Mineralogical and Geochemical vectors to ore zones: a case study of the Canadian Malartic
gold deposit footprint, Québec

N Gaillard ¹, AE Williams-Jones ¹, S Salvi ², JR Clark ¹, P Lypaczewski ³, S Perrouty ⁴

¹ Department of Earth and Planetary Sciences, McGill University, Montréal, Québec, 
nicolas.gaillard@mail.mcgill.ca
² GET, CNRS, Université de Toulouse, Toulouse, France
³ Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Alberta
⁴ Department of Earth Sciences, University of Western Ontario, London, Ontario

Canadian Malartic represents an important example of a large-tonnage, low-grade gold deposit in
the southern Superior Province. It is located in the Pontiac Subprovince, in contact with, and
immediately south of the east-west trending Cadillac-Larder Lake fault zone, marking the
contact with the Abitibi Subprovince. Most gold deposits in the Abitibi Greenstone Belt are of
orogenic type and are typically associated with quartz-carbonate veins and albite-carbonate
alteration. Canadian Malartic contrasts with these deposits in that the gold is disseminated in
potassically altered (pyrite-K-feldspar-biotite-calcite) quartz monzodiorite porphyries and
adjacent clastic metasedimentary rocks. Mineralization is associated with quartz-biotite-
carbonate-microcline±pyrite veinlets with potassic (biotite, K-feldspar) and pyritic alteration
haloes, and is distributed as elongated, lens-shaped orebodies, strongly controlled by faults and
lithological contacts. Hydrothermal alteration in clastic metasediments was accompanied by
mass gains in S, LOI and K, consistent with the mineralogical characteristics of the alteration
assemblage. Gold mineralization in metagreywacke is associated with substantial mass gains in
Ag-Te-Bi-Mo-Pb-W. These observations can be used to trace the extent of the ore deposit
footprint and provide vectors towards mineralization. Core-logging, whole-rock geochemistry as
well as variation in gold concentrations show that the intensity of hydrothermal alteration
decreases sharply away from the deposit. Biotite compositions are a potentially valuable
footprinting tool to identify directional vectors toward mineralization, as they show significant
increases in fluorine and magnesium concentrations from distal unaltered rocks toward the ore
shell. Preliminary results indicate that the visible alteration halo (e.g., pyritisation, carbonation or
potassic alteration) does not extend more than 500 meters from the southern limit of the pit.

CMIC-NSERC Exploration Footprints Network Contribution 040.