

In 2004 and 2005, Sander Geophysics Limited completed four multi-sensor airborne geophysical surveys in the Nahanni River area of the Northwest Territories (Parks Canada (Prairie Creek, Caribou River and Flat River) and the Government of the Northwest Territories (Seaw Range)). The Geological Survey of Canada provided survey supervision and quality control. The purpose of the survey was to obtain quantitative gamma-ray spectrometric and aeromagnetic data. The survey was flown over two seasons, from August 28 to October 3, 2004 and the second phase from June 13 to August 20, 2005 using the SGL ASar 350 B-3 helicopter, C-GSGH.

**Gamma-ray Spectrometric Data**  
The airborne gamma-ray measurements were made with an Epsilon 6000 gamma-ray spectrometer using nine 102 x 102 x 400 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 relative count rates 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, i.e. eU and eTh. The energy windows used to measure potassium, uranium and thorium are:

Potassium ( <sup>40</sup> K)	1360-1560 keV
Uranium ( <sup>238</sup> U)	1660-1960 keV
Thorium ( <sup>232</sup> Th)	2410-2810 keV

Gamma-ray spectra were recorded at one-second intervals at a planned terrain clearance of 135 m and an air speed of 120 km/h. Noise Adjusted Singular Value Decomposition (NASVD) analysis was carried out on the full spectrum 256 channel data to reduce statistical noise in the windowed data. During processing, the spectra were energy calibrated, and counts were accumulated into the windows described above. Counts from the radon detectors were recorded in a 1600-1800 keV window and radiation at energies greater than 3000 keV was recorded in the cosmic window. The window counts were corrected for dead time, and for background activity from cosmic radiation, the 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 of altitude 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 near Ottawa.

**Magnetic Data**  
The helicopter was equipped with a Scribner CS-2 cesium vapour magnetic sensor mounted in a bird suspended 30 m below the aircraft. The system recorded readings every 0.1 seconds with a noise level of less than 0.02 nT. Magnetic interferences caused by aircraft maneuvers were compensated using an RMS-ADCI Magnetic compensator. Diurnal variations and GPS fluctuations were recorded using a Sander Geophysics Ground Station Recording System. The International Geomagnetic Reference Field was calculated daily and removed for each flight. The airborne magnetometer data was IGRF corrected, using the location, altitude and date of each point. The IGRF was calculated using the IGRF 2000 model.

The corrected magnetic data was interpolated to a 100m grid using a minimum curvature algorithm. The first vertical derivative grid was calculated from the corrected total magnetic intensity grid using a FFT based frequency domain filtering algorithm. The shaded relief was calculated with an inclination of 17° and a declination of 60°.

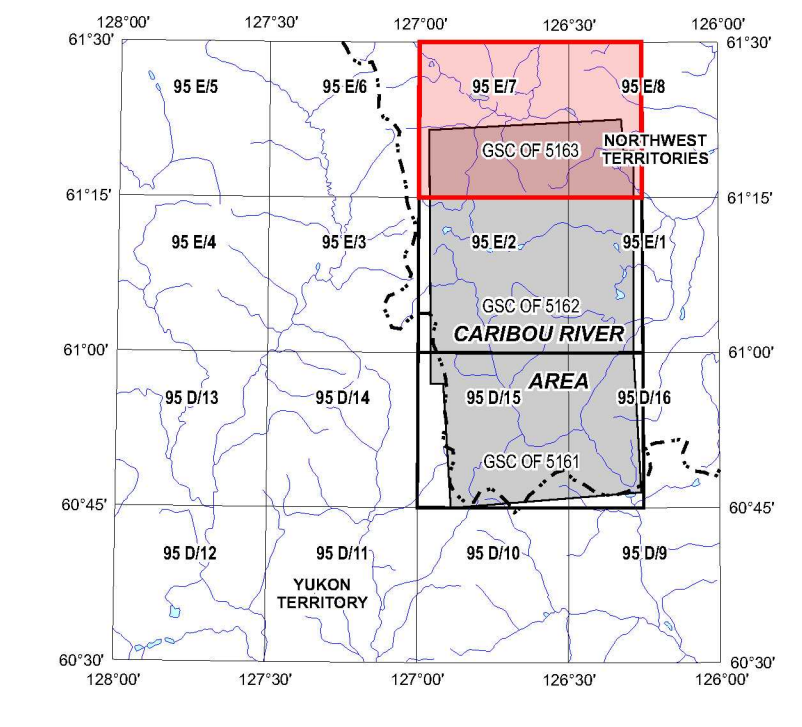
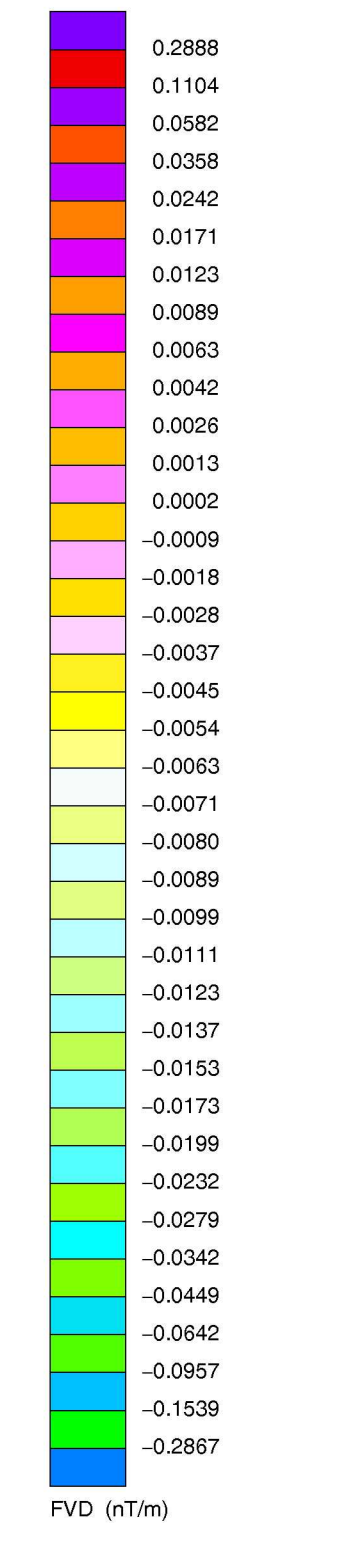
**Positional Data**  
Survey line spacing of 500 m and control line spacing of 4000 m was used for the Prairie Creek, Caribou River and Flat River survey blocks. Survey line spacing of 400 m and control line spacing of 2400 m was used for the Seaw Range survey blocks. Survey lines were oriented N-S for the Prairie Creek and Caribou River areas. For the Flat River area survey lines were oriented NW-SE and for the Seaw Range survey lines were oriented SW-NE. Survey and control line positions were pre-planned using Sander Geophysics Limited, Smooth Drive software. Terrain clearance was monitored by radar altimeter. Positional data were recorded using a dual frequency Novatel Millennium system. GPS ground station data were combined with airborne GPS data to produce differentially corrected positional data with an accuracy of 2 to 5 m.

**Data Presentation**  
Colour levels and contours were calculated for each grid and combined with map surround information to create HP RTL plot files, which were plotted using SGL's HP Design/Plot colour plotters.

**Project Funding**  
The Prairie Creek, Caribou River and Flat River surveys were funded by Parks Canada through the Mineral and Energy Resource Assessment Project. The Seaw Range survey was funded by the Northwest Territories Geoscience Office. Technical expertise and contract administration were provided by the Radiation Geophysics and Regional Geophysics Sections of the Geological Survey of Canada.

**PLANIMETRIC SYMBOLS**

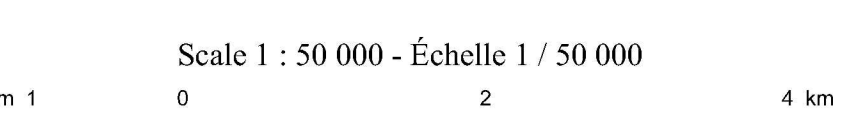
Topographic Contour	
Drainage	
Wetland	
Permanent Ice	
Roads	
Trails	
Flight Line	



This airborne geophysical survey and the production of this map were funded by Parks Canada through the Mineral and Energy Resource Assessment Project.

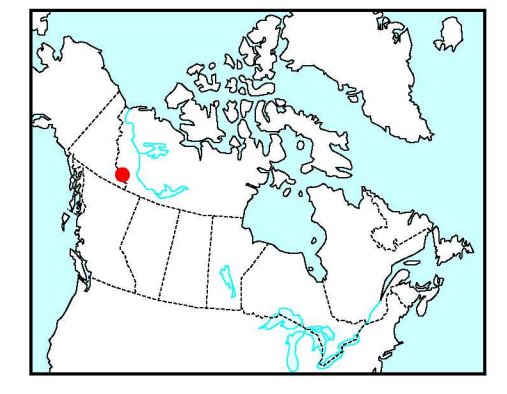
**GEOPHYSICAL SERIES - NTS 95 E/7 and 95 E/8 - SEAPLANE LAKE  
NORTHWEST TERRITORIES**

**FIRST VERTICAL DERIVATIVE  
OF THE MAGNETIC FIELD MAP**



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**FIRST VERTICAL DERIVATIVE  
OF THE MAGNETIC FIELD MAP**  
SEAPLANE LAKE  
NORTHWEST TERRITORIES  
NTS 95 E/7 and 95 E/8



Version française: **Produit cartographique**  
Produit cartographique en français  
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