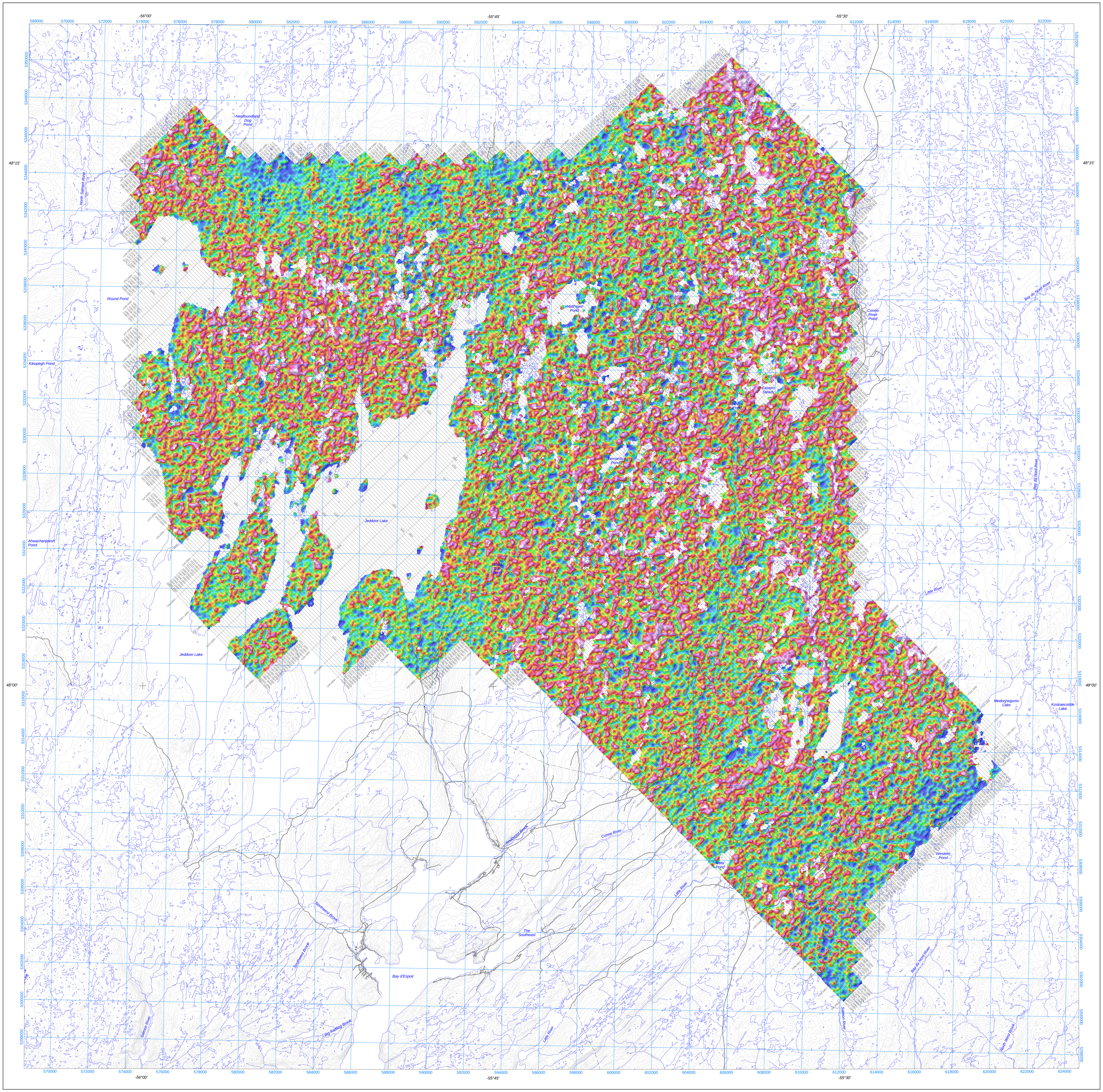

Topographic contour interval: 30 metres

MAP 2020-07
TWILLICK BROOK
NTS MAP AREA 2D/04 AND PARTS OF 1M/13, 1M/14, 2D/03 AND 2D/05

Scale 1:75000

1000 0 1000 2000 3000 4000 5000 6000

(metres)

NAD83 / UTM zone 21N

Digital topographic data provided by Geomatics Canada, Natural Resources Canada

Flown and compiled by:

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Newfoundland Labrador
NATURAL RESOURCES

GEOLOGICAL SURVEY NEWFOUNDLAND AND LABRADOR 1864

AIRBORNE GEOPHYSICAL SURVEY OF THE TWILLICK BROOK REGION, NEWFOUNDLAND

NTS MAP AREA 2D/04 AND PARTS OF 1M/13, 1M/14, 2D/03 AND 2D/05,

RATIO OF EQUIVALENT URANIUM TO PERCENT POTASSIUM

MAP 2020-07
OPEN FILE NFLD/3383
Map 7 of 13

G.J. Kilfoil

ABOUT THE SURVEY

Introduction
This quantitative gamma-ray spectrometric, aeromagnetic and VLF-Electromagnetic airborne geophysical survey of Twillick Brook region, Newfoundland, was completed by Sander Geophysics Limited. The survey was fown from October 17th to November 10th, 2019 using a single Cessna 208 Caravan (C-GSGL). The nominal traverse and control line spacings were, respectively, 150 m and 1000 m, and the aircraft flew at a nominal terrain clearance of 90 m at an airspeed between 200 and 270 km/h. Traverse lines were oriented 135° with orthogonal control lines. The flight path was recovered following post-flight Precise Point Positioning (PPP) corrections using precise ephemerides applied to raw data recorded by a Global Positioning System.

Gamma-ray Spectrometric Data
The airborne gamma-ray measurements were made with a Sander Geophysics SGLSpec gamma-ray spectrometer using fourteen 102x102x406 mm NaI (Ti) crystals. The main detector array consisted of twelve crystals (total volume 50.4 litres). Two crystals (total volume 8.4 litres), shielded by the main array, were used to detect variations in background radiation caused by atmospheric radon. The system continuously adjusted the gain of each crystal by monitoring the natural potassium, uranium, and thorium peaks. Upward crystals were provided a small cesium source to supplement the three natural peaks.

Potassium is measured directly from the 1460 kev gamma-ray photons emitted by K(40) , whereas uranium and thorium are measured indirectly from gamma-ray photons emitted by daughter products (Bi(214) for uranium and Tl(208) 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,respectively;1370 -1570 keV, 1660-1860 keV and 2410-2810 keV.

Gamma-ray spectra were recorded at one-second intervals. Data processing followed standard procedures as described in IAEA, 1991 and IAEA, 2003. 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 1660 - 1860 keV window and radiation at energies greater than 3000 keV was recorded in the cosmic window. The window counts were corrected for 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 the Breckenridge, Quebec calibration range.

Corrected data were interpolated to a 30 m 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 three split-beam cesium vapour magnetometers (sensitivity = 0.005 nT) mounted inside the tail boom and two wingtip pods of the aircraft. This array of sensors form a horizontal gradiometer with a lateral dimension of 19.02 m and a longitudinal dimension of 10.04 m. Differences in magnetic values at the intersections of control and traverse lines were computer-analysed to obtain a mutually levelled set of flight-line magnetic data. The International Geomagnetic Reference Field (IGRF) defined at the average GPS altitude of 313 m for the date November 1st 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. An enhanced version of the levelled magnetic data is calculated by leveraging horizontal and longitudinal gradients to better define short wavelength signal, which is then interpolated to a 30 m grid interval.

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 of magnetic units at high magnetic latitudes (Hood,1965).

VLF-EM
Very low frequency (VLF) electro-magnetic data was measured using a Herz Totem 2A VLF-EM receiver mounted in a 2.5 m fibreglass stinger installed on the tail of the aircraft. For this survey, the VLF station in LaMoure, North Dakota (25.2 kHz) provided Line data and Rhauderfehn, Germany (23.4 kHz), and Skelton, U.K. (22.1 kHz) provided Ortho data. Due to intermittent signal transmission forom the VLF stations, 100% VLF coverage of the survey area was not achieved. Variation in signal quality is also apparent in the data as bands of less coherent data.

Additional Information
Data compilation and map production were performed by Sander Geophysics Limited, Ottawa, Ontario.
Contract and project management was provided by the Newfoundland and Labrador Department of Natural Resources.

Copies of this map may be obtained from the Geological Survey, Department of Natural Resources,
Government of Newfoundland and Labrador, PO Box 8700, St. John’s, NL, Canada, A1B 4J6.

This map is subject to revision and modification. Comments to the author concerning errors or omissions are invited.

Department Website: http://www.nr.gov.nl.ca/nr
Geological Survey Website: http://www.nr.gov.nl.ca/nr
E-mail: pub@gov.nl.ca

References
Hood, P.J.
1965: Gradient measurements in aeromagnetic surveying. Geophysics, vol. 30, p. 891-902.

8.90
3.17
2.84
2.67
2.54
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1.24
1.23
1.21
1.18
1.16
1.14
1.11
1.09
1.06
1.03
1.00
0.97
0.93
0.89
0.82
0.73
0.17

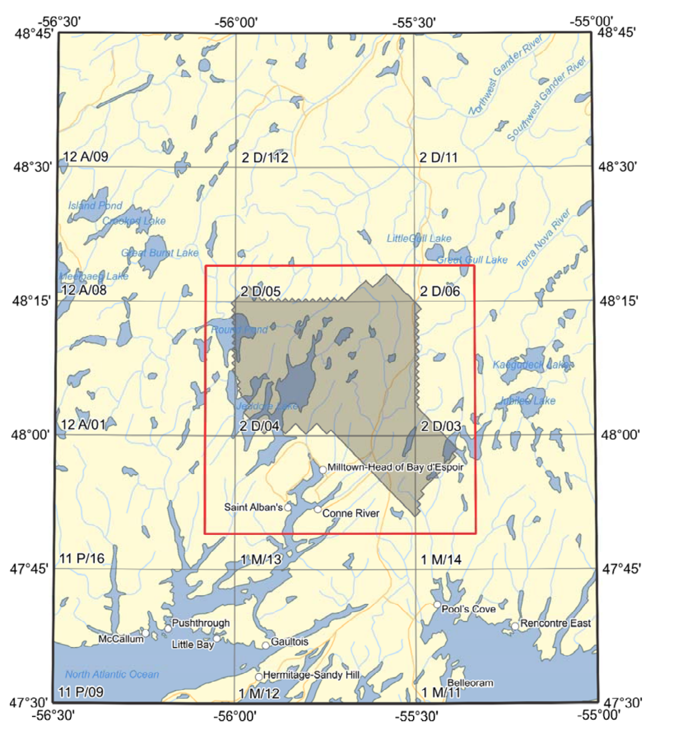
ppm/%

PLANIMETRIC SYMBOLS

Topographic contours............................
Drainage..
Road...
Flight line... 1155.1:1015 > 12345
Building..
Transmission line.................................

LOCATION MAP

NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND GEOPHYSICAL MAP INDEX



Recommended Citation
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