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Universities Attended:

National Polytechnic Institute (2018)
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Conferences:

Jimenez-Gonzalez, J., Lentz, D.R., and Walker, J.A., 2019. Chemostratigraphic correlation between drill cores S362 and S916, Heath Steele E zone, New Brunswick, Canada. *In* Abstracts 2019: Exploration, Mining and Petroleum New Brunswick. *Edited by* E.A. Keith. New Brunswick Department of Natural Resources and Energy Development, Geoscience Report 2019-1, p. 11.

Jimenez-Gonzalez, J., Lentz, D.R., Walker J.A., 2019. Summer Fieldwork in Heath Steele E Zone Area, Bathurst Mining Camp, New Brunswick. *In* Geoscience Project Summaries and Other Activities 2019. *Edited by* E.A. Keith. New Brunswick Department of Energy and Resource Development, Information Circular 2019-1, p. 49-53.

Jimenez-Gonzalez, J., Lentz, D.R., Walker J.A., and Day, J.J., 2019. Advances in the Lithogeochemical Study of Drill Core from the Heath Steele E-Zone, Bathurst Mining Camp, New Brunswick. Geological Association of Canada-Mineralogical Association of Canada, Volume of Abstracts, vol. 42, p. 117.

Jimenez-Gonzalez, J., Lentz, D.R., Walker J.A., and Day, J.J., 2019. Chemostratigraphic Assessment of Drill Core S916 from the Heath Steele E Zone, Bathurst Mining Camp, New Brunswick. Atlantic Geoscience Society, vol. 55, p. 182.

Jimenez-Gonzalez, J., Lentz, D.R., Walker J.A., 2018. Lithogeochemical data from drill core S-916, the Heath Steele E Zone, Bathurst Mining Camp, New Brunswick: A preliminary pXRF analysis. *In* Abstracts 2018: Exploration, Mining and Petroleum New Brunswick. *Edited by* E.A. Keith. New Brunswick Department of Energy and Resource Development, Geoscience Report 2018-1, p. 14.

Lithogeochemical Analysis of the Heath Steele E Zone Volcanogenic Massive Sulphide Deposit, Bathurst Mining Camp, New Brunswick

UNIVERSITY OF NEW BRUNSWICK
THESIS DEFENCE AND EXAMINATION

in Partial Fulfillment

of the Requirement for the Degree of
Master of Science

by

Josue Jimenez-Gonzalez

in the Department of Earth Science

U.N.B., Fredericton, N.B.

Monday, August 17th, 2020
11:00 a.m.

Via MS TEAMS

Examining Committee

Dr. David Lentz	Supervisor
Dr. Bruce Broster	Internal Examiner
Dr. Michelle Gray	External Examiner
Dr. Joseph C. White	Chair of Oral Examination

Abstract

The Heath Steele E zone Zn-Pb-Cu-Ag volcanogenic massive sulphide deposit lies in the Heath Steele belt in the Bathurst Mining Camp, northeast New Brunswick. The Heath Steele E zone deposit is hosted mainly by felsic volcanic and related volcano-sedimentary rocks of the Nepisiguit Falls Formation (Tetagouche Group), which were deposited in the Tetagouche-Exploits back arc basin in the Middle Ordovician. The host sequence is affected by locally intense, deposit-related hydrothermal alteration, and polyphase deformation and mid- to upper-greenschist grade regional metamorphism related to inclusion of the host sequence in the Brunswick Subduction Complex.

Numerous geological events have affected the E zone deposit and the host rocks, which have complicated any interpretation of a proper stratigraphic interpretation in the area. Furthermore the similarity among the various volcano-sedimentary units precludes confident unit correlation among adjacent drill cores on the basis of macro-scale observations alone. For this reason, chemostratigraphy is employed to discriminate among the various volcano-sedimentary units, and for assessment of deposit related hydrothermal alteration using a portable X-ray fluorescence spectrometry (pXRF) as the main tool. The pXRF is a useful analytical tool for acquiring high-quality results in real time with a level of resolution that surpasses most other techniques, thereby providing at least 30 potential variables for use in chemostratigraphic characterization and correlation.

The pXRF analysis of eight drill cores of the study area allows: 1) the construction of discrimination diagrams that show that the host felsic volcanic rocks in the E zone deposit are rhyodacite/dacite and rhyolite with a tholeiitic magmatic affinity; consistent with an intracontinental back arc environment, 2) the identification of geochemically distinct rock units In this case, a clear difference between structural hanging wall and footwall was recognized, and 3) qualitative characterization of hydrothermal alteration in the footwall (mainly chlorite-carbonate and chlorite-pyrite-sericite assemblage) and in the hanging wall (K-feldspar-sericite and sericite-chlorite-pyrite assemblage).