.03	5349362.89	11.91
210401	604512.12	5349363.49	13.17
210402	604511.81	5349363.37	13.43
210402	604512.44	5349363.26	12.85





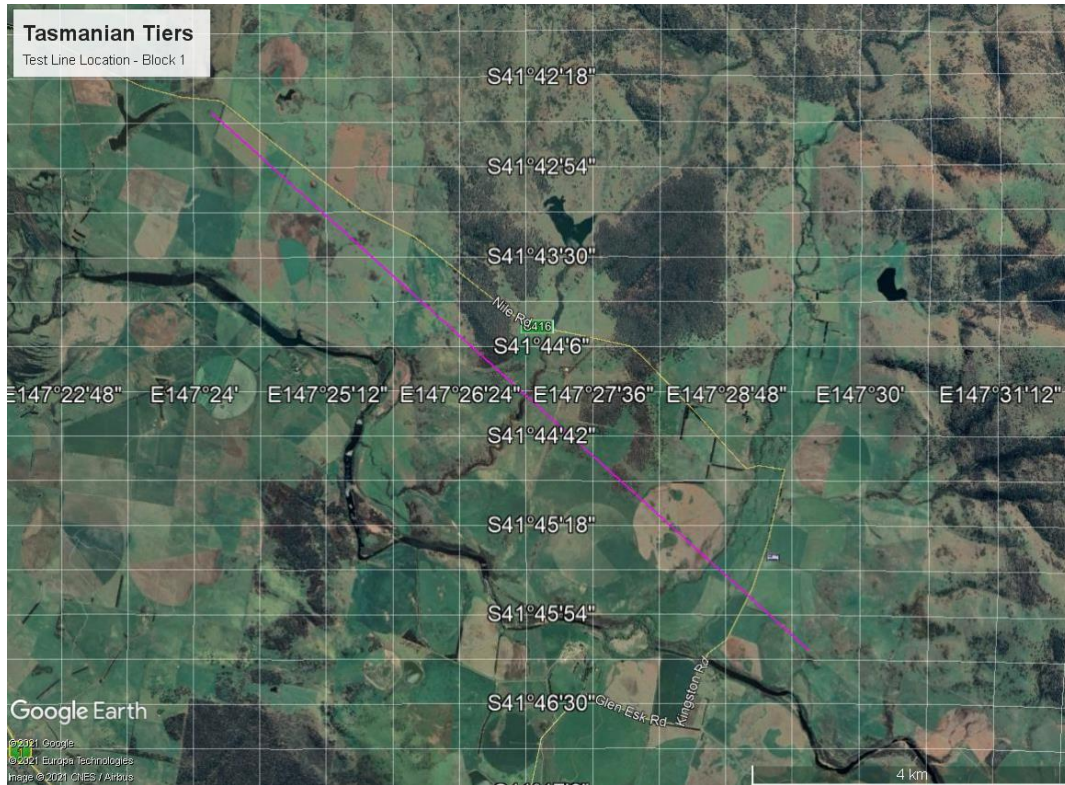




**Low Level Test Lines**

Radiometric low-level test lines were established near each base of operation. The daily data were collected to monitor the effects of soil moisture and average thorium counts tabulated and plotted.

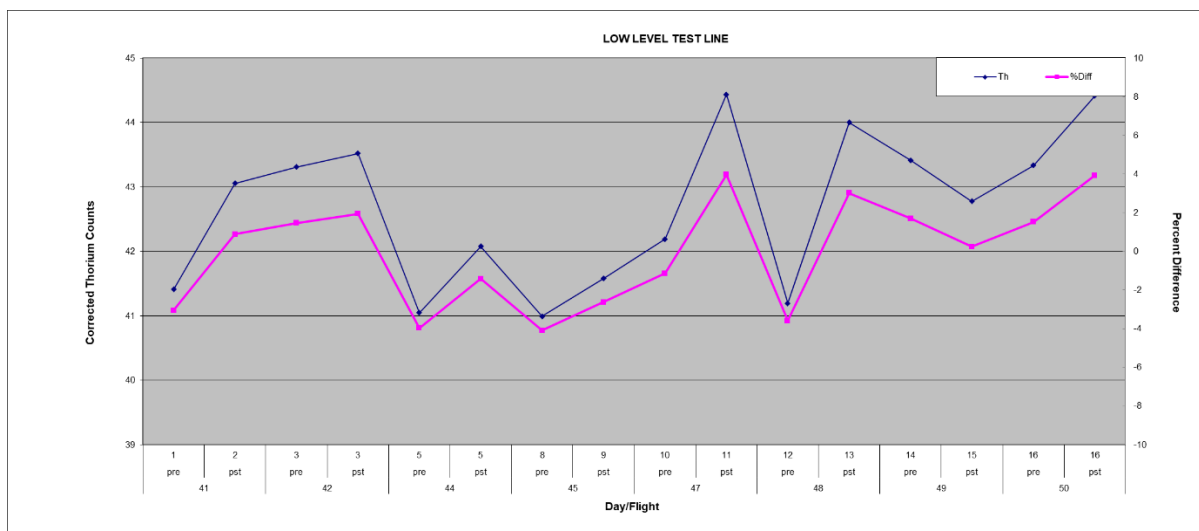
**Fixed Wing - Central Block 1**



Radiometric Testline Central Block 1

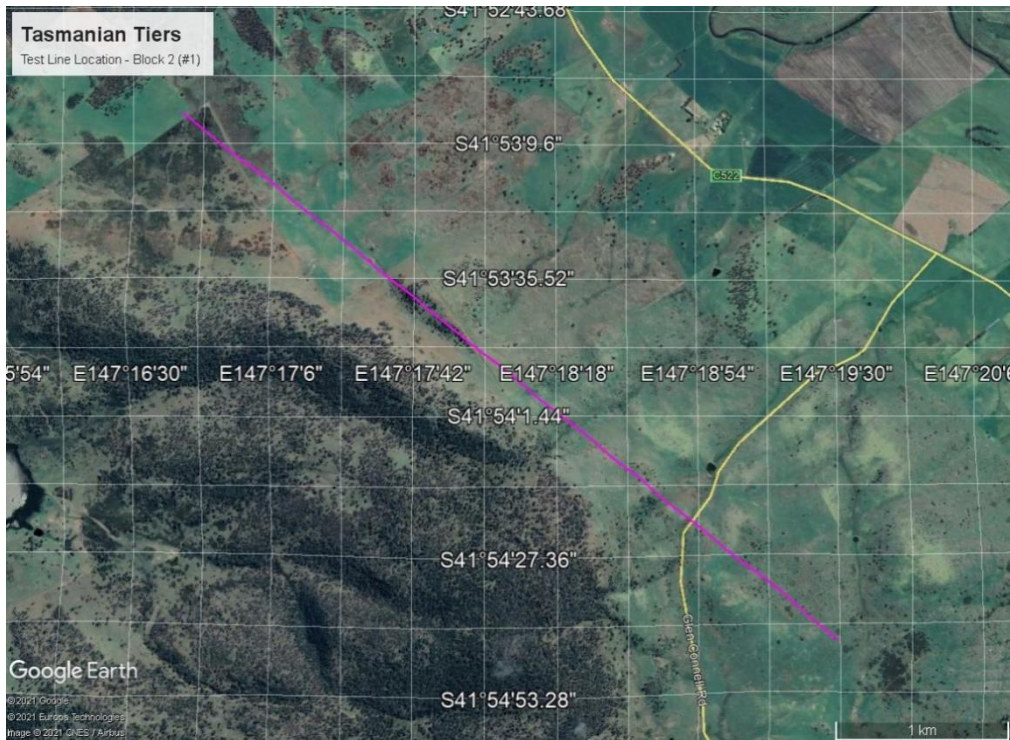
Start and end coordinates (MGA55): 533491E, 5382493N to 540982E, 5375715N

Date	Flight #	Average Corrected Th (cps)	Deviation from Mean (%)
10/02/21	1	41.41	-3.04
10/02/21	2	43.06	0.90
11/02/21	3	43.31	1.47
11/02/21	3	43.52	1.95
13/02/21	5	41.05	-3.96
13/02/21	7	42.08	-1.42
14/02/21	8	41.09	-4.10
14/02/21	9	41.74	-2.63
16/02/21	10	42.19	-1.14
16/02/21	11	44.43	3.97
17/02/21	12	41.20	-3.58
17/02/21	13	44.00	3.02
18/02/21	14	43.41	1.71
18/02/21	15	42.78	0.25
19/02/21	16	43.33	1.53
19/02/21	16	44.42	3.93



Low level test line – Central Block 1

Helicopter - Western Block 2



Radiometric Testline Western Block 2 (#1)



Radiometric Testline Western Block 2 (#2)



Radiometric Testline Western Block 2 (#3)

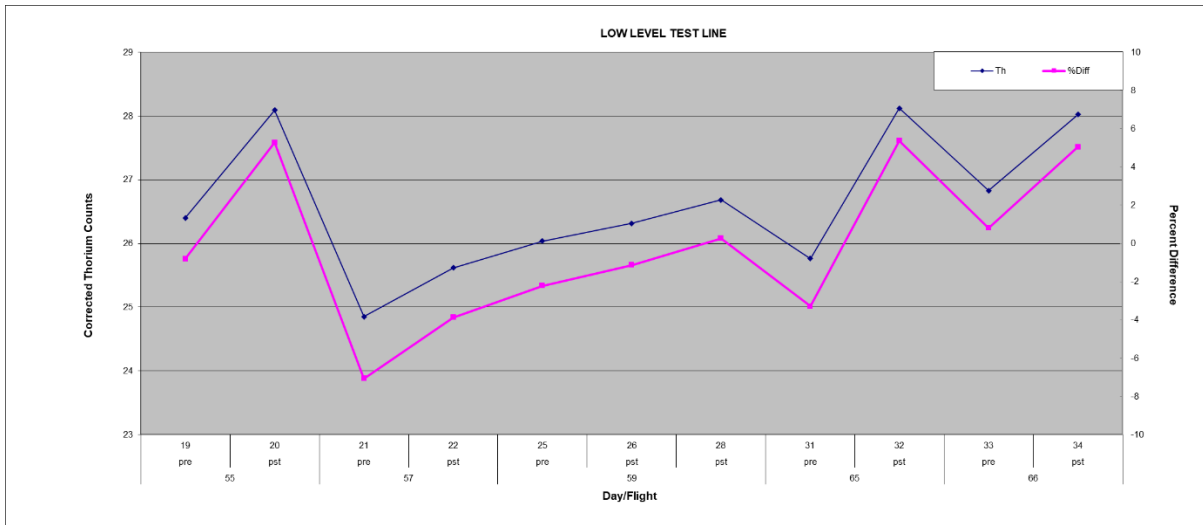
Start and end coordinates (MGA55): -

Test Line #1: 526893E 5359968N to 523124E 5363011N

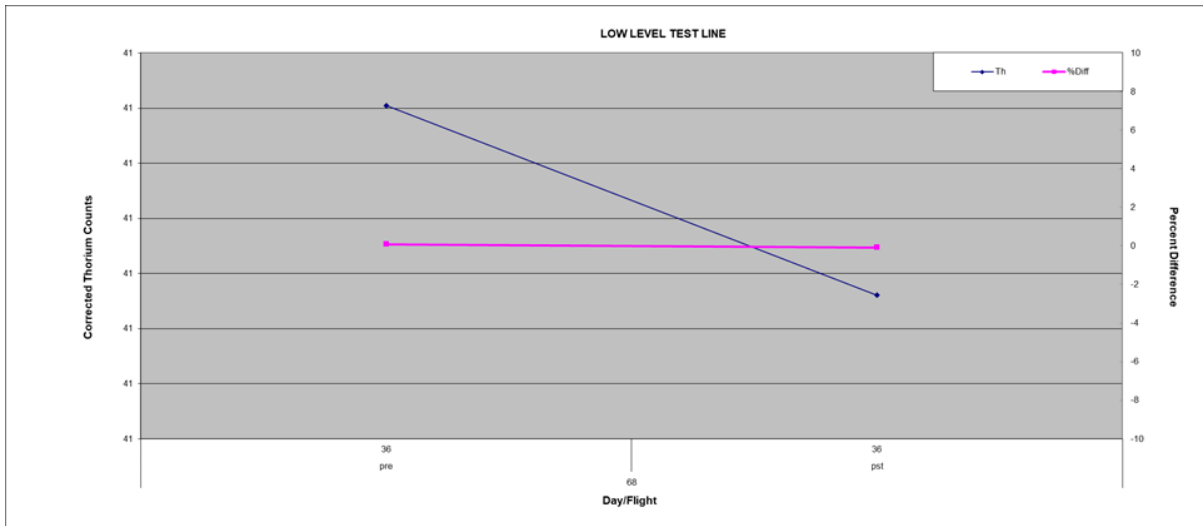
Test Line #2: 512608E 5383825N to 511779E 5388389N

Test Line #3: 510758E 5386394N to 513434E 5383702N

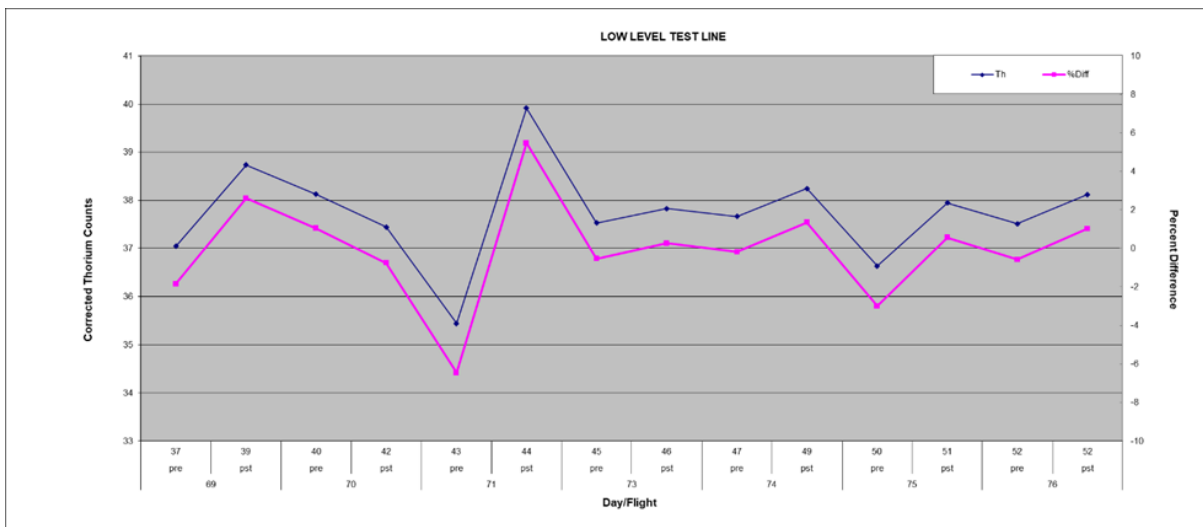
Date	Flight #	Average Corrected Th (cps)	Deviation from Mean (%)
Test Line #1			
24/02/21	19	26.40	-0.81
24/02/21	20	28.09	5.26
26/02/21	21	24.85	-7.08
26/02/21	22	25.62	-3.88
28/02/21	25	26.03	-2.21
28/02/21	26	26.31	-1.14
03/03/21	28	26.68	0.26
06/03/21	31	25.76	-3.29
06/03/21	32	28.12	5.37
07/03/21	33	26.83	0.81
07/03/21	34	28.02	5.04
Test Line #2			
09/03/21	36	41.34	0.08
09/03/21	36	41.27	-0.08
Test Line #3			
10/03/21	37	37.05	-1.83
10/03/21	39	38.74	2.60
11/03/21	40	38.13	1.05
11/03/21	42	37.45	-0.75
12/03/21	43	35.44	-6.45
12/03/21	44	39.92	5.48
14/03/21	45	37.53	-0.53
14/03/21	46	37.83	0.26
15/03/21	47	37.66	-0.17
15/03/21	49	38.25	1.35
16/03/21	50	36.63	-2.99
16/03/21	51	37.94	0.57
17/03/21	52	37.51	-0.57
17/03/21	52	38.12	1.04



Low level test line #1 – Western Block 2

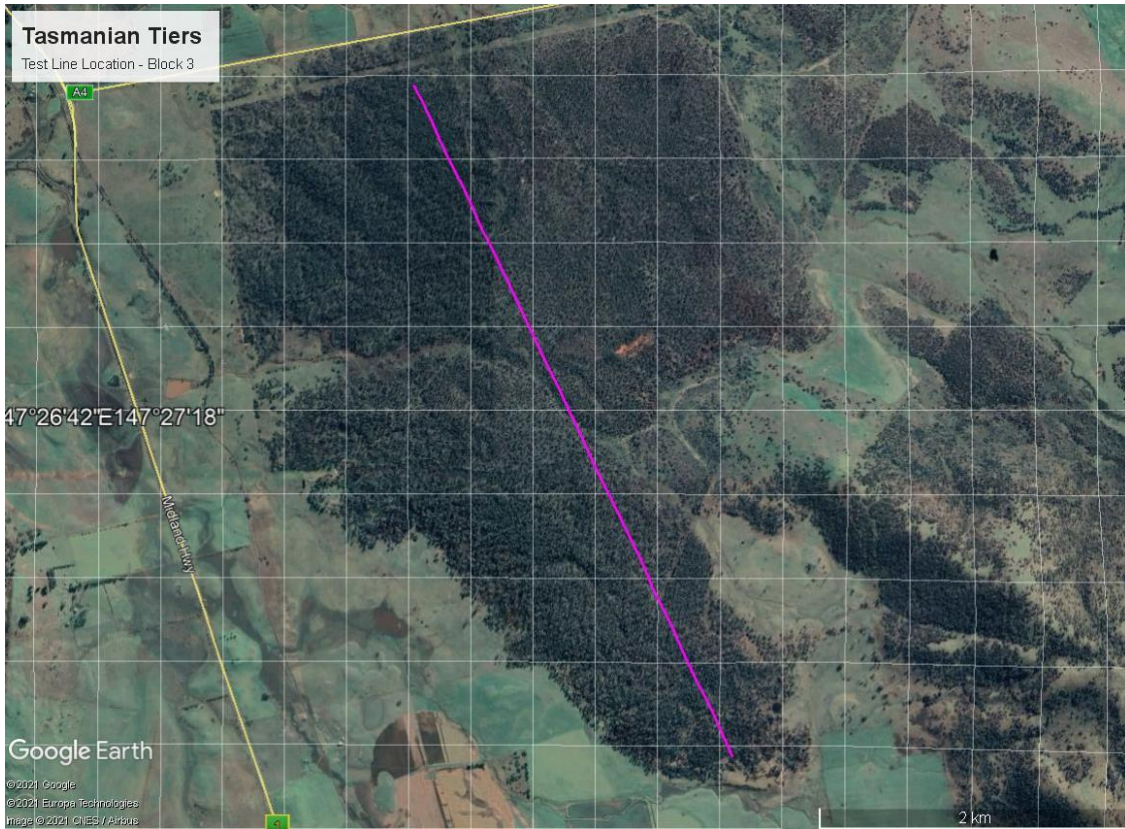


Low level test line #2 – Western Block 2



Low level test line #3 – Western Block 2

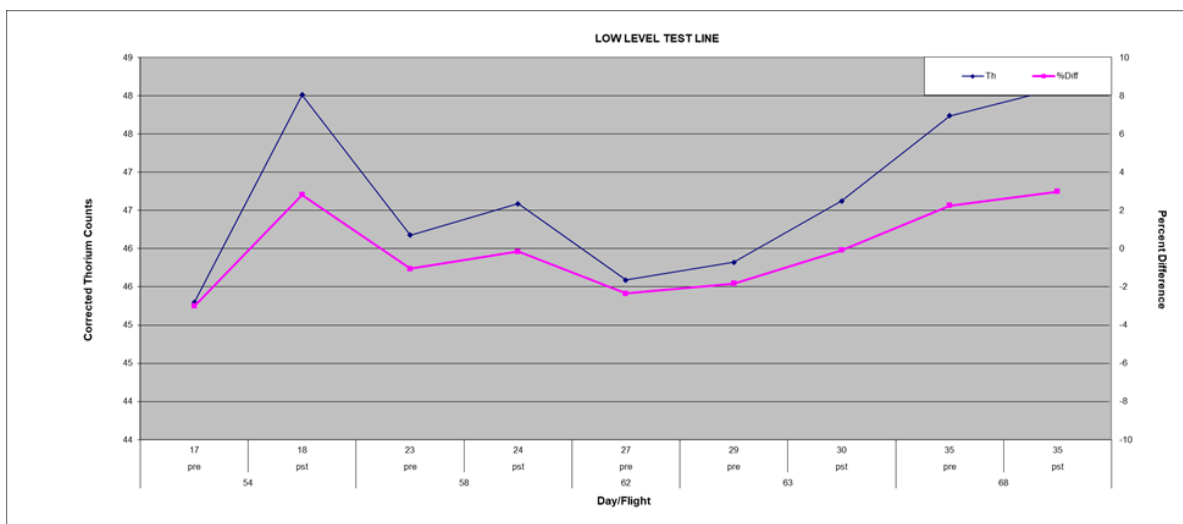
Helicopter - Eastern Block 3



Radiometric Testline Eastern Block 3

Start and end coordinates (MGA55): 541555E 5363950N to 539483E 5368356N

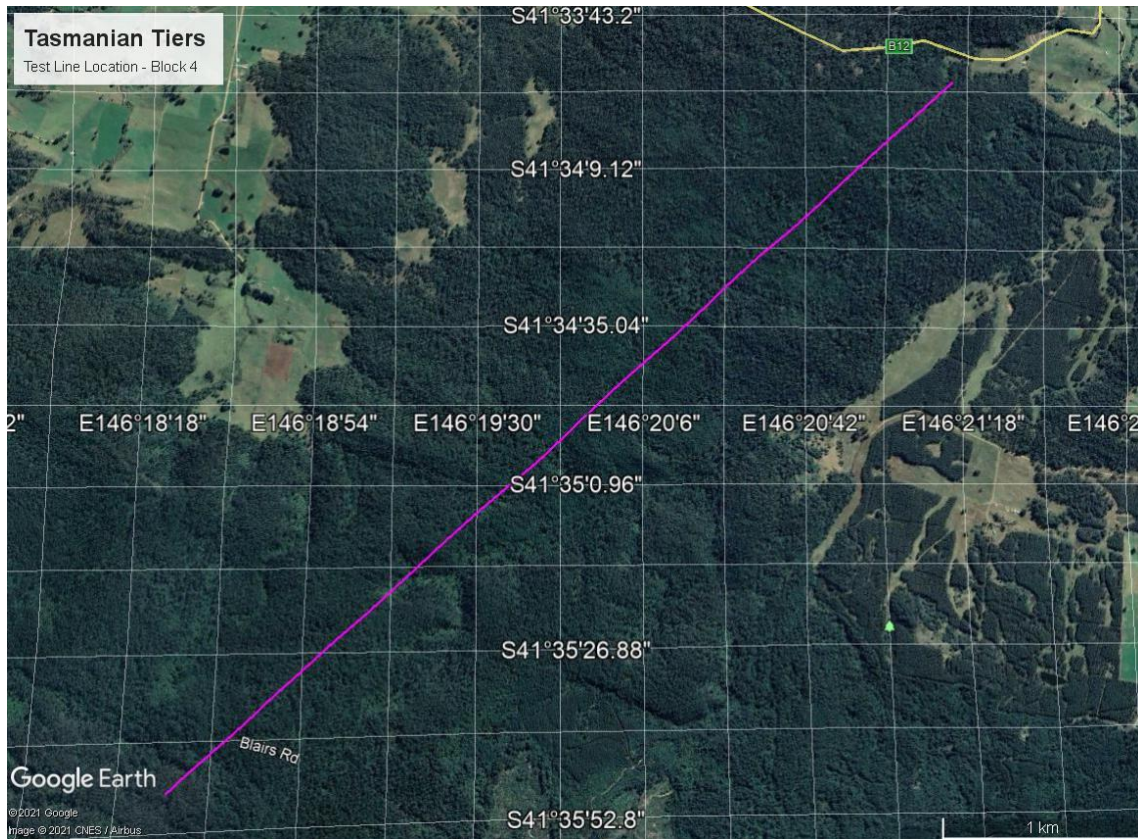
Date	Flight #	Average Corrected Th (cps)	Deviation from Mean (%)
23/02/21	17	45.30	-3.01
23/02/21	18	48.01	2.82
27/02/21	23	46.18	-1.05
27/02/21	24	46.59	-0.16
03/03/21	27	45.59	-2.35
04/03/21	29	45.82	-1.83
04/03/21	30	46.62	-0.08
09/03/21	35	47.74	2.26
09/03/21	35	48.10	2.99



Low level test line – Eastern Block 3



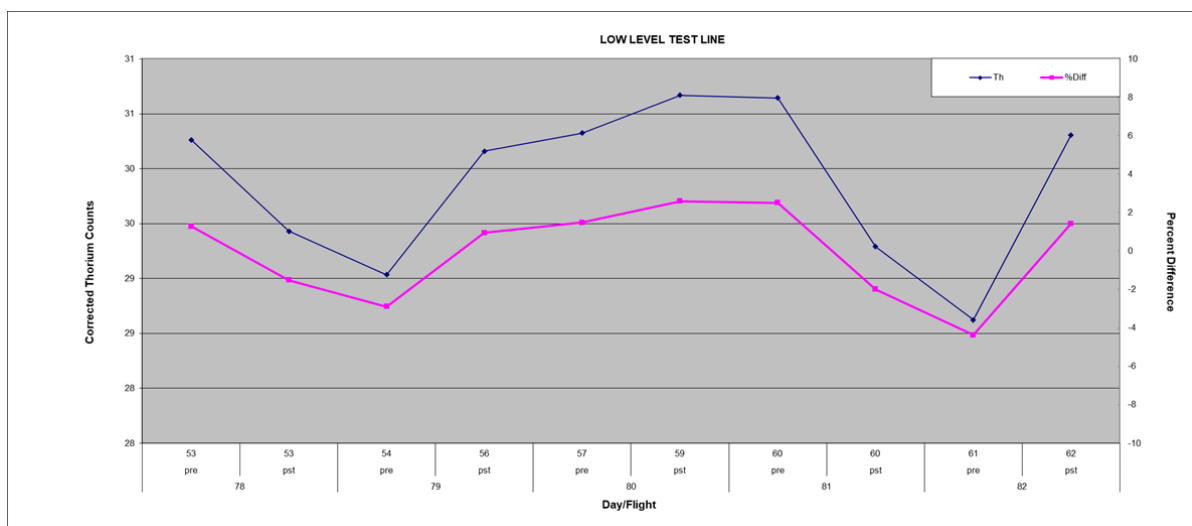
Helicopter - Western Extension Block 4



Radiometric Testline Western Extension Block 4

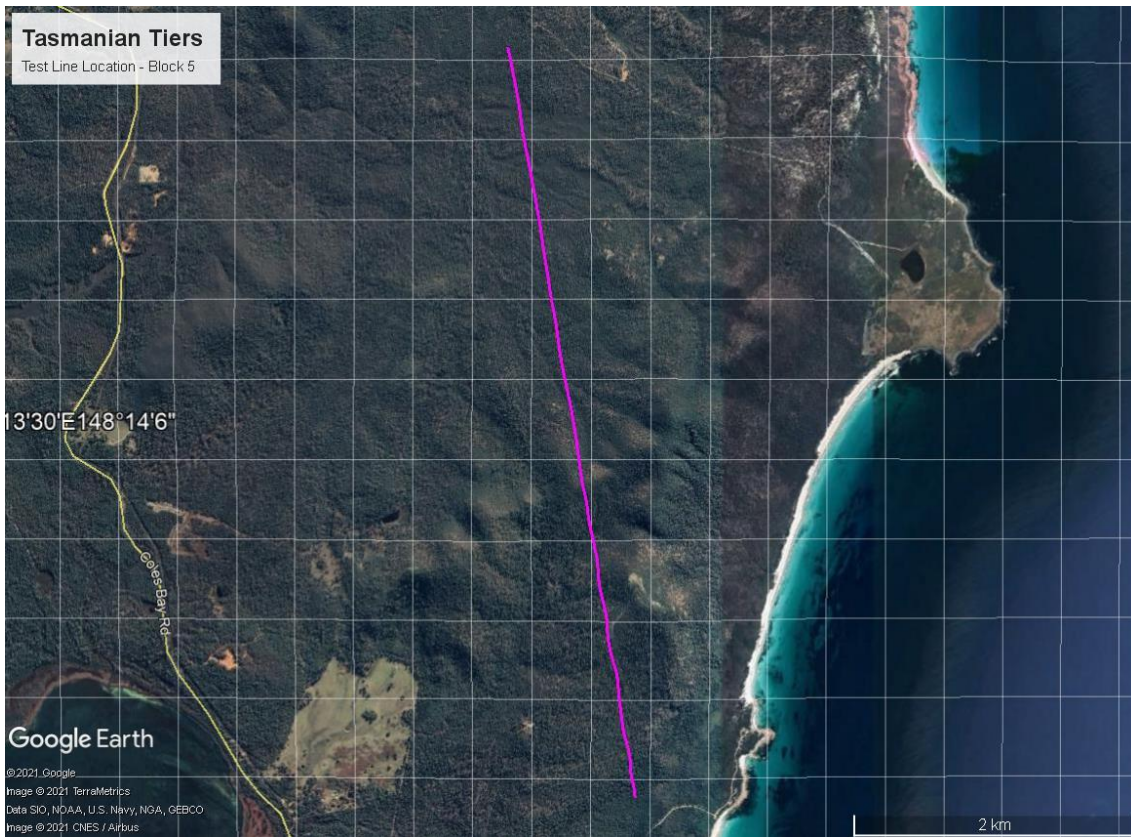
Start and end coordinates (MGA55): 446116E 5398276N to 442329E 5394818N

Date	Flight #	Average Corrected Th (cps)	Deviation from Mean (%)
19/03/21	53	30.26	1.28
19/03/21	53	29.43	-1.51
20/03/21	54	29.03	-2.89
20/03/21	56	30.16	0.94
21/03/21	57	30.32	1.49
21/03/21	59	30.67	2.59
22/03/21	60	30.64	2.51
22/03/21	60	29.29	-1.99
23/03/21	61	28.62	-4.37
23/03/21	62	30.31	1.43



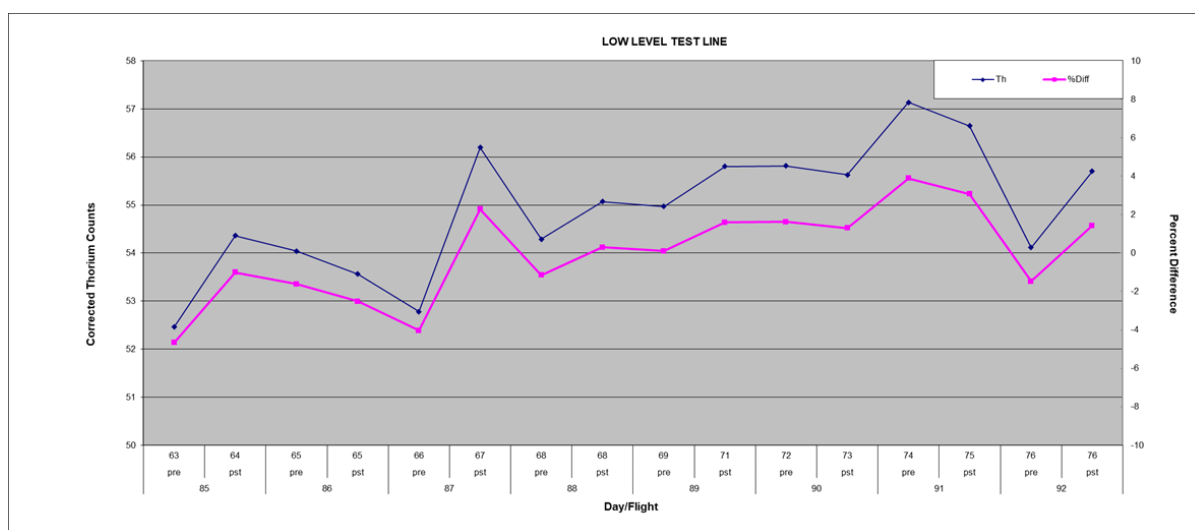
Low level test line – Western Extension Block 4

Helicopter - Eastern Extension Block 5



Radiometric Testline Eastern Extension Block 5

Date	Flight #	Average Corrected Th (cps)	Deviation from Mean (%)
26/03/21	63	52.46	-4.67
26/03/21	64	54.36	-1.01
27/03/21	65	54.04	-1.61
27/03/21	65	53.56	-2.52
28/03/21	66	52.78	-4.04
28/03/21	67	56.19	2.29
29/03/21	68	54.29	-1.15
29/03/21	68	55.07	0.29
30/03/21	69	54.97	0.10
30/03/21	71	55.80	1.60
31/03/21	72	55.81	1.61
31/03/21	73	55.63	1.29
01/04/21	74	57.13	3.89
01/04/21	75	56.65	3.07
02/04/21	76	54.11	-1.47
02/04/21	76	55.70	1.42



Low level test line – Eastern Extension Block 5

## APPENDIX 3 PROCESSING PARAMETERS AND DELIVERABLES

### Magnetics

#### Average Diurnal

Central Block 1:	61,480 nT
Western Block 2:	61,340 nT
Eastern Block 3:	61,340 nT
Western Extension Block 4:	61,440 nT
Eastern Extension Block 5:	61,407 nT

#### IGRF Correction Parameters

	Central Block 1	Western Block 2	Eastern Block 3	Western Extension Block 4	Eastern Extension Block 5
Year:	2021.13	2021.18	2021.18	2021.22	2021.24
Latitude:	-41.767354°	-41.792492°	-41.746711°	-41.719767°	-41.782595°
Longitude:	147.235962°	146.833943°	147.574762°	146.158201°	148.098485°
Total Field:	61517.90 nT	61568.76 nT	61450.89 nT	61626.29 nT	61394.75 nT
Declination:	14.5994°	14.4137°	14.7604°	14.0351°	15.0412°
Inclination:	-71.7066°	-71.7849°	-71.6415°	-71.8227°	-71.5943°

### Radiometrics

#### Radiometric Correction Parameters

##### *Height Attenuation Coefficients (theoretical values used)*

	VH-HHJ	VH-SRB
Total Count:	-0.0074	-0.0074
Potassium:	-0.0094	-0.0094
Uranium:	-0.0084	-0.0084
Thorium:	-0.0074	-0.0074

##### *Aircraft Background Coefficients*

	VH-HHJ	VH-SRB
Total Count:	23.35	105.5
Potassium:	5.3757	10.019
Uranium:	0.1439	3.0882

Thorium:	0.000	0.00
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***Cosmic Correction Coefficients***

	<b>VH-HHJ</b>	<b>VH-SRB</b>
Total Count:	1.1482	1.1218
Potassium:	0.0659	0.0630
Uranium:	0.0540	0.0516
Thorium:	0.0640	0.0673

**Radiometric Stripping Coefficients**

	<b>VH-HHJ</b>	<b>VH-SRB</b>
Alpha:	0.2875	0.2875
Beta:	0.4483	0.4483
Gamma:	0.7943	0.7943
a:	0.0523	0.0523

**Radiometric Concentration Coefficients**

	<b>VH-HHJ (Carnamah, WA)</b>	<b>VH-SRB (Meander, TAS)</b>
Total Count:	25.5	25.4
Potassium:	77.9	77.9
Uranium:	9.9	9.6
Thorium:	4.7	4.4

## Located and Gridded Data

Located data were supplied in ASEG-GDF format (.DAT, .DES, .DFN). Gridded data were supplied in ERMapper format (.ERS).

## Raw ASCII Located Data File Formats and Channels

### Magnetics

flight:I5:NULL=-999  
LINE:I9:NULL=-9999999  
fiducial:I9:NULL=-9999999  
date:I10:NULL=-99999999:UNIT=YYYYMMDD  
time\_gps:F10.2:NULL=-99999.99:UNIT=seconds past midnight UTC  
time\_local:F10.2:NULL=-99999.99:UNIT=seconds past midnight AED  
longitude:F13.7:NULL=-999.9999999:UNIT=decimal degrees  
latitude:F13.7:NULL=-999.9999999:UNIT=decimal degrees  
easting:F11.2:NULL=-999999.99:UNIT=metres  
northing:F12.2:NULL=-9999999.99:UNIT=metres  
gnss\_height:F8.2:NULL=-999.99:UNIT=metres  
gnss\_height\_edited:F8.2:NULL=-999.99:UNIT=metres  
gnss\_status:I4:NULL=-99  
sv\_number:I4:NULL=-99  
hdop:F5.2:NULL=-9.99  
radar\_raw:F8.2:NULL=-999.99:UNIT=metres  
radar\_calibrated:F8.2:NULL=-999.99:UNIT=metres  
radar\_calibrated\_edited:F8.2:NULL=-999.99:UNIT=metres  
laser\_raw:F8.2:NULL=-999.99:UNIT=metres  
laser\_calibrated:F8.2:NULL=-999.99:UNIT=metres  
laser\_calibrated\_edited:F8.2:NULL=-999.99:UNIT=metres  
laser\_quality:F8.2:NULL=-999.99:UNIT=metres  
fluxgate\_x:F11.3:NULL=-99999.999:UNIT=nT  
fluxgate\_y:F11.3:NULL=-99999.999:UNIT=nT  
fluxgate\_z:F11.3:NULL=-99999.999:UNIT=nT  
magnetics\_raw:F11.3:NULL=-99999.999:UNIT=nT  
magnetics\_compensated:F11.3:NULL=-99999.999:UNIT=nT  
magnetics\_compensated\_edited:F11.3:NULL=-99999.999:UNIT=nT  
magnetic\_diurnal:F11.3:NULL=-99999.999:UNIT=nT

### Diurnal

date:I10:NULL=-99999999:UNIT=YYYYMMDD  
time\_gps:F10.2:NULL=-99999.99:UNIT=seconds past midnight UTC  
time\_local:F10.2:NULL=-99999.99:UNIT=seconds past midnight AEDT  
magnetic\_diurnal\_raw:F11.3:NULL=-99999.999:UNIT=nT

## Radiometrics

flight:I5:NULL=-999  
LINE:I9:NULL=-9999999  
fiducial:I9:NULL=-9999999  
date:I10:NULL=-99999999  
time\_gps:F10.2:NULL=-99999.99:UNIT=seconds past midnight UTC  
time\_local:F10.2:NULL=-99999.99:UNIT=seconds past midnight AEDT  
longitude:F13.7:NULL=-999.9999999:UNIT=degrees  
latitude:F13.7:NULL=-999.9999999:UNIT=degrees  
easting:F11.2:NULL=-999999.99:UNIT=metres  
northing:F12.2:NULL=-9999999.99:UNIT=metres  
gnss\_height\_edited:F8.2:NULL=-999.99:UNIT=metres  
radar\_calibrated\_edited:F8.2:NULL=-999.99:UNIT=metres  
laser\_calibrated\_edited:F8.2:NULL=-999.99:UNIT=metres  
pressure:F8.2:NULL=-999.99:UNIT=mbar  
temperature:F7.2:NULL=-99.99:UNIT=degrees C  
k\_raw:F9.2:NULL=-999.99:UNIT=cps  
u\_raw:F9.2:NULL=-999.99:UNIT=cps  
th\_raw:F9.2:NULL=-999.99:UNIT=cps  
total\_count\_raw:F10.2:NULL=-9999.99:UNIT=cps  
cosmic\_raw:F9.2:NULL=-999.99:UNIT=cps  
sample\_integration:I6:NULL=-9999:UNIT=ms  
live\_time:I6:NULL=-9999:UNIT=ms  
resolution:F6.2:NULL=-9.99:UNIT=percent  
spectrum:256F6.0:NULL=-99:UNIT=cps



## Final ASCII Located Data File Formats and Channels

### Magnetics

flight:I5:NULL=-999  
LINE:I9:NULL=-9999999  
fiducial:I9:NULL=-9999999  
date:I10:NULL=-99999999  
longitude:F13.7:NULL=-999.9999999:UNIT=decimal degrees  
latitude:F13.7:NULL=-999.9999999:UNIT=decimal degrees  
easting:F11.2:NULL=-999999.99:UNIT=metres  
northing:F12.2:NULL=-9999999.99:UNIT=metres  
gnss\_height:F8.2:NULL=-999.99:UNIT=metres  
radar\_altimeter:F8.2:NULL=-999.99:UNIT=metres  
laser\_altimeter:F8.2:NULL=-999.99:UNIT=metres  
radar\_dem:F8.2:NULL=-999.99:UNIT=metres  
laser\_dem:F8.2:NULL=-999.99:UNIT=metres  
magnetics\_corrected:F11.3:NULL=-99999.999:UNIT=nT  
magnetics\_corrected\_tielevelled:F11.3:NULL=-99999.999:UNIT=nT  
magnetics\_corrected\_microlevelled:F11.3:NULL=-99999.999:UNIT=nT  
magnetics\_corrected\_microlevelled\_1vd:F11.6:NULL=-99.9999999:UNIT=nT/m  
magnetic\_diurnal:F11.3:NULL=-99999.999:UNIT=nT  
magnetic\_igrf:F11.3:NULL=-99999.999:UNIT=nT

### Radiometrics

flight:I5:NULL=-999  
LINE:I9:NULL=-9999999  
fiducial:I9:NULL=-9999999  
date:I10:NULL=-99999999  
longitude:F13.7:NULL=-999.9999999:UNIT=degrees  
latitude:F13.7:NULL=-999.9999999:UNIT=degrees  
easting:F11.2:NULL=-999999.99:UNIT=metres  
northing:F12.2:NULL=-9999999.99:UNIT=metres  
gnss\_height:F8.2:NULL=-999.99:UNIT=metres  
radar\_altimeter:F8.2:NULL=-999.99:UNIT=metres  
laser\_altimeter:F8.2:NULL=-999.99:UNIT=metres  
radar\_dem:F8.2:NULL=-999.99:UNIT=metres  
laser\_dem:F8.2:NULL=-999.99:UNIT=metres  
pressure:F8.2:NULL=-999.99:UNIT=mbar  
temperature:F7.2:NULL=-99.99:UNIT=degrees C  
dose\_rate:F11.3:NULL=-9999.999:UNIT=nGy/hr  
k\_percent:F9.2:NULL=-999.99:UNIT=percent  
th\_ppm:F9.2:NULL=-999.99:UNIT=ppm  
u\_ppm:F9.2:NULL=-999.99:UNIT=ppm  
dose\_rate\_nasvd:F11.3:NULL=-9999.999:UNIT=nGy/hr  
k\_percent\_nasvd:F9.2:NULL=-999.99:UNIT=percent  
th\_ppm\_nasvd:F9.2:NULL=-999.99:UNIT=ppm  
u\_ppm\_nasvd:F9.2:NULL=-999.99:UNIT=ppm

## Gridded Data File Names and Descriptions

### Central Block 1

P5003_1_TMI:	Total Magnetic Intensity (TMI)
P5003_1_TMI_RTP :	TMI Reduced to Pole (RTP)
P5003_1_TMI_RTP-1VD:	TMI RTP with a First Vertical Derivative applied (1VD)
P5003_1_dose_rate_nasvd:	Dose Rate NASVD smoothed
P5003_1_K_percent_nasvd:	Potassium NASVD smoothed
P5003_1_Th_ppm_nasvd:	Thorium NASVD smoothed
P5003_1_U_ppm_nasvd:	Uranium NASVD smoothed
P5003_1_radar_DEM:	Radar Digital Elevation Model
P5003_1_laser_DEM:	Laser Digital Elevation Model

### Western Block 2

P5003_2_TMI:	Total Magnetic Intensity (TMI)
P5003_2_TMI_RTP :	TMI Reduced to Pole (RTP)
P5003_2_TMI_RTP-1VD:	TMI RTP with a First Vertical Derivative applied (1VD)
P5003_2_dose_rate_nasvd:	Dose Rate NASVD smoothed
P5003_2_K_percent_nasvd:	Potassium NASVD smoothed
P5003_2_Th_ppm_nasvd:	Thorium NASVD smoothed
P5003_2_U_ppm_nasvd:	Uranium NASVD smoothed
P5003_2_radar_DEM:	Radar Digital Elevation Model
P5003_2_laser_DEM:	Laser Digital Elevation Model

### Eastern Block 3

P5003_3_TMI:	Total Magnetic Intensity (TMI)
P5003_3_TMI_RTP :	TMI Reduced to Pole (RTP)
P5003_3_TMI_RTP-1VD:	TMI RTP with a First Vertical Derivative applied (1VD)
P5003_3_dose_rate_nasvd:	Dose Rate NASVD smoothed
P5003_3_K_percent_nasvd:	Potassium NASVD smoothed
P5003_3_Th_ppm_nasvd:	Thorium NASVD smoothed
P5003_3_U_ppm_nasvd:	Uranium NASVD smoothed
P5003_3_radar_DEM:	Radar Digital Elevation Model
P5003_3_laser_DEM:	Laser Digital Elevation Model

### Western Extension Block 4

P5003_4_TMI:	Total Magnetic Intensity (TMI)
P5003_4_TMI_RTP :	TMI Reduced to Pole (RTP)
P5003_4_TMI_RTP-1VD:	TMI RTP with a First Vertical Derivative applied (1VD)
P5003_4_dose_rate_nasvd:	Dose Rate NASVD smoothed
P5003_4_K_percent_nasvd:	Potassium NASVD smoothed
P5003_4_Th_ppm_nasvd:	Thorium NASVD smoothed
P5003_4_U_ppm_nasvd:	Uranium NASVD smoothed
P5003_4_radar_DEM:	Radar Digital Elevation Model
P5003_4_laser_DEM:	Laser Digital Elevation Model

### Eastern Extension Block 5

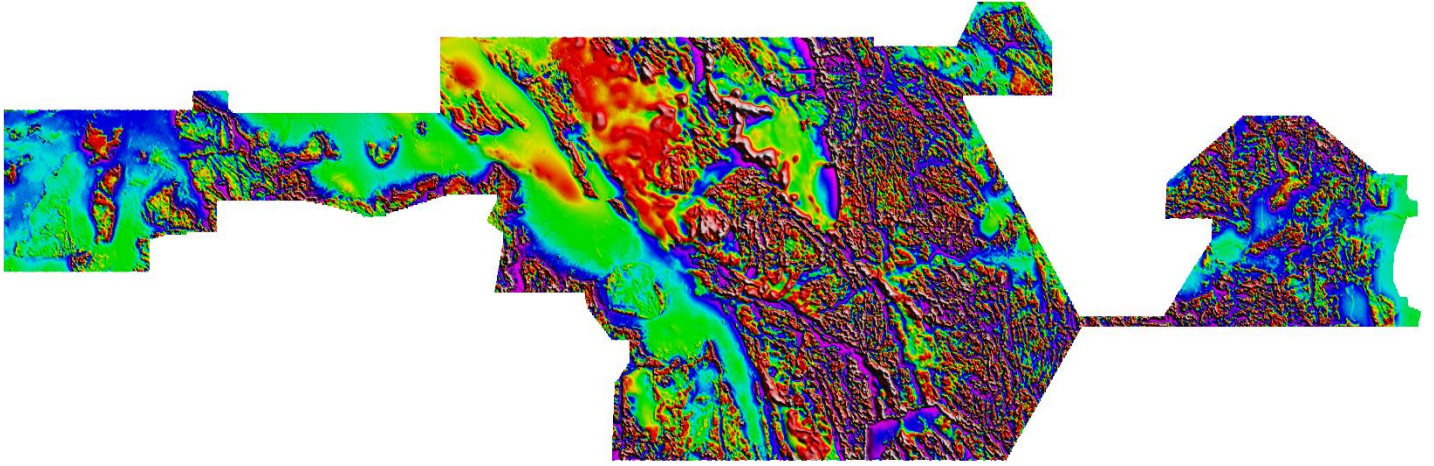
P5003_5_TMI:	Total Magnetic Intensity (TMI)
P5003_5_TMI_RTP :	TMI Reduced to Pole (RTP)
P5003_5_TMI_RTP-1VD:	TMI RTP with a First Vertical Derivative applied (1VD)

P5003_5_dose_rate_nasvd:	Dose Rate NASVD smoothed
P5003_5_K_percent_nasvd:	Potassium NASVD smoothed
P5003_5_Th_ppm_nasvd:	Thorium NASVD smoothed
P5003_5_U_ppm_nasvd:	Uranium NASVD smoothed
P5003_5_radar_DEM:	Radar Digital Elevation Model
P5003_5_laser_DEM:	Laser Digital Elevation Model

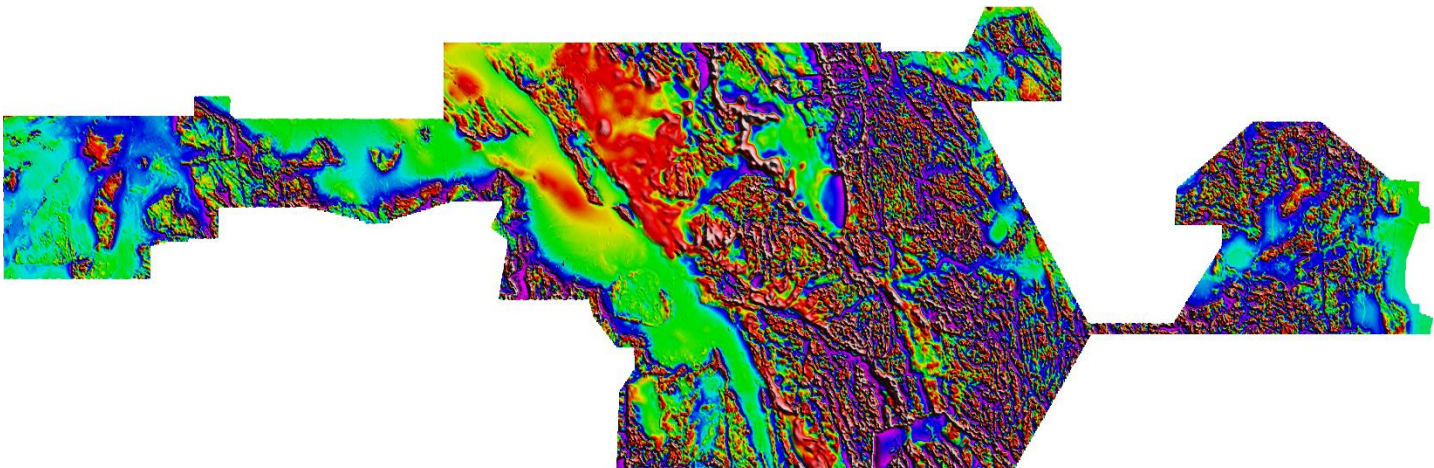
### Merged Grids

P5003_1-5_TMI:	Total Magnetic Intensity (TMI)
P5003_1-5_TMI_RTP :	TMI Reduced to Pole (RTP)
P5003_1-5_TMI_RTP-1VD:	TMI RTP with a First Vertical Derivative applied (1VD)
P5003_1-5_dose_rate_nasvd:	Dose Rate NASVD smoothed
P5003_1-5_K_percent_nasvd:	Potassium NASVD smoothed
P5003_1-5_Th_ppm_nasvd:	Thorium NASVD smoothed
P5003_1-5_U_ppm_nasvd:	Uranium NASVD smoothed
P5003_1-5_radar_DEM:	Radar Digital Elevation Model
P5003_1-5_laser_DEM:	Laser Digital Elevation Model

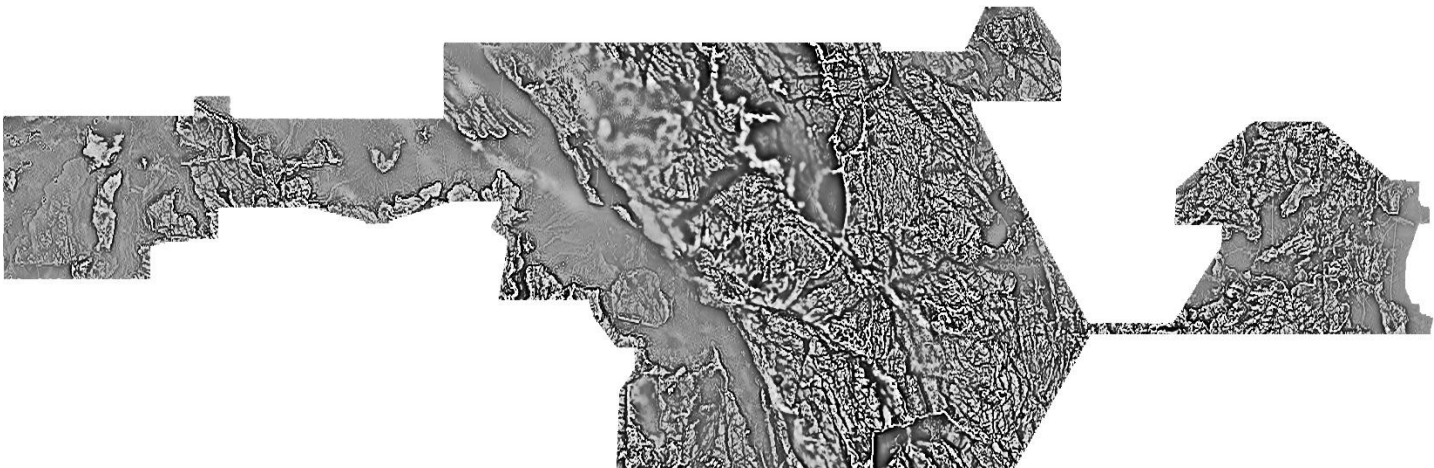
## APPENDIX 4 VERIFICATION IMAGES



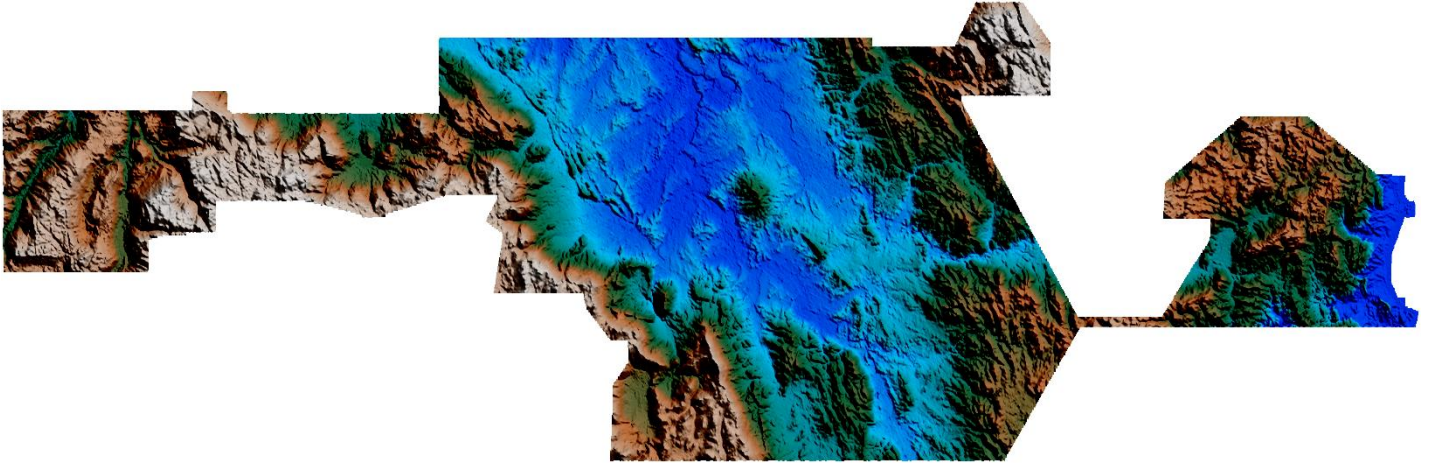
Total Magnetic Intensity



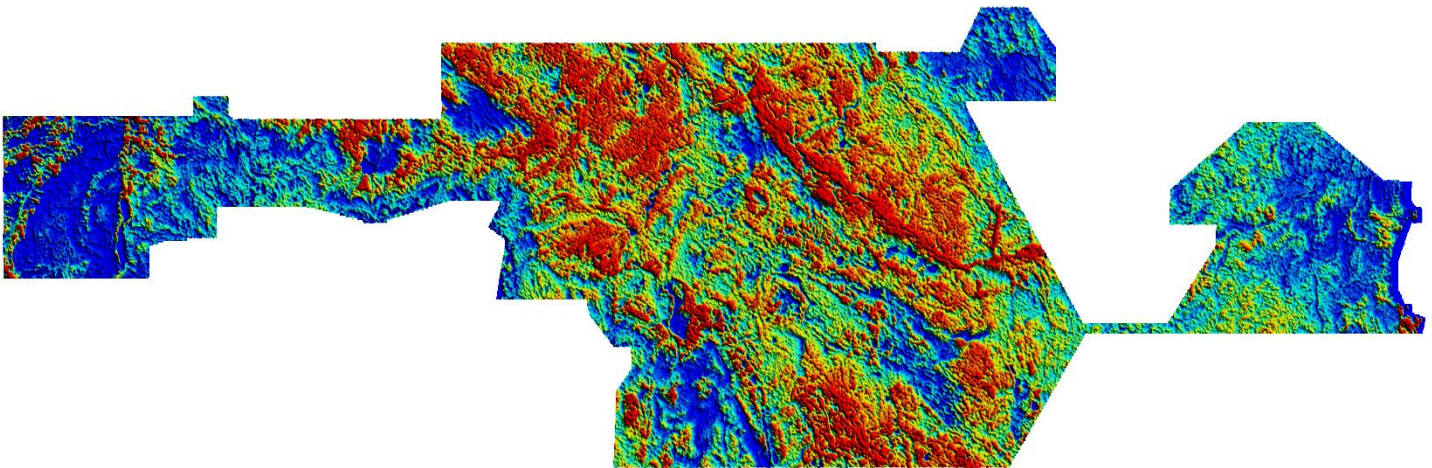
Reduced to Pole Total Magnetic Intensity



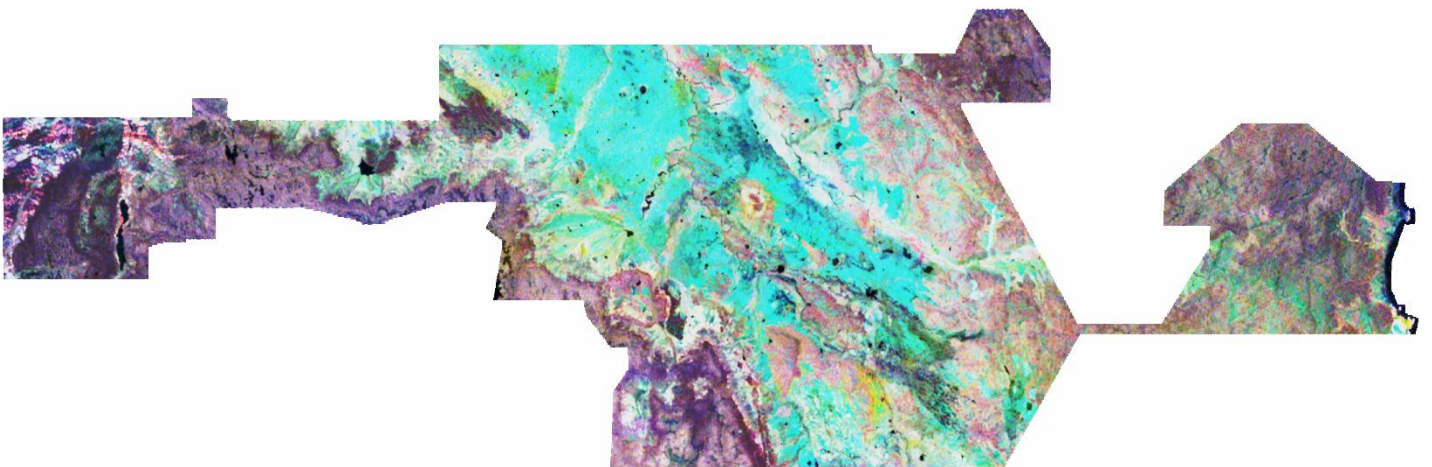
Reduced to Pole TMI First Vertical Derivative



Colour Digital Elevation Model



Dose Rate



Radiometric Ternary

## APPENDIX 5 LINE LISTING

### Central Block 1

Line Number	Date (YYMMDD)	Flight #	Start Fiducial	End Fiducial
100010	210210	1	3049000	3388950
100021	210210	1	3690000	4033950
100030	210210	1	4157000	4500950
100040	210210	1	4593000	4935950
100050	210210	1	5031000	5369950
100060	210210	1	5775850	6119850
100070	210210	1	6319000	6658950
100080	210210	1	6754000	7093950
100090	210210	1	7186000	7527950
100100	210210	1	7780900	8129450
100110	210210	1	8232000	8572950
100120	210210	1	8684000	9027950
100130	210210	1	9133000	9472950
100140	210210	1	9580000	9917950
100150	210210	1	10047000	10386950
100160	210217	13	3665000	3990950
100170	210217	13	4044000	4403950
100180	210217	13	4453000	4789950
100190	210217	13	4842000	5209950
100200	210217	13	5311000	5641950
100210	210217	13	5698000	6056950
100220	210217	13	7817000	8148950
100230	210217	13	8205000	8572950
100240	210217	13	8643000	8973950
100250	210217	13	9024000	9390950
100260	210217	13	9448000	9777950
100270	210217	13	9834000	10204950
100280	210217	13	10265000	10597950
100290	210217	13	10650000	11019950
100300	210217	13	11113000	11447950
100310	210217	13	11493000	11864950
100320	210218	15	1745000	2083950
100330	210218	15	2131000	2500950
100340	210218	15	2546000	2881950
100350	210218	15	2931000	3301950
100360	210218	15	3393000	3716950
100370	210218	15	3803000	4167950
100380	210218	15	4260000	4591950
100390	210218	15	4687000	5067950
100400	210210	1	10585000	10934950
100411	210210	1	11233000	11569950
100420	210210	1	11680000	12028950
100430	210218	15	5104000	5448950

100440	210218	15	5505000	5879950
100450	210210	2	2041000	2400950
100460	210210	2	2524000	2862950
100470	210210	2	2974000	3338950
100480	210210	2	3578000	3912950
100490	210210	2	4050000	4412950
100500	210210	2	4542000	4882950
100510	210210	2	5019000	5381950
100520	210210	2	5508000	5862950
100530	210210	2	6003000	6382000
100540	210210	2	6602000	6974950
100550	210211	3	1761000	2155950
100560	210218	15	5967000	6341950
100570	210218	15	6515000	6929950
100580	210218	15	6977000	7349950
100590	210218	15	7427000	7849950
100600	210218	15	7902000	8273950
100610	210218	15	8363000	8790950
100620	210218	15	8840000	9211950
100630	210218	15	9298000	9723950
100640	210218	15	9767000	10131950
100650	210218	15	10236000	10659950
100660	210218	15	10706000	11070950
100670	210218	15	11157000	11593950
100680	210218	15	11640000	12005950
100690	210218	15	12093000	12515950
100700	210218	15	12565000	12923950
100710	210218	15	12987000	13413950
100720	210218	15	13454000	13820950
100730	210218	15	13876000	14307950
100740	210218	15	14354000	14719950
100750	210218	15	14780000	15206950
100760	210218	15	15261000	15629950
100770	210218	15	15702000	16132950
100780	210218	15	16182000	16540950
100790	210218	15	16627000	17057950
100800	210218	15	17100000	17460950
100810	210218	15	17518000	17940950
100820	210218	15	17984000	18344950
100830	210218	15	18411000	18826950
100840	210218	15	18867000	19228950
100850	210218	15	19276000	19705950
100860	210218	15	19746000	20112950
100870	210218	15	20198000	20615950
100880	210218	15	20658000	21028950
100890	210218	15	21090000	21498950
100900	210218	15	21550000	21902950

100910	210218	15	21950000	22369950
100920	210218	15	22455000	22811950
100930	210219	16	2933000	3327950
100940	210219	16	3389000	3761950
100950	210219	16	3831000	4227950
100960	210219	16	4276000	4621950
100970	210219	16	4691000	5063950
100980	210219	16	5107000	5428950
100990	210219	16	5486000	5850950
101000	210219	16	5898000	6228950
101010	210211	3	2888000	3231950
101020	210211	3	3441000	3814950
101031	210211	3	4061000	4413950
101040	210211	3	4528000	4930950
101050	210211	3	5059000	5406950
101060	210211	3	5512000	5925950
101070	210211	3	6056000	6409950
101080	210211	3	6517000	6943950
101090	210211	3	7061000	7444950
101100	210211	3	7549000	7976950
101110	210211	3	8095000	8457950
101120	210211	3	8563000	9012950
101130	210211	3	9134000	9513950
101141	210213	5	1812000	2213950
101150	210213	5	2333000	2762950
101160	210213	5	2896000	3317950
101170	210213	5	3437000	3872950
101180	210213	5	3995000	4429950
101190	210213	5	4548000	4998950
101200	210213	5	5202000	5660950
101210	210213	5	5780000	6237950
101220	210213	5	6397000	6865950
101230	210213	5	6993000	7464950
101240	210213	5	7577000	8066950
101250	210213	5	8194000	8673950
101260	210213	5	8849000	9353950
101270	210213	5	9463000	9959950
101280	210213	5	10099000	10621950
101290	210213	5	10765000	11271950
101300	210213	5	11402000	11943950
101310	210214	8	1401000	1962950
101320	210214	8	2089000	2635950
101331	210214	8	3664000	4210950
101340	210214	8	2772000	3354950
101350	210214	8	4365000	4970950
101360	210214	8	5119000	5704950
101370	210214	8	5855000	6487950



101380	210214	8	6628000	7208950
101390	210214	8	7332000	7967950
101400	210214	8	8084000	8685950
101410	210214	8	9008000	9671950
101420	210214	8	9808000	10404950
101430	210214	8	10521000	11164950
101440	210214	8	11313000	11895950
101450	210214	8	12041000	12674950
101460	210214	8	12779000	13380950
101470	210214	8	13545000	14169950
101481	210217	12	1536000	2150950
101490	210216	10	1405000	1983950
101500	210216	10	2098000	2730950
101510	210216	10	2854000	3466950
101520	210216	10	3610000	4250950
101530	210216	10	4357000	4978950
101540	210216	10	5086000	5731950
101550	210216	10	5827000	6451950
101560	210216	10	6588000	7223950
101570	210216	10	7313000	7924950
101580	210216	10	8011000	8662950
101590	210216	10	8754000	9379950
101600	210216	10	9506000	10163950
101610	210216	10	10256000	10913950
101620	210216	10	11031000	11699950
101630	210216	10	11798000	12447950
101640	210216	10	12557000	13239950
101650	210216	10	13325000	13988950
101660	210216	10	14081000	14772950
101670	210216	10	14860000	15538950
101680	210216	10	15642000	16324950
101690	210217	12	2398000	3068950
101700	210217	12	3148000	3821950
101710	210217	12	3919000	4582950
101721	210217	12	4799000	5467950
101730	210217	12	5582000	6235950
101740	210217	12	6357000	7025950
101750	210217	12	7188000	7833950
101760	210217	12	7951000	8631950
101770	210217	12	8737000	9368950
101780	210217	12	9471000	10154950
101790	210217	12	10265000	10903950
101800	210217	12	11018000	11690950
101810	210217	12	11904000	12540950
101820	210217	12	12645000	13321950
101830	210217	12	13455000	14080950
101840	210217	12	14206000	14878950

101850	210217	12	15013000	15635950
101860	210217	12	15737000	16436950
101870	210217	12	16557000	17175950
101880	210218	14	2854000	3521950
101890	210217	13	20288000	20894950
101900	210218	14	4930000	5541950
101911	210218	14	5773000	6419950
101920	210218	14	6523000	7122950
101930	210218	14	7216000	7853950
101940	210218	14	7972000	8554950
101950	210218	14	8655000	9277950
101960	210218	14	9399000	9977950
101970	210218	14	10281000	10910950
101980	210218	14	11037000	11617950
101990	210218	14	11755000	12372950
102000	210218	14	12475000	13061950
102010	210218	14	13165000	13773950
102020	210218	14	13859000	14418950
102030	210218	14	14527000	15132950
102040	210218	14	15246000	15797950
102050	210218	14	15984000	16576950
102060	210216	11	18845000	19395950
102070	210216	11	18205000	18797950
102080	210216	11	17579000	18125950
102090	210216	11	16934000	17523950
102100	210216	11	16321000	16863950
102110	210216	11	15628000	16225950
102120	210216	11	15033000	15568950
102130	210216	11	14371000	14966950
102140	210216	11	13726000	14279950
102150	210216	11	13075000	13664950
102160	210216	11	12470000	13016950
102170	210216	11	11831000	12413950
102180	210216	11	11223000	11769950
102190	210216	11	10605000	11172950
102200	210216	11	9998000	10543950
102210	210216	11	9382000	9946950
102220	210216	11	8780000	9325950
102230	210216	11	8170000	8733950
102240	210216	11	7569000	8106950
102250	210216	11	6934000	7494950
102260	210216	11	6349000	6881950
102270	210216	11	5706000	6263950
102280	210216	11	5113000	5654950
102290	210216	11	4500000	5063950
102300	210216	11	3911000	4444950
102310	210216	11	3295000	3851950

102320	210216	11	2723000	3248950
102330	210216	11	2127000	2668950
102340	210216	11	1538000	2070950
102350	210216	11	936000	1469950
102360	210214	9	23018000	23530950
102370	210214	9	22427000	22973950
102380	210214	9	21873000	22377950
102390	210214	9	21280000	21825950
102400	210214	9	20711000	21216950
102410	210214	9	20054000	20619950
102420	210214	9	19479000	19984950
102430	210214	9	18902000	19432950
102440	210214	9	18340000	18843950
102450	210214	9	17712000	18242950
102460	210214	9	17140000	17646950
102470	210214	9	16542000	17073950
102480	210214	9	15969000	16477950
102490	210214	9	15368000	15907950
102500	210214	9	14806000	15316950
102510	210214	9	14202000	14737950
102520	210214	9	13637000	14137950
102530	210214	9	12595000	13386950
102540	210214	9	11803000	12525950
102550	210214	9	10916000	11714950
102560	210214	9	10132000	10854950
102570	210214	9	9273000	10067950
102580	210214	9	8499000	9211950
102590	210214	9	7650000	8420950
102600	210214	9	6874000	7584950
102610	210214	9	6026000	6810950
102620	210214	9	5236000	5951950
102630	210214	9	4382000	5150950
102640	210214	9	3608000	4317950
102650	210214	9	2754000	3544950
102660	210214	9	1960000	2689950
102670	210214	9	1092000	1860950
102680	210213	7	13402000	14118950
102690	210213	7	12615000	13340950
102700	210213	7	11805000	12525950
102710	210213	7	11006000	11741950
102720	210213	7	10214000	10937950
102730	210213	7	9439000	10167950
102740	210213	7	8648000	9358950
102750	210213	7	7875000	8599950
102760	210213	7	7079000	7792950
102770	210213	7	6295000	7026950
102780	210213	7	5476000	6197950

102790	210213	7	4629000	5368950
102800	210213	7	3809000	4538950
102810	210213	7	3010000	3756950
102820	210213	7	2195000	2910950
102830	210213	7	1412000	2140950
102841	210213	7	615000	1327950
102850	210213	6	3608000	4345950
102860	210213	6	722000	1426950
190010	210218	15	23197000	23245950
190020	210210	2	1864000	1906950
190030	210218	15	22890000	23133950
190040	210219	16	2692000	2740950
190050	210218	15	23368000	23672950
190060	210218	15	23765000	23823950
190070	210210	1	2350000	2791950
190080	210218	14	1566000	2034950
190090	210218	14	2154000	2712950
190100	210219	16	1153000	1701950
190110	210219	16	1776000	2416950
190120	210218	15	863000	1498950
190130	210217	13	926000	1608950
190140	210217	13	1671000	2511950
190150	210217	13	2607000	3417950
190160	210217	13	6137000	6978950
190170	210217	13	7055000	7737950
190180	210217	13	12355000	12966950
190190	210217	13	13638000	14146950
190200	210217	13	14221000	14772950
190210	210217	13	14844000	15325950
190220	210217	13	15396000	15908950
190230	210217	13	17435000	17879950
190240	210217	13	17949000	18419950
190250	210217	13	18595000	19015950
190260	210217	13	19086000	19528950
190270	210217	13	19592000	19977950
190280	210218	14	3759000	4166950
190290	210217	13	16350000	16717950
190300	210217	13	16788000	17168950
190310	210218	14	4303000	4646950
190320	210218	14	16730000	16835950
190330	210213	6	2784000	2881950
190340	210213	6	2601000	2695950
190350	210213	6	2443000	2533950
190360	210213	6	2244000	2352950
190370	210213	6	2096000	2175950
190380	210213	6	1900000	2012950
190390	210213	6	1736000	1823950

**Western Block 2**

Line Number	Date (YYMMDD)	Flight #	Start Fiducial	End Fiducial
200010	210317	52	8455000	8963950
200020	210226	21	7595000	8213950
200030	210226	21	8265000	8792950
200040	210226	21	8840000	9465950
200050	210226	21	9523000	10044950
200060	210226	21	10105000	10714950
200070	210226	21	10758000	11261950
200080	210226	21	11342000	11911950
200090	210226	21	11952000	12482950
200100	210226	21	12558000	13145950
200110	210226	21	13207000	13751950
200120	210226	22	780000	1426950
200130	210226	22	1487000	2045950
200140	210226	22	2096000	2726950
200150	210226	22	2776000	3342950
200160	210226	22	3413000	3961950
200170	210226	22	4025000	4526950
200180	210226	22	4569000	5111950
200190	210226	22	5180000	5674950
200200	210312	44	1515000	2046950
200210	210316	50	10735000	11255950
200220	210316	50	10151000	10693950
200230	210316	50	9539000	10090950
200240	210316	50	8958000	9505950
200250	210316	50	8361000	8925950
200260	210316	50	7763000	8316950
200270	210316	50	7170000	7730950
200280	210316	50	6557000	7127950
200290	210316	50	5946000	6520950
200300	210316	50	4891000	5550950
200310	210316	50	4267000	4841950
200320	210316	50	3530000	4192950
200330	210316	50	2863000	3470950
200340	210316	50	2089000	2744950
200350	210314	45	2001000	2496950
200360	210314	45	2553000	3076950
200370	210314	45	3111000	3595950
200380	210314	45	3649000	4163950
200390	210314	45	4199000	4680950
200400	210314	45	4732000	5225950
200410	210312	44	7509000	8085950
200420	210312	44	6857000	7460950
200430	210312	44	6222000	6823950
200440	210312	44	5559000	6180950
200450	210312	44	4915000	5526950

200460	210307	33	14011000	14621950
200470	210307	33	12595000	13156950
200480	210307	33	11962000	12553950
200490	210307	33	11306000	11909950
200500	210307	33	10636000	11225950
200510	210307	33	10004000	10587950
200520	210307	33	9393000	9962950
200530	210307	33	8789000	9347950
200540	210307	33	8188000	8763950
200550	210307	33	7623000	8146950
200560	210307	33	7064000	7582950
200570	210307	33	6523000	7015950
200580	210307	33	4052000	4554950
200590	210307	33	3465000	4003950
200600	210307	33	2924000	3417950
200610	210307	33	986000	1509950
200620	210307	33	2321000	2845950
200630	210307	33	1712000	2259950
200640	210307	33	4671000	5228950
200650	210307	33	5277000	5815950
200660	210307	33	5870000	6419950
200670	210307	33	13314000	13883950
200680	210312	44	4217000	4783950
200690	210312	44	3582000	4176950
200700	210307	34	14205000	14701950
200710	210307	34	13684000	14175950
200720	210307	34	13193000	13647950
200730	210307	34	12663000	13155950
200740	210307	34	12130000	12611950
200750	210307	34	11538000	12090950
200760	210307	34	10979000	11496950
200770	210307	34	10422000	10938950
200780	210307	34	9900000	10375950
200790	210307	34	9340000	9854950
200800	210306	31	14449000	14978950
200810	210306	31	13942000	14393950
200820	210306	31	13390000	13877950
200830	210307	34	8755000	9286950
200840	210307	34	802000	1367950
200850	210306	31	1254000	1778950
200860	210306	32	677000	1179950
200870	210303	28	14169000	14731950
200880	210303	28	653000	1197950
200890	210228	25	14224000	14689950
200900	210228	25	13690000	14160950
200910	210228	25	13186000	13638950
200920	210228	25	8565000	9012950

200930	210228	25	8013000	8512950
200940	210228	25	7441000	7945950
200950	210228	25	9081000	9579950
200960	210228	25	9642000	10129950
200970	210228	25	10181000	10673950
200980	210228	25	10741000	11212950
200990	210228	25	11264000	11792950
201000	210228	25	11837000	12386950
201010	210228	25	12480000	13081950
201020	210226	22	8212000	8741950
201030	210226	22	7622000	8151950
201040	210226	22	7062000	7549950
201050	210226	22	6486000	7020950
201060	210226	21	6517000	7016950
201070	210226	21	5899000	6442950
201080	210226	21	5346000	5832950
201090	210226	21	4757000	5290950
201100	210226	21	4196000	4688950
201110	210226	21	3597000	4120950
201120	210226	21	3044000	3521950
201130	210226	21	2463000	2979950
201140	210224	19	766000	1552950
201150	210224	19	1621000	2328950
201160	210224	20	629000	1322950
201170	210224	20	843000	1478950
201180	210226	21	871000	1566950
201190	210226	21	1631000	2287950
201200	210226	22	8928000	9613950
201210	210226	22	9673000	10311950
201220	210226	22	10381000	11057950
201230	210226	22	11111000	11754950
201240	210226	22	11835000	12431950
201250	210226	22	12496000	13048950
201260	210226	22	13095000	13658950
201270	210226	22	13717000	14294950
201280	210228	25	3367000	3959950
201290	210228	25	4030000	4620950
201300	210228	25	4677000	5330950
201310	210228	25	5407000	6020950
201320	210228	25	6071000	6681950
201330	210306	32	14466000	15037950
201340	210307	34	7214000	7754950
201350	210307	34	7823000	8357950
201360	210310	37	1191000	1803950
201370	210310	37	1969000	2513950
201380	210310	37	2605000	3112950
201390	210310	37	3174000	3695950

201400	210310	37	3768000	4240950
201410	210310	37	4294000	4766950
201420	210310	37	4832000	5304950
201430	210310	37	5343000	5777950
201440	210310	37	5847000	6275950
201450	210310	37	6318000	6792950
201460	210310	37	6858000	7331950
201470	210310	37	7382000	7859950
201480	210310	37	7925000	8384950
201490	210310	37	8429000	8838950
201500	210310	37	8906000	9303950
201510	210314	45	5730000	6078950
201520	210314	45	6113000	6444950
201530	210314	45	6506000	6846950
201540	210314	45	6876000	7163950
201550	210306	31	11048000	11177950
201560	210314	45	7205000	7562950
201570	210306	31	10866000	10994950
201580	210314	45	7585000	7909950
201590	210306	31	10693000	10820950
201600	210314	45	7964000	8301950
201610	210306	31	10521000	10655950
201620	210314	45	8342000	8660950
201630	210306	31	10338000	10484950
201640	210314	45	8715000	9039950
201650	210306	31	10159000	10303950
201660	210314	45	9076000	9385950
201670	210306	31	9958000	10113950
201680	210314	45	9466000	9774950
201690	210306	31	9777000	9925950
201700	210314	45	9817000	10099950
201710	210306	31	9593000	9745950
201720	210314	45	10150000	10442950
201730	210306	31	9395000	9566950
201740	210314	45	10488000	10752950
201750	210306	31	9180000	9348950
201760	210311	41	4998000	5062950
201770	210314	45	10809000	11100950
201780	210306	31	8964000	9145950
201790	210311	41	4885000	4949950
201800	210307	34	6652000	6989950
201810	210306	31	8762000	8931950
201820	210311	41	4757000	4842950
201830	210307	34	6343000	6617950
201840	210306	31	8543000	8726950
201850	210311	41	4588000	4710950
201860	210307	34	5964000	6244950



201870	210306	31	8351000	8511950
201880	210311	41	4377000	4540950
201890	210307	34	5652000	5914950
201900	210306	31	8155000	8319950
201910	210311	41	4094000	4323950
201920	210307	34	5343000	5611950
201930	210306	31	7957000	8121950
201940	210311	41	3790000	4041950
201950	210307	34	5024000	5303950
201960	210306	31	7730000	7886950
201970	210311	41	3415000	3720950
201980	210307	34	4376000	4662950
201990	210306	31	7536000	7692950
202000	210311	41	7053000	7423950
202010	210307	34	4055000	4339950
202020	210306	31	7353000	7500950
202030	210306	32	7430000	7805950
202040	210307	34	3629000	3922950
202050	210306	31	7135000	7295950
202060	210306	32	5022000	5463950
202070	210307	34	3342000	3582950
202080	210306	32	7888000	8835950
202090	210307	34	2991000	3289950
202100	210311	41	7529000	8460950
202110	210306	32	13988000	14234950
202120	210311	41	2315000	3273950
202130	210306	32	13697000	13943950
202140	210306	32	3950000	4922950
202150	210306	32	13401000	13631950
202160	210303	28	1742000	3178950
202170	210303	28	3243000	4601950
202180	210303	28	4662000	6228950
202190	210303	28	6270000	7627950
202200	210303	28	7679000	9260950
202210	210303	28	9291000	10622950
202220	210303	28	10663000	12141950
202230	210303	28	12183000	13607950
202240	210306	31	11447000	12774950
202250	210306	32	2376000	3804950
202260	210306	32	8996000	10304950
202270	210306	32	10410000	11837950
202280	210306	32	11899000	13251950
202290	210309	36	1490000	3029950
202300	210309	36	3116000	4476950
202310	210309	36	4531000	6079950
202320	210309	36	6132000	7476950
202330	210309	36	7506000	8959950

202340	210309	36	9000000	10324950
202350	210309	36	10358000	11870950
202360	210309	36	11927000	13223950
202370	210310	37	9677000	11123950
202380	210310	37	11235000	12676950
202390	210310	38	763000	2275950
202400	210310	38	2318000	3787950
202410	210310	38	3811000	5387950
202420	210310	38	5433000	7034950
202430	210310	38	7062000	8643950
202440	210310	38	11906000	13412950
202450	210310	39	631000	2063950
202460	210310	39	2103000	3531950
202470	210310	39	3564000	4946950
202480	210311	41	739000	2100950
202490	210311	41	8673000	10102950
202500	210311	41	11654000	13064950
202510	210310	39	5018000	6415950
202520	210311	41	10191000	11596950
202530	210311	42	2269000	3745950
202540	210311	42	3788000	5261950
202550	210311	42	675000	2146950
202560	210311	42	5339000	6760950
202570	210312	43	879000	2105950
202580	210312	43	2139000	3392950
202590	210312	43	3449000	4703950
202600	210312	43	4743000	6003950
202610	210312	43	7385000	8692950
202620	210312	43	6102000	7335950
202630	210312	43	10083000	11375950
202640	210312	43	8804000	10029950
202650	210315	48	763000	2096950
202660	210315	48	2147000	3406950
202670	210315	48	3470000	4669950
202680	210315	48	5086000	6325950
202690	210315	48	6384000	7609950
202700	210315	48	7669000	8981950
202710	210306	31	3072000	4280950
202720	210310	38	11394000	11592950
202730	210312	43	11468000	11874950
202740	210310	38	11198000	11359950
202750	210314	45	11569000	11915950
202760	210310	38	11037000	11158950
202770	210314	45	11975000	12381950
202780	210310	38	10869000	10990950
202790	210314	45	12444000	12798950
202800	210310	38	10675000	10822950

202810	210314	45	12845000	13233950
202820	210310	38	10507000	10639950
202830	210314	45	13280000	13639950
202840	210310	38	10320000	10476950
202850	210312	43	12025000	12382950
202860	210310	38	10150000	10280950
202870	210314	45	13705000	14090950
202880	210310	38	9963000	10111950
202890	210314	45	14163000	14529950
202900	210310	38	9790000	9917950
202910	210315	48	9089000	9498950
202920	210310	38	9613000	9762950
202930	210315	48	9576000	10015950
202940	210310	38	9452000	9572950
202950	210315	48	11369000	11706950
202960	210310	38	9304000	9422950
202970	210315	48	11742000	12110950
202980	210310	38	9151000	9263950
202990	210315	48	12146000	12499950
203000	210310	38	9012000	9120950
203010	210315	48	12562000	12923950
203020	210315	48	12959000	13305950
203030	210315	48	13342000	13708950
203040	210315	48	13744000	14079950
203050	210315	48	14112000	14478950
203060	210315	48	14517000	14850950
203070	210315	48	14883000	15250950
203080	210315	48	15289000	15629300
290010	210312	44	3209000	3341950
290020	210312	44	2892000	3132950
290030	210312	44	2232000	2719950
290040	210228	25	889000	1332950
290050	210228	25	1428000	1913950
290060	210228	25	2031000	2591950
290070	210228	25	2666000	3239950
290080	210316	50	12251000	12858950
290090	210317	52	9193000	9784950
290100	210314	45	789000	1397950
290110	210312	44	705000	1324950
290120	210314	45	1537000	1811950
290130	210312	44	8308000	8713950
290140	210306	31	12987000	13302950
290150	210303	28	1271000	1592950
290160	210303	28	13729000	14009950
290170	210307	34	1549000	2303950
290180	210306	32	1368000	2041950
290190	210306	31	2141000	2842950

290200	210224	19	424000	1417950
290210	210224	19	247000	1085950
290220	210224	19	1216000	1837950
290230	210224	19	2020000	2599950
290240	210224	20	1607000	2141950
290250	210224	20	2238000	2653950
290260	210224	20	2759000	3206950
290270	210224	20	3308000	3700950
290280	210224	20	3810000	4247950
290290	210224	20	189000	532950
290300	210311	41	5174000	5562950
290310	210311	41	5637000	5960950
290320	210311	41	6042000	6415950
290330	210311	41	6518000	6944950
290340	210306	32	6859000	7280950
290350	210306	32	6426000	6768950
290360	210306	32	6040000	6348950
290370	210306	32	5600000	5952950
290380	210306	31	6687000	7000950
290390	210306	31	6303000	6608950
290400	210306	31	5828000	6214950
290410	210306	31	5193000	5746950
290420	210306	31	4460000	5059950

**Eastern Block 3**

Line Number	Date (YYMMDD)	Flight #	Start Fiducial	End Fiducial
300010	210303	27	12580000	12721950
300020	210303	27	12768000	12917950
300030	210303	27	12950000	13107950
300040	210303	27	13141000	13294950
300050	210303	27	13330000	13484950
300060	210303	27	13520000	13676950
300070	210303	27	13709000	13887950
300080	210303	27	13914000	14101950
300090	210303	27	14129000	14311950
300100	210303	27	14347000	14521950
300110	210304	29	1923000	2084950
300120	210304	29	2143000	2353950
300130	210304	29	2392000	2586950
300140	210304	29	2646000	2884950
300150	210304	29	2927000	3128950
300160	210304	29	3173000	3446950
300170	210304	29	3494000	3714950
300180	210304	29	3755000	4021950
300190	210304	29	4079000	4291950
300200	210304	29	4332000	4620950
300210	210304	29	4672000	4890950
300220	210304	29	4939000	5213950
300230	210304	29	5259000	5503950
300240	210304	29	5546000	5823950
300250	210304	29	5866000	6126950
300260	210304	29	6167000	6479950
300270	210304	29	6517000	6792950
300280	210304	29	6855000	7160950
300290	210304	29	7215000	7488950
300300	210304	29	7543000	7839950
300310	210304	29	7893000	8148950
300320	210304	29	8189000	8483950
300330	210304	29	8523000	8795950
300340	210304	29	8830000	9151950
300350	210304	29	9207000	9467950
300360	210304	29	9509000	9826950
300370	210304	29	9873000	10157950
300380	210304	29	10211000	10536950
300390	210304	29	10620000	10883950
300400	210304	29	10927000	11230950
300410	210304	29	11279000	11554950
300420	210304	29	11597000	11928950
300430	210304	29	11969000	12264950
300440	210304	29	12312000	12638950
300450	210304	29	12675000	12969950

300460	210304	29	12998000	13319950
300470	210304	29	13363000	13653950
300480	210304	29	13690000	14046950
300490	210304	29	14074000	14365950
300500	210304	29	14403000	14749950
300510	210304	30	618000	928950
300520	210304	30	971000	1306950
300530	210304	30	1376000	1695950
300540	210304	30	1744000	2095950
300550	210304	30	2152000	2466950
300560	210304	30	2512000	2838950
300570	210304	30	2895000	3173950
300580	210304	30	3218000	3552950
300590	210304	30	3613000	3887950
300600	210304	30	3935000	4269950
300610	210304	30	4320000	4611950
300620	210304	30	4650000	5000950
300630	210304	30	5066000	5368950
300640	210304	30	5401000	5756950
300650	210304	30	5802000	6110950
300660	210304	30	6150000	6554950
300670	210304	30	6596000	6919950
300680	210304	30	6942000	7370950
300690	210311	40	3698000	4083950
300700	210311	40	4133000	4523950
300710	210311	40	4582000	4984950
300720	210311	40	5022000	5428950
300730	210311	40	5493000	5893950
300740	210311	40	5921000	6331950
300750	210311	40	6809000	7237950
300760	210311	40	7295000	7696950
300770	210311	40	7778000	8189950
300780	210311	40	8244000	8641950
300790	210311	40	8707000	9114950
300801	210311	40	9308000	9718950
300810	210311	40	9801000	10226950
300820	210311	40	10294000	10763950
300830	210311	40	11115000	11559950
300840	210311	40	11593000	12004950
300850	210311	40	12034000	12487950
300860	210311	40	12526000	12954950
300870	210311	40	13394000	13906950
300880	210315	49	2059000	2463950
300890	210315	49	2488000	2891950
300900	210315	49	2921000	3324950
300910	210315	49	3351000	3753950
300920	210315	49	3779000	4155950

300930	210316	51	7689000	8224950
300940	210316	51	8281000	8831950
300950	210316	51	8889000	9480950
300960	210316	51	9527000	10101950
300970	210316	51	10151000	10731950
300980	210316	51	10778000	11344950
300990	210316	51	11746000	12333950
301000	210316	51	12394000	12998950
301010	210316	51	13070000	13609950
301020	210317	52	1446000	2041950
301030	210317	52	2096000	2583950
301040	210317	52	2603000	3159950
301050	210317	52	3202000	3702950
301060	210317	52	3736000	4246950
301070	210317	52	4413000	4869950
301080	210317	52	4899000	5444950
301090	210317	52	5487000	5945950
301100	210317	52	5985000	6500950
301110	210317	52	6545000	7016950
301120	210317	52	7056000	7598950
301130	210309	35	10815000	11344950
301140	210309	35	10345000	10775950
301150	210309	35	9810000	10319950
301160	210309	35	9267000	9757950
301170	210309	35	8690000	9230950
301180	210309	35	8169000	8646950
301190	210309	35	7632000	8135950
301200	210309	35	7142000	7583950
301210	210309	35	6589000	7097950
301220	210309	35	6068000	6556950
301230	210309	35	5526000	6028950
301240	210309	35	5035000	5470950
301250	210309	35	4503000	5003950
301260	210309	35	4010000	4470950
301270	210309	35	3506000	3965950
301280	210309	35	3037000	3463950
301290	210309	35	2568000	3010950
301300	210309	35	2127000	2534950
301310	210309	35	1706000	2100950
301320	210309	35	1338000	1676950
301330	210309	35	949000	1292950
301340	210309	35	598000	912950
301350	210223	17	876000	1156950
301360	210223	17	1249000	1533950
301370	210223	17	1620000	1882950
301380	210223	17	1958000	2250950
301390	210223	17	2302000	2579950

301400	210223	17	2647000	2964950
301410	210223	17	3019000	3309950
301420	210223	17	3402000	3754950
301430	210223	17	3810000	4127950
301440	210223	17	4203000	4597950
301450	210223	17	4663000	5025950
301460	210223	17	5124000	5591950
301470	210223	17	5642000	6034950
301480	210223	17	6113000	6546950
301490	210223	17	6612000	6963950
301500	210223	17	7062000	7501950
301510	210223	17	7562000	7938950
301520	210223	17	8007000	8450950
301530	210223	17	8512000	8879950
301540	210223	17	8949000	9373950
301550	210223	17	9447000	9827950
301560	210223	17	9894000	10342950
301570	210223	17	10428000	10818950
301580	210223	17	10904000	11383950
301590	210223	17	11452000	11874950
301600	210223	17	11943000	12433950
301610	210223	17	12513000	12934950
301620	210223	17	12996000	13400950
301630	210223	17	13474000	13844950
301640	210223	17	13912000	14368950
301650	210223	18	536000	941950
301660	210223	18	1012000	1435950
301670	210223	18	1514000	1911950
301680	210223	18	1986000	2369950
301690	210223	18	2429000	2812950
301700	210223	18	2866000	3255950
301710	210223	18	3342000	3737950
301720	210223	18	3812000	4213950
301730	210223	18	4274000	4650950
301740	210223	18	4713000	5144950
301750	210223	18	5226000	5632950
301760	210223	18	5685000	6129950
301770	210223	18	6197000	6583950
301780	210223	18	6750000	7147950
301790	210223	18	7210000	7593950
301800	210223	18	7650000	8052950
301810	210223	18	8106000	8502950
301820	210223	18	8562000	8956950
301830	210223	18	9042000	9436950
301840	210223	18	9511000	9952950
301850	210223	18	10013000	10408950
301860	210223	18	10474000	10886950



301870	210223	18	10980000	11378950
301880	210223	18	11428000	11831950
301890	210223	18	11885000	12274950
301900	210223	18	12330000	12734950
301910	210223	18	12783000	13193950
301920	210223	18	13238000	13681950
301930	210223	18	13736000	14167950
301940	210223	18	14220000	14700950
301950	210311	40	1181000	1675950
301960	210315	49	713000	1139950
301970	210316	51	5583000	6106950
301980	210316	51	5009000	5517950
301990	210316	51	4491000	4966950
302000	210316	51	3962000	4428950
302010	210316	51	627000	1123950
302020	210315	47	13973000	14527950
302030	210315	47	13412000	13911950
302040	210315	47	12786000	13349950
302050	210315	47	12188000	12712950
302060	210315	47	11591000	12140950
302070	210315	47	10744000	11199950
302080	210315	47	10167000	10710950
302090	210315	47	9627000	10112950
302100	210315	47	9075000	9595950
302110	210315	47	8577000	9023950
302120	210315	47	8063000	8539950
302130	210315	47	6952000	7513950
302140	210315	47	6298000	6859950
302150	210315	47	5739000	6213950
302160	210315	47	5156000	5653950
302170	210315	47	4597000	5065950
302180	210315	47	4034000	4519950
302190	210315	47	3121000	3529950
302200	210315	47	2581000	3062950
302210	210315	47	2119000	2535950
302220	210315	47	1601000	2074950
302230	210315	47	1082000	1547950
302240	210314	46	13886000	14383950
302250	210314	46	13451000	13854950
302260	210314	46	12959000	13406950
302270	210314	46	12545000	12928950
302280	210314	46	12019000	12498950
302290	210314	46	11559000	11969950
302300	210314	46	10991000	11507950
302310	210314	46	10554000	10964950
302320	210314	46	10005000	10486950
302330	210314	46	9523000	9953950

302340	210314	46	8951000	9471950
302350	210314	46	8468000	8925950
302360	210314	46	7904000	8400950
302370	210314	46	7426000	7872950
302380	210314	46	6902000	7381950
302390	210314	46	6422000	6844950
302400	210314	46	5930000	6381950
302410	210314	46	5484000	5894950
302420	210314	46	4982000	5422950
302430	210314	46	4547000	4948950
302440	210303	27	10746000	11215950
302450	210227	23	5175000	5648950
302460	210227	23	4191000	4629000
302470	210227	23	6034000	6755950
302480	210227	23	6860000	7617950
302490	210227	24	13072000	13799950
302500	210227	24	13861000	14539950
302510	210227	24	14606000	15315950
302520	210303	27	9834000	10633950
302530	210303	27	9039000	9794950
302540	210303	27	8254000	8981950
302550	210303	27	7526000	8199950
302560	210303	27	6738000	7462950
302570	210303	27	5990000	6704950
302580	210303	27	5148000	5928950
302590	210303	27	4314000	5098950
302600	210303	27	3404000	4233950
302610	210303	27	2515000	3351950
302620	210228	26	13319000	14196950
302630	210228	26	12431000	13269950
302640	210228	26	11495000	12360950
302650	210228	26	10593000	11444950
302660	210228	26	9632000	10521950
302670	210228	26	8670000	9570950
302680	210228	26	7674000	8596950
302690	210228	26	6803000	7624950
302700	210228	26	5862000	6727950
302710	210228	26	4951000	5796950
302720	210228	26	4028000	4864950
302730	210228	26	3067000	3970950
302740	210228	26	2120000	2985950
302750	210227	24	12047000	12816950
302760	210227	24	11235000	11979950
302770	210227	24	10409000	11153950
302780	210227	24	9540000	10331950
302790	210227	24	8583000	9477950
302800	210227	24	7591000	8472950

302810	210314	46	3592000	3844950
302820	210228	26	1517000	1932950
302830	210314	46	3297000	3527950
302840	210227	24	5366000	5743950
302850	210314	46	2993000	3248950
302860	210227	24	4950000	5325950
302870	210314	46	2685000	2925950
302880	210227	24	4530000	4902950
302890	210314	46	2376000	2636950
302900	210227	24	4132000	4479950
302910	210314	46	2112000	2328950
302920	210227	24	3736000	4046950
302930	210227	24	3409000	3692950
302940	210227	24	3030000	3362950
302950	210227	24	2649000	2988950
302960	210227	24	2267000	2601950
302970	210227	24	1901000	2203950
302980	210227	24	1556000	1853950
302990	210227	23	14138000	14447950
303000	210227	23	13785000	14103950
303010	210227	23	13394000	13704950
303020	210227	23	13053000	13329950
303030	210227	23	12680000	12974950
303040	210227	23	11843000	12133950
303050	210227	23	11488000	11788950
303060	210227	23	11090000	11397950
303070	210227	23	10739000	11035950
303080	210227	23	10392000	10683950
303090	210227	24	6244000	6543950
303100	210227	24	5918000	6185950
303110	210227	23	10039000	10267950
303120	210227	23	9789000	9994950
303130	210227	23	9534000	9743950
303140	210227	23	9298000	9469950
303150	210227	23	9023000	9192950
303160	210227	23	8807000	8943950
390020	210311	40	3426000	3637950
390030	210311	40	2949000	3294950
390040	210315	49	1358000	1788950
390050	210227	24	6682000	6916950
390061	210316	51	6688000	7304950
390070	210227	23	8423000	8717950
390080	210311	40	1755000	2585950
390090	210227	23	7970000	8318950
390100	210316	51	1250000	2347950
390110	210227	23	2678000	3111950
390120	210316	51	2497000	3700950

390130	210227	23	2170000	2505950
390140	210303	27	11339000	12458950
390150	210227	23	1786000	2073950
390160	210304	29	1012000	1177950
390170	210227	23	14596000	15643950
390180	210304	30	7503000	7674950
390190	210227	23	918000	1616950
390200	210304	29	728000	865950
390210	210227	24	694000	1392950
390220	210228	26	654000	1283950
390230	210303	27	778000	1232950
390240	210303	27	1361000	1754950
390250	210303	27	1864000	2239950
390260	210314	46	700000	1101950
390270	210314	46	1290000	1520950
390280	210314	46	1856000	1989950

**Western Extension Block 4**

Line Number	Date (YYMMDD)	Flight #	Start Fiducial	End Fiducial
400020	210321	58	10837000	11310950
400030	210321	58	10291000	10798950
400040	210321	58	9747000	10253950
400050	210321	58	9220000	9719950
400060	210321	58	8661000	9181950
400070	210321	58	8101000	8626950
400080	210321	58	7508000	8047950
400090	210321	58	6917000	7465950
400100	210321	58	6319000	6860950
400110	210321	58	5726000	6278950
400120	210321	58	5130000	5667950
400130	210321	58	4533000	5099950
400140	210321	57	12394000	12938950
400150	210321	57	11830000	12346950
400160	210321	57	11282000	11800950
400170	210321	57	10741000	11226950
400180	210321	57	10206000	10714950
400190	210321	57	9703000	10178950
400200	210321	57	9143000	9652950
400210	210321	57	8629000	9101950
400220	210321	57	8060000	8596950
400230	210321	57	7548000	8018950
400240	210321	57	6967000	7486950
400250	210321	57	6450000	6928950
400260	210321	57	5779000	6368950
400270	210321	57	5211000	5745950
400280	210321	57	4553000	5181950
400290	210321	57	3999000	4518950
400300	210319	53	1155000	1788950
400310	210319	53	1830000	2412950
400320	210319	53	2448000	3030950
400330	210319	53	3064000	3653950
400340	210319	53	3699000	4330950
400350	210319	53	4365000	4957950
400360	210319	53	5008000	5646950
400370	210319	53	5679000	6326950
400380	210319	53	6356000	6968950
400390	210319	53	7000000	7593950
400400	210321	59	994000	1649950
400410	210321	59	1691000	2411950
400420	210321	59	2448000	3102950
400430	210321	59	3146000	3915950
400440	210321	59	3952000	4661950
400450	210321	59	4708000	5429950
400460	210321	59	5461000	6072950

400470	210321	59	6134000	6879950
400480	210322	60	782000	1420950
400490	210322	60	1451000	2164950
400500	210322	60	2203000	2813950
400510	210322	60	2842000	3511950
400520	210323	62	2760000	3488950
400530	210322	60	4194000	4805950
400540	210322	60	4836000	5382950
400550	210322	60	5415000	6081950
400560	210323	61	756000	1318950
400570	210323	61	1354000	2092950
400580	210323	61	2133000	2742950
400590	210323	61	2774000	3466950
400600	210323	61	3501000	4083950
400610	210323	61	4116000	4849950
400620	210323	61	4879000	5508950
400630	210323	61	5547000	6242950
400640	210323	61	6292000	6901950
400650	210323	61	6928000	7661950
400660	210323	61	7688000	8307950
400670	210323	61	8331000	9058950
400680	210323	61	9081000	9689950
400690	210323	61	9726000	10450950
400700	210323	61	10472000	11058950
400710	210323	61	11086000	11798950
400720	210323	61	11819000	12431950
400730	210323	61	12475000	13152950
400740	210323	61	13175000	13758950
400750	210323	61	13796000	14455950
400760	210323	62	1971000	2610950
400770	210323	62	1235000	1944950
400780	210323	62	626000	1193950
400790	210321	58	12480000	13193950
400800	210320	56	5570000	6257950
400810	210320	56	4904000	5470950
400820	210320	56	3464000	4074950
400830	210320	56	2765000	3426950
400840	210320	56	2031000	2725950
400851	210320	56	4153000	4810950
400860	210320	56	1191000	1905950
400870	210320	56	421000	1159950
400880	210320	55	11035000	11720950
400890	210320	55	11782000	12509950
400900	210320	55	10172000	10961950
400910	210320	55	9332000	10074950
400920	210320	55	8561000	9275950
400930	210320	55	7871000	8497950

400940	210320	55	7146000	7819950
400950	210320	55	6409000	7113950
400960	210320	55	5576000	6382950
400970	210320	55	4630000	5521950
400980	210320	55	3598000	4581950
400990	210320	55	2512000	3557950
401000	210320	55	1474000	2471950
401010	210320	55	452000	1435950
401020	210320	54	8667000	9589950
401030	210320	54	7773000	8628950
401040	210320	54	6828000	7746950
401050	210320	54	6013000	6756950
401060	210320	54	5150000	5956950
401070	210320	54	4320000	5083950
401080	210320	54	3409000	4278950
401090	210320	54	2593000	3360950
401100	210320	54	1732000	2548950
401110	210320	54	903000	1662950
490010	210321	57	13103000	13587950
490020	210321	59	425000	839950
490030	210321	57	3319000	3792950
490040	210321	57	2515000	3216950
490050	210321	57	1839000	2429950
490060	210321	57	1268000	1747950
490070	210321	57	721000	1185950
490081	210321	58	878000	1373950
490090	210321	58	1458000	2124950
490100	210321	58	2214000	2741950
490110	210321	58	2813000	3600950
490120	210321	58	3674000	4374950
490130	210321	58	11401000	12265950

**Eastern Extension Block 5**

Line Number	Date (YYMMDD)	Flight #	Start Fiducial	End Fiducial
500440	210402	76	12227000	13354950
500450	210402	76	11022000	12167950
500460	210331	72	11005000	12139950
500470	210331	72	9727000	10938950
500480	210331	72	8504000	9666950
500490	210331	72	7178000	8447950
500500	210331	72	5926000	7128950
500510	210331	72	4325000	5568950
500530	210331	72	3406000	4274950
500540	210331	72	847000	1805950
500550	210331	73	514000	1344950
500560	210331	73	1392000	2264950
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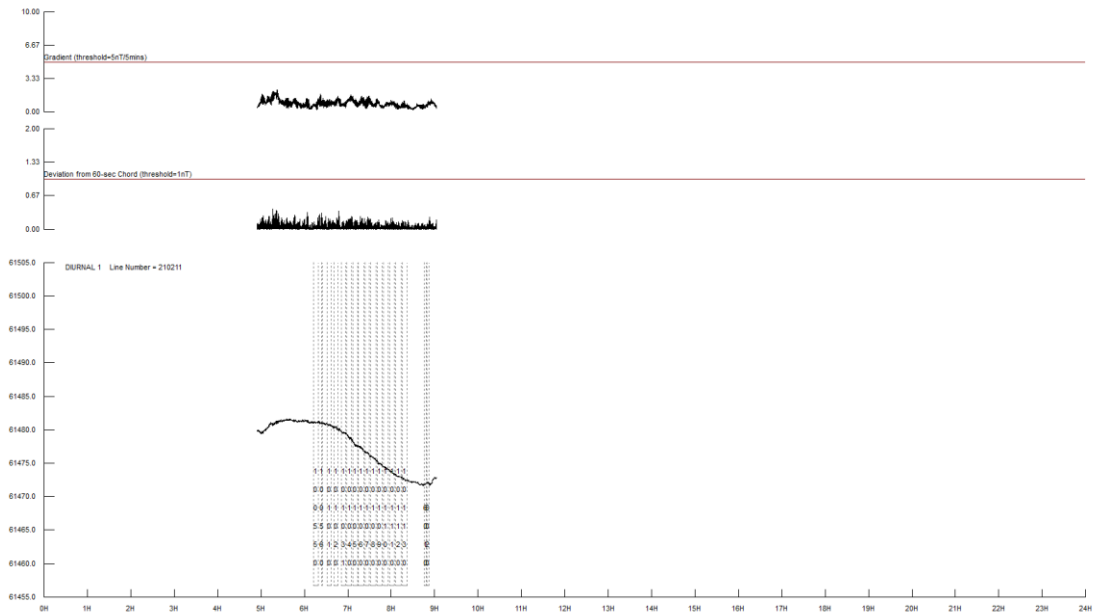
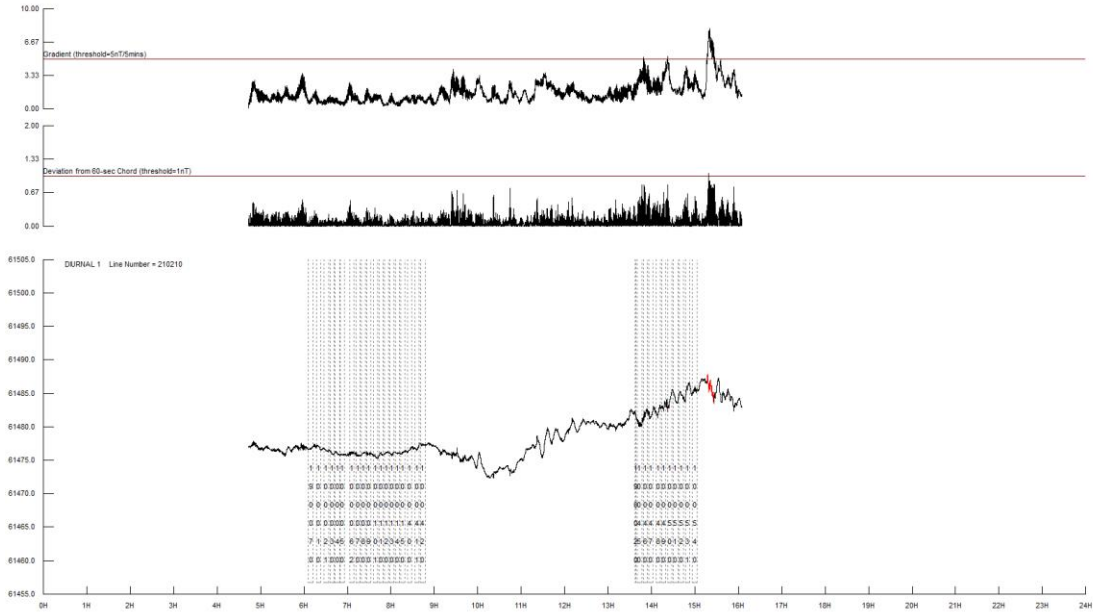
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# APPENDIX 6 DIURNAL BASE STATION PLOTS

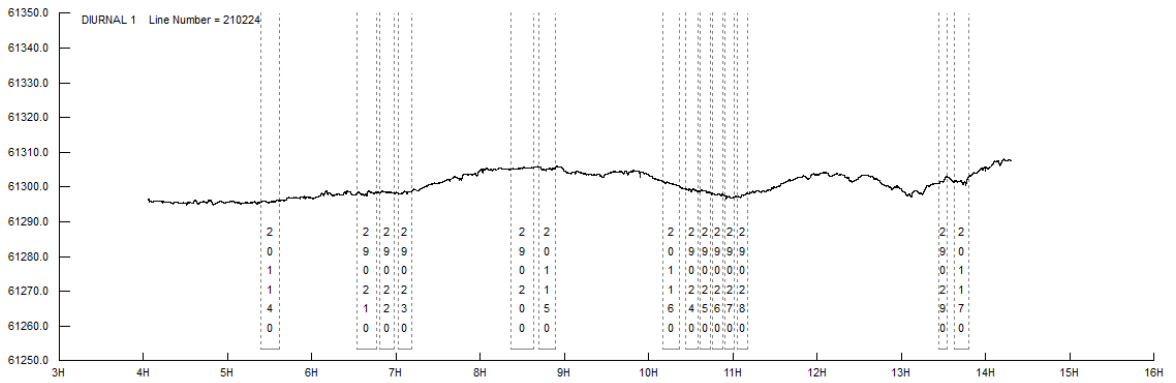
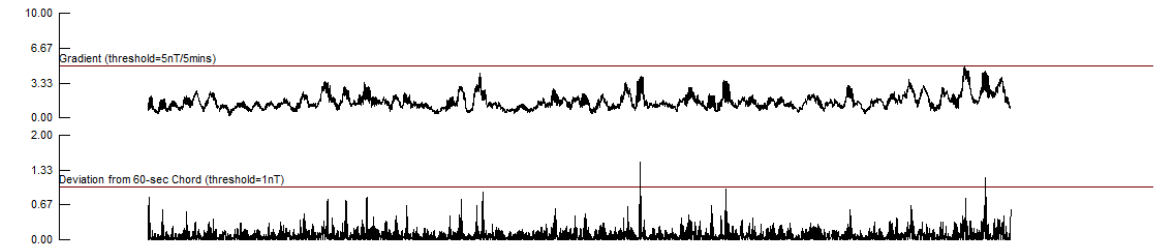
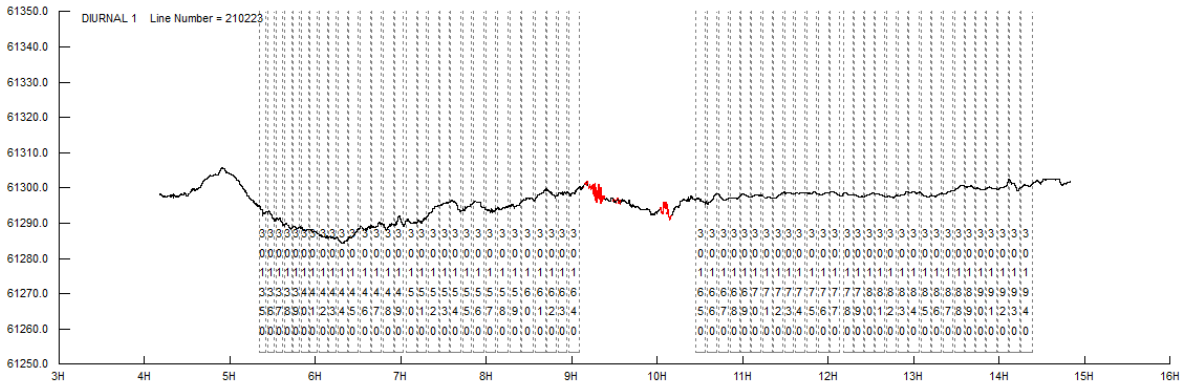
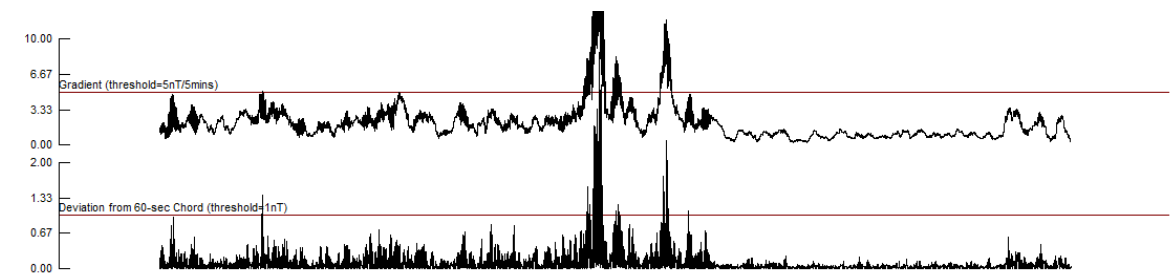
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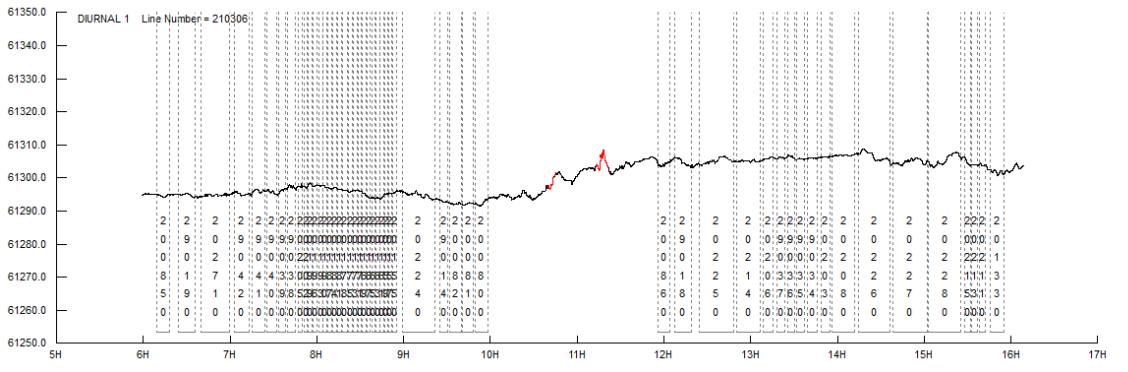
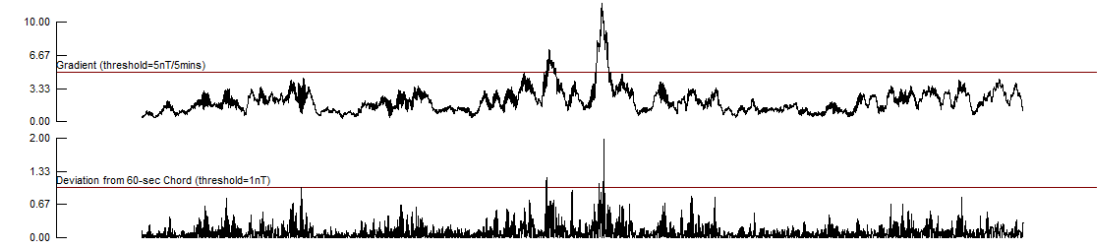
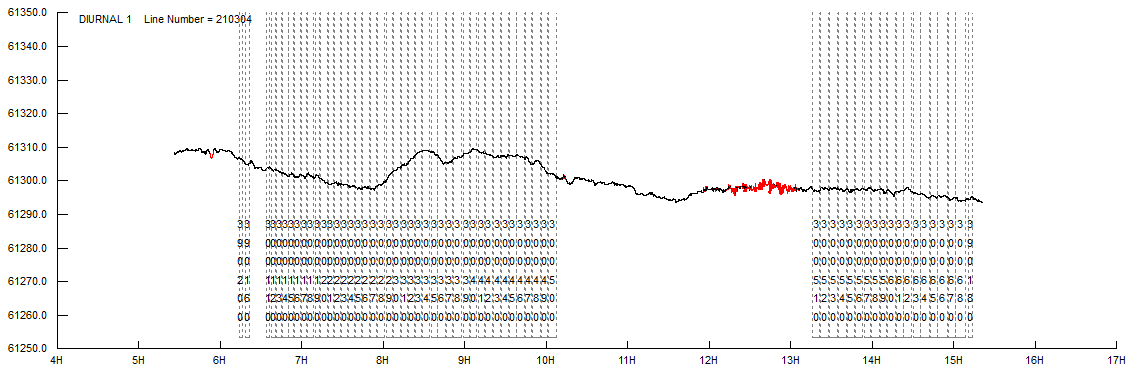
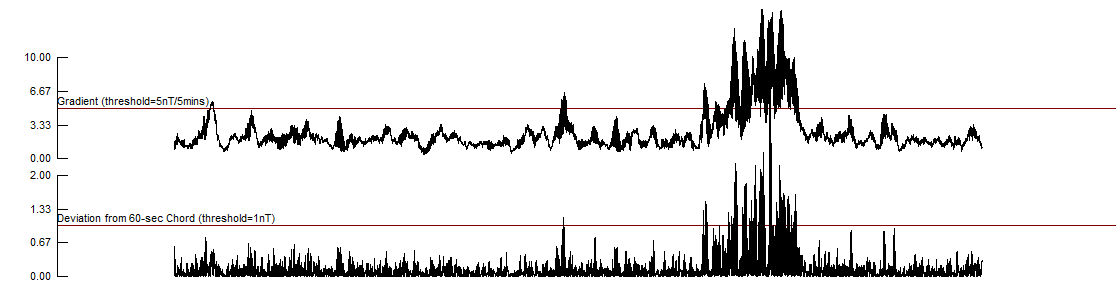






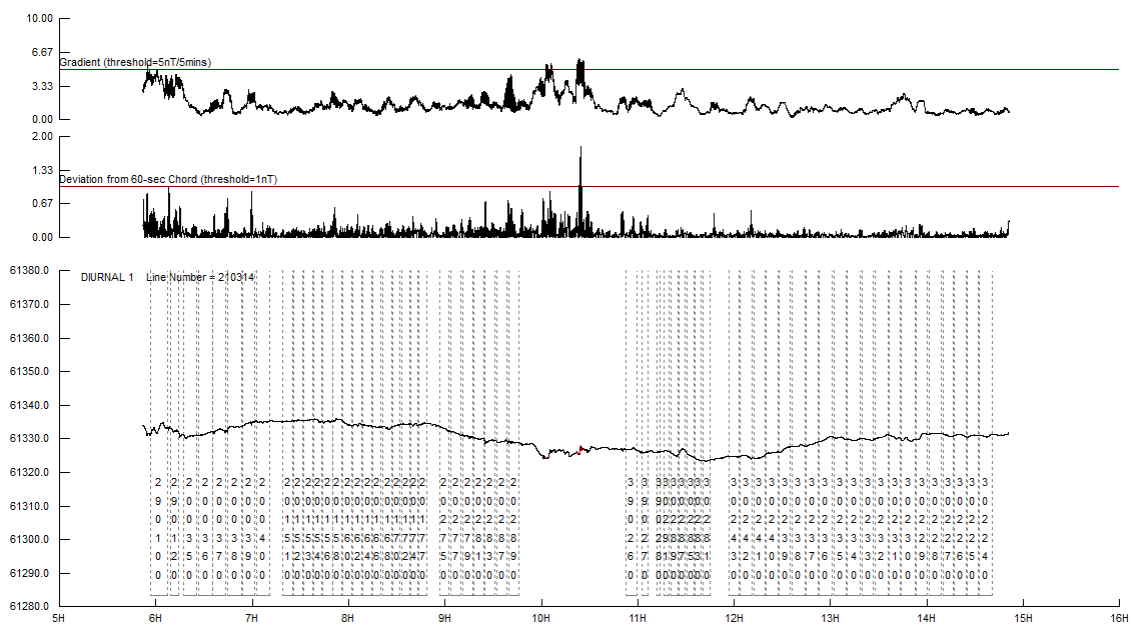
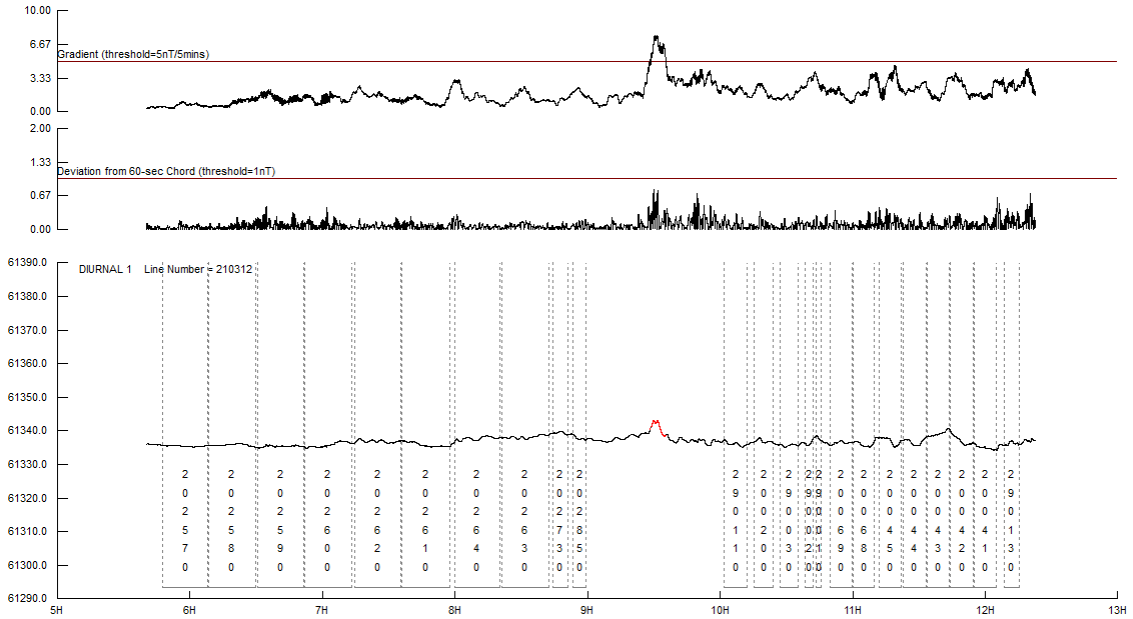


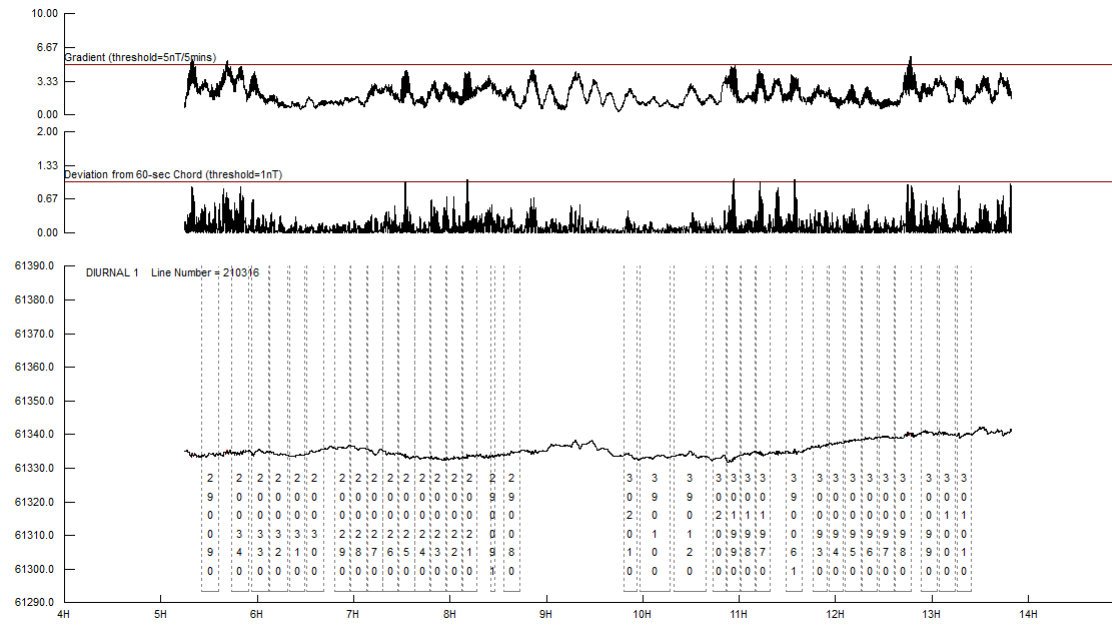
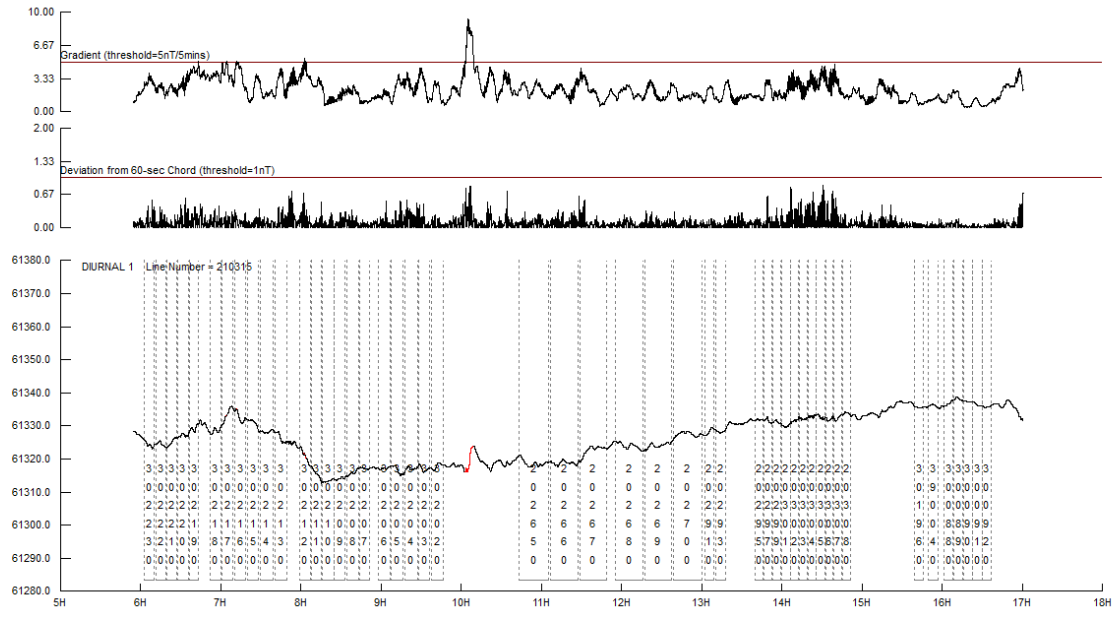


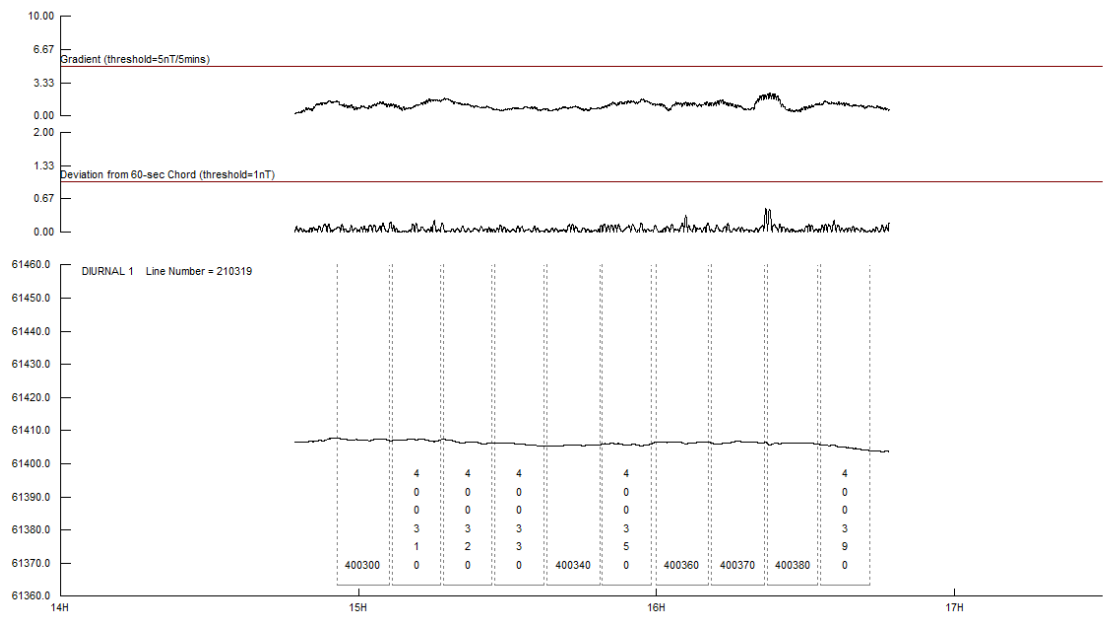
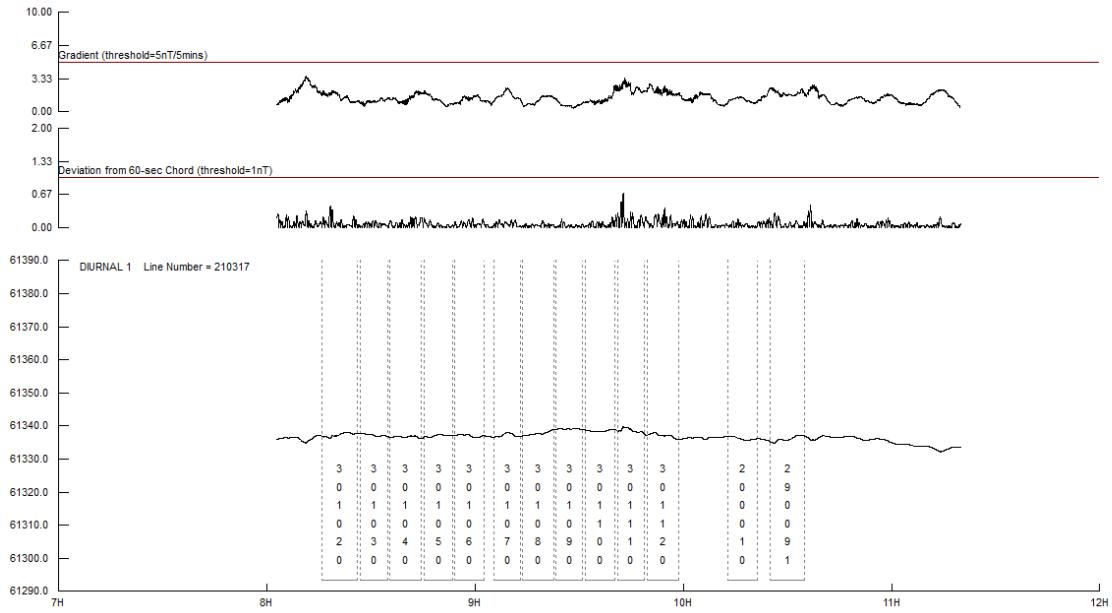






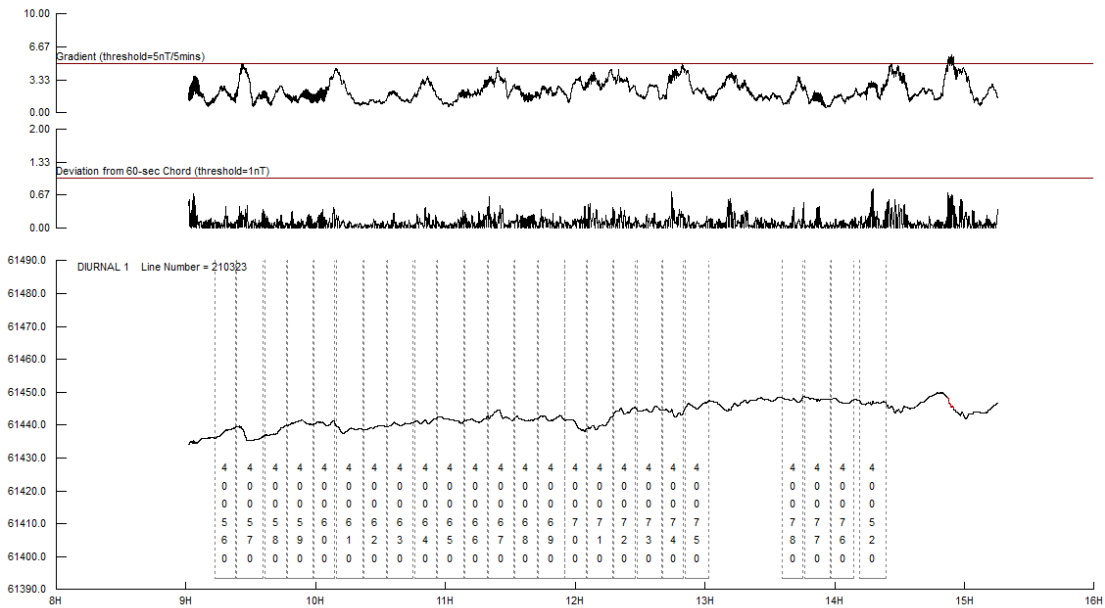
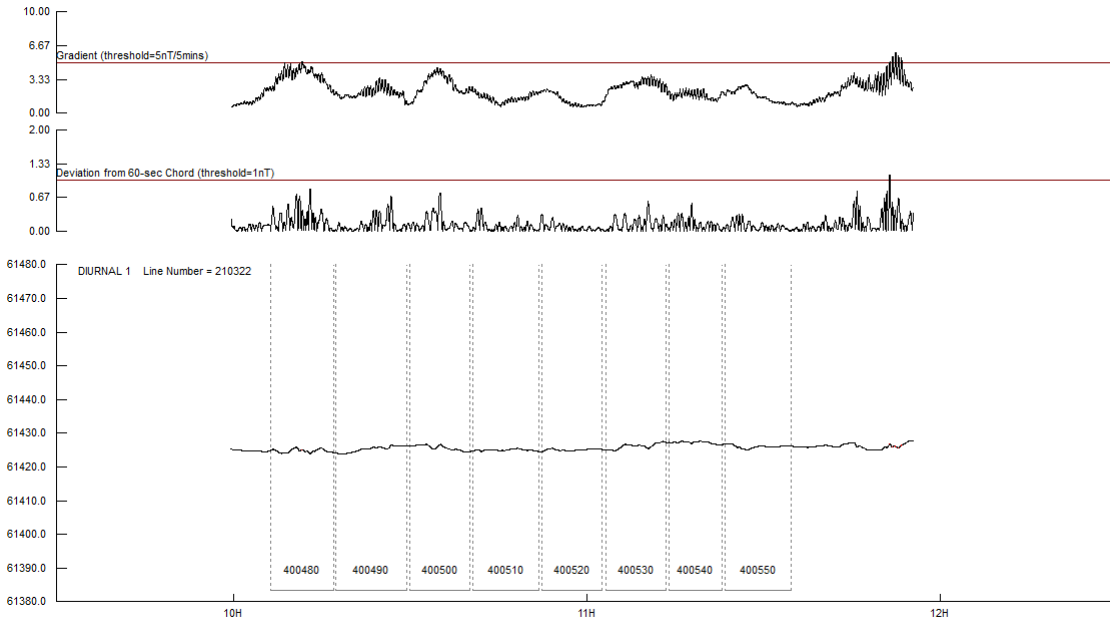




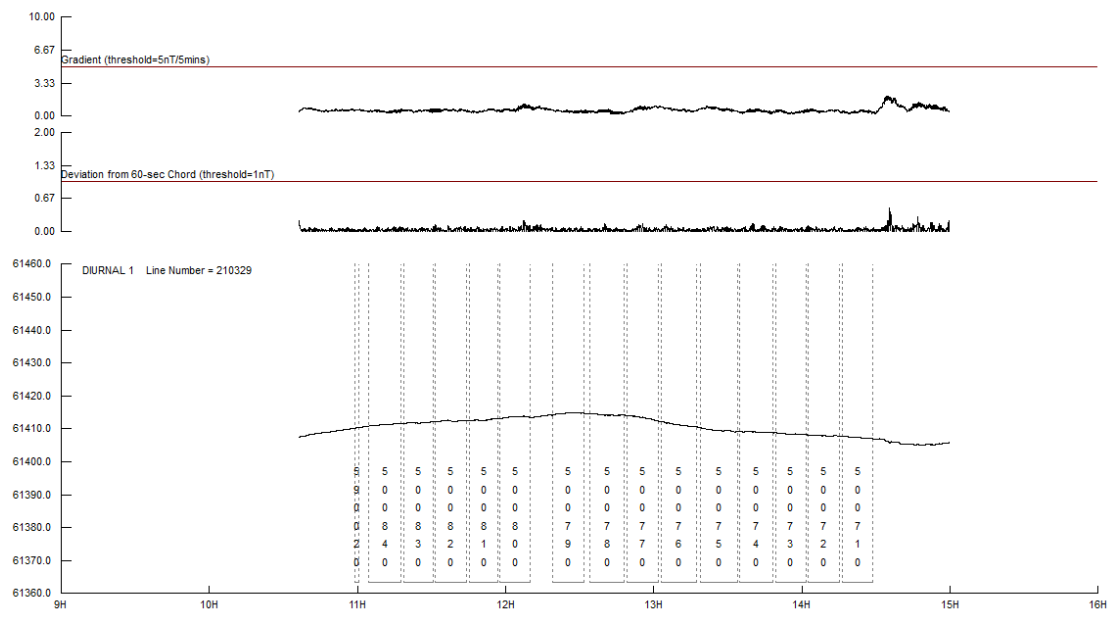
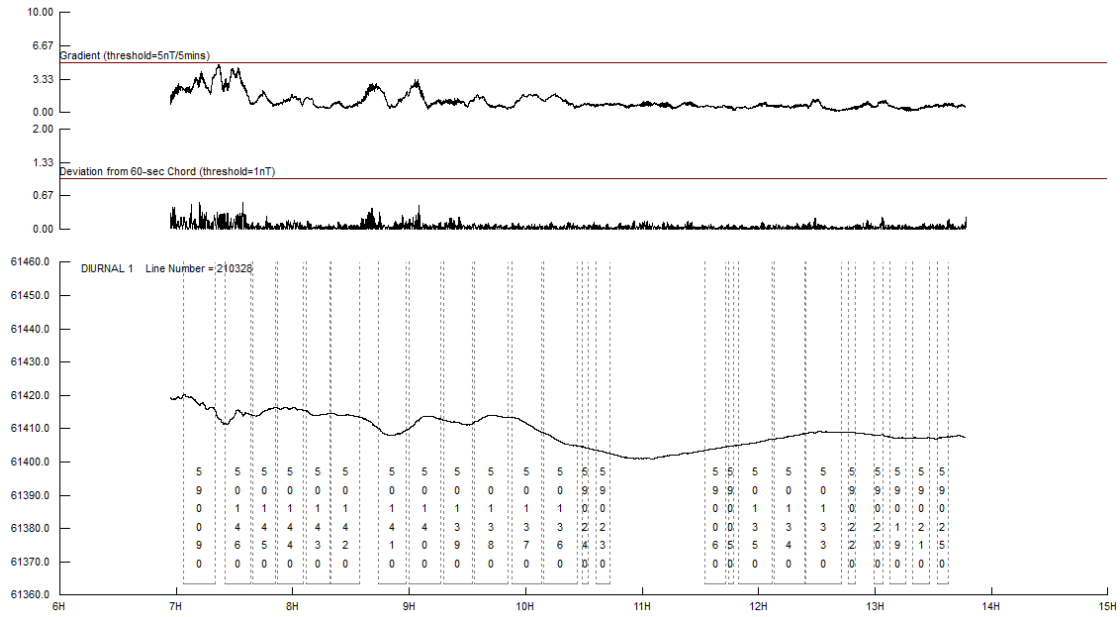


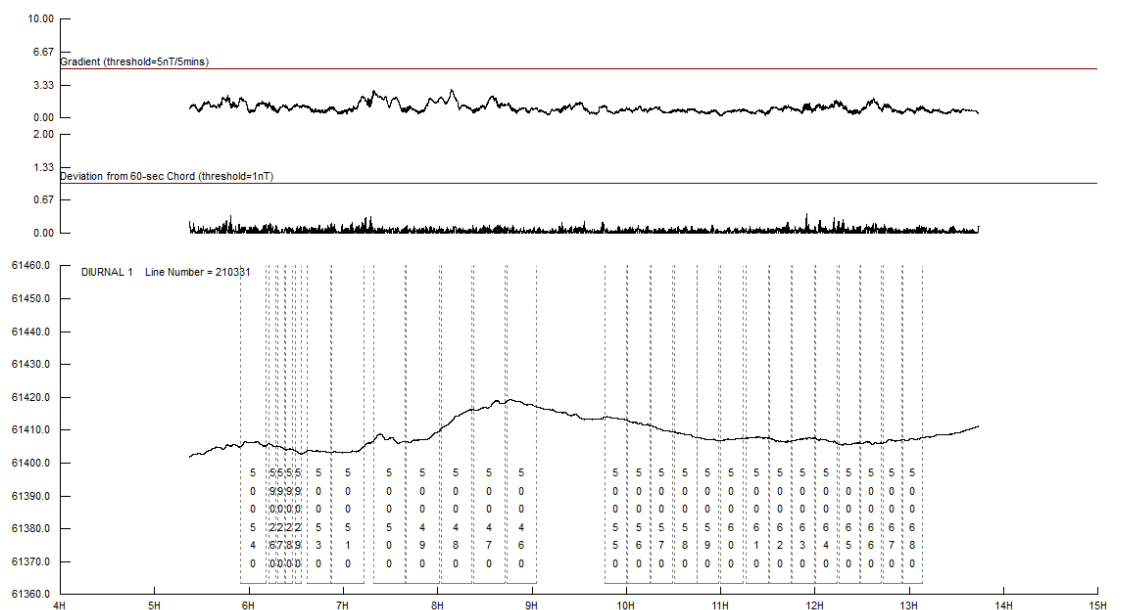
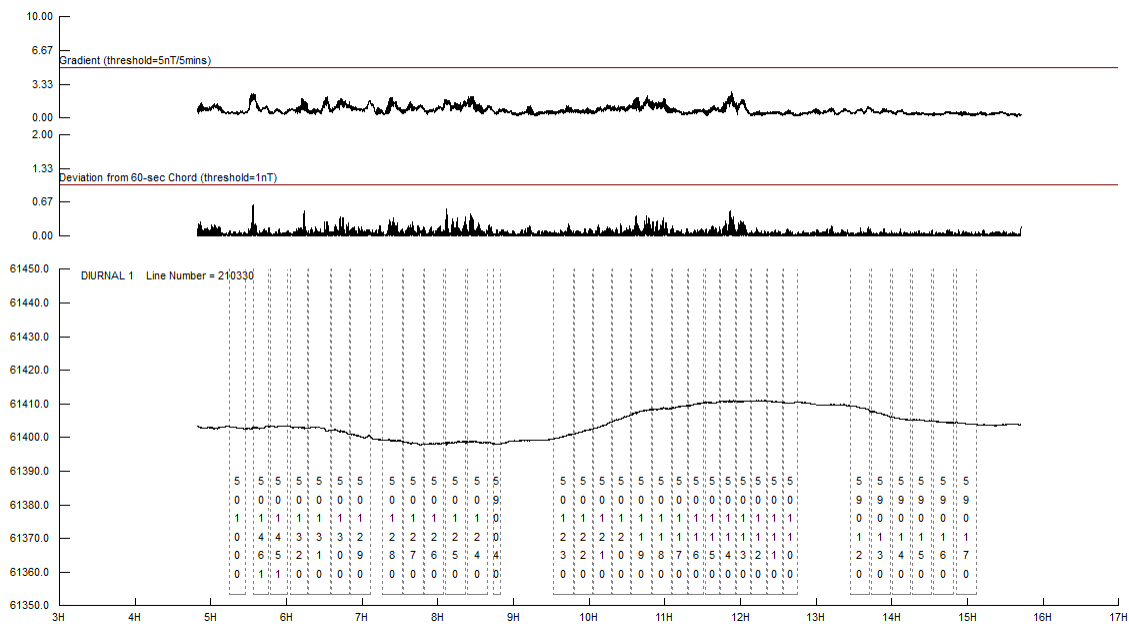














## APPENDIX 7 RADIOMETRIC SPECTRA

