

MEMORANDUM

| | | | |
|-----------------|--|---------------------|---|
| To: | Grant Williamson email: grant.willimason@uel.com.au | Affiliation: | Uranium Equities Ltd., Level 5, 95 King William St., Adelaide SA 5000 |
| From: | Jim Hanneson | Costing: | |
| Date: | 8 February 2011 | Reference: | AMG11/01 |
| Subject: | Radiometric and Magnetic and Terrain Images for the Headwaters Area, Uranium Equities Ltd., Arnhem Land, Northern Territory | | |

INTRODUCTION

Files of airborne data for the Headwaters Project, Arnhem Land, NT, have been provided by you on DVD for compilation and the creation of images for the Uranium Equities Ltd [UEL] tenements. This report presents images of terrain elevations, total magnetic intensity, residual magnetics and, after adjustments described below, total count radiometrics followed by potassium, uranium and thorium count rates.

DATA

The data as received were found in several directories and sub-directories, all of which had to be examined to determine survey locations with regard for the UEL tenement boundaries. ASCII files of the located data, with accompanying files describing the formats, were used here as the original data from which images below are derived. Magnetic and radiometric data were mostly found in separate files which doubled the reformatting efforts required prior to plotting of any data.

Table 1 presents a summary of the files received and the structure of the directory on the DVD on which the data was found. The names of all files were altered to reflect the local area and the date of the survey as indicated in the table caption.

All data files containing aeromagnetic data are plotted in Appendix A and are intended only to show the limits of each survey separately within the vicinity of tenements. The root name of each data file is indicated in the inset text block and relates to the "New Name" column in Table 1.

COMPILED IMAGES AND PROCESSING

Of the several surveys available it was agreed via email that this initial compilation would be comprised of the four largest surveys. They are seen in Figures A3 (BU_9705), A6 (DA_9707), A8 (EA_0505) and A10 (HW_1008) in Appendix A.

Other smaller surveys can be presented later at enlarged scales as required, perhaps after individual prospect areas have been selected. A number of smaller airborne electromagnetic (AEM) surveys are also available as noted in Table 1, and of these, all have files of apparent conductivity that may be

useful if the area is considered prospective for unconformity style uranium associated with graphitic conductors (as in northern Saskatchewan, Canada).

The initial compilation of the data was a simple concatenation of the four agreed files; however, significant base level differences between surveys were evident in all channels of the data – except perhaps for the terrain elevations shown in Figure 1, although the southernmost survey (HW_1008) might benefit from a relative upward shift of 20 metres. Any elevation bench marks that you may have within each survey area could be used to re-level the surveys. If the radiometric data is to be treated like geochemical data then surface drainage patterns inferred from the terrain may be useful in assessing local anomalies and their origins.

To create the aeromagnetic image shown in Figure 2.1, I added 400nT to survey EA_0505, -366nT to survey BU_9705 and -152nT to survey DA_9707. The results seem to be reasonable as no survey boundaries are evident in either the TMI in Figure 2.1 or the magnetic residual of Figure 2.2.

Initial images showed major base level differences in the radiometric images, presumably due to different scintillometer crystal volumes. However I began by creating images of certain ratios (K/TC, U/TC and Th/TC, where TC = total count) on the assumption that normalising to the total count rate would yield images relatively independent of the sensor equipment and/or surface moisture conditions at the time of flying. The results shown in Appendix B suggest that this assumption is invalid and that base level shifts are required.

To determine the shifts required to bring the various radiometric components of the surveys into line, I calculated the mean and standard deviation for each component of each survey. The results are summarised in Table 2a and show that the averages differ from survey to survey

Table 2a. Statistics report *before* base level adjustments

| <u>Statistics Report for Input File = HW FINR.TMP</u> | | | | | | |
|---|---------|-------------|------------|------------|------------|-----------|
| Survey Code: "97Bul " 1033523 records (BU_9705) | | | | | | |
| Field | Columns | Min | Mean | Max | Std Dev | Label |
| 1 | 119-127 | -0.7693E+01 | 0.2420E+02 | 0.1667E+03 | 0.2351E+02 | Potassium |
| 2 | 128-136 | 0.0000E+00 | 0.1852E+02 | 0.1071E+03 | 0.6379E+01 | Uranium |
| 3 | 137-145 | -0.7120E+00 | 0.3455E+02 | 0.1910E+03 | 0.1499E+02 | Thorium |
| 4 | 146-156 | 0.0000E+00 | 0.7572E+03 | 0.3719E+04 | 0.2959E+03 | TotCount |
| Survey Code: "97Jul " 784366 records (DA_9707) | | | | | | |
| Field | Columns | Min | Mean | Max | Std Dev | Label |
| 1 | 119-127 | 0.6000E+01 | 0.3522E+02 | 0.2627E+03 | 0.1678E+02 | Potassium |
| 2 | 128-136 | 0.1000E+01 | 0.2256E+02 | 0.1665E+03 | 0.1113E+02 | Uranium |
| 3 | 137-145 | 0.1500E+01 | 0.2449E+02 | 0.2352E+03 | 0.1631E+02 | Thorium |
| 4 | 146-156 | 0.1929E+03 | 0.5706E+03 | 0.4080E+04 | 0.2903E+03 | TotCount |
| Survey Code: "05Cam " 44693 records (EA_0505) | | | | | | |
| Field | Columns | Min | Mean | Max | Std Dev | Label |
| 1 | 119-127 | -0.2190E+02 | 0.2856E+02 | 0.1832E+03 | 0.1678E+02 | Potassium |
| 2 | 128-136 | 0.1380E+02 | 0.3928E+02 | 0.3064E+03 | 0.1662E+02 | Uranium |
| 3 | 137-145 | 0.0000E+00 | 0.4527E+01 | 0.9000E+01 | 0.2875E+01 | Thorium |
| 4 | 146-156 | 0.6518E+03 | 0.1160E+04 | 0.6478E+04 | 0.3685E+03 | TotCount |
| Survey Code: "10Aug " 232479 records (HW_1008) | | | | | | |
| Field | Columns | Min | Mean | Max | Std Dev | Label |
| 1 | 119-127 | 0.3200E+02 | 0.1265E+03 | 0.1728E+04 | 0.5689E+02 | Potassium |
| 2 | 128-136 | 0.1300E+02 | 0.8349E+02 | 0.1782E+04 | 0.3144E+02 | Uranium |
| 3 | 137-145 | 0.1500E+02 | 0.8624E+02 | 0.3640E+03 | 0.3913E+02 | Thorium |
| 4 | 146-156 | 0.6610E+03 | 0.2119E+04 | 0.3198E+05 | 0.8169E+03 | TotCount |

Table 2b indicates the shifts applied to the four components of the first three surveys above to make the averages the same as for the respective components in the fourth survey. After adjustments, the means were consistent from area to area as indicated in Table 2c.

Table 2. Amounts added to the means surveys EA_0505, DA_9705 and BU_9705 them the same as the means of survey HW_1008.

| Survey | "05Cam" EA0505 | "97Jul" DA9705 | "97Bul" BU9705 |
|-----------|----------------|----------------|----------------|
| Potassium | 97.94 | 91.28 | 102.30 |
| Uranium | 44.21 | 60.93 | 64.97 |
| Thorium | 81.71 | 61.75 | 51.69 |
| TotCount | 959.00 | 1548.40 | 1361.80 |

Table 2c. Statistics report *after* base level adjustments

Statistics Report for Input File = HW FINR.MGA

| Survey Code: "97Bul" " 1033523 records (BU_9705) | | | | | | |
|--|---------|------------|------------|------------|------------|-----------|
| Field | Columns | Min | Mean | Max | Std Dev | Label |
| 1 | 119-127 | 0.9461E+02 | 0.1265E+03 | 0.2690E+03 | 0.2351E+02 | Potassium |
| 2 | 128-136 | 0.6497E+02 | 0.8349E+02 | 0.1720E+03 | 0.6379E+01 | Uranium |
| 3 | 137-145 | 0.5098E+02 | 0.8624E+02 | 0.2427E+03 | 0.1499E+02 | Thorium |
| 4 | 146-156 | 0.1362E+04 | 0.2119E+04 | 0.5081E+04 | 0.2959E+03 | TotCount |

| Survey Code: "97Jul" " 784366 records (DA_9707) | | | | | | |
|---|---------|------------|------------|------------|------------|-----------|
| Field | Columns | Min | Mean | Max | Std Dev | Label |
| 1 | 119-127 | 0.9728E+02 | 0.1265E+03 | 0.3540E+03 | 0.1678E+02 | Potassium |
| 2 | 128-136 | 0.6193E+02 | 0.8349E+02 | 0.2274E+03 | 0.1113E+02 | Uranium |
| 3 | 137-145 | 0.6325E+02 | 0.8624E+02 | 0.2969E+03 | 0.1631E+02 | Thorium |
| 4 | 146-156 | 0.1741E+04 | 0.2119E+04 | 0.5629E+04 | 0.2903E+03 | TotCount |

| Survey Code: "05Cam" " 44693 records (EA_0505) | | | | | | |
|--|---------|------------|------------|------------|------------|-----------|
| Field | Columns | Min | Mean | Max | Std Dev | Label |
| 1 | 119-127 | 0.7604E+02 | 0.1265E+03 | 0.2811E+03 | 0.1678E+02 | Potassium |
| 2 | 128-136 | 0.5801E+02 | 0.8349E+02 | 0.3506E+03 | 0.1662E+02 | Uranium |
| 3 | 137-145 | 0.8171E+02 | 0.8624E+02 | 0.9071E+02 | 0.2875E+01 | Thorium |
| 4 | 146-156 | 0.1611E+04 | 0.2119E+04 | 0.7437E+04 | 0.3685E+03 | TotCount |

| Survey Code: "10Aug" " 232479 records (HW_1008) | | | | | | |
|---|---------|------------|------------|------------|------------|-----------|
| Field | Columns | Min | Mean | Max | Std Dev | Label |
| 1 | 119-127 | 0.3200E+02 | 0.1265E+03 | 0.1728E+04 | 0.5689E+02 | Potassium |
| 2 | 128-136 | 0.1300E+02 | 0.8349E+02 | 0.1782E+04 | 0.3144E+02 | Uranium |
| 3 | 137-145 | 0.1500E+02 | 0.8624E+02 | 0.3640E+03 | 0.3913E+02 | Thorium |
| 4 | 146-156 | 0.6610E+03 | 0.2119E+04 | 0.3198E+05 | 0.8169E+03 | TotCount |

The procedure was beneficial to images of Total Count, Potassium and Uranium, as can be seen in Figures 3.1, 3.2 and 3.3 respectively. Unfortunately Figure 3.4 for Thorium shows that the shift applied to the Thorium component of Survey EA_0505 in the far north may be inappropriate. I also note that the blandness of this area is reflected in the very low standard deviation indicated in Tables 2a and 2c. I have ensured that the correct component was being selected from the original file and, at time of writing, wonder if the header record pertaining to the original file could have an error. Further tests could be carried out at your request if the thorium component of this survey is deemed critical.

Finally I used the final file with the adjusted backgrounds to create the image of U^2/Th shown in Figure 3.5. While individual uranium anomalies may be better highlighted, survey boundaries are apparent, as is minor mislevelling along east-west lines in the central area.

Applying base level shifts to the data appear beneficial but are not necessarily legitimate. If survey boundaries coincide with geological domain boundaries, then base level differences may be caused by different radiation properties of the surface material.

The smaller surveys shown in Appendix A but not used here are in areas already covered by the larger surveys. The closer line spacings would show greater detail if these surveys are in areas selected for follow up. I have also noted that some of these data files have apparent conductivity information derived from the AEM channels in the event that this latter data stream is considered useful

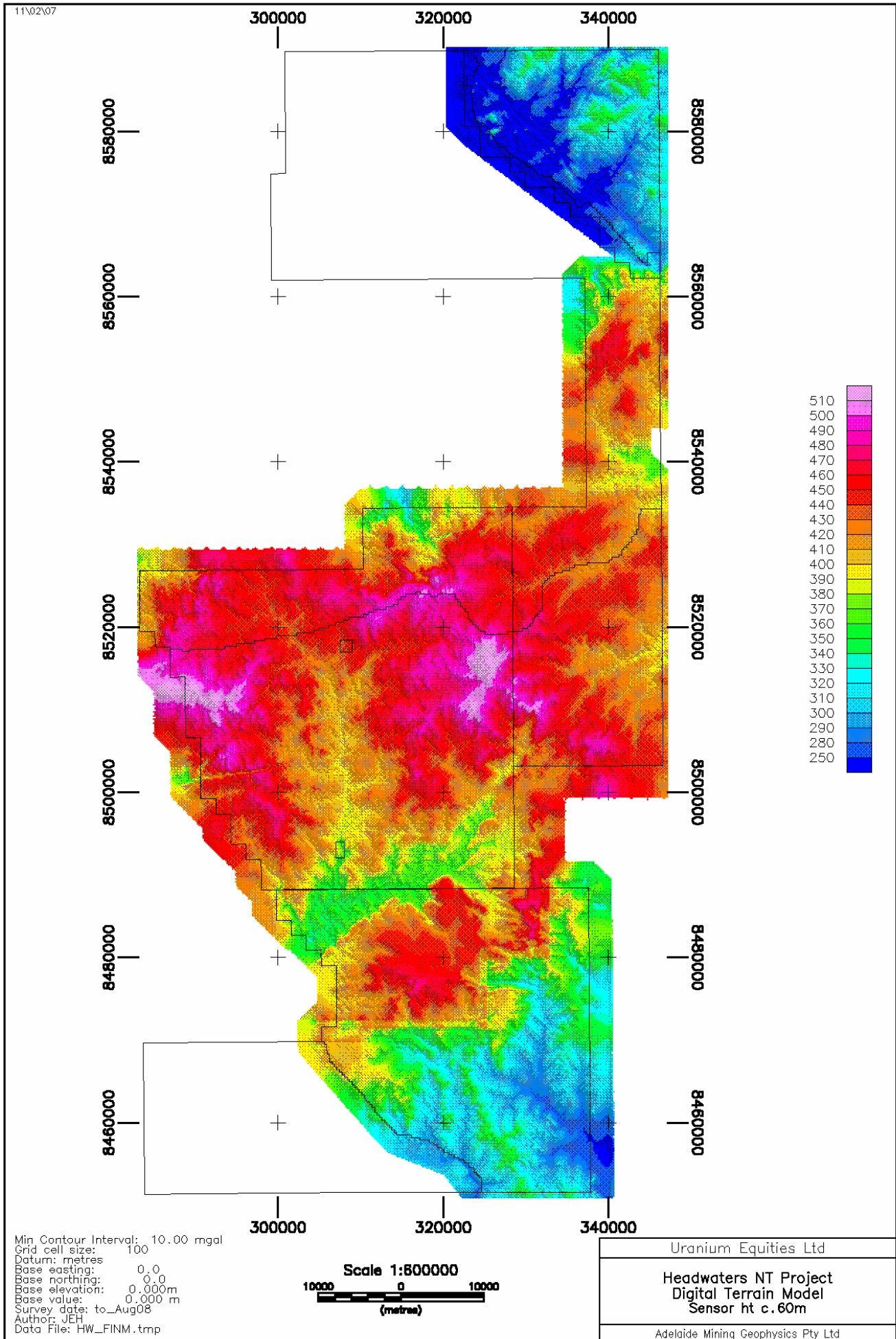


Figure 1

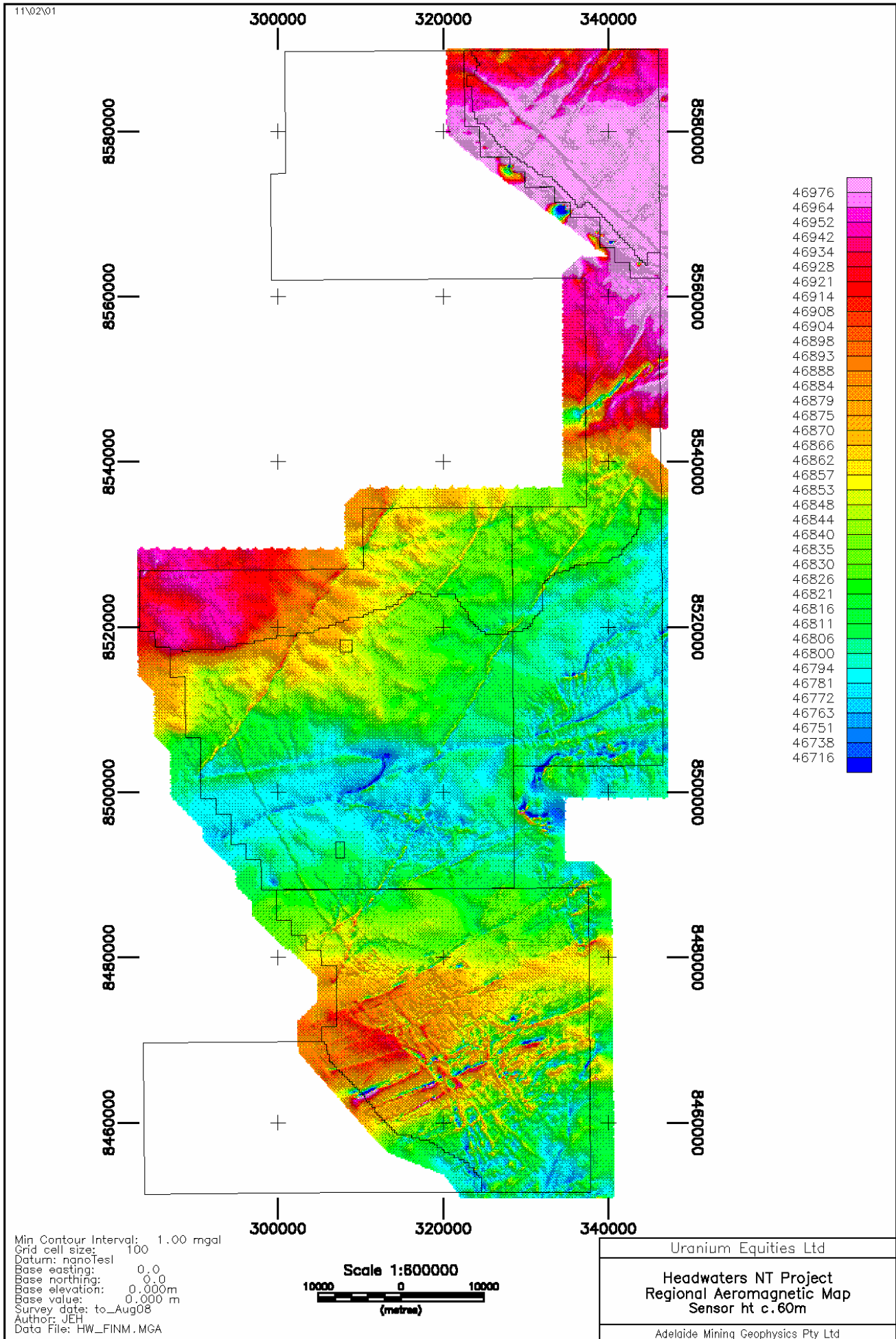


Figure 2.1

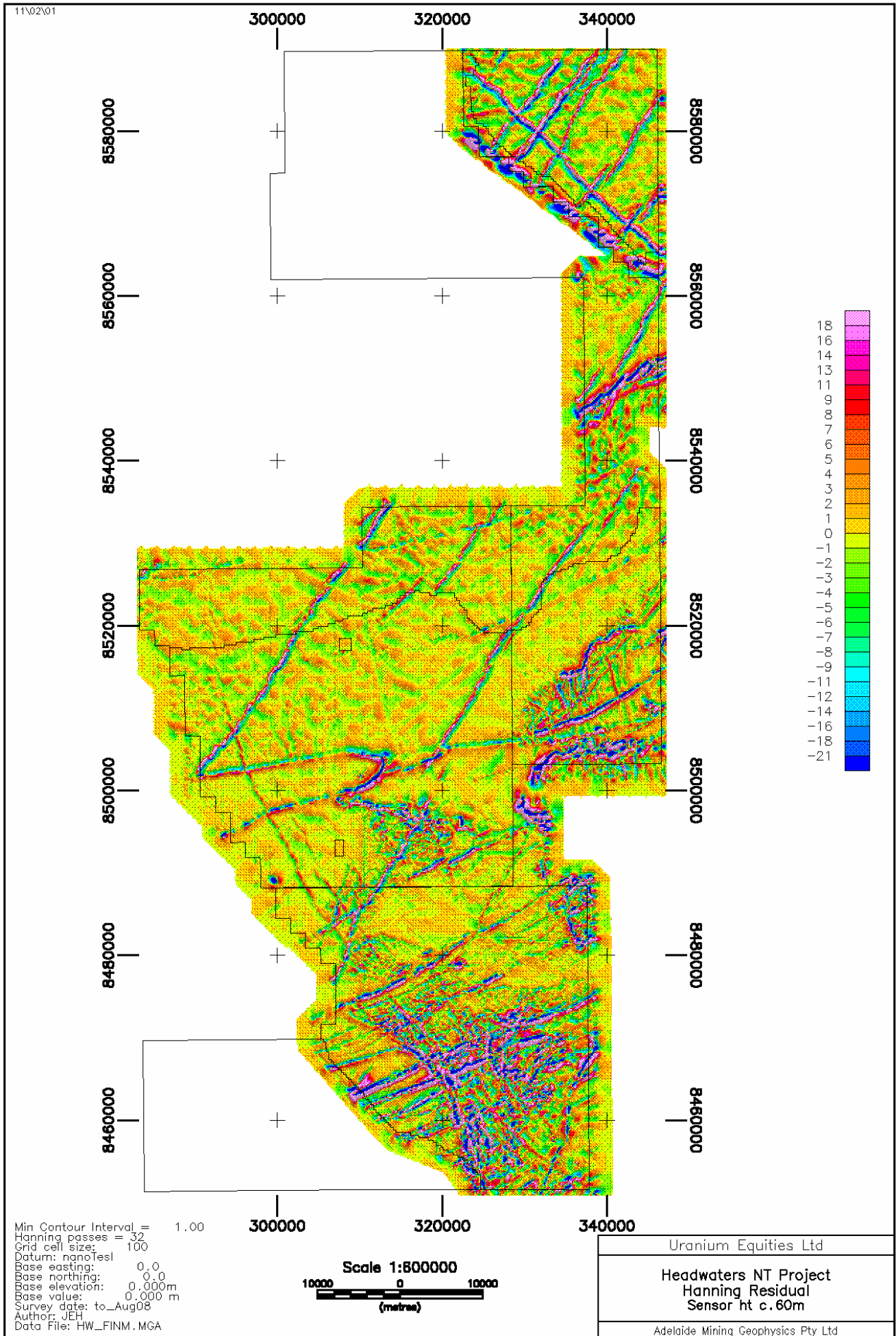


Figure 2.2

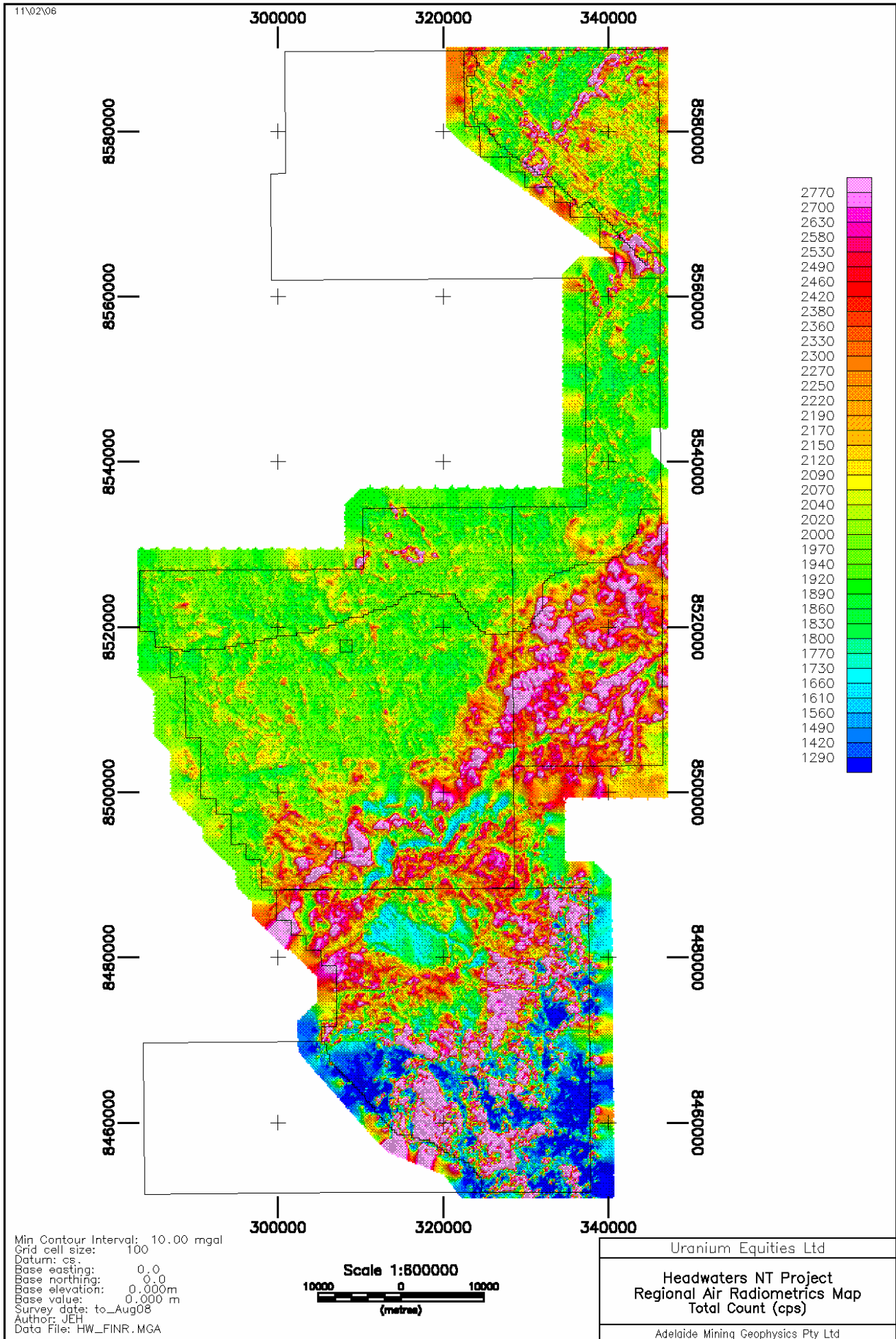


Figure 3.1

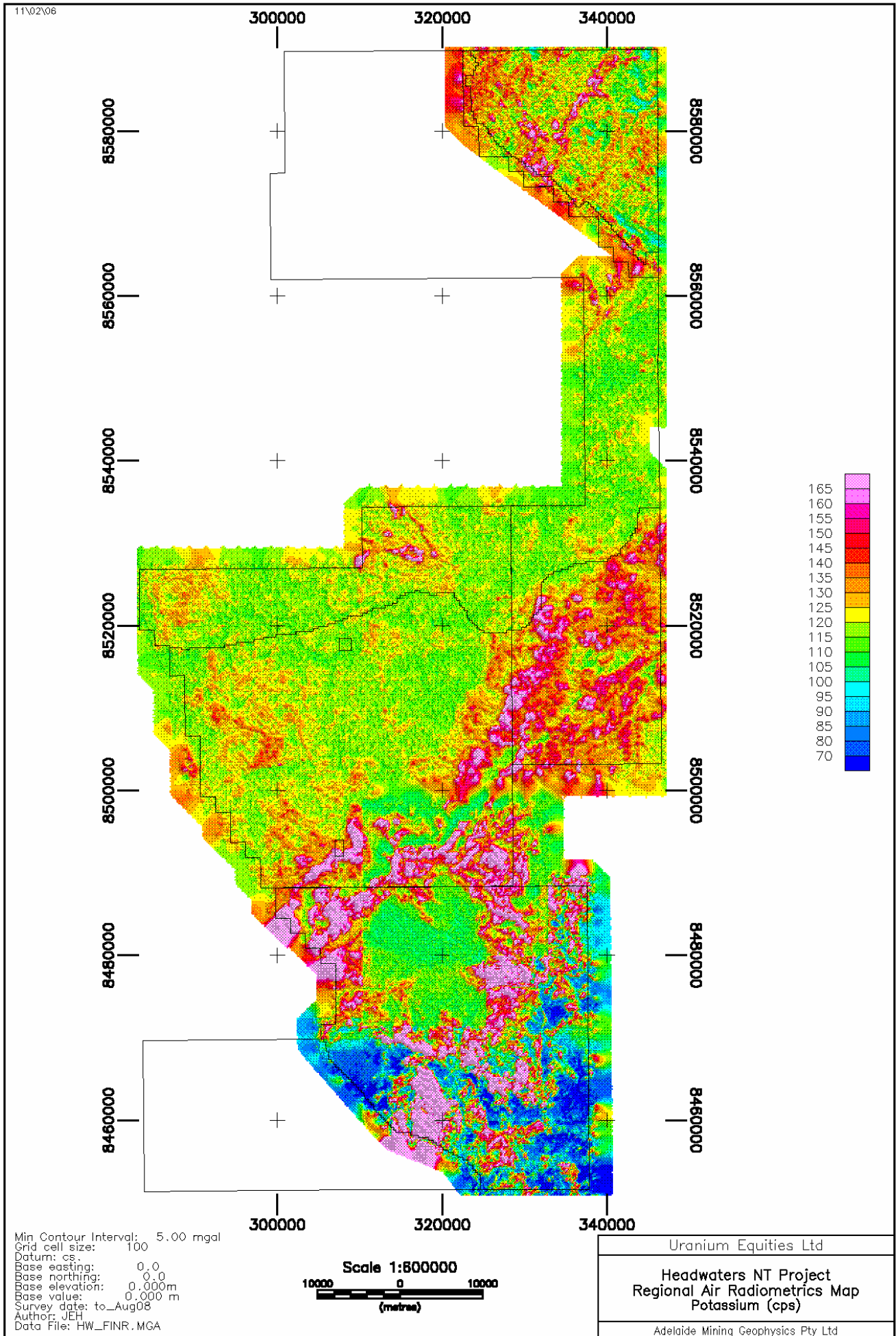


Figure 3.2

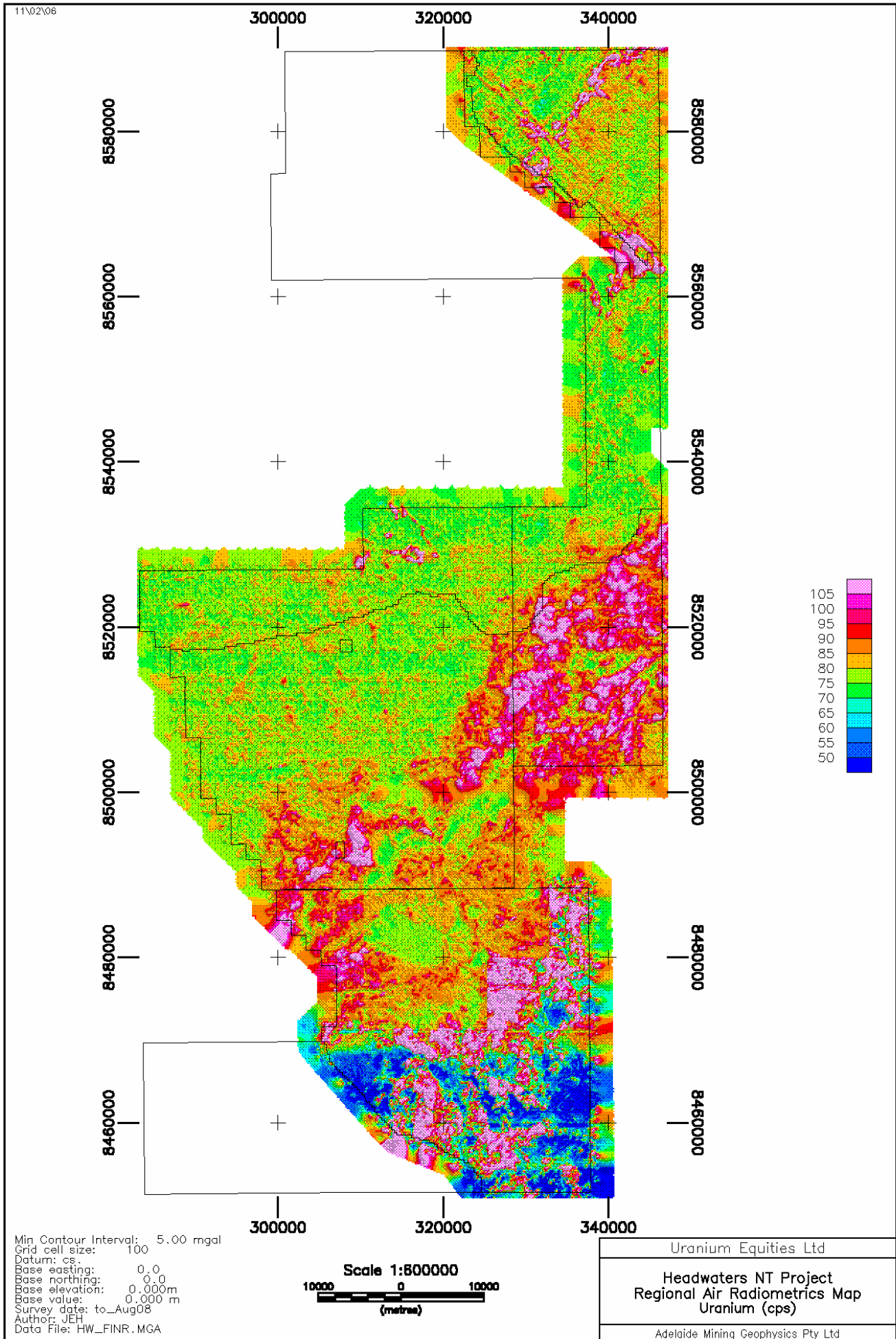


Figure 3.3

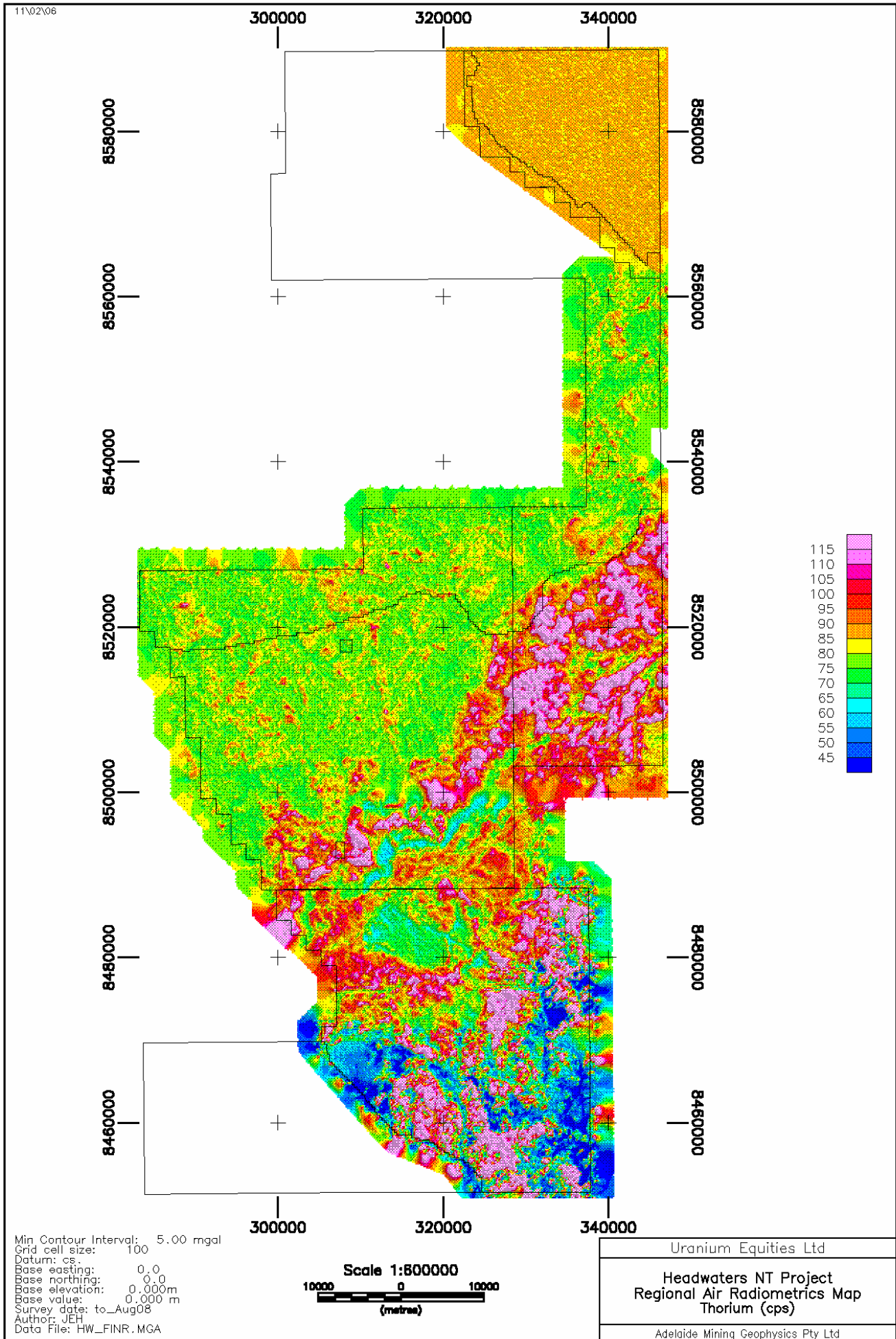


Figure 3.4

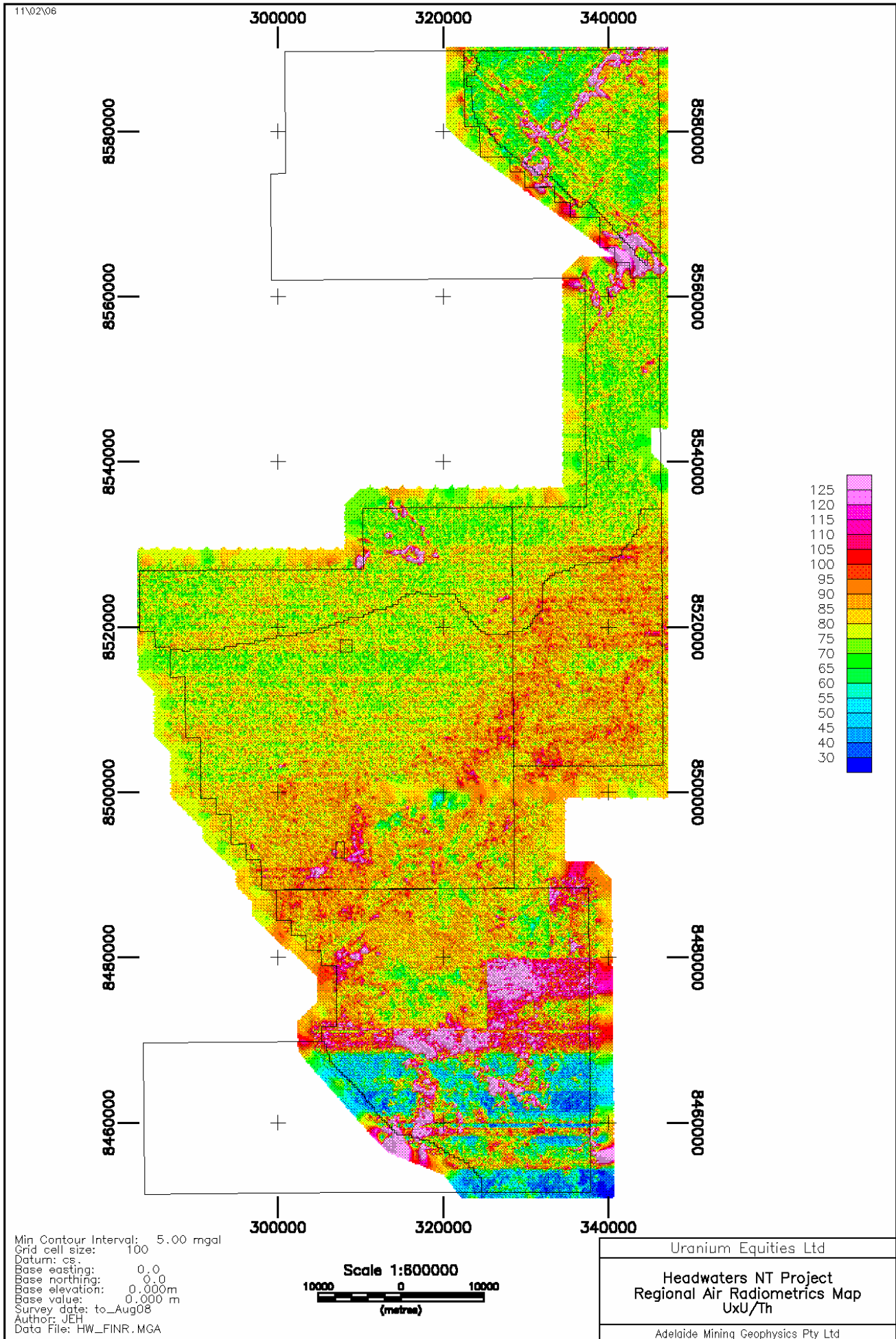


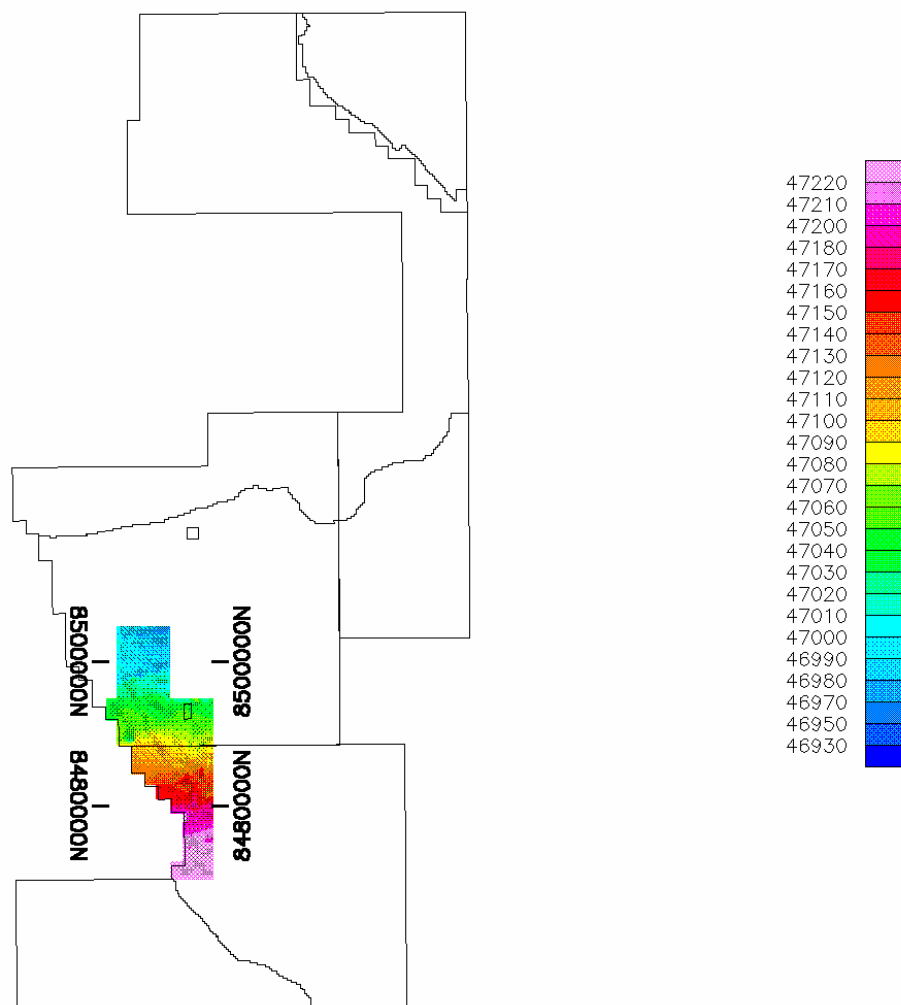
Figure 3.5

Table 1. Data files received on DVD for the Headwaters compilation. All directory names are preceded on DVD by
E:\HEADWATERS\dave burt june 2010\Geophysical Images\NTGS)Open File Data. New file names reflect area and date acquired
(eg. In "HW_1008.MGA"; "HW" means Headwaters; "1008" means 2010, August; "MGA" means converted if necessary to AGD94 MGA)

| DVD Directory | Original File Name(s) | Surveyor | New Name | Figure | Comments on availability & current status |
|--|---|---|--|---------------------------------------|--|
| Disk2 | mag_dtm.dat, rad.dat | Thompson 2010 | HW_1008.MGA | A10 | Mags, Rads & DTM reformatted; mags plotted |
| Cameco_EA | ea_atem.dat, ea_amag.dat, ea_arad.dat | Fugro 2005 | EA_0505.MGA | A8 | Mags, Rads & DTM reformatted; mags plotted |
| CR19980426\ Airborne Data\ Ground Data\ Raw Ground Data\ | airborne_WGS.XYZ | WGS Corp | DA_9707.MGA | A7 | Mags, Rads reformatted; mags plotted Ground data not examined here Ground data not examined here |
| CR19990287\ Casper-Banshee\ Deaf Adder\ Flying Ghost\ | CR19990287.ZIP banshee_dtm.gdf, dfn Banshee_heliborn_EM.gdf, dfn Banshee_mags.gdf, dfn Banshee_rads.gdf, dfn Deaf_adder_aem.gdf, dfn Deaf_adder_mags.gdf, dfn Deaf_adder_rads.gdf, dfn Flying_ghost_dtm.gdf, dfn Flying_ghost_aem.gdf, dfn Flying_ghost_mags.gdf, dfn Flying_ghost_rads.gdf, dfn | Dighem? 1998 Dighem? 1997 Dighem? 1998 | BA_9807T.MGA BA_9807C.MGA BA_9807M.MGA BA_9807R.MGA DA_9707M.MGA DA_9707R.MGA FG_9807M.MGA FG_9807R.MGA | - - A2 - A6 A9 | Contains located data files for sub areas DTM available, not reformatted AEM conductivity available; not reformatted Mags reformatted & replotted Rads reformatted, not plotted AEM not reformatted Reformatted & plotted Reformatted, not plotted DTM available, not reformatted or plotted AEM conductivity available, not reformatted Mags reformatted and plotted Rads reformatted, not plotted |
| CR20000260\ Geophysics\ Cameco\ Stockdale\ Geophysics_Down_Hole\ | sp_dtm.dat, sp_arad.dat, ap_amag.dat dasd_amag.gdf, dfn | Unknown Unknown | SP_9907M.MGA SP_9907R.MGA | A1 - | Mags and Rads found in separate files. Mags plotted No coords in file ; survey location unknown Down-hole data not examined here |
| CR20010272\ Geophysics\ Geoterrex\ Haines\ UTS\ | da_hem.dat dal_dtm.gdf, dfn dal_mag.gdf, dfn dal_rad.gdf, dfn dasd_amag.gdf, dfn | Dighem? Haines UTS Surveys UTS Surveys | DA_9807M.MGA | | Mags and Apparent conductivity available; mags only plotted 144 gravity stations available; not reformatted Mags plotted, rads reformatted, not plotted Dtm available, not plotted No coords in file ; file is small, may warrant further search |
| CR20020048\ Bulman\ Amag\1997\Area1 \Area2 \1998 Dighem\ GmagGrav\ | located.dat located.dat EL8437_located_data.dat 392A.XYZ 392B.XYZ Bulman_Gmag_Grav.csv | WGS Corp WGS Corp WGS Corp Dighem Ltd Dighem Ltd Unknown | BU_9705.MGA BU_9708.MGA BU_9802.MGA AR_9810.MGA AR_9811.MGA | A3 A4 A5 A11 A12 | Mags, rads & dtm available in single file; mags only plotted Mags, rads & dtm available in single file; mags only plotted Mags, rads (dtm?) in single file; mags only plotted Mags & conductivity available; mags only plotted Mags & conductivity available; mags only plotted 41,309 ground mag stations; not reformatted or plotted |

APPENDIX A

Images of Separate Surveys in the Headwaters Region



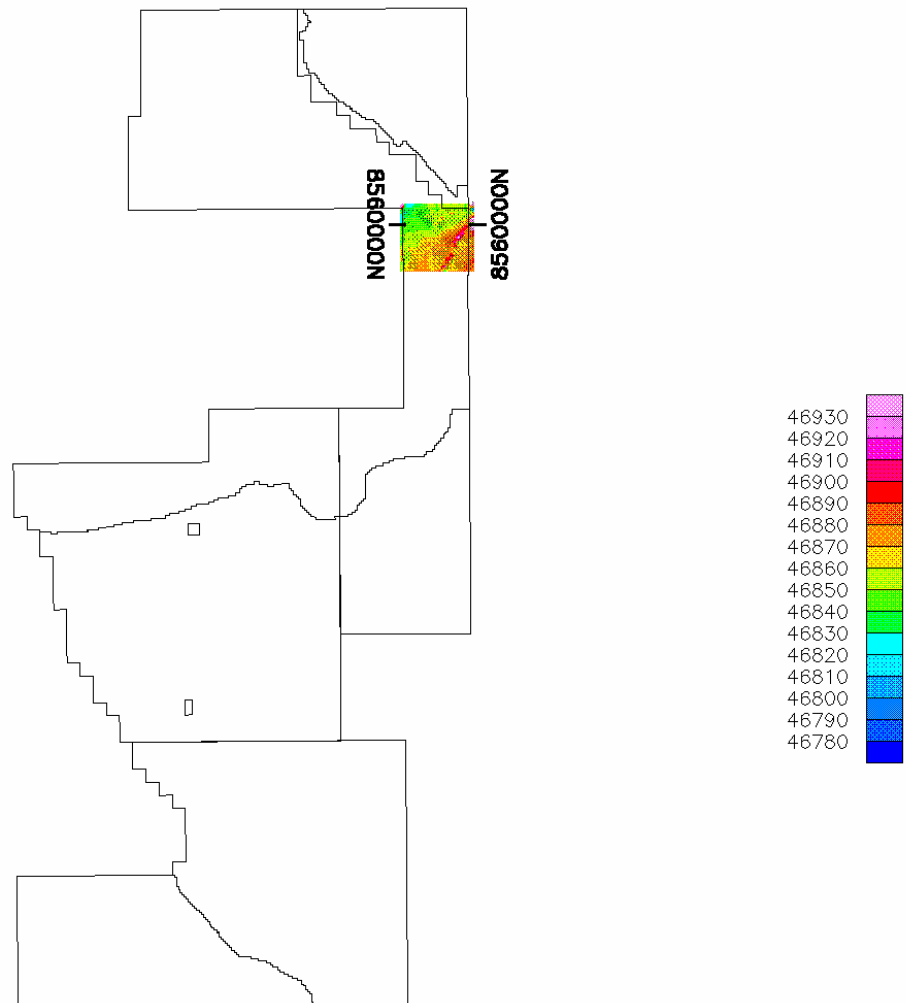
Min Contour Interval = 10.000nT
Grid cell size = 500
Base easting = 0
Base northing = 0
Base elevation = 0.0m
Base value = 0.0nT
Survey date = Aug2010
Author: JEH
Data File: SP_AMAG.M10

Uranium Equities Ltd

Headwaters NT Region
Aeromagnetic Map
Sensor Ht = 25m

Adelaide Mining Geophysics Pty Ltd

Figure A1



Min Contour Interval = 10.000nT
 Grid cell size = 500
 Base easting = 0
 Base northing = 0
 Base elevation = 0.0m
 Base value = 0.0nT
 Survey date = Aug2010
 Author: JEH
 Data File: BA_9807M.M10

Scale 1:1000000

25000 0 25000

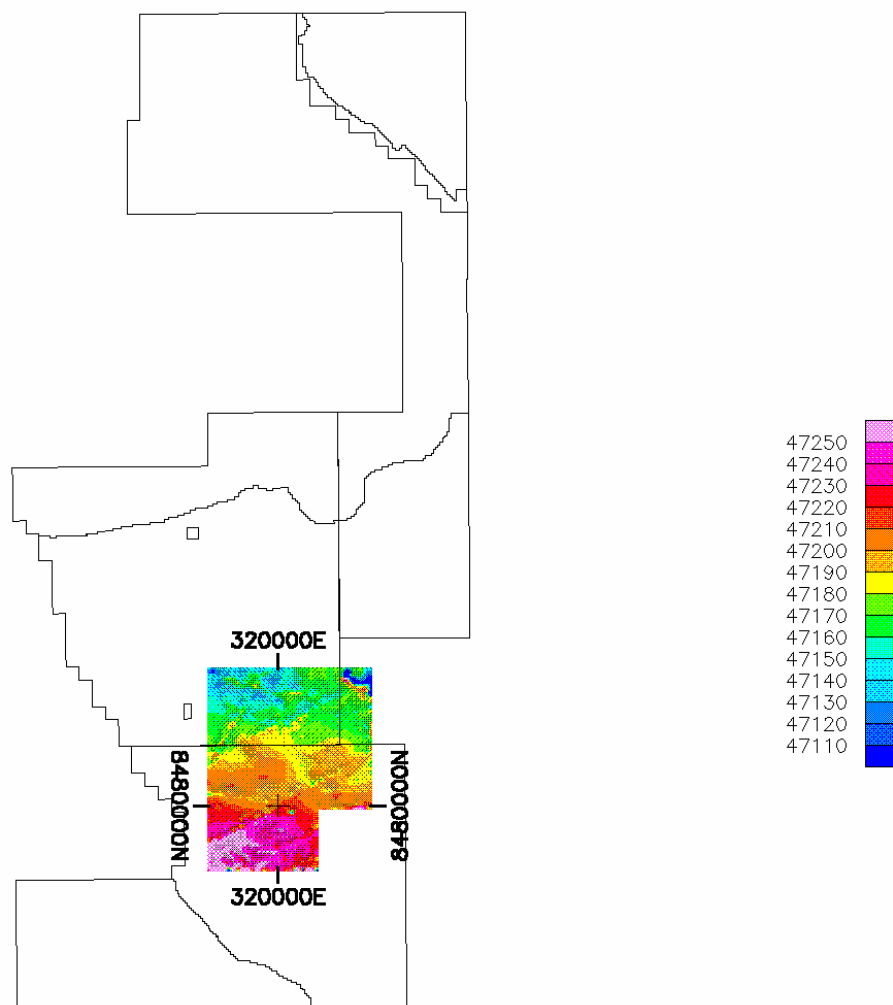
(metres)

Uranium Equities Ltd

Headwaters NT Region
 Aeromagnetic Map
 Sensor Ht = 45m

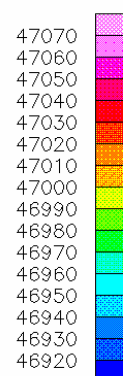
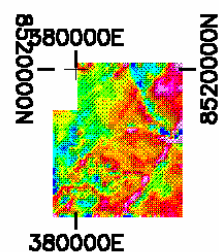
Adelaide Mining Geophysics Pty Ltd

Figure A2



Min Contour Interval = 10.000nT
Grid cell size = 500
Base easting = 0
Base northing = 0
Base elevation = 0.0m
Base value = 0.0nT
Survey date = Aug2010
Author: JEH
Data File: BU_9705.M10

Figure A3



```
Min Contour Interval = 10.000nT
Grid cell size = 500
Base easting = 0
Base northing = 0
Base elevation = 0. m
Base value = 0. nT
Survey date = Aug2010
Author: JEH
Data File: BU_9708.M10
```

Scale 1:1000000

10000 0 10000 20000 30000

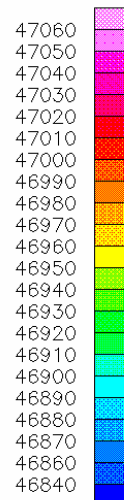
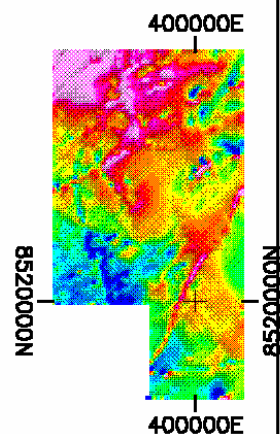
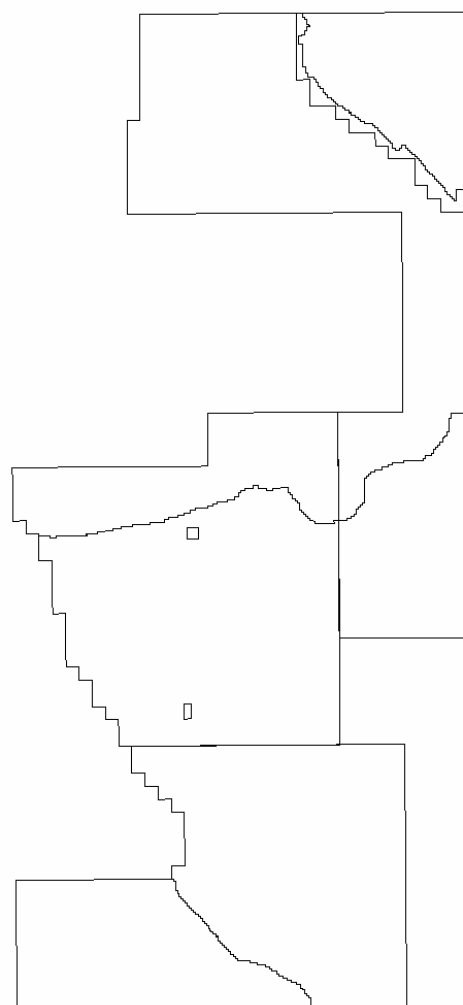
(metres)

Uranium Equities Ltd

Headwaters NT Region
Aeromagnetic Map
Sensor Ht = 45m

Adelaide Mining Geophysics Pty Ltd

Figure A4



Min Contour Interval = 10.000nT
 Grid cell size = 500
 Base easting = 0
 Base northing = 0
 Base elevation = 0.0m
 Base value = 0.0nT
 Survey date = 9802
 Author: JEH
 Data File: BU_9802.M10

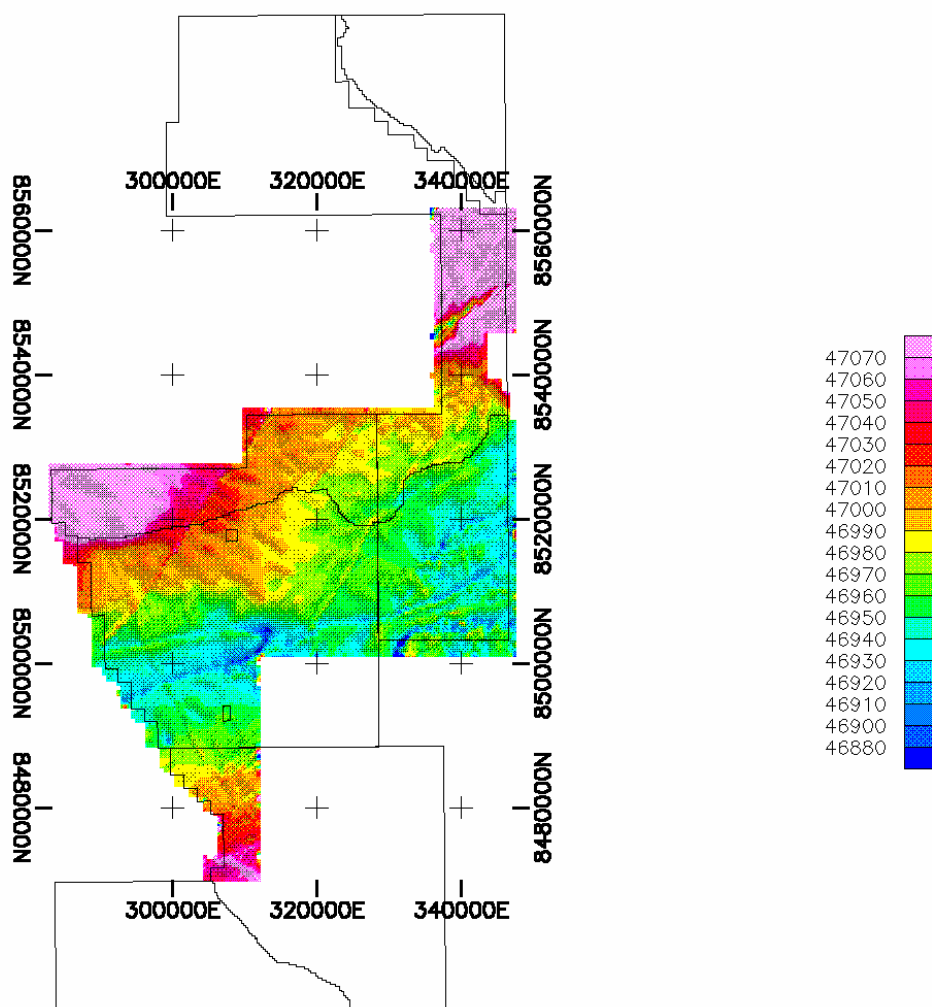
Scale 1:1000000
 10000 0 10000 20000 30000
 (metres)

Uranium Equities Ltd

Headwaters NT Region
 Aeromagnetic Map
 Sensor Ht = 50m

Adelaide Mining Geophysics Pty Ltd

Figure A5



Min Contour Interval = 10.000nT
 Grid cell size = 500
 Base easting = 0
 Base northing = 0
 Base elevation = 0.0m
 Base value = 0.0nT
 Survey date = Aug2010
 Author: JEH
 Data File: DA_9707.M10

Scale 1:1000000
 10000 0 10000 20000 30000
 (metres)

Uranium Equities Ltd

Headwaters NT Region
 Aeromagnetic Map
 Sensor Ht = 45m

Adelaide Mining Geophysics Pty Ltd

Figure A6

Scale 1:1000000

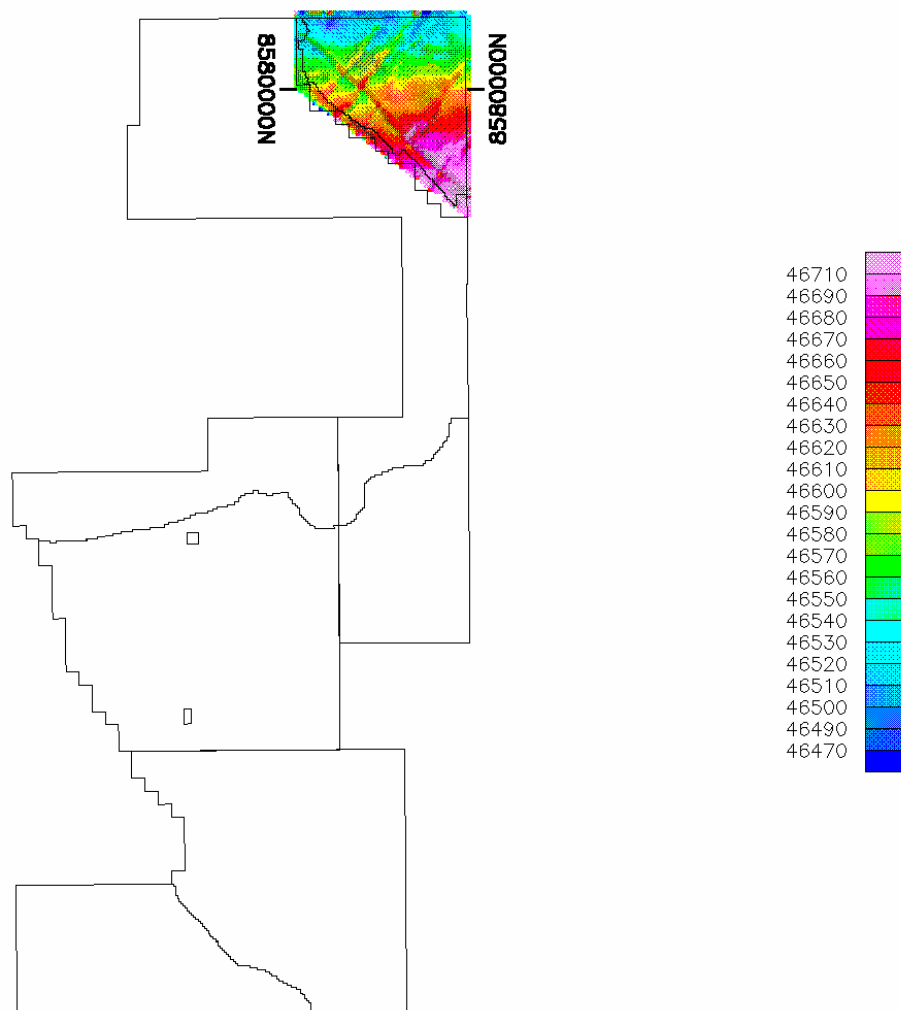
10000 0 10000 20000 30000

(metres)

Headwaters NT Region
Aeromagnetic Map
Sensor Ht = 25m

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Figure A7



Min Contour Interval = 10.000nT
 Grid cell size = 500
 Base easting = 0
 Base northing = 0
 Base elevation = 0.0m
 Base value = 0.0nT
 Survey date = Aug2010
 Author: JEH
 Data File: EA_0505M.M10

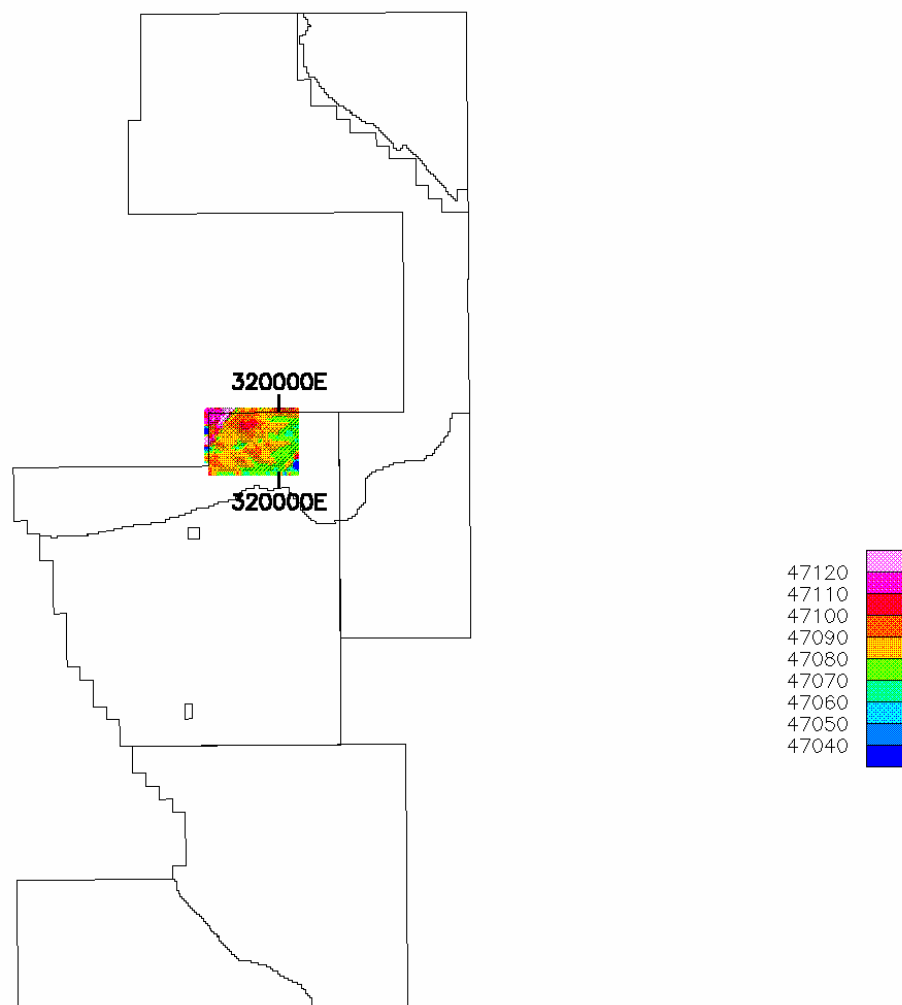
Scale 1:1000000
 25000 0 25000
 (metres)

Uranium Equities Ltd

Headwaters NT Region
 Aeromagnetic Map
 Sensor Ht = 75m

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Figure A8



Min Contour Interval = 10.000nT
 Grid cell size = 500
 Base easting = 0
 Base northing = 0
 Base elevation = 0.0m
 Base value = 0.0nT
 Survey date = Aug2010
 Author: JEH
 Data File: FG_9807M.M10

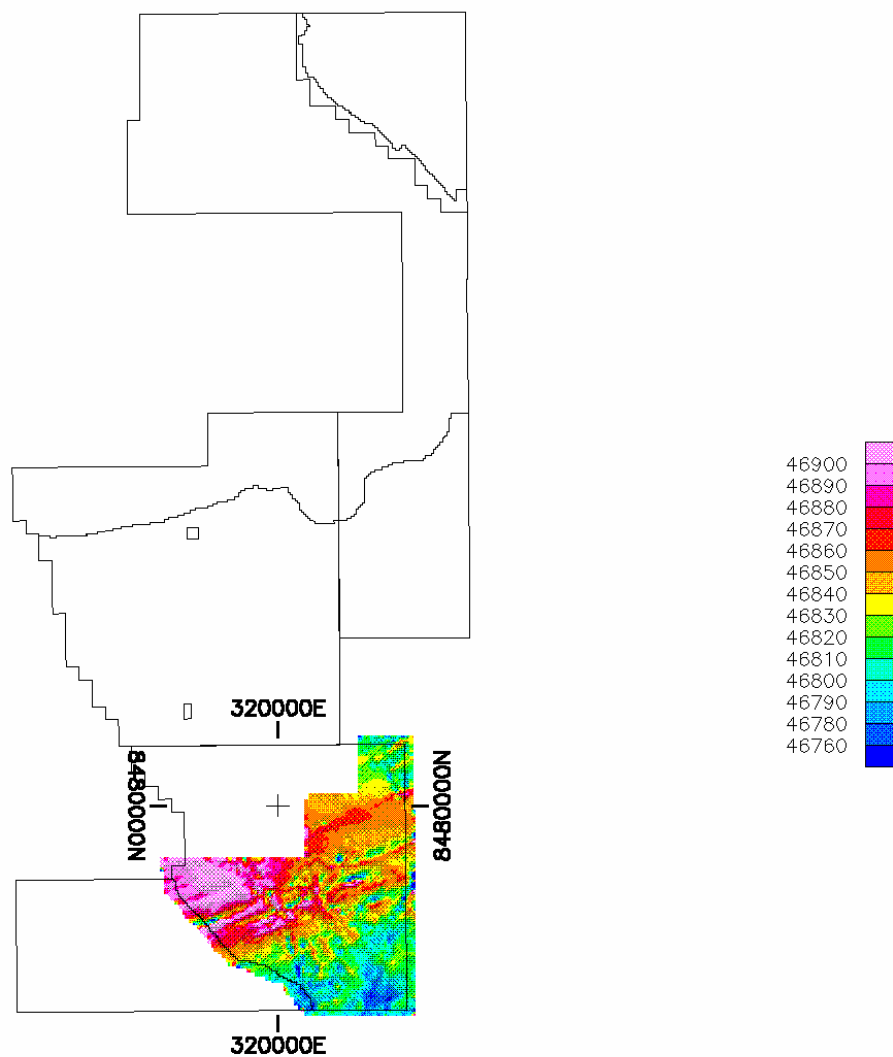
Scale 1:1000000
 10000 0 10000 20000 30000
 (metres)

Uranium Equities Ltd

Headwaters NT Region
 Aeromagnetic Map
 Sensor Ht = 25m

Adelaide Mining Geophysics Pty Ltd

Figure A9



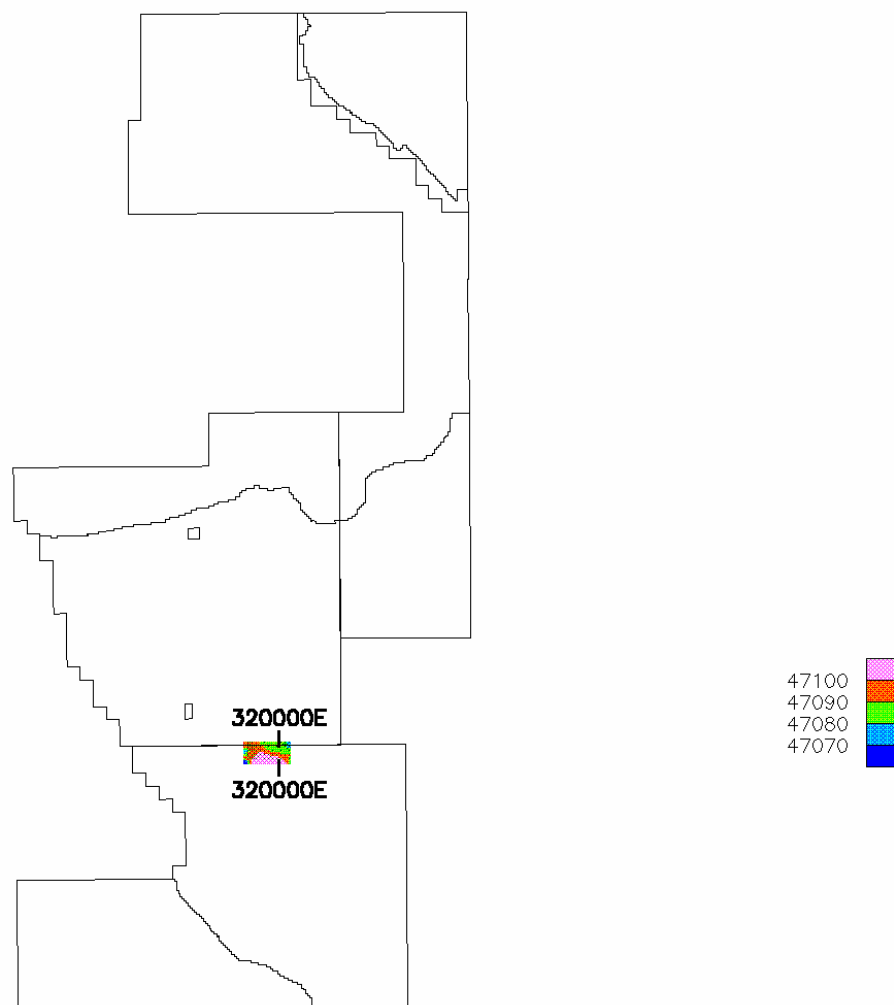
Min Contour Interval = 10.000nT
 Grid cell size = 500
 Base easting = 0
 Base northing = 0
 Base elevation = 0.0m
 Base value = 0.0nT
 Survey date = Aug2010
 Author: JEH
 Data File: HW_1008M.M10

Uranium Equities Ltd

Headwaters NT Region
 Aeromagnetic Map
 Sensor Ht = 45m

Adelaide Mining Geophysics Pty Ltd

Figure A10



Min Contour Interval = 10.000nT
 Grid cell size = 500
 Base easting = 0
 Base northing = 0
 Base elevation = 0.0m
 Base value = 0.0nT
 Survey date = 9802
 Author: JEH
 Data File: AR_9810M.M10

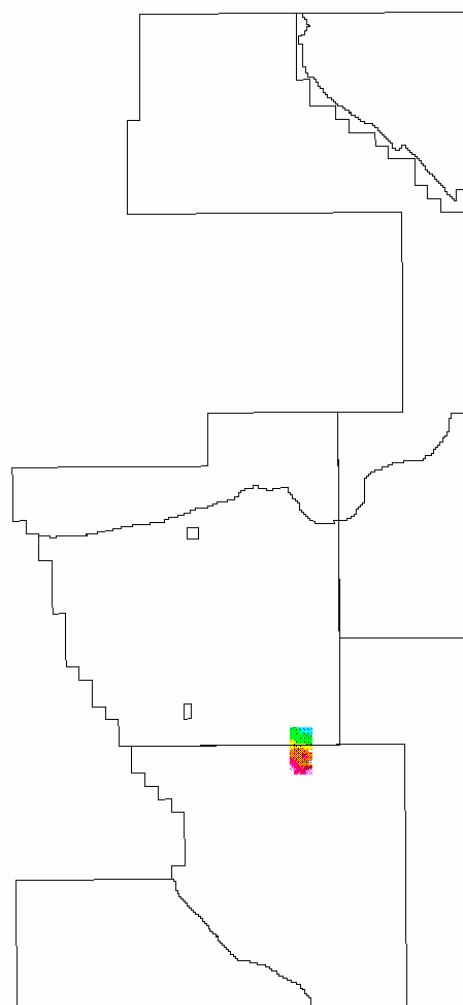
Scale 1:1000000
 10000 0 10000 20000 30000
 (metres)

Uranium Equities Ltd

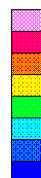
Headwaters NT Region
 Aeromagnetic Map
 Sensor Ht = 50m

Adelaide Mining Geophysics Pty Ltd

Figure A11



47100
47090
47080
47070
47060
47050
47040



Min Contour Interval = 10.000nT
Grid cell size = 500
Base easting = 0
Base northing = 0
Base elevation = 0.0m
Base value = 0.0nT
Survey date = 9802
Author: JEH
Data File: AR_9811M.M10

Scale 1:1000000
25000 0 25000
(metres)

Uranium Equities Ltd

Headwaters NT Region
Aeromagnetic Map
Sensor Ht = 50m

Adelaide Mining Geophysics Pty Ltd

Figure A12

APPENDIX B

Images of Channel Ratios based on Original Data before Background Adjustments

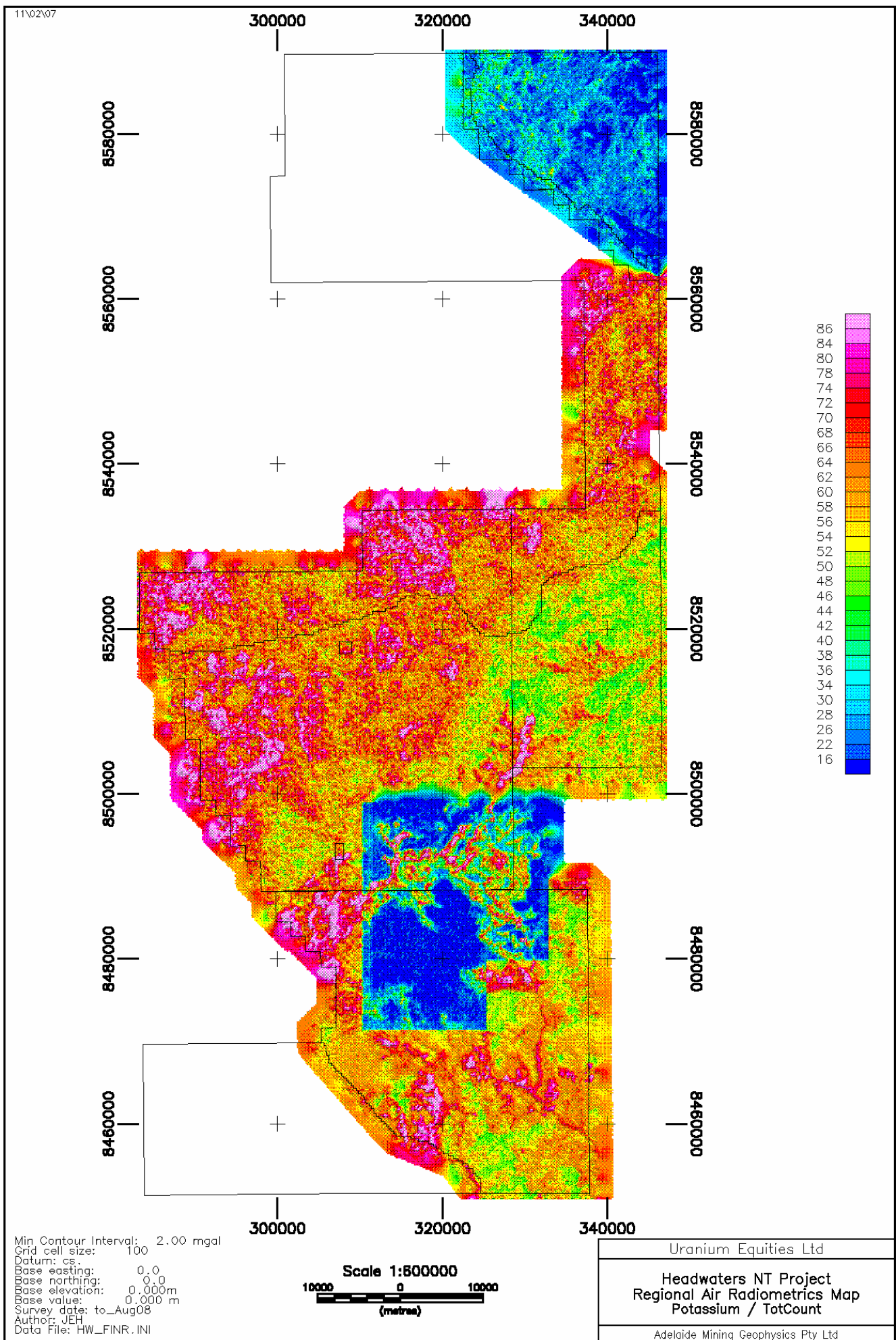


Figure B1

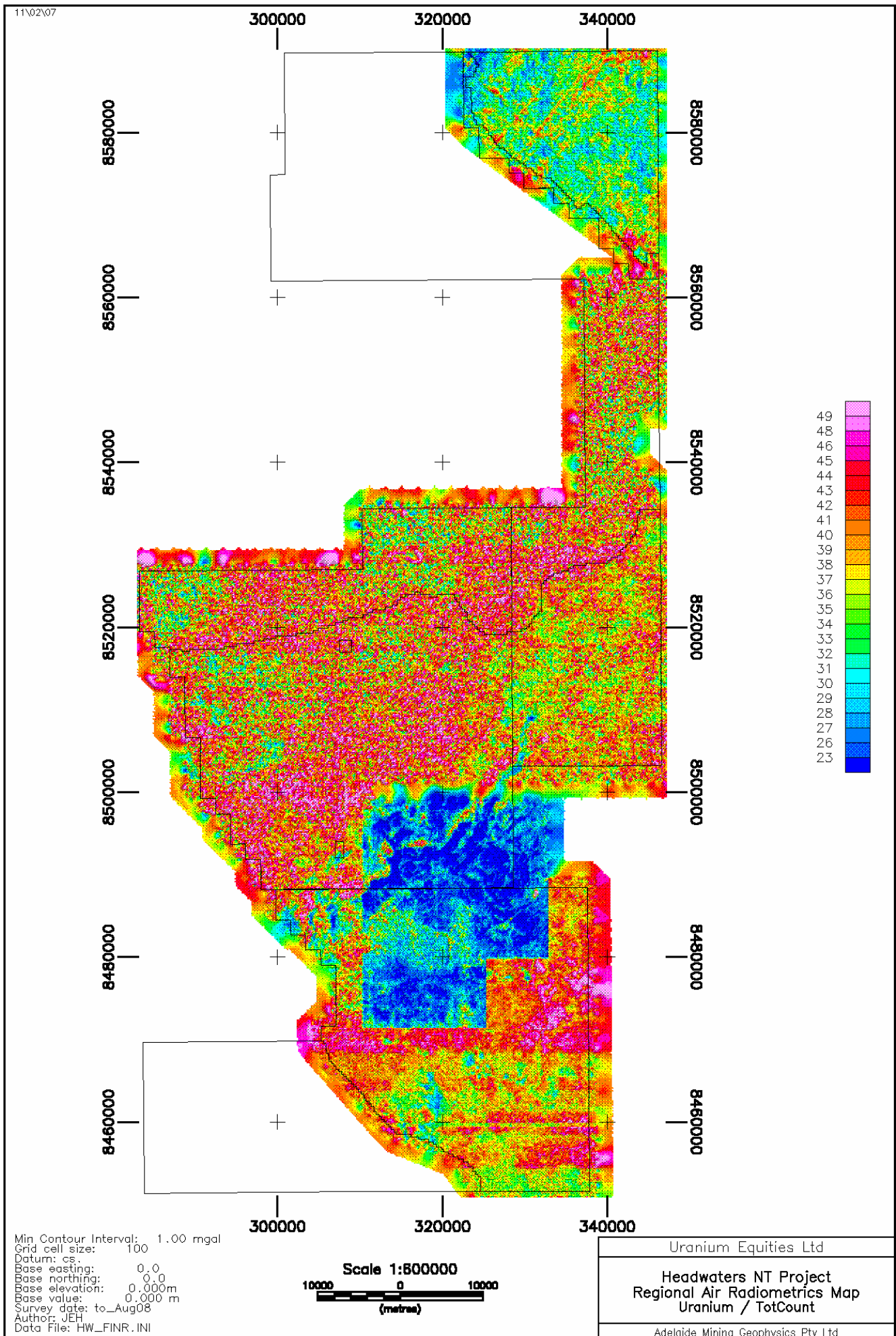


Figure B2

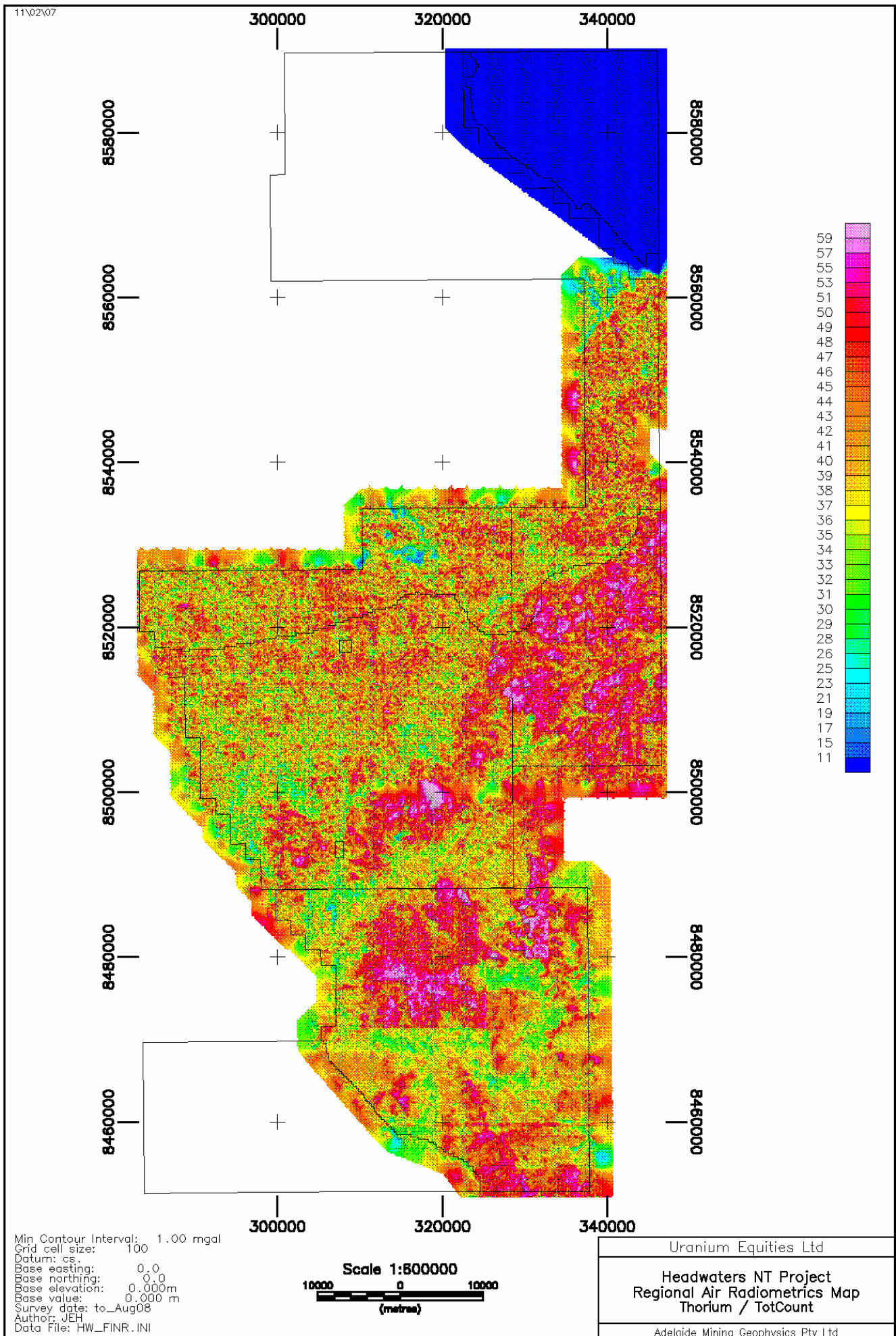


Figure B3