

This map was compiled from data acquired during an airborne electromagnetic/magnetic survey carried out by Geotech Ltd. utilizing a VTEM Plus™ Time-Domain Electromagnetic (registration C-FVTM) and was carried out between March 31 and June 21, 2016. The helicopter flight altitude was maintained at an average ground clearance of 132 m with an 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 Terra altimeter and the pressure transducter. The magnetic gradient data were recorded 10 times per second

Magnetic sensor nominal clearance 108 m using two Geometrics G822-A cesium magnetometers separated by 12.5 m.

The TDEM system operating at a base frequency of 30 Hz transmits a 5.41 ms square

Electromagnetic System Specifications: signal from a four-turn, 531 m<sup>2</sup> horizontal loop mounted approximately 31.0 m below and 28 m behind the helicopter. This configuration generates a dipole moment of 470 000 Am<sup>2</sup>. The response of conductors in the subsurface is recorded at 192 kHz over the entire waveform using a three axis (X, Y and Z) electromagnetic receiver coincident with the transmitter loop (In-Loop Transmitter-Receiver). The EM system records 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 total magnetic field (B) is numerically integrated. High-altitude background

using selected early channels 4 to 14 (0.018 ms to 0.103 ms), middle channels 15 to 30 (0.103 ms to 0.945 ms) and late channels 31 to 46 (0.945 ms - 8.685 ms) of the off-time signal. The algorithm is based on the scheme of the apparent resistivity transform of Meju (1998) and the time domain electromagnetic response from the conductive half-space. The software was developed by Geotech Ltd. and depth calibrated based on forward plate modelling for the VTEM system configuration. The nomogram indicates the

conductivities. Electromagnetic Decay Constant Decay constant (Tau) values are obtained by fitting the data from selected early channels 4 to 14 (0.018 ms to 0.103 ms), middle channels 15 to 30 (0.103 ms to 0.945 ms) and late channels 31 to 46 (0.945 ms - 8.685 ms) of the off-time signal to a single exponential. In semi-log space, the slope of this function will reflect the exponential decay

(IGRF) defined at a mean GPS altitude (1375 m) for a constant mid-survey date (May 11, 2016) was then removed. Removal of the IGRF, representing the magnetic field of

Digital versions of this map are 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

Mines and Resources, Government of Yukon, P.O. Box 2703 (K-102), Whitehorse, Yukon, Y1A 2C6. Telephone: (867) 667-3201, email: geology@gov.yk.ca, website: http://www.geology.gov.yk.ca. Acknowledgments:

(TDEM) system. The system was mounted on a Eurocopter AS350 B3 helicopter average speed of 95 km/h. Aircraft navigation used a 12-channel NovaTel dual frequency GPS. Post-flight differential corrections were applied to finalize flight path barometric altitude was recorded five times per second using a Honeywell precision

Survey Area Parameters:

Aircraft average clearance

Transmitter Pulse width

Transmitter Loop diameter

Fransmitter Current

1<sup>st</sup> off-time Z channel

Transmitter Area/Effective Area 530.9 m<sup>2</sup> / 2123.7 m<sup>2</sup>

Dipole moment (approximately) 470 00 Am<sup>2</sup> (4 turns)

0.32 m (245 turns)

Channel 4 at ~0.021 ms

after pulse turn off

EM transmitter nominal clearance

sections flown at the start and end of each flight allow a 1st-order removal of system drift. The apparent conductivity values (mS/m) were derived from the electromagnetic decays

Windowed data sampling rate

correspondence between the amplitude of the signal Z dB/dt (nT/s) and the half-space Digital recording

decay, reflecting a high conductivity, will be represented by a high decay constant value. The magnetic field was sampled 10 times per second using a cesium vapour magnetometer (sensitivity = 0.005 nT) mounted 7 m above the EM transmitter loop.

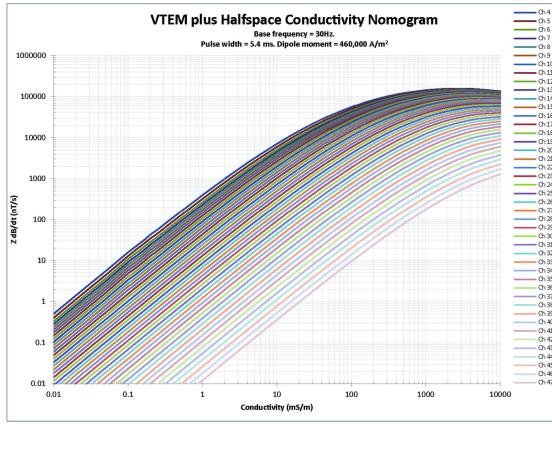
Antenna Differences in magnetic values at the intersections of control and traverse lines were analysed to obtain a mutually levelled set of flight-line magnetic data. The levelled values were then interpolated to a 50 m grid. The International Geomagnetic Reference Field

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 longwavelength 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). 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.

http://gdr.agg.nrcan.gc.ca/index\_e.html. The same products are also available, for a fee, from the Geophysical Data Centre, Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario K1A 0E8. Telephone: (613) 995-5326, email: <a href="mailto:infogdc@nrcan.gc.ca">infogdc@nrcan.gc.ca</a>. Copies of this map may also be obtained from the Yukon Geological Survey, Energy,

The authors thank the Geotech Ltd. field crew, Geoffrey Plastow and Tanya Nagowski for their cooperation. We thank Douglas Oneschuk (GSC) for his cartographic design expertise. The authors thank Warner Miles and Mark Pilkington for helpful comments and suggestions to improve the maps.

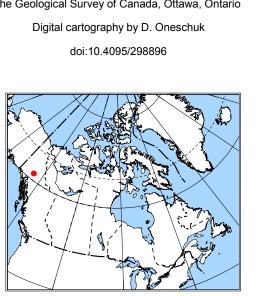
Hood, P.J., 1965. Gradient measurements in aeromagnetic surveying; Geophysics, v. 30, Meju, M.A., 1998. A simple method of transient electromagnetic data analysis; Geophysics, v. 63, p. 405-410.

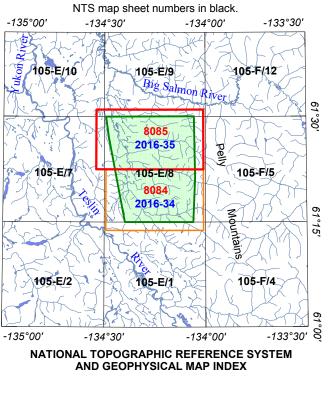


PLANIMETRIC SYMBOLS Topographic Contours .... (Contour Interval = 20 m)

Sheet 1: Time Decay Constant (Tau-Z) – Early Channels 4 - 14 (0.018 ms - 0.103 ms) Sheet 2: Time Decay Constant (Tau-Z) – Mid Channels 15 - 30 (0.103 ms - 0.945 ms) Sheet 3: Time Decay Constant (Tau-Z) – Late Channels 31 - 46 (0.945 ms - 8.685 ms) Sheet 4: Apparent Conductivity – Early Channels 4 - 14 (0.018 ms - 0.103 ms) Sheet 5: Apparent Conductivity – Mid Channels 15 - 30 (0.103 ms - 0.945 ms) Sheet 6: Apparent Conductivity – Late Channels 31 - 46 (0.945 ms - 8.685 ms) Sheet 7: Residual Total Magnetic Field
Sheet 8: First Vertical Derivative of the Magnetic Field Sheet 9: Electromagnetic Interpretation

Authors: O. Boulanger, F. Kiss and M. Coyle Data acquisition and data compilation by Geotech Limited, Aurora, Ontario Contract by Yukon Geological Survey, Whitehorse, Yukon, and project management and map production by the Geological Survey of Canada, Ottawa, Ontario





GSC open file numbers in red. YGS open file numbers in blue.

GSC OPEN FILE 8085 / YGS OPEN FILE 2016-35 ELECTROMAGNETIC SURVEY OF THE LIVINGSTONE CREEK AREA YUKON Parts of NTS 105-E/7, 8, 9 and 10

TIME DECAY CONSTANT (TAU-Z)
MID CHANNELS 15 - 30 (0.103 ms - 0.945 ms)

Map projection Universal Transverse Mercator, zone 8. World Geodetic System 1984
© Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources, 2016
Topographic data from Natural Resources Canada
Contour interval 20 metres

OPEN FILE / DOSSIER PUBLIC

Publications in this series have not been edited; they are released as submitted by the author GEOLOGICAL SURVEY OF CANADA COMMISSION GÉOLOGIQUE DU CANADA série ne sont pas révisées; elles sont publiées telles elles sont publiées telles 2016 que soumises par l'auteur. Sheet 2 of 9 / Feuillet 2 de 9

**OPEN FILE / DOSSIER PUBLIC** YUKON GEOLOGICAL SURVEY COMMISSION GÉOLOGIQUE DU YUKON 2016 Sheet 2 of 9 / Feuillet 2 de 9

The Livingstone Creek electromagnetic survey was conceived and funded by the Yukon Geological Survey (YGS), which gratefully acknowledges the Strategic Initiatives in Northern Economic Development Program of Northern Economic Development Canada as the source of funding. Natural Resources Canada generously provided survey oversight and data processing and produced the maps as part of the Geo-mapping for Energy and Minerals (GEM) Program of the Earth Sciences Sector, Natural Resources Canada, efforts for which YGS is sincerely appreciative.

Recommended citation
Boulanger, O., Kiss, F. and Coyle, M., 2016.
Electromagnetic Survey of the Livingstone Creek Area, Yukon, Parts of NTS 105-E/7, 8, 9 and 10;
Geological Survey of Canada, Open File 8085;
Yukon Geological Survey Open File 2016-35;
Scale 1:20 000. doi:10.4095/298896