



SGH – Soil Gas Hydrocarbons

“As exploration maturity increases, mining companies are faced with the challenge of exploring more and more in areas of transported cover where traditional geochemical methods are less effective. In order to deal with this cover, government, industry and academic institutions have invested heavily in developing airborne and ground geophysical methods to see through the exotic overburden. Unfortunately, geochemical exploration has not evolved as rapidly, despite the availability of a wide range of partial and selective extractions provided by the commercial laboratories. Reasons for this are varied and range from a general lack of understanding by the exploration community of the use and interpretation of these methods to skepticism about their effectiveness. It is only through well documented, nonbiased, comparative field testing of these methods that the exploration community can gain the knowledge and confidence to apply deep-penetrating geochemistry (DPG) to routine exploration programs.”

David Heberlein M.Sc., P.Geo.

“This study and others that have preceded it (Cook and Dunn, 2007; Lett and Sandwith, 2008) provide the exploration geologist with the knowledge and tools necessary to make an informed decision and therefore to maximize the benefit of their investment in geochemistry.”

David Heberlein M.Sc., P.Geo.

These are two excerpts from a Geoscience BC funded project (Project 2009-19) carried out by **David Heberlein of Heberlein Geoconsulting in North Vancouver**, which compared geochemical exploration techniques performed by four different laboratories on samples taken from the Mt. Milligan area of north-central BC. Much of the central interior of British Columbia is covered by an extensive blanket of glacially derived sediments that completely mask the underlying bedrock. The Mt. Milligan area contains Copper-Gold porphyry mineralization through quaternary glaciofluvial sediments covered by significantly disturbed surficial soil. Exploration techniques investigated in this study included; aqua regia digestion, loss of ignition, fire assay, MMI, HCl extraction, supertrace gold analysis, cold aqua regia digestion, ionic leach, bioleach, enzyme leach and Soil Gas Hydrocarbons.

In summary, this study found that surface disturbance have significantly downgraded the effectiveness of most of the chemical extractions tested in this study. Nevertheless, results indicate that the Ah and upper B horizons are the most appropriate sample media and that aqua regia is the favoured digestion method, which is consistent with the outcomes of the Kwanika study. Poor element responses for just about all of the extraction methods are attributable to destruction of the soil profile over the mineralization. Nevertheless, SGH and the ratio of weak extraction Ca to aqua regia Ca accurately locate the position of the mineralization through the cover. Comparison of the results generated by each method demonstrated that the SGH technique and Aqua Regia method for Calcium were the most successful at locating the copper and gold mineralization deposits at Mt. Milligan. Inorganic extractions were particularly affected by the disturbances in the soil surface while Soil Gas Hydrocarbons was not.

Soil Gas Hydrocarbons (SGH) is a dual purpose, deep penetrating, organic based geochemistry that can vector to the location and provide a signature of the type of mineralization of a buried exploration target. It is a geochemistry that is able to be used for a variety of mineralogies such as Copper, Gold, Uranium, Nickel, VMS, SEDEX, Polymetallic, Rare Element Targets and Kimberlites. Note, in spite of the name, SGH does not measure any gaseous compounds in the suite of the 162 compounds measured, although these compounds may disperse through the overburden in a vapour or gaseous state. Although the name also indicates the analysis of soil samples, other sample matrices such as lake-bottom sediments, peat, humus and even snow samples have been successfully used on a routine basis. This is of great advantage in areas where samples can vary greatly. Thus, instead of missing valuable sample locations and their associated data, samples may be collected from dry and wet areas of soil, peat, humus, etc. which together may be used within the same grid or transect. SGH has also been shown to differentiate between barren and ore bearing conductors and has been linked to some geophysical surveys. Although successful with shallow targets, it is truly a deep penetrating geochemistry and has been able to detect the McArthur River Uranium deposit at over 700 metres in depth.

The general SGH templates that we have developed are applicable to a wide variety of lithology. As a couple of examples, our general Gold template for SGH has been successfully used for vein-hosted, porphyry, epithermal, and Carlin types of Gold deposition; our Uranium template has been used for unconformity style deposits in the Athabasca and Thelon basins, Roll Front deposits in Wyoming and Mongolia as well as Breccia pipe deposits in Northern Arizona.

Should the SGH Geochemistry be of interest to you, we can email you the latest presentation (NWOPA 2010, 2.2 megabytes or PDAC 2010, 4.5 megabytes) or alternatively we have a CD-ROM which also contains our latest in-depth information regarding sampling and sampling grid design that can be requested through Ms. Lisa Muha (LisaMuha@actlabs.com). If you have more immediate questions, please e-mail or call Mr. Dale Sutherland (dalesutherland@actlabs.com or 905-648-9611 x 114).