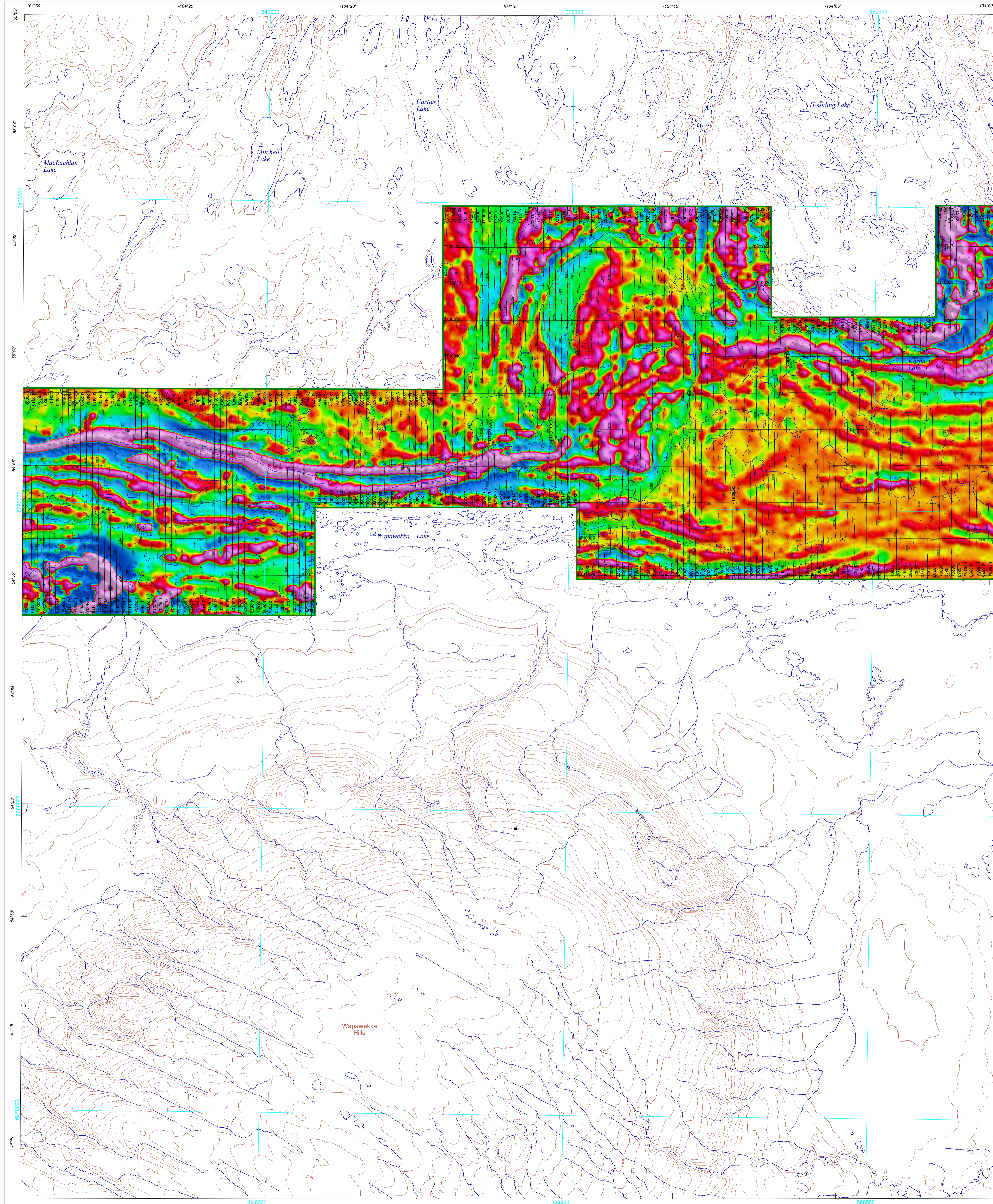




FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD



**Technical Information**

This map was compiled from data acquired during an airborne electromagnetic/magnetic survey carried out by Geotech Canada Inc. utilizing Geoscan's VTEM Max Time-Domain Electromagnetic (TDEM) system. The systems were mounted on two Eurocopter AS350 B3 helicopters (registration C-GTCD and C-GTCE) and the survey was carried out between December 15, 2019 and March 10, 2020. The helicopter flight altitude was maintained at an average ground clearance of 60 m, with an average speed of 90 km/h. Aircraft navigation used a Leica Novatel dual frequency GPS system. Post-flight differential corrections were applied to finalize the flight path position. A vertically mounted video camera was used to record images of the ground. The radar height was recorded ten times per second using a TRK3000 altimeter. The magnetic data were recorded 10 times per second using a Geometrics G-822A cesium magnetometer installed a 10 m below the helicopter.

**Electromagnetics**

The TDEM system operated at a base frequency of 30 Hz transmits a 7.0 ms half square signal from a 400-turn, 940 m<sup>2</sup> horizontal loop mounted approximately 48 m below and 6 m behind the helicopter. This configuration generates a peak dipole moment of 721,920 Am<sup>2</sup>. The response of conductors in the subsurface was recorded at 102 Hz with a sine waveform using a three-axis (X, Y and Z) electromagnetic receiver coincident with the transmitter loop (in-Loop Transmitter-Receiver). The EM receiver recorded data in a continuous stream for each of the three components. The EM receiver directly measures the change in the magnetic field with respect to time (dB/dt) from which the secondary magnetic field (B) is numerically integrated. High-pass background sections from at the start and end of each flight allowed a first-order removal of system drift.

**Apparent Conductivity**

The apparent conductivity values (mS/m) were derived from the electromagnetic decays using selected early channels 4 to 14 (0.021 - 0.096 ms), middle channels 15 to 30 (0.110 - 0.893 ms) and late channels 31 to 46 (1.010 - 8.083 ms) of the off-time signal. The nomogram indicates the correspondence between the value of dB/dt (nT/s) and halfspace conductivity. Forward time plate modeling is used to estimate the depth to the top of target (m) for the VTEM™ MAX TDEM system.

**Electromagnetic Decay Constant**

Decay constant (Tau) values were obtained by fitting the data from selected early channels 4 to 14 (0.021 - 0.096 ms), middle channels 15 to 30 (0.110 - 0.893 ms) and late channels 31 to 46 (1.010 - 8.083 ms) of the off-time signal to a single exponential. In semi-log space, the slope of this function will reflect the exponential decay rate of the transient field and, therefore, the strength of the conductivity. A slow rate of decay, reflecting a high conductivity, will be represented by a high conductivity value.

**Magnetics**

The magnetic field was sampled 10 times per second using a cesium vapour magnetometer (sensitivity = 0.021 nT) mounted on the EM transmitter loop. Differences in magnetic values at the intersections of control and traverse lines were analysed to obtain a mutually levelled set of flightline magnetic data. The levelled values were then interpolated to a 50 m grid. The International Geomagnetic Reference Field (IGRF) defined as a mean GRS altitudes (472 m) for a constant mid-survey date (January 15, 2020) was then removed. Removal of the IGRF, representing the magnetic field of Earth's core, produces a residual component related essentially to magnetizations within 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 geologic contacts at high magnetic latitudes (Hood, 1965). The first vertical derivative of the magnetic field was calculated using the fast Fourier transform on the gridded total magnetic field with a grid cell size of 50 m.**

**Availability**

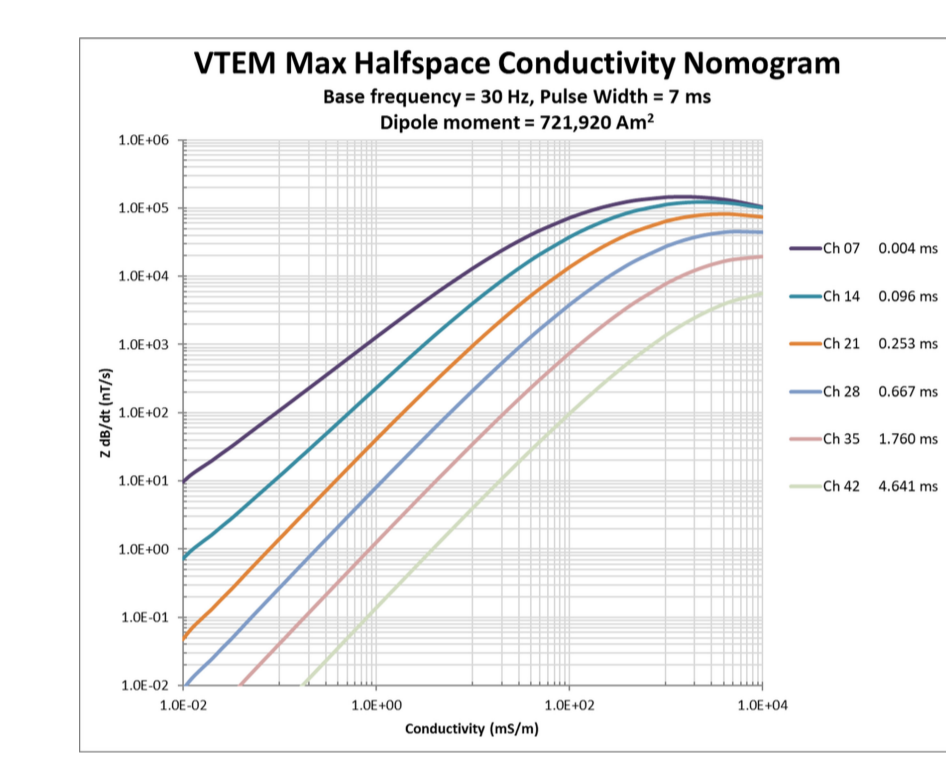
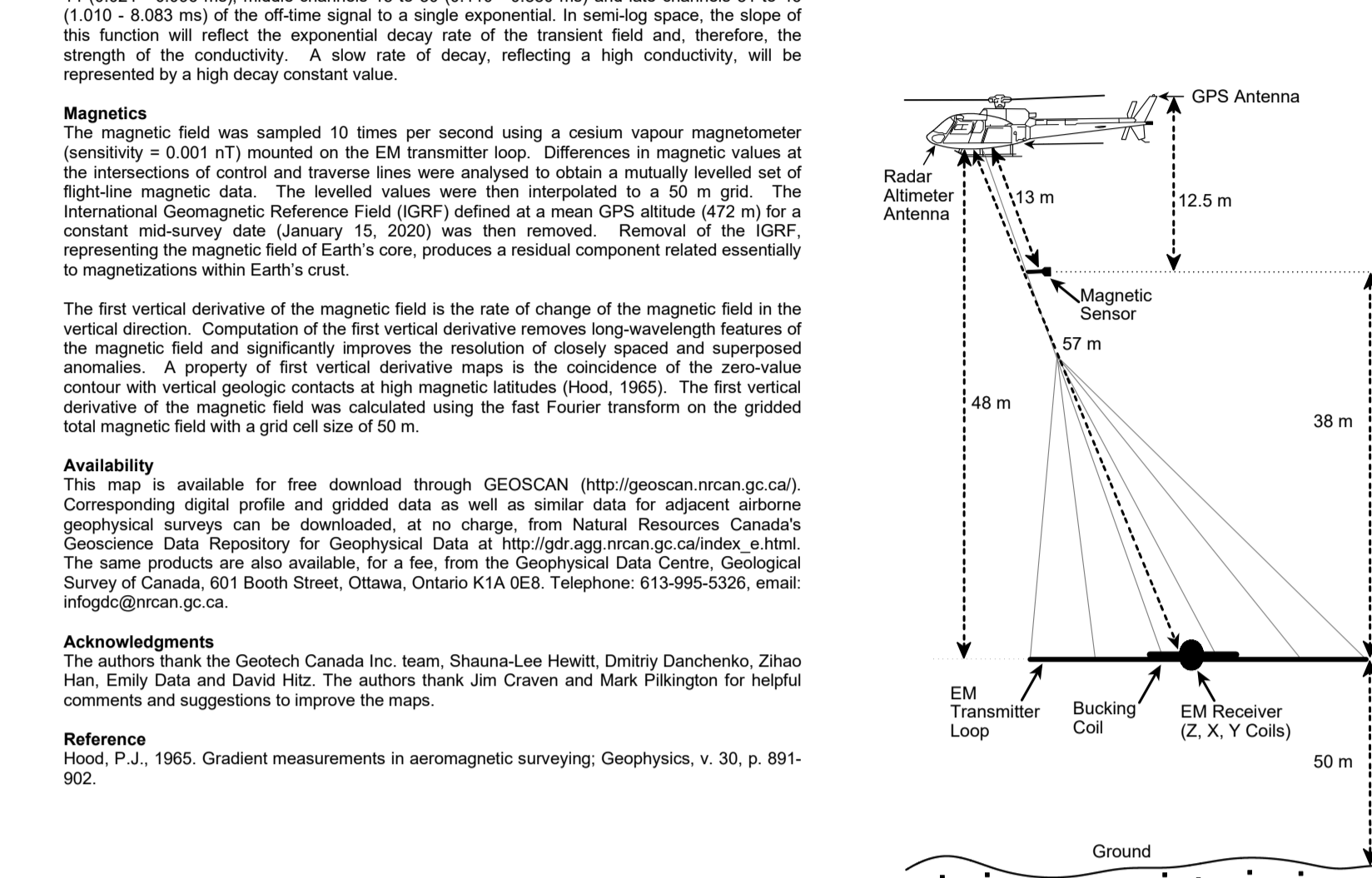
This map is available for free download through GEOSCAN (<http://geoscan.nrcan.gc.ca/>). Corresponding digital profile and gridded data as well as similar data for adjacent airborne geophysical surveys can be downloaded, at no charge, from Natural Resources Canada's Geoscience Data Repository for Geophysical Data at [http://geopage.nrcan.gc.ca/index\\_e.html](http://geopage.nrcan.gc.ca/index_e.html). The same products are also available, for a fee, from The Geophysical Data Centre, Geological Survey of Canada, 501 Booth Street, Ottawa, Ontario K1A 0E8. Telephone: 613-995-5326, email: [info@geoscan.gc.ca](mailto:info@geoscan.gc.ca).

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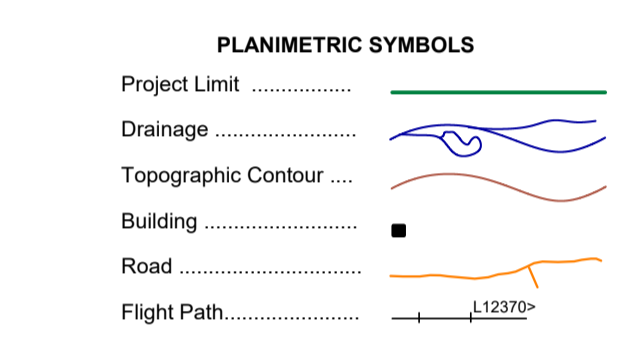
**Reference**

Hood, P.A., 1965. Gradient measurements in aeromagnetic surveying. *Geophysics*, v. 30, p. 891-902.

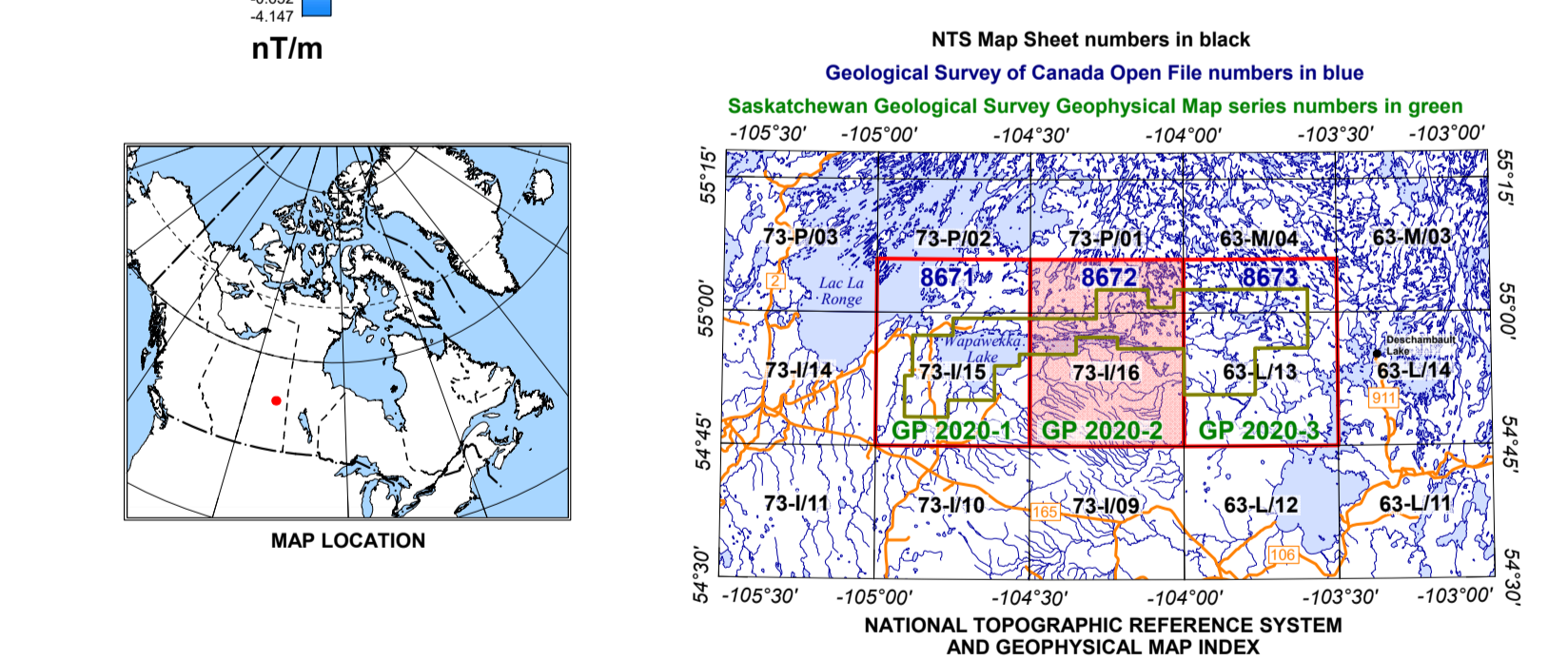


**MAP SHEET SUMMARY**

Sheet 1: Time Decay Constant (Tau-2) - Early Channels 4 to 14 (0.021 - 0.096 ms)  
 Sheet 2: Time Decay Constant (Tau-2) - Mid Channels 15 to 30 (0.110 - 0.893 ms)  
 Sheet 3: Time Decay Constant (Tau-2) - Late Channels 31 to 46 (1.010 - 8.083 ms)  
 Sheet 4: Apparent Conductivity - Early Channels 4 to 14 (0.021 - 0.096 ms)  
 Sheet 5: Apparent Conductivity - Mid Channels 15 to 30 (0.110 - 0.893 ms)  
 Sheet 6: Apparent Conductivity - Late Channels 31 to 46 (1.010 - 8.083 ms)  
 Sheet 7: Residual Total Magnetic Field  
 Sheet 8: First Vertical Derivative of the Magnetic Field  
 Sheet 9: Interpretation



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**FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD**  
 Scale 1:50 000

Scale 1:50 000  
 Universal Transverse Mercator Projection  
 World Geodetic System 1984  
 © Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources, 2020  
 Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications  
 Elevations in metres above sea level

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