**Survey and Grid Type Descriptions**

**Electromagnetic and Magnetic Airborne Geophysical Survey Data Compilation**

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**Note: These descriptions appear on several map products**

**Date: 2016-11-07**

Yukon Crossing:

DESCRIPTIVE NOTES

This map was derived from data acquired during a CGG RESOLVE electromagnetic and magnetic survey carried out by CGG Canada Services Ltd. The survey was flown from February 20 to March 18, 2016 using an AS350-B2 Écureuil (Squirrel) helicopter (registration N567NA), flown at a mean terrain clearance of 60 metres. The electromagnetic and magnetic data were recorded at 10 Hz using a RESOLVE electromagnetic (EM) system and a Scintrex cesium magnetometer mounted in the EM bird. The EM and magnetic sensors were flown at an optimal height of 30 metres. Positioning data were recorded at 2 Hz using Novatel OEM4 Global Positioning System located in both the helicopter and the EM bird. Final flight path was obtained using post-flight differential positioning to a relative accuracy of better than 5 metres. Additional equipment on board the helicopter included a radar altimeter, 50/60 Hz monitors and a video camera. Ground based systems included Scintrex CS3 and GEM Systems GSM-19 magnetometers and a Novatel OEMSTAR GPS receiver.

Traverse lines were flown approximately north/south (002°/182°) at a line spacing of 400 metres for the main block and 80 metres for the infill block. Tie lines were flown east/west (092°/272°) with variable line spacing.

Goldstream main Block

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Traverse lines were flown approximately northeast/southwest (055°/235°) at a line spacing of 200 metres for the main block and infill lines were flown in two blocks for a final line spacing of 100 metres in these areas. Tie lines were flown northwest/southeast (145°/325°) with variable line spacing.

Yukon Crossing to Fox Ferry Line

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One 127 kilometre line was flown as the system was ferried between the Yukon Crossing and Goldstream survey blocks. It was flown at survey height, southwest (137°) from the Yukon Crossing block to the Goldstream base of operations at Fox.

Western Yukon Flats:

DESCRIPTIVE NOTES

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Sixteen lines were flown at variable line direction and spacing to provide coverage and information across the Western Yukon Flats area, situated to the northeast of the Yukon Crossing survey block.

Yukon Crossing:

SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS) and CGG Canada Services Ltd.

The survey was funded by the Alaska Department of Transportation & Public Facilities as part of U.S. Department of Transportation Federal Highway Administration Project 0653(8), State Project 60878.

DGGS acknowledges technical support provided by staff from the Alaska Department of Transportation & Public Facilities and by scientists from the U.S. Geological Survey Crustal Geophysics and Geochemistry Science Center, Denver, Colorado

All data and maps produced from this survey are available for download from the DGGS website (<http://dggs.alaska.gov>). Digital products and paper maps are also available from the DGGS office, 3354 College Road, Fairbanks, Alaska, 99709-3307 (phone 907-451-5010; email: [dggspubs@alaska.gov](file:///D%3A%5CPROJECTS%5C501291_BU1%5CFinal%20Archive%5C2017-02-01%5Cdggspubs%40alaska.gov)).

GoldStream, Yukon Crossing to Fox (ferry line) and Western Yukon Flats:

SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS) and CGG Canada Services Ltd.

The survey was funded by the National Science Foundation\* (NSF) as part of the Goldstream Valley Watershed Project with the University of Alaska Fairbanks Institute of Northern Engineering (INE) Water and Environmental Research Center (WERC).

*\*National Science Foundation, Office of Polar Programs, Arctic System Science Program, Award #1500931*

DGGS acknowledges technical support provided by scientists from University of Alaska Fairbanks and by scientists from the U.S. Geological Survey Crustal Geophysics and Geochemistry Science Center, Denver, Colorado

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RESISTIVITY

The RESOLVE EM system operates at six distinct frequencies, and measures the inphase and quadrature components at each frequency. Five coplanar coil-pairs operate at 400, 1800, 8200, 40,000 and 140,000 Hz, and one coaxial coil-pair operates at 3300 Hz. The EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and man-made cultural sources. Apparent resistivity is generated from the inphase and quadrature components for each frequency using the pseudo-layer half space model.

RESIDUAL MAGNETIC INTENSITY

The magnetic total field data were processed using digitally recorded data from a CGG D1344 base station magnetometer with a Scintrex CS3 cesium sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtraction of the base station magnetic data, (2) IGRF corrected (IGRF model 2010, updated for data of flight and altimeter variations) and (3) levelled using the tie line data.

FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a CGG D1344 base station magnetometer with a Scintrex CS3 cesium sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtraction of the base station magnetic data, (2) IGRF corrected (IGRF model 2010, updated for data of flight and altimeter variations) and (3) levelled using the tie line data. The first vertical derivative grid was calculated from the processed residual magnetic intensity grid using an FFT base frequency domain filtering algorithm. The resulting first vertical derivative grid provides better definition and resolution of near-surface magnetic units and helps to identify weak magnetic features that may not be evident in the residual magnetic data.

ANALYTIC SIGNAL

Analytic signal is the total amplitude of all directions of magnetic gradient calculated from the sum of the squares of the three orthogonal gradients. Mapped highs in the calculated analytic signal of the magnetic parameter locate the anomalous source edges and corners (such as contacts, fault/shear zones, etc.). Analytic signal enhances the source edges regardless of structural dip and independent of the direction of the induced and/or remanent magnetization.