Broughton Creek 2010MAR Ground Gamma-Spectral Data Analysis Report

2010-FEB-20

During 2010-FEB-05 through 2010-FEB-12 ground gamma-spectral measurements were gathered at several different zones or sites in the Broughton Creek Prospect in the Mt. Isa district. This report provides technical analyses and imaging of the measured data.

A complete set images of the survey grids and results are provided separately owing to the large number of images and size of the associated files. Those image sets are compiled according to site location/name and then collated according to data type and imaging approach.

Summary

As described in the Broughton Creek field report six sites were surveyed using the Pico Envirotech PGIS-SP portable/mobile gamma-radiation spectrometer. The measured data have been analyzed and imaged for the purposes of helping to understand the local geology and geochemistry.

While given the present state of Queensland mining law uranium is not of interest, its abundance on the prospect without question has strong implications regarding the geology and so plays a prevalent role in the analyses. There are significant concentrations of rare-earth elements (REE) associated with the uranium-bearing zones.

Conclusions and recommendations are:

1. Ground gamma-spectral measurements (K,U,Th) correlate reasonably well with measured grab-sample assays. Extrapolating this correlation at the sites surveyed, suggests that tens of thousands of pounds of uranium/REEs lying near the surface might be readily and cheaply "mined."
2. Tests showed that given the usual height of the PGIS-SP sensor (1.25m), single fist-sized radioactive samples, owing to the inverse distance cubed relationship, will not noticeably register in the readings. Larger volumes are required to impact the normal measurements.
3. Spatial variability or frequency content in the measurements suggests that 10m line-spacing is generally to wide for most locations and that 2m line-spacing is preferred.
4. While not "tightly" correlated, comparisons of spot assay results versus standing/at-rest PGIS-SP measurements suggest between 400 and 1000 U_{ppm} expected assayed results per one U_{ppm} indicated by the PGIS-SP.
5. Based on tests taking readings at various distances from a radioactive sample, a device with greater sensitivity than that of the PGIS-SP used, should provide improved results.
6. The strongest U_{ppm} anomaly measured is at 399953 East, 7673942 North in the CentralWest site, also corresponding to a grab-sample locating assaying over 33% uranium.

   The airborne radiometrics U_{ppm} channel shows an anomaly spatially corresponding with the CentralWest ground detailed results presented in this report. The airborne radiometric results show a large number of similar anomalies, which should be investigated.
7. In consideration of a larger-area and detailed (2m line-spacing) survey one would presume and average speed of 2.2 to 2.5 kilometers per hour or 0.04 km^2 per eight-hour traverse. Hence, large-scale ground coverage at the desired spatial resolution might require multiple operators and systems to achieve a reasonable production rate of, say, more than 0.1 km^2 per day.

Surveyed Sites

Six sites were surveyed using grids of various spacings as described in the Field Report. Conditions were not especially difficult, with dense turpentine forming the only obstacle of note.

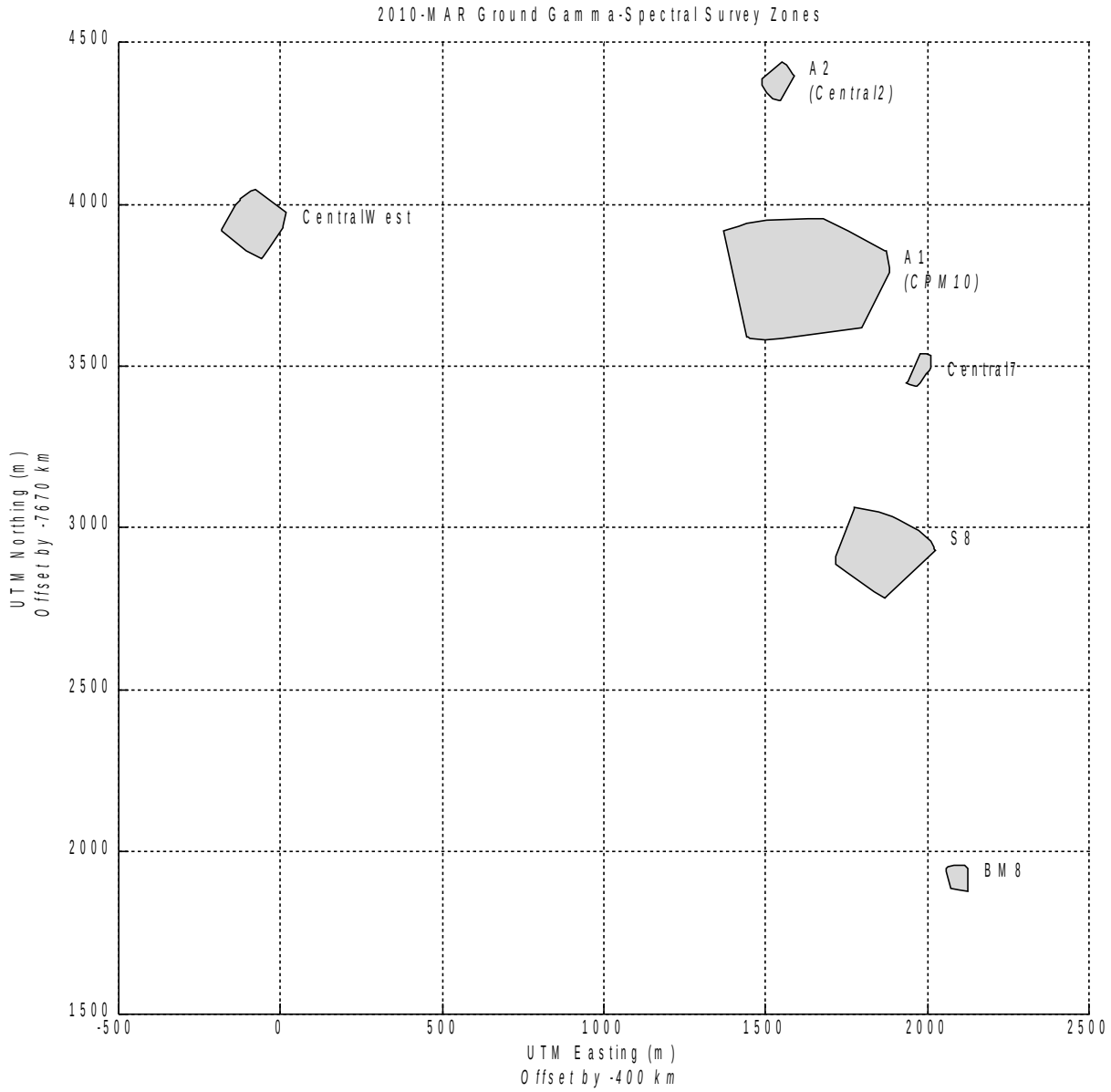

Figure 1: Map of sites surveyed using the PGIS-SP portable spectrometer.

Data Processing

In order to improve data quality and prepare for gridding, a specialized processing scheme was developed using the MATLAB scientific programming environment. The sequence of steps were:

1) As some PGIS-SP files appeared to be corrupted or contain invalid data, each file was searched for repeated times and scrub/remove all subsequent records after the first indication of a repeated time (DTsc_sec), inclusive.
2) Search for GPS-location positional outliers and scrub/remove from dataset.
3) Perform moving average filtering employing Matlab's "filtfilt" function to remove associated positional or time shifts and taking care to mitigate end-effects. This also results in a more tapered filter (hanning convolved with hanning), which enjoys some useful characteristics in not unduly smearing data while at the same time providing adequate averaging.
4) Search for data segments reflecting particularly slow forward progress and average together to provide a more uniform distance-based sample spacing. This helps to attenuate cluster artifacts in the gridded data.

Once the initial scrubbing and averaging were completed the data were gridded using Delaunay triangulation with “natural neighbor” interpolation.

Considerable effort was put into leveling using the tie-lines run on most surveys and shown in the *Field Report* traverse plots. Unfortunately those efforts were not fruitful owing to the apparent lack of repeatability in the data (as discussed in the Field Report) and lack of any smoothly varying (time-wise) drift character. All data surface images for this report were created without the tie-line data incorporated.

The MATLAB code and associated notes have been provided in a file named “*BCreekPrograms.2010FEB.zip*.”

Images

Gridded images are provided in separate files owing to their digital size and large number of total images. These data are presented:

traverse path employed (i.e. tie-lines were not used and so not shown)
GPS-based elevation
U-channel calibrated (cU_ppm)
U-channel counts (cps)
K-channel calibrated (cK_%)
K-channel counts (cps)
Th-channel calibrated (cU_ppm)
Th-channel counts (cps)
Total Counts (cps)

Every radiometric channel is displayed as six different images:

blue-yellow-red (jet) colors, shortened maximum range
blue-yellow-red (jet) colors, greater maximum range
black-orange-white (hot) colors, shortened maximum range
black-orange-white (hot) colors, greater maximum range
grey-scale shaded relief, light azimuth 45°
grey-scale shaded relief, light azimuth -45°

For a given channel, the same color stretches or max data ranges are employed for all sites surveyed. The traverse path is faintly superimposed on all images. JPEGs of all images have also been provided to facilitate incorporation in later reports.

"Jet" and "Hot" color images of the detailed survey at CentralWest are shown in the Figures 6 and 7 below. Note how the gridding has extended the image beyond the tight-boundaries of the traverses to the northwest and so care must be taken to properly dismiss those extrapolated zones. The airborne radiometrics U_{ppm} anomaly associated with the ground survey results is also shown.

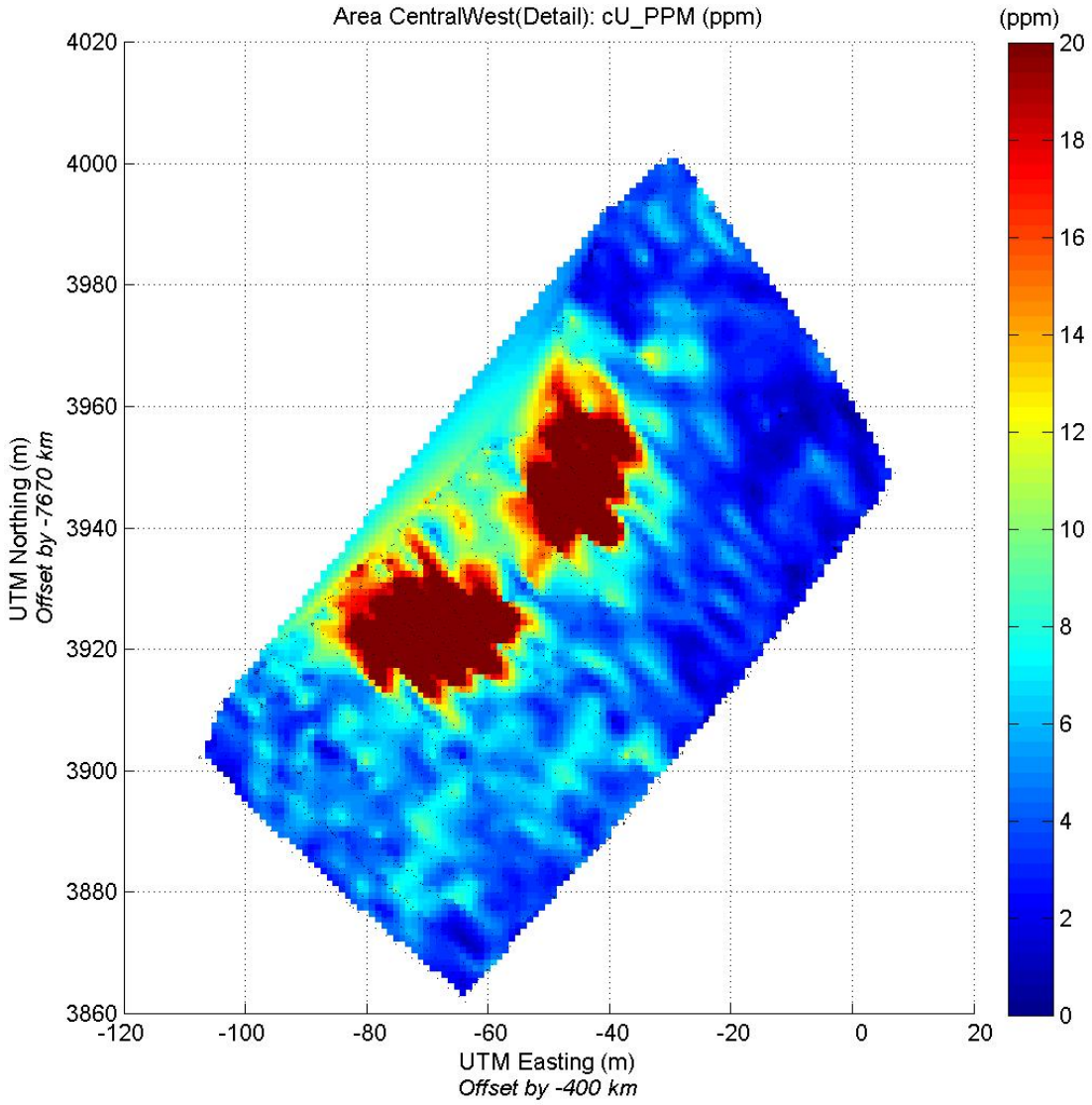

Figure 2: CentralWest (detail) U_ppm shown in low-range and "jet" colors

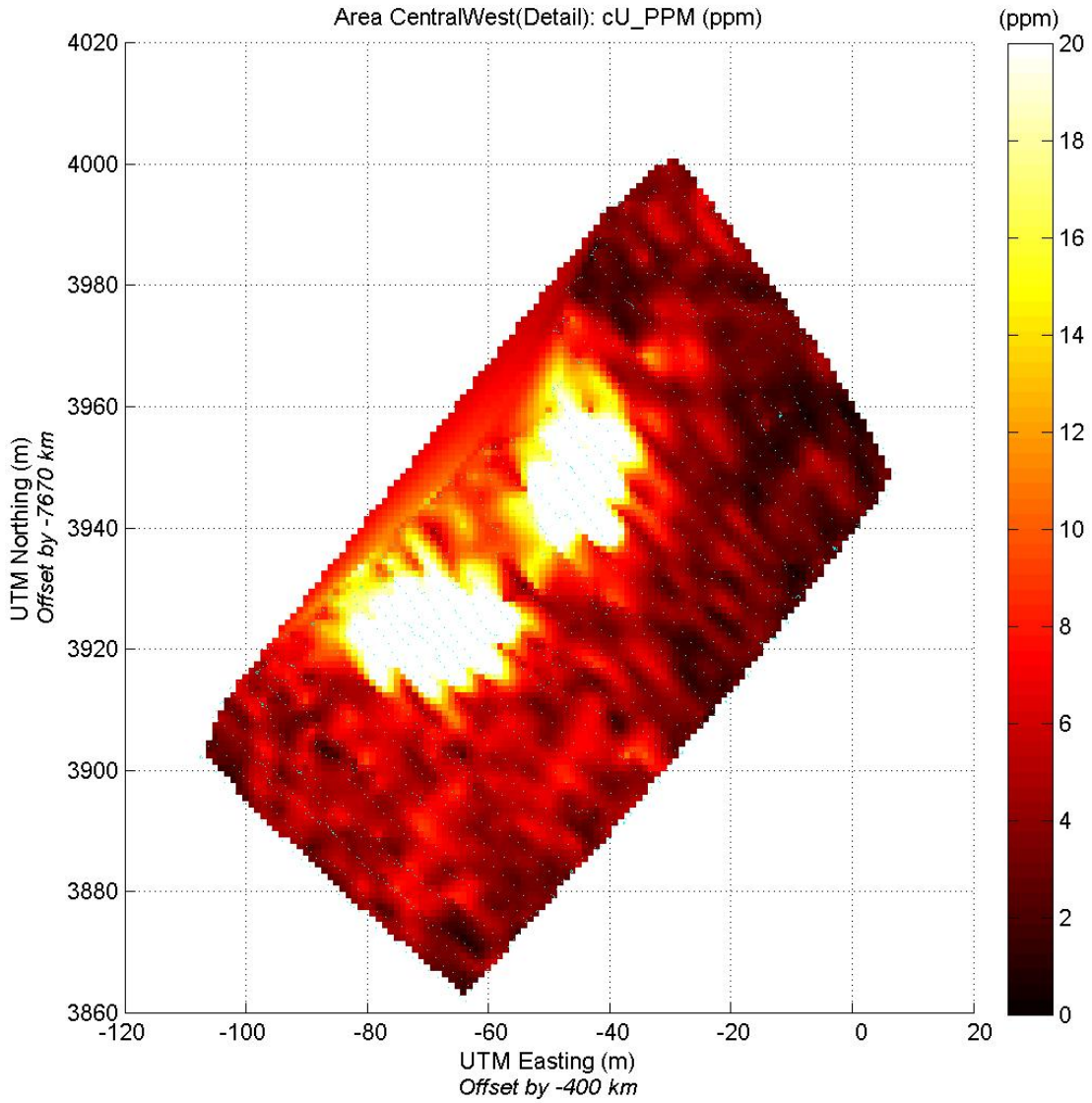

Figure 3: CentralWest (detail) U_ppm shown in low-range and "hot" colors

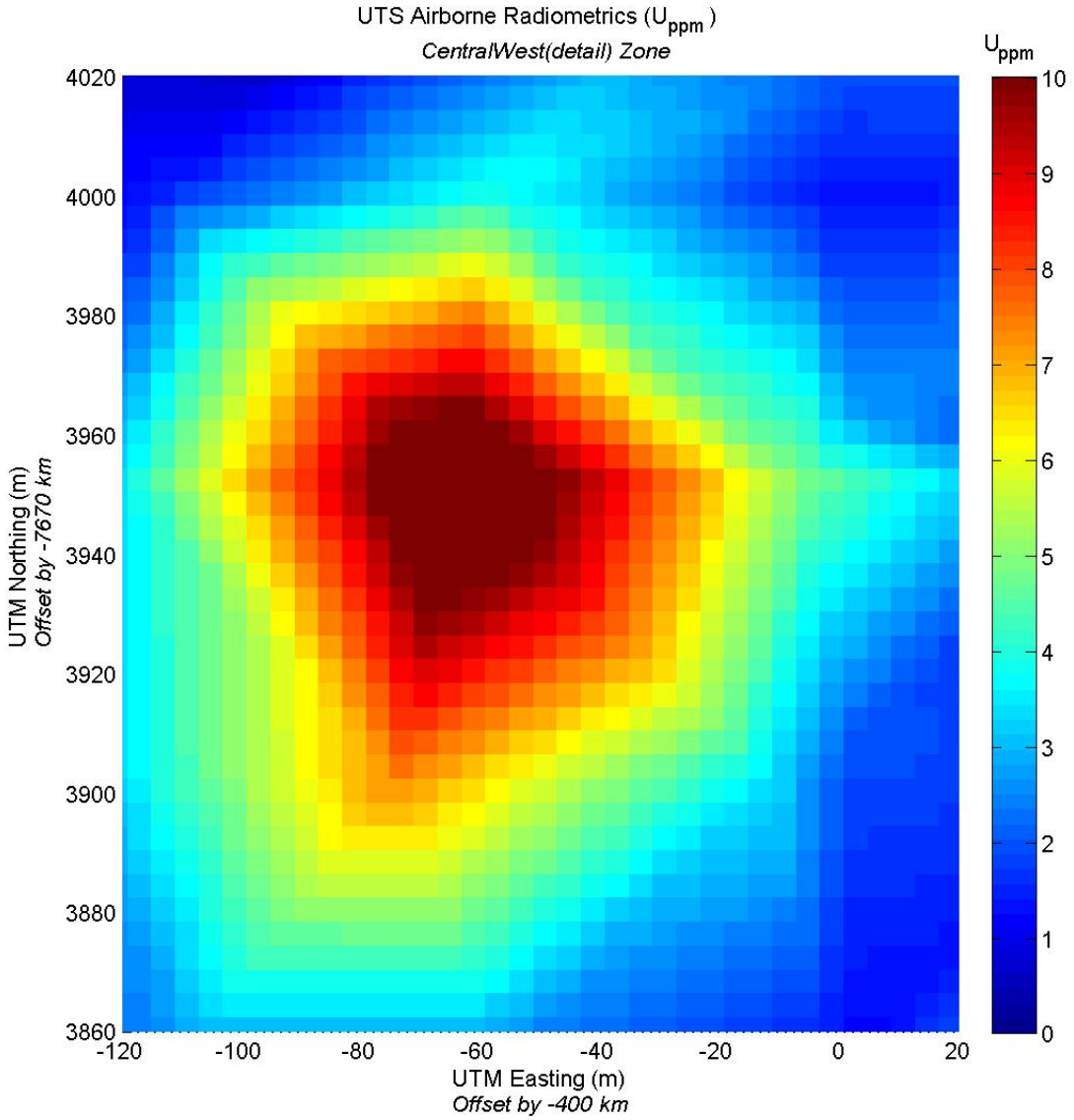

Figure 4: Airborne radiometrics results, gridded a 4m x 4m, over the same area as shown in Figures 6 and 7.