

QUEST-West Geophysics in Central British Columbia (NTS 093E, F, G, K, L, M, N, 103I): New Regional Gravity and Helicopter-Borne Time-Domain Electromagnetic Data

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Introduction

Geoscience BC's 2008 QUEST-West Project continues the successful 2007 QUEST program. The survey area adjoins the QUEST area, and extends westward past Terrace and Kitimat (Figure 1). Similar to the QUEST Project, the QUEST-West Project combines airborne geophysical surveys with new regional geochemical data, providing new geoscience datasets that will help uncover the significant mineral potential of central British Columbia. This paper describes the new regional geophysical data acquired in the QUEST-West Project, comprising an airborne gravity survey and a helicopter-borne time-domain electromagnetic survey (Figure 2). The QUEST-West geochemical survey and other projects in the QUEST-West project area are described in other papers in this volume, particularly Jackaman et al. (2008). Funding partners on this project include Geoscience BC, Northern Development Initiative Trust, Regional District of Bulkley-Nechako, Regional District of Kitimat-Stikine and BC Ministry of Energy, Mines and Petroleum Resources.

The QUEST-West airborne gravity survey was released in November 2008 as Geoscience BC Report 2008-10 (for technical details, *see* Sander Geophysics Limited, 2008b), extending westward from the QUEST project area (Figure 3; Barnett and Kowalczyk, 2008). This new gravity dataset joins seamlessly with the 2007 QUEST gravity data (Geoscience BC Report 2008-8; for technical details, *see* Sander Geophysics Limited, 2008a) and the 2008 Natural Resources Canada Nechako Basin gravity data releases (Dumont, 2008a–d). It provides new high-quality data to assist in the identification of regional mineralizing controls and help the mapping of geology beneath cover, and complements the existing aeromagnetic data, geological mapping and new geochemical data (Jackaman et al, 2008). As the dataset crosses two UTM zones, the grids and point data are currently available from the Geoscience BC website in

UTM zone 9 WGS84, UTM zone 10 WGS84, and in the BC Albers projection to accommodate usage in different projections. The survey was flown by Sanders Geophysics Limited using their Airborne Inertially Referenced Gravitometer (AIRGrav™; Sander et al., 2004) and comprises 25 500 line-kilometres (line-km) of new airborne gravity data.

New helicopter-borne time-domain electromagnetic (TEM) data were also acquired over the QUEST-West area (Sattel, 2006). The survey was flown by Aeroquest Limited, using their Aerotem™ III system, with more than 12 900 line-km of helicopter TEM data acquired at a 4 km line spacing (Figure 4). These data complement the airborne gravity data and the existing regional aeromagnetic data. The survey was not intended to prospect for new mineral deposits, but rather to map the regional geological response (i.e., depth of overburden, regional geological bedrock features and throughgoing regional structures). The survey results will assist geological mapping and provide context for exploration projects in the area. Geoscience BC also commissioned detailed helicopter TEM surveys over six known deposits in the QUEST-West area: Morrison, Bell, Granisle, Equity Silver, Endako and Huckleberry (MINFILE 093M 007, 093M 001, 093L 146, 093L 001, 093K 006 and 093E 037; MINFILE, 2008). These case studies will provide useful information to companies planning exploration projects in the QUEST-West and surrounding areas. The QUEST-West helicopter TEM data are expected to be released at Roundup 2009.

Both the airborne gravity data and the helicopter-borne TEM survey were acquired with state-of-the-art, fully calibrated digital systems. The data are of high quality and are amenable to, and intended for, digital processing using inversion methods to produce maps of inferred depth of bedrock, overburden thickness and conductivity, and basement conductivity. The new case-history TEM surveys carried out over particular deposits in the QUEST-West project area add to the orientation survey acquired over the Mount Milligan deposit and the detailed airborne gravity data acquired over the Mount Milligan, Gibraltar and Mount Polley deposits in 2007. This catalogue of deposit re-

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This publication is also available, free of charge, as colour digital files in Adobe Acrobat® PDF format from the Geoscience BC website: <http://www.geosciencebc.com/s/DataReleases.asp>.

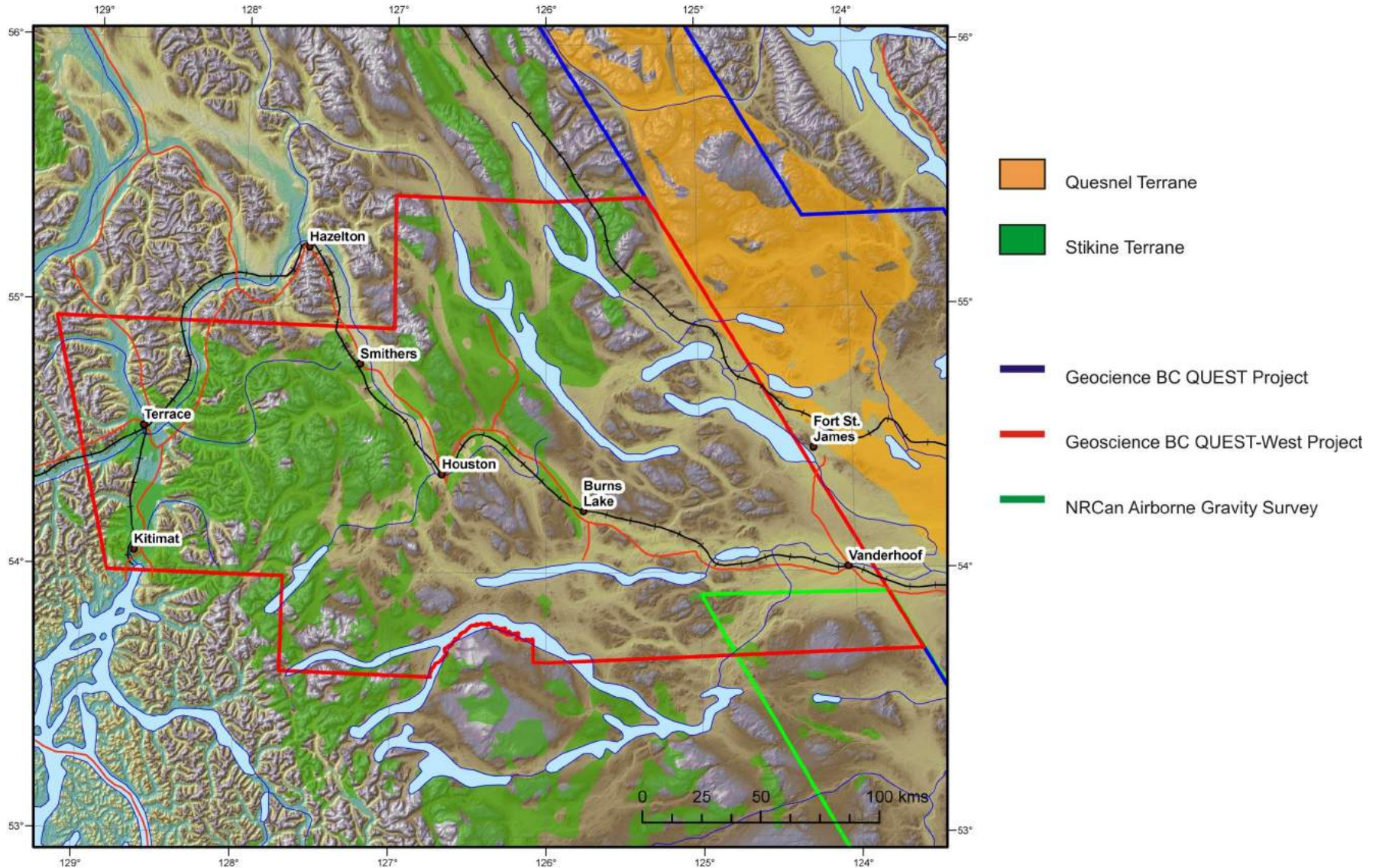


Figure 1. Outline of the Geoscience BC QUEST-West survey areas. The red line shows the limits of the airborne gravity survey, flown at a 2 km line spacing. The blue outline to the east shows the area of the adjoining QUEST survey. The red line shows the limits of the helicopter-borne electromagnetic survey flown at 4 km line spacing. The small parallelogram in the southeast corner represents the area covered by the Natural Resources Canada (NRCan) airborne gravity survey flown in 2007; the area within QUEST-West covered by this survey was excluded from the QUEST-West airborne gravity survey. The QUEST, QUEST-West and NRCan Nechako airborne gravity surveys were all flown to the same specifications and form a seamless, contiguous block of data. Digital elevation model prepared by K. Shimamura, Geological Survey of Canada–Vancouver.

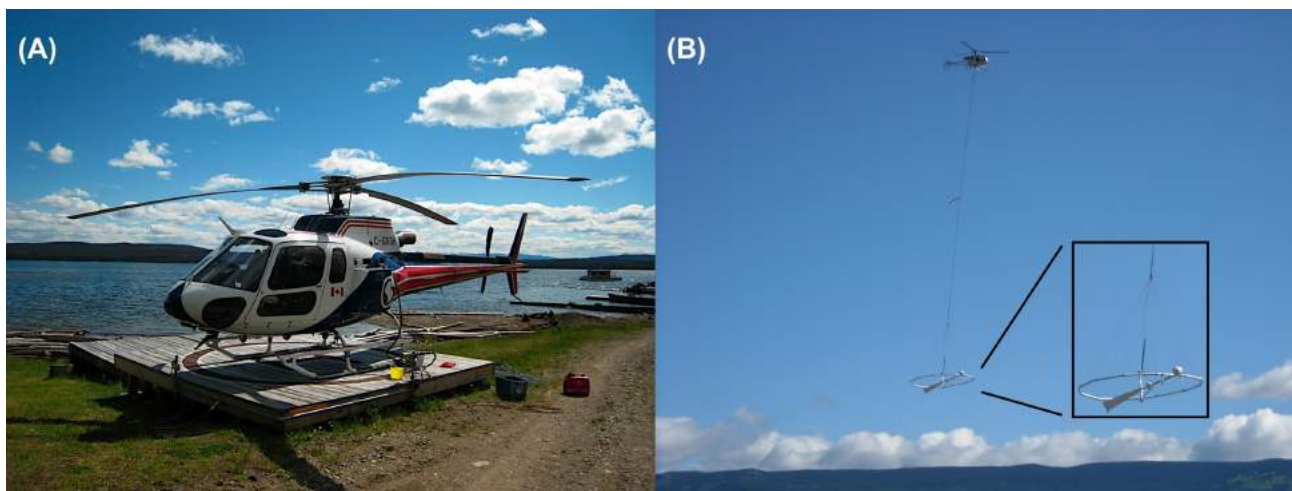


Figure 2. Flying operations during the gravity and electromagnetic surveys: A) helicopter used by Sander Geophysics Limited to acquire the airborne gravity data; Sander elected to fly the gravity survey using a helicopter instead of a fixed-wing aircraft to allow slower flight speeds and better adherence to a preprogrammed 'drape' surface; photo courtesy of O. Peterson, Sander Geophysics Limited; B) helicopter used by Aeroquest Limited, with the AeroTEM™ III system and magnetometer seen beneath the aircraft; inset shows the AeroTEM III transmitter and receiver coils in more detail; a Llama helicopter suitable for mountain flying was used by Aeroquest in the western parts of the survey area to allow better control of the system ground clearance; photo courtesy of Aeroquest Limited. These choices of aircraft improved the quality of the survey, particularly in the more rugged western part of the survey area.

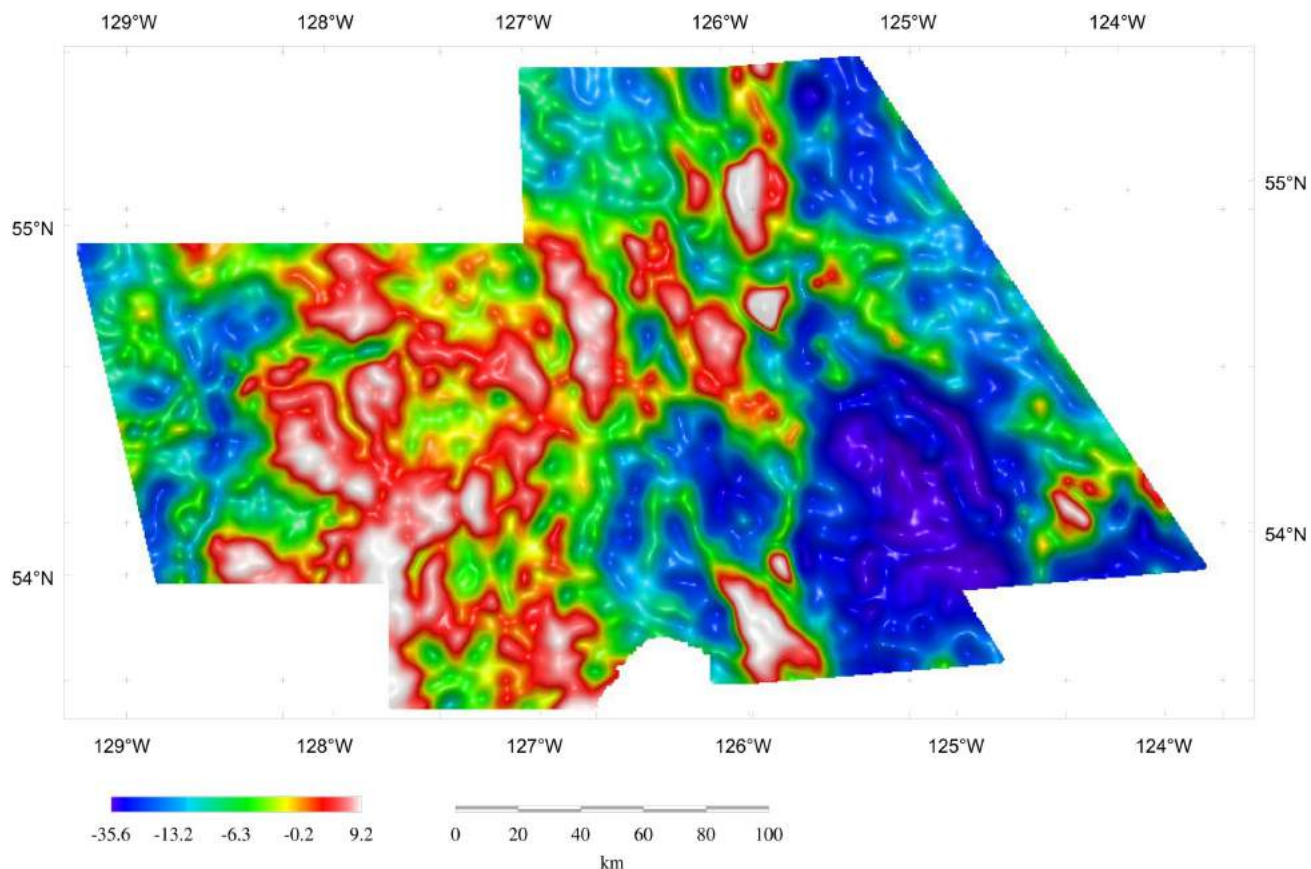


Figure 3. Sun-shadowed image of the 2008 QUEST-West airborne gravity results. Shown is the isostatically corrected Bouguer gravity image, smoothed with a 3 km filter. The flight lines are spaced 2 km apart and are aligned east-west in the UTM zone system. North-south tie lines were flown at 20 km spacing.

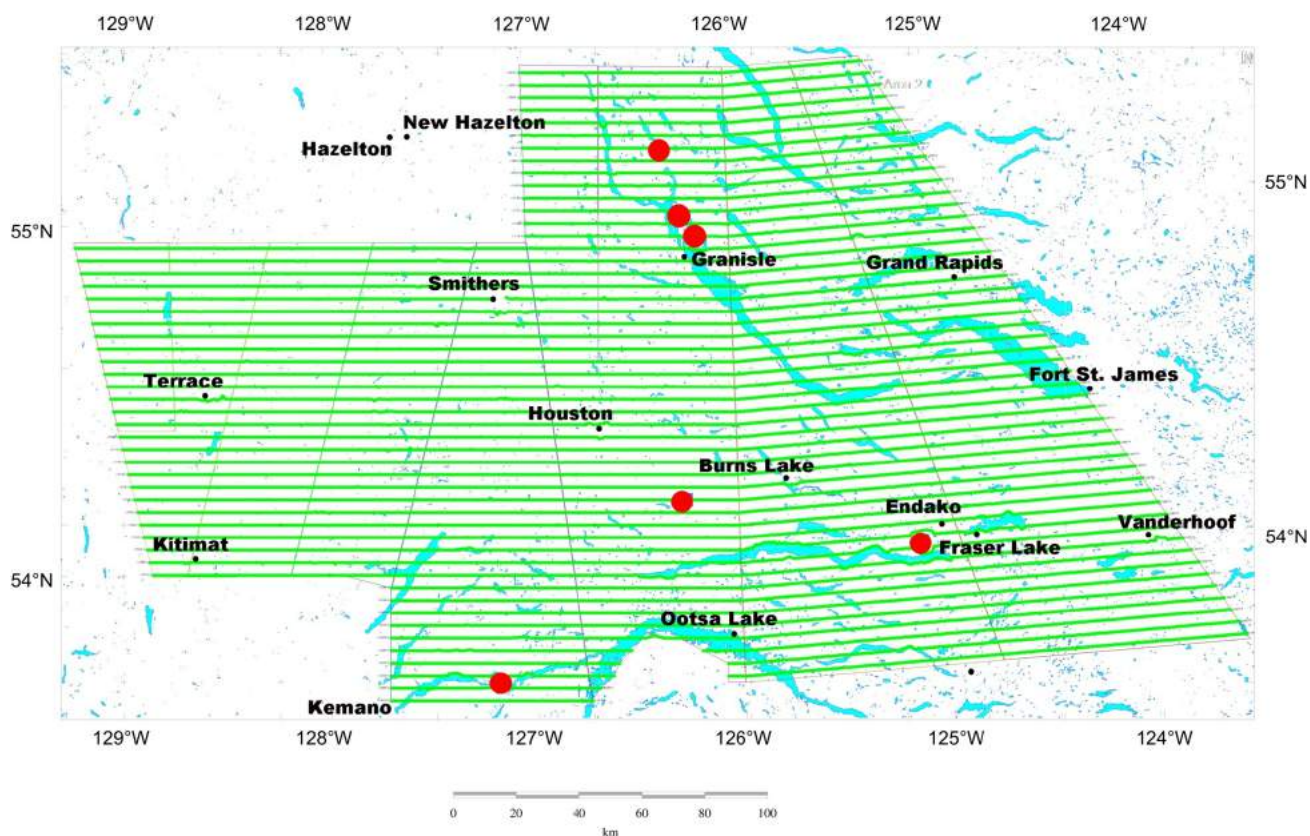


Figure 4. Helicopter-borne TEM survey lines in the QUEST-West project area. The six detailed surveys, marked with red dots, are (from north to south) the Morrison, Bell, Granisle, Equity, Endako and Huckleberry deposits. The regional flight lines are oriented east-west in the UTM co-ordinate system at 4 km spacing. The survey area crosses the boundary between UTM Zones 9 and 10 at latitude 126° W and the lines turn to accommodate the change in orientation of the UTM grid.

sponses will retain its value into the future as reference data sets for the exploration community.

The gravity and TEM flight lines have been selected so that the TEM data are acquired along alternate gravity flight lines. The lines follow even UTM northings, so their location is well defined and they can be used as reference lines for future infilling.

All QUEST-West data will be released through Geoscience BC's website at <http://www.geosciencebc.com/s/DataReleases.asp>.

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