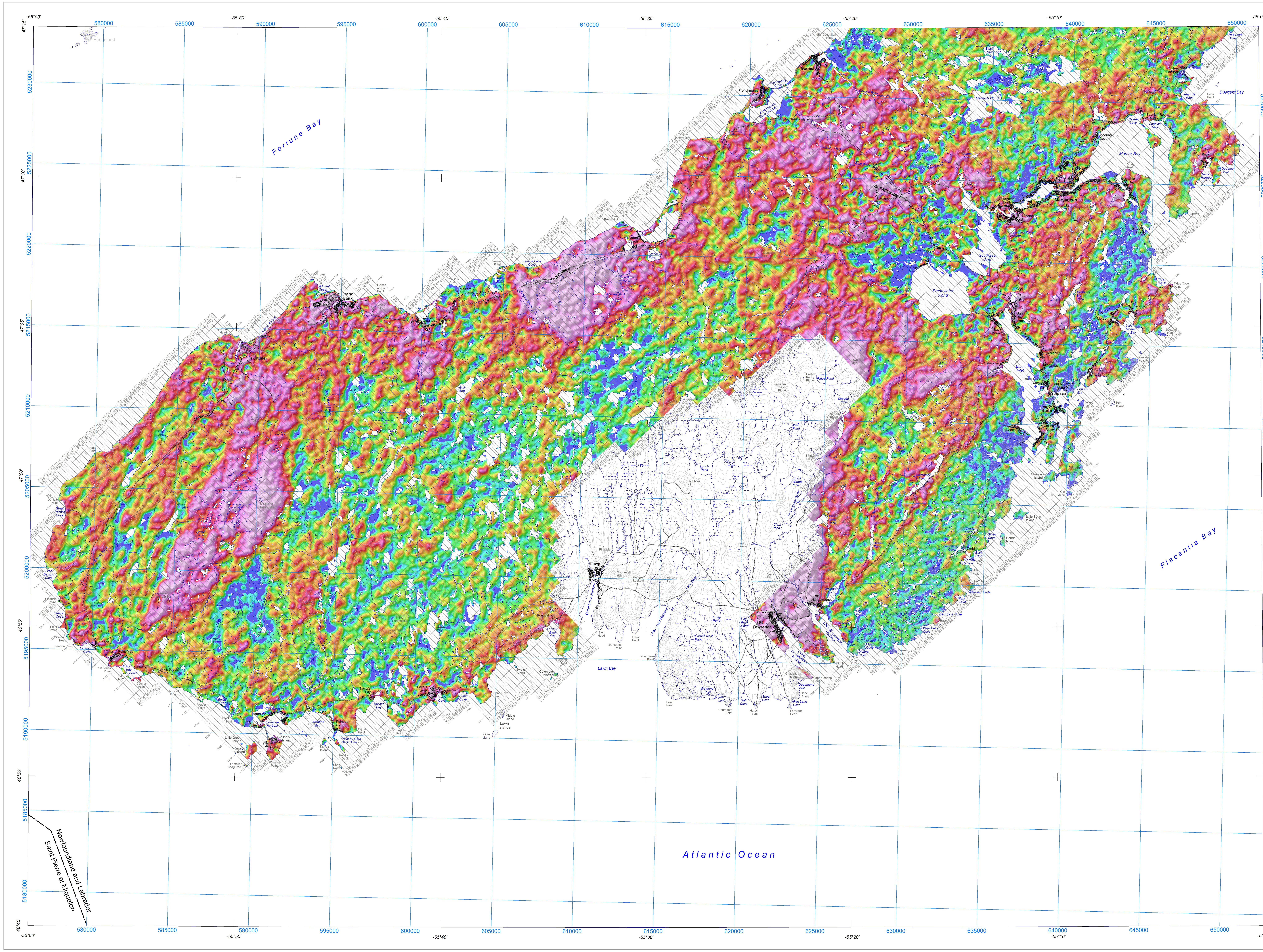

Topographic contour interval: 30 metres

Flown and compiled by:

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MAP 2022-07
BURIN PENINSULA
NTS MAP AREAS 1L/13, 1L/14, 1M/03 AND 1M/04

Scale 1:100000

2000 0 2000 4000 6000
(metres)
NAD83 / UTM zone 21N

Digital topographic data provided by
Geomatics Canada, Natural Resources Canada

Newfoundland Labrador

Industry, Energy and Technology

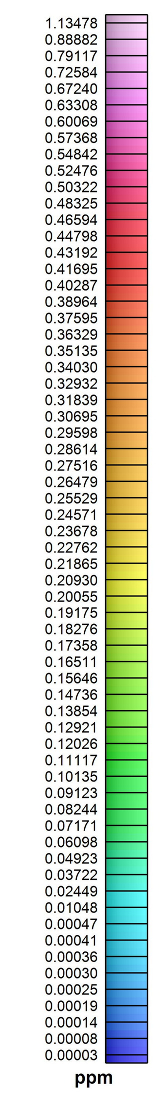
AIRBORNE GEOPHYSICAL SURVEY OF THE BURIN PENINSULA REGION, NEWFOUNDLAND

NTS MAP AREAS
1L/13, 1L/14, 1M/03 AND 1M/04

EQUIVALENT URANIUM

MAP 2022-07
OPEN FILE NFLD/3402
Map 7 of 26

G.J. Kilfoil



ABOUT THE SURVEY

Introduction
This quantitative gamma-ray spectrometric, aeromagnetic and VLF-Electromagnetic airborne geophysical survey of Burin Peninsula region, Newfoundland, was completed by Sander Geophysics Limited. The survey was flown from November 12th 2021 to March 29th, 2022 using a single Cessna 208 Caravan (C-GSGW). 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 differential GPS corrections using raw data recorded by Global Positioning Systems in the survey aircraft and at a static reference station.

Gamma-ray Spectrometric Data
The airborne gamma-ray measurements were made with a Sander Geophysics SGLSpec gamma-ray spectrometer using fifteen 102x102x406 mm NaI (Tl) crystals. The main detector array consisted of twelve crystals (total volume 50.4 litres). Three crystals (total volume 12.6 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. A small cesium source was used to supplement the responses of the three natural peaks for the upward-looking crystals.

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, Québec 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 determined from measured counts, having energies 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 19.20 m and a longitudinal dimension of 9.95 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 249 m for the date January 1st 2022 was then removed. Removal of the IGRF, representing the magnetic field of the Earth's core, yields a residual component related essentially to magnetizations within the Earth's crust. An enhanced version of the levelled magnetic data was calculated by leveraging lateral and longitudinal gradients to better define short wavelength signal, which was 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, combinations of Line and Ortho data from the VLF stations in Cutler, Maine (24.0 kHz), LaMoure, North Dakota (25.2 kHz) and Skelton, UK (22.1 kHz) provide complete coverage of the survey area for both Total and Quadrature representations of the VLF signal. Variation in signal quality from the different stations is apparent in the data as bands of more or 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 Industry, Energy and Technology.

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

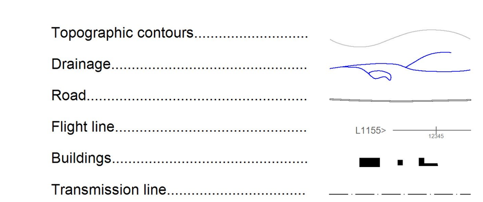
This map is subject to revision and modification. Comments to the author concerning errors or omissions are invited.

Department Website: https://www.gov.nl.ca/iet
Geological Survey website: https://www.gov.nl.ca/iet/mines/
E-mail: pub@gov.nl.ca

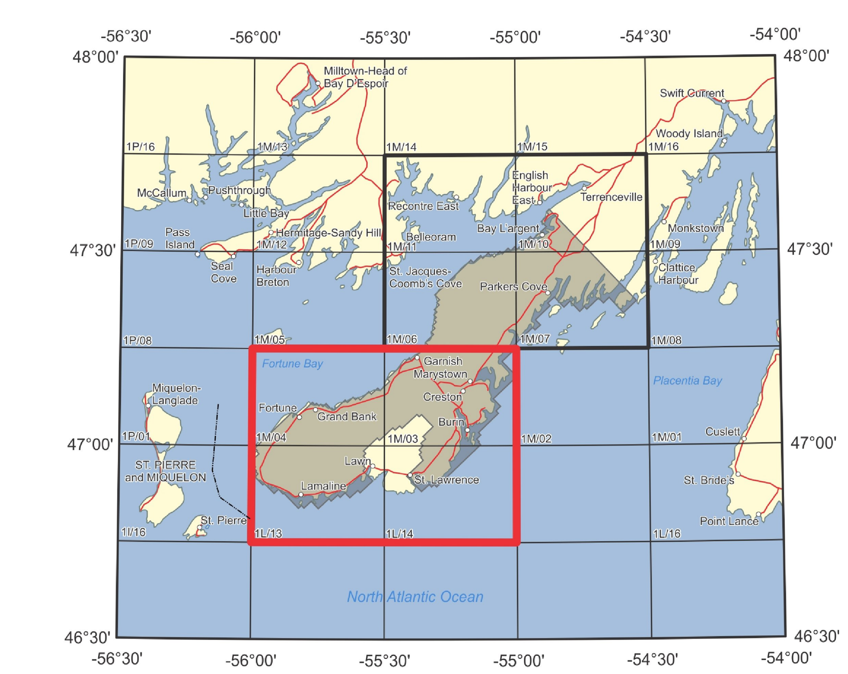
Reference

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

PLANIMETRIC SYMBOLS



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND GEOPHYSICAL MAP INDEX



LOCATION MAP

Recommended Citation
Kilfoil, G.J.
2022: Airborne Geophysical Survey of the Burin Peninsula region, Newfoundland (NTS Map Areas 1L/13, 1L/14, 1M/03 and 1M/04). Equivalent Uranium. Geological Survey, Department of Industry, Energy and Technology, Government of Newfoundland and Labrador, Map 2022-07; Open File NFLD/3402.