

A quantitative gamma-ray spectrometric and aeromagnetic airborne geophysical survey of the Bonaparte Lake area, British Columbia, was completed by Fugro Airborne Surveys. The survey was flown from September 18th to October 23rd, 2006, using an AS-350-B2 helicopter C-FDNF. The nominal traverse and control line spacings were, respectively, 400 m and 2000 m, and the aircraft flew at a nominal terrain clearance of 125 m at an air speed of 120 km/h. Over the two areas held by industry partners the traverse line spacing was reduced to 210 m and 250 m. Traverse lines were oriented N10°E with orthogonal control lines. The flight path was recovered following post-flight differential corrections to raw data recorded by a Global Positioning System.

**Gamma-ray Spectrometric Data**  
 The airborne gamma-ray measurements were made with an Explanorium GR820 gamma-ray spectrometer using nine 102 x 102 x 406 mm NaI (Tl) crystals. The main detector array consisted of eight crystals (total volume 33.6 litres). One crystal, (total volume 4.2 litres), shielded by the main array, was used to detect variations in background radiation caused by atmospheric radon. The system constantly monitored the natural thorium peak for each crystal, and using a Gaussian least squares algorithm, adjusted the gain for each crystal.

Potassium is measured directly from the 1460 keV gamma-ray photons emitted by <sup>40</sup>K, whereas uranium and thorium are measured indirectly from gamma-ray photons emitted by daughter products (<sup>214</sup>Pb for uranium and <sup>214</sup>Pb for thorium). Although these daughters are far down their respective decay chains, they are assumed to be in equilibrium with their parents; thus gamma-ray spectrometric measurements of uranium and thorium are referred to as equivalent uranium and equivalent thorium. <sup>137</sup>Cs and <sup>60</sup>Co. The energy windows used to measure potassium, uranium and thorium are, respectively, 1370 - 1570 keV, 1660 - 1660 keV, and 2410 - 2810 keV.

Gamma-ray spectra were recorded at one-second intervals. During processing, the counts were accumulated into the windows described above. Counts from the radon detectors were recorded in a 1660 - 1660 keV window and radiation at energies greater than 2000 keV was recorded in the cosmic window. The window counts were corrected for dead time, background activity from cosmic radiation, radioactivity of the aircraft and atmospheric radon decay products. The window data were then corrected for spectral scattering in the ground, air and detectors. Corrections for deviations from the planned terrain clearance and for variation of temperature and pressure were made prior to conversion to ground concentrations of potassium, uranium and thorium, using factors determined from flights over a calibration range at Lac la Hache. The factors for potassium, uranium, and thorium were, respectively, 56.88 cps/%, 6.14 cps/ppm, and 0.32 cps/ppm.

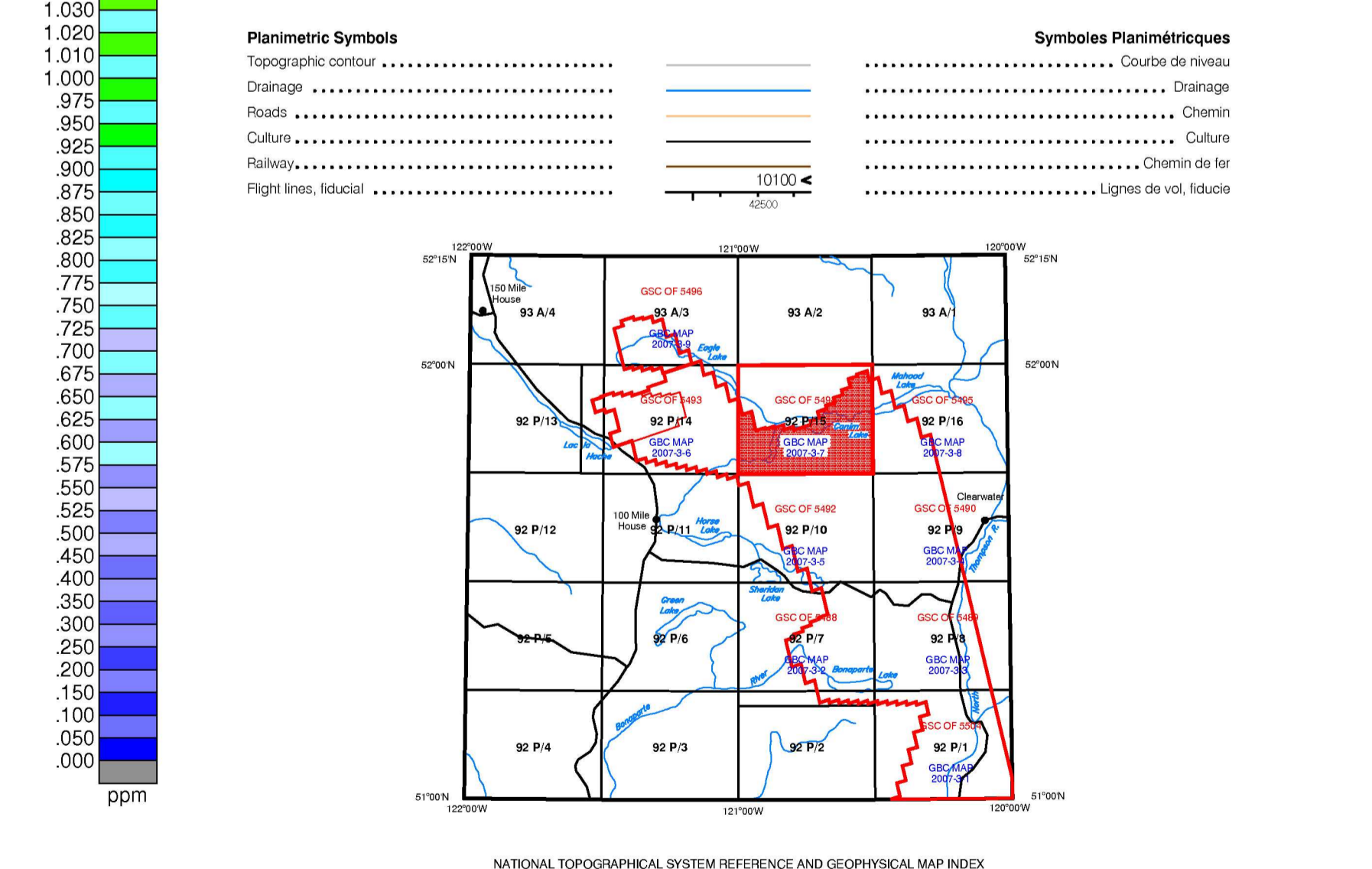
Corrected data were filtered and interpolated to a 100m grid interval. The results of an airborne gamma-ray spectrometer survey represent the average surface concentrations that are influenced by varying amounts of outcrop, overburden, vegetation cover, soil moisture and surface water. As a result the measured concentrations are usually lower than the actual bedrock concentrations. The total air absorbed dose rate in nanograys per hour was produced from measured counts between 400 and 2810 keV.

**Magnetic Data**  
 The magnetic field was sampled 10 times per second using a split-beam cesium vapour magnetometer (sensitivity = 0.005 nT) rigidly mounted to the aircraft. Differences in magnetic values at the intersections of control and traverse lines were computer-analysed to obtain a mutually levelled set of airborne magnetic data. The levelled values were then interpolated to a 100 m grid. The International Geomagnetic Reference Field (IGRF) defined at the average GPS altitude for the year 2006.3 was then removed. Removal of the IGRF, representing the magnetic field of the Earth's core, produces a residual component related essentially to magnetizations within the Earth's crust.

The first vertical derivative of the magnetic field is the rate of change of the magnetic field in the vertical direction. Computation of the first vertical derivative removes long-wavelength features of the magnetic field and significantly improves the resolution of closely spaced and superposed anomalies. A property of first vertical derivative maps is the coincidence of the zero-value contour with vertical contacts at high magnetic latitudes (Hood, 1965).

**Data Availability**  
 Digital versions of this map, corresponding digital profile and gridded data, and similar data for adjacent aeromagnetic and gamma-ray spectrometric surveys can be downloaded, at no charge, from Natural Resources Canada's Geoscience Data Repository at <http://gdr.nrcan.gc.ca>. The same products are also available, for a fee, from the Geophysical Data Centre, Geological Survey of Canada, 615 Booth Street, Ottawa, Ontario, K1A 0E9. Telephone: (613) 995-5326, email: [info@gsd.nrcan.gc.ca](mailto:info@gsd.nrcan.gc.ca).

**References/Références**  
 Hood, P.J. (1965). Gradient measurements in aeromagnetic surveying. *Geophysics*, 30, 891-902.



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**BONAPARTE LAKE EAST GEOPHYSICAL SURVEY  
 LÉVÉ GÉOPHYSIQUE BONAPARTE LAKE EAST**

**URANIUM**

Scale 1:50 000 - Échelle 1/50 000

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