Notice of the Final Oral Examination
for the Degree of Master of Science

of

LAURA PISIAK

BSc (University of Manitoba, 2011)

“Magnetite as an Indicator Mineral in Till: A Test Using the Mount Polley Porphyry Cu-Au Deposit, British Columbia”

School of Earth and Ocean Sciences

Monday, December 14, 2015
10:00 A.M.
Bob Wright Centre
Room A319

Supervisory Committee:
Dr. Dante Canil, School of Earth and Ocean Sciences, University of Victoria (Supervisor)
Dr. Laurence Coogan, School of Earth and Ocean Sciences, UVic (Member)
Dr. Stephen Rowins, School of Earth and Ocean Sciences, UVic (Member)

External Examiner:
Dr. Dan Marshall, Department of Earth Sciences, Simon Fraser University

Chair of Oral Examination:
Dr. Natia Frank, Department of Chemistry, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

In the Canadian Cordillera, Mesozoic calcalkaline and alkaline intrusive igneous rocks that are prospective for hosting porphyry Cu-Au mineralization may be overlain by thick glacial overburden. Previous studies have shown that magnetite from ore deposits has a unique trace element signature that differs from magnetite in common igneous or metamorphic rocks. This study investigated if the composition of ore-related magnetite in till could provide a unique exploration tool to locate porphyry deposits in glaciated terrain. Bulk till samples were collected over an area of ~700 km² surrounding the Mount Polley porphyry Cu-Au deposit, south-central British Columbia. Twenty elements were measured by LA-ICP-MS in ~50 detrital magnetite grains in each of 20 till samples. Previously proposed discrimination diagrams are proven to be of limited use in correctly identifying ore-related magnetite. Therefore, linear discriminant analysis (LDA) was performed on a compiled dataset of magnetite compositions from various porphyry deposits and intrusive igneous rocks in order to rigorously redefine the chemical signature of hydrothermal magnetite from porphyry systems. Application of the LDA models to magnetite in till found that the dispersal of hydrothermal grains from Mount Polley is coincident with the deposit and the interpreted ice-flow history. Anomalous concentrations of hydrothermal magnetite grains in till are detected up to 2.5 km west-southwest and 4 km northwest of the deposit, indicating that magnetite has a strong potential to be an effective indicator in mineral exploration for porphyry systems.